

POWER HEAD AND ROTARY DRILLING RIG

TECHNICAL FIELD

[0001] The present application relates to the technical field of rotary drilling rig, in particular, to a power head and a rotary drilling rig.

BACKGROUND

[0002] The rotary drilling rig is a kind of construction machinery suitable for hole-forming operations in building foundation projects. It is mainly suitable for the construction of soil layers such as sandy soil, cohesive soil and silty soil. It is widely used in cast-in-place pile, foundation reinforcement and other foundation construction.

[0003] The rotary drilling rig includes a power head, and the power head is used to apply torque to a drill pipe. Since the power head is exposed, the power head with a large volume is easily affected by various factors of the external environment and bumped by the construction materials on the construction site during construction work, so the construction efficiency is low, and it is necessary to reduce the volume of the power head as much as possible.

SUMMARY

[0004] Therefore, the technical problem to be solved by the present application is the problem that the overall volume of the power head in the prior art is relatively large, resulting in low construction efficiency, so a power head and a rotary drilling rig are provided.

[0005] In order to achieve the above purpose, an embodiment of the present application provides a power head, comprising: an installation box, provided with an installation cavity inside; the installation box being also provided with an opening communicating with the installation cavity; an input shaft, arranged in the installation cavity; a first end of the input shaft connected to the installation cavity through a first bearing, and a second end of the input shaft extending outward from the opening; a reducer, arranged on the installation box and coaxial with the input shaft; an output end of the reducer sleeved on a second end of the input shaft, and the output end of the reducer meshing with the second end of the input shaft.

[0006] Optionally, the second end of the input shaft is provided with a spline portion, the spline portion is provided with a first spline structure, and the output end of the reducer is provided with a second spline structure matched with the first spline structure.

[0007] Optionally, the reducer is provided with a second bearing, the second bearing is configured to support an outside of the output end, and the second end of the input shaft extends at least to a position of the output end where the second bearing is arranged.

[0008] Optionally, the power head further including: an annular oil seal structure , the oil seal mechanism is configured to fit with the opening and inserted into the opening for installation, an accommodating cavity is provided in the center of the oil seal structure; a gear portion is formed at a position between the first end and the second end of the input shaft, and an oil seal portion is formed at a position between the second end and the gear portion of the input shaft, and the oil seal portion is configured to be inserted into the accommodating cavity.

[0009] Optionally, a sealing ring is arranged between the oil seal structure and the installation box; and/or, a sealing ring is arranged between the oil seal structure and the oil seal portion.

[0010] Optionally, the oil seal structure is provided with a ring portion in a circumferential direction at an edge of one end close to the reducer, and the ring portion extends outward in a radial direction of the opening for being stopped outside an edge of the installation box around the opening.

[0011] Optionally, the ring portion is fixed to the edge of the opening by a fastener.

[0012] Optionally, the installation box is provided with a groove on a circumferential surface that is in contact with the oil seal structure or on an outer circumferential surface of the oil seal structure, and a sealing ring is arranged between the oil seal structure and the installation box, and the sealing ring is adapted to be embedded in the groove.

[0013] Optionally, the power head, further including: a reducer base, arranged on the installation box; the reducer base is suitable for installing the reducer.

[0014] Optionally, the reducer base includes a first receiving portion and a second receiving portion connected to each other, one end of the first receiving portion away from the second receiving portion is connected to the reducer, and one end of the second receiving portion away from the first receiving portion is connected to the installation box.

[0015] Optionally, the first receiving portion and the second receiving portion are both arranged in a cylindrical shape, an outer diameter of the first receiving portion is larger than an outer diameter of the second receiving portion, and an inner diameter of the first receiving portion is larger than an

inner diameter of the second receiving portion; geometric centers of the first receiving portion and the second receiving portion are on an axis of the input shaft.

[0016] Optionally, the first receiving portion is connected to the reducer by a bolt.

[0017] Optionally, the second receiving portion is welded to the installation box.

[0018] The present application also provides a power head, including: a reducer, including a sleeve-shaped output end and a bearing supporting on an outer side of the output end; an input shaft, a portion of the input shaft located between the first end and the second end is formed as a gear portion for power output; the output end of the reducer is sleeved on the second end of the input shaft, and the output end meshes with the second end of the input shaft so that the output end drives the input shaft to rotate.

[0019] The present application also provides a rotary drilling rig, including a power head according to any one of the above embodiments.

[0020] The technical solution of the present application has the following advantages:

[0021] 1. the embodiment of the present application provides a kind of power head, the power head includes: an installation box, provided with an installation cavity inside; the installation box is also provided with an opening communicating with the installation cavity; an input shaft, arranged in the installation cavity; a first end of the input shaft is connected to the installation cavity through a first bearing, and a second end of the input shaft extends outward from the opening; a reducer, arranged on the installation box and coaxial with the input shaft; an output end of the reducer is sleeved on a second end of the input shaft, and the output end of the reducer meshes with the second end of the input shaft.

[0022] With this arrangement, the output end of the reducer is sleeved on the second end of the input shaft and the output end of the reducer meshes with the second end of the input shaft, so it is not necessary to support the second end of the input shaft through an additional bearing, and thus the overall length of the power head in the vertical direction can be reduced, thereby reducing the overall volume of the power head. In addition, by reducing the overall volume of the power head, the power head in the technical solution is smaller in volume, so it is not easily affected by various factors of the external environment and bumped by the construction materials on the construction site during the construction process when compared with the power head with a larger volume, which can improve the construction efficiency, reduce the number of power head parts, and reduce the use cost of additional bearings.

[0023] 2. Unlike the scheme in which the second end of the input shaft is supported by an additional bearing to ensure the normal operation of the input shaft, in this technical solution, the second end of the input shaft is inserted into the sleeve-shaped output end of the reducer, a second bearing is arranged outside the output end of the reducer, and the second bearing can support the output end, so that the second bearing indirectly supports the second end of the input shaft. Therefore, the use of the bearing directly supporting the input shaft can be reduced, the length of the power head in the axial direction can be reduced, and the production cost can be reduced.

BRIEF DESCRIPTION OF DRAWINGS

[0024] In order to more clearly illustrate the specific embodiments of the present application or the technical solutions in the prior art, the accompanying drawings that need to be used in the description of the specific embodiments or the prior art will be briefly introduced below. The drawings are some embodiments of the present application. For ordinary skills in the art, other drawings can also be obtained based on these drawings without any creative effort.

[0025] FIG. 1 is a schematic diagram of a power head according to an embodiment of the present application;

[0026] FIG. 2 is a partial enlarged view of FIG. 1;

[0027] FIG. 3 is a schematic diagram of a reducer base according to an embodiment of the present application;

[0028] FIG. 4 is a schematic diagram of an oil seal structure according to an embodiment of the present application;

[0029] FIG. 5 is a cross-sectional view of the oil seal structure according to an embodiment of the present application;

[0030] FIG. 6 is a schematic diagram of an input shaft according to an embodiment of the present application;

[0031] FIG. 7 is a schematic diagram of a power head.

[0032] Reference numbers are as following:

[0033] 1- reducer; 11- second bearing; 12-output end; 2- installation box; 3- input shaft; 31- spline portion; 32- oil seal portion; 33- gear portion; 4- reducer base; 41- first receiving portion; 42- second

receiving portion; 5- oil seal structure; 51- ring portion; 52- accommodating cavity; 53-groove; 6- first bearing; 7-first sealing ring; 8-second sealing ring.

DETAILED DESCRIPTION

[0034] The technical solutions of the present application will be clearly and completely described below with reference to the accompanying drawings. Obviously, the described embodiments are a part of the embodiments of the present invention, but not all of the embodiments. Based on the embodiments in this application, all other embodiments obtained by ordinary workers in the art without creative work fall within the protection scope of this application.

[0035] In the description of this application, it should be noted that the indicated orientation or positional relationship of terms of "center", "upper", "lower", "left", "right", "vertical", "horizontal", "inner", "outer", etc. is based on the orientation or positional relationship shown in the accompanying drawings, which is only for the convenience of describing the present application and simplifying the description, rather than indicating or implying that the indicated device or element must have a specific orientation or must operate in a specific orientation, and therefore should not be construed as limitations on this application. Furthermore, the terms of "first", "second", and "third" are used for descriptive purposes only and should not be construed to indicate or imply relative importance.

[0036] In the description of the present application, it should be noted that, unless otherwise expressly specified and limited, the terms of "installed", "connected" and "connecting" should be understood in a broad sense, for example, it may be a fixed connection or a detachable connection, or integral connection; it can be a mechanical connection or an electrical connection; it can be a direct connection or an indirect connection through an intermediate medium, or it can be the internal connection of two components, which can be a wireless connection or a wired connection connect. For ordinary workers in the art, the specific meanings of the above terms in this application can be understood in specific situations.

[0037] In addition, the technical features involved in the different embodiments of the present application described below can be combined with each other as long as there is no conflict with each other.

[0038] The rotary drilling rig is a kind of construction machinery suitable for hole-forming operations in building foundation projects. It is mainly suitable for the construction of soil layers such as sandy soil, cohesive soil and silty soil. At present, when the traditional reducer and input shaft are installed, an additional bearing is arranged at the position of the input shaft close to the

reducer1 to support the input shaft, but this installation method makes the overall length of the power head in the vertical direction longer and the overall volume larger. Because the power head is exposed, the larger power head is easily affected by various factors of the external environment and is easily bumped by the construction materials on the construction site during construction work, so the construction efficiency is low.

[0039] Therefore, the technical problem to be solved by the present application is the problem that the overall volume of the power head in the prior art is relatively large, resulting in low construction efficiency, so as to provide a power head and a rotary drilling rig.

Embodiment 1

[0040] As shown in FIG.1 to FIG.6, an embodiment of the present application provides a power head. The power head includes an installation box 2, an input shaft 3 and a reducer 1.

[0041] Specifically, in the embodiment of the present application, an installation cavity is arranged inside the installation box 2, an opening is also provided on the upper left end of the installation box 2, and the opening communicates with the installation cavity. The input shaft 3 is arranged on the left side of the installation cavity, the first end of the input shaft 3 is connected to the installation cavity by a first bearing 6, and the second end of the input shaft 3 extends outward from the opening. The reducer 1 is arranged above the installation box 2, and the axis of the output end 12 of the reducer 1 is coaxial with the axis of the input shaft 3. In the embodiment of the present application, the output end 12 of the reducer 1 is sleeved on the second end of the input shaft 3, and the output end 12 of the reducer 1 meshes with the second end of the input shaft 3. That is, the output end 12 of the reducer 1 is arranged as a sleeve structure that can be sleeved on the second end of the input shaft 3, and the sleeve structure is sleeved on the second end of the input shaft 3 and meshes with the second end of the input shaft 3 so that the output end of the reducer's drives the input shaft 3 to rotate.

[0042] In this way, the output end 12 of the reducer 1 is sleeved on the second end of the input shaft 3, and the output end 12 of the reducer 1 meshes with the second end of the input shaft 3, so that the second end of the input shaft 3 does not need to be supported through an additional bearing. Compared with the traditional installation process of reducer 1 and input shaft 3 as shown in FIG.7, since the use of bearings is reduced, the overall length of the power head in the vertical direction can be reduced, thereby reducing the overall volume of the power head. In addition, by reducing the overall volume of the power head, the power head in the technical solution is smaller in volume, so it is not easily affected by various factors of the external environment and bumped by the construction materials on the construction site during the construction process when compared with the power

head with a larger volume, which can improve the construction efficiency, reduce the number of power head parts, and reduce the use cost of additional bearings.

[0043] Optionally, in an embodiment of the present application, the second end of the input shaft 3 is provided with a spline portion 31, the spline portion 31 is provided with a first spline structure, and the output end 12 of the reducer 1 is provided with a second spline structure matched with the first spline structure, that is, the output end 12 of the reducer 1 is a spline sleeve with a second spline structure inside, and after the spline portion 31 of the input shaft 3 is inserted into the spline sleeve of the reducer 1, the first spline structure meshes with the second spline structure, so that the output end of reducer 1 can drive input shaft 3 to rotate.

[0044] In an embodiment of the present application, the reducer 1 is further provided with a second bearing 11, the second bearing 11 is arranged to support the outer side of the output end 12 of the reducer 1, and the second end of the input shaft 3 at least extends into a position of the output end 12 where the second bearing 11 is arranged, so that the output end of the reducer 1 is supported by the second bearing 11 and the second end of the input shaft 3 is indirectly supported.

[0045] FIG. 7 shows a power head that support the second end of the input shaft 3 through an additional bearing. Compared with the solution shown in FIG. 7, in the present application the second bearing 11 is arranged on the outer side of the output end 12 of the reducer 1. The second end of the input shaft 3 extends into the output end 12, and the second bearing 11 supports both the output end 12 of the reducer 1 and the second end of the input shaft 3, so there is no need to arrange additional bearings for independent support the second end of the input shaft 3, thereby reducing the use of bearings, the length of the power head in the axial direction and the volume and production cost.

[0046] Optionally, in an embodiment of the present application, the power head further includes a ring-shaped oil seal structure 5, and the oil seal structure 5 is configured to fit with the opening and be inserted into the opening for installation, so that the oil seal structure 5 is embedded installation box 2. As shown in FIG. 1 and FIGS. 4-6, the center of the oil seal structure 5 is provided with an accommodating cavity 52, the input shaft 3 is provided with an oil seal portion 32, and the oil seal portion 32 is adapted to be inserted into the accommodating cavity 52. Furthermore, a gear portion 33 is formed at a position of the input shaft 3 between the first end and the second end, and the oil seal portion 32 is formed at a position of the input shaft 3 between the second end and the gear portion 33. The oil seal structure 5 is provided with a ring portion 51 in a circumferential direction at an edge of one end close to the reducer 1. The ring portion 51 extends outward along a radial

direction of the opening and is used to be stopped outer sides an edge around the opening of the installation box 2. The ring portion 51 is connected to the installation box 2 through a fixed structure, and the fixed structure may be a bolt or other types of fasteners.

[0047] In this way, compared to the technical solution shown in FIG. 7, in which the oil seal structure 5 is directly arranged on the top of the installation box 2, so that the bottom of the oil seal structure 5 is flush with the top of the installation box 2. In the embodiment of the present application, the oil seal structure 5 can be embedded in the installation box 2, which can further reduce the overall installation space of the power head. Moreover, compared with the technical solution of FIG. 7, the outer diameter of the ring portion 51 can also be reduced, so that the width of the installation box 2 in the horizontal direction can be reduced.

[0048] In the embodiment of the present application, the fixing structure may be a bolt, the ring portion 51 is provided with a plurality of first bolt holes suitable for the insertion of the bolt, and the installation box 2 is provided with a plurality of holes suitable for the bolt insertion, the first bolt hole and the second bolt hole are arranged in a one-to-one correspondence. The bolts pass through the first bolt holes and the second bolt holes to connect the ring portion 51 with the installation box 2. Furthermore, a sealing ring is arranged between the oil seal structure 5 and the installation box 2, such as the first sealing ring 7 shown in FIG. 1. Specifically, the installation box 2 is provided with a groove 53 on the circumferential surface that is in contact with the oil seal structure 5 or on the outer circumferential surface of the oil seal structure 5, and the first seal ring 7 provided between the oil seal structure 5 and the installation box 2 is adapted to be embedded in the groove 53 (as shown in FIGS 2 and 5). Optionally, the first sealing ring 7 is an O-ring. In addition, a sealing ring can also be arranged between the oil seal structure 5 and the oil seal portion 32, so that a better seal is formed between the input shaft 3 and the installation box 2, as second sealing ring 8 shown in FIG. 1 and FIG. 2.

[0049] Those skilled in the art can change the type of the sealing ring according to the actual situation. The embodiment is only for illustration and not limitation, as long as the same technical effect can be achieved.

[0050] In an embodiment of the present application, the installation box 2 is also provided with a slewing support, and the input shaft 3 is provided with a gear portion 33 that meshes with the slewing support. The input shaft 3 and the slewing support can transmit power to the power head.

[0051] Optionally, in an embodiment of the present application, the power head further includes a reducer base 4, the reducer base 4 is arranged on the installation box 2, and the reducer base 4 is

suitable for installing the reducer 1. The reducer base 4 can be directly welded with the installation box 2. Those skilled in the art can change the connection method between the reducer base and the installation box 2 according to the actual situation. The embodiment is only an example, not a limitation as long as it can have the same technical effect.

[0052] Specifically, in an embodiment of the present application, the reducer base 4 may include a first receiving portion 41 and a second receiving portion 42 that are connected to each other. As shown in FIG. 1 and FIG. 3, one end of the first receiving portion 41 away from the second receiving portion 42 is connected to the reducer 1, and one end of the second receiving portion 42 away from the first receiving portion 41 is connected to the installation box 2.

[0053] Furthermore, the first receiving portion 41 and the second receiving portion 42 are both arranged in a cylindrical shape, and the geometric centers of the first receiving portion 41 and the second receiving portion 42 are on the axis of the input shaft 3, the outer diameter of the first receiving portion 41 is larger than the outer diameter of the second receiving portion 42, and the inner diameter of the first receiving portion 41 is larger than the inner diameter of the second receiving portion 42, so that the reducer base arranged in the shape of a verted round frustum in the technical solution shown in FIG.7 is cancelled.

[0054] In an embodiment of the present application, the first receiving portion 41 is further provided with a plurality of first threaded holes, the reducer 1 is provided with a plurality of second threaded holes, and the bolts pass through the first threaded holes and the second threaded holes and connect the first receiving portion 41 to the reducer 1. The second receiving portion 42 can be fixed to the installation box 2 by welding, or can be connected to the installation box 2 by screws.

[0055] Those skilled in the art can change the connection manner between the first receiving portion 41 and the reducer 1 according to the actual situation. This embodiment is merely an example, and is not limited as long as the same technical effect can be achieved.

Embodiment 2

[0056] This embodiment also provides a power head, and the power head includes:

[0057] a reducer 1, the reducer1 includes a sleeve-shaped output end 12 and a bearing supporting the outside of the output end12;

[0058] an input shaft 3, the portion of the input shaft 3 between the first end and the second end is formed as a gear portion 33 for power output;

[0059] The output end 12 of the reducer 1 is sleeved on the second end of the input shaft 3, and the output end 12 meshes with the second end of the input shaft 3 so that the output end drives the input shaft 3 to rotate.

[0060] The first end of the input shaft 3 is provided with a first spline structure, the inner side of the output end of the reducer 1 is provided with a second spline structure, and the first spline structure of the input shaft 3 meshes with the second spline structure of the output end of the reducer 1.

[0061] In this embodiment, the input shaft 3 is inserted into the output end 12 of the reducer 1, and the bearing is arranged at the output end of the reducer 1 to support the input shaft 3, which can reduce the number of bearings arranged on the input shaft 3, thereby reducing the length of the power head in the axial direction and the volume.

Embodiment 3

[0062] The embodiment of the present application provides a rotary drilling rig, and the rotary drilling rig includes: the power head described in any of the above embodiments.

[0063] In this way, the output end 12 of the reducer 1 is sleeved on the second end of the input shaft 3, and the output end 12 of the reducer 1 meshes with the second end of the input shaft 3, so that the second end of the input shaft 3 does not need to be supported by an additional bearing. Compared with the traditional installation process of the reducer 1 and the input shaft 3, the overall length of the power head in the vertical direction can be reduced, thereby reducing the overall volume of the power head. In addition, by reducing the overall volume of the power head, the power head in the technical solution is smaller in volume, so it is not easily affected by various factors of the external environment and bumped by the construction materials on the construction site during the construction process when compared with the power head with a larger volume, which can improve the construction efficiency, reduce the number of power head parts, and reduce the use cost of additional bearings.

[0064] Obviously, the above-mentioned embodiments are only examples for clear description, and are not intended to limit the implementation manner. For ordinary skills in the field, changes or amendments in other different forms can also be made on the basis of the above description. There is no need and cannot be exhaustive of all implementations here. And the obvious changes or amendments derived from this are still within the protection scope of the present application.

What is claimed is:

1. A power head, comprising:

an installation box (2), provided with an installation cavity inside; the installation box (2) being also provided with an opening communicating with the installation cavity;

an input shaft (3), arranged in the installation cavity; a first end of the input shaft (3) connected to the installation cavity through a first bearing, and a second end of the input shaft (3) extending outward from the opening;

a reducer (1), arranged on the installation box (2) and coaxial with the input shaft (3); an output end of the reducer (1) sleeved on a second end of the input shaft (3), and the output end of the reducer (1) meshing with the second end of the input shaft (3).

2. The power head according to claim 1, wherein the second end of the input shaft (3) is provided with a spline portion (31), the spline portion (31) is provided with a first spline structure, and the output end of the reducer (1) is provided with a second spline structure matched with the first spline structure.

3. The power head according to claim 1, wherein the reducer (1) is provided with a second bearing (11), the second bearing (11) is configured to support an outside of the output end, and the second end of the input shaft (3) extends at least to a position of the output end where the second bearing (11) is arranged.

4. The power head according to any one of claims 1-3, further comprising: an annular oil seal structure (5), wherein the oil seal mechanism (5) is configured to fit with the opening and inserted into the opening for installation, an accommodating cavity (52) is provided in the center of the oil seal structure (5);

a gear portion (33) is formed at a position between the first end and the second end of the input shaft (3), and an oil seal portion (32) is formed at a position between the second end and the gear portion (33) of the input shaft (3), and the oil seal portion (32) is configured to be inserted into the accommodating cavity (52).

5. The power head according to claim 4, wherein a sealing ring is arranged between the oil seal structure and the installation box (2);

and/or, a sealing ring is arranged between the oil seal structure (5) and the oil seal portion (32).

6. The power head according to claim 4, wherein the oil seal structure (5) is provided with a ring portion (51) in a circumferential direction at an edge of one end close to the reducer (1), and the ring portion (51) extends outward in a radial direction of the opening for being stopped outside an edge of the installation box (2) around the opening.

7. The power head according to claim 6, wherein the ring portion (51) is fixed to the edge of the opening by a fastener.

8. The power head according to claim 4, wherein the installation box (2) is provided with a groove on a circumferential surface that is in contact with the oil seal structure (5) or on an outer circumferential surface of the oil seal structure (5), and a sealing ring is arranged between the oil seal structure (5) and the installation box (2), and the sealing ring is adapted to be embedded in the groove.

9. The power head according to any one of claims 1 to 8, further comprising:

a reducer base (4), arranged on the installation box (2); wherein the reducer base (4) is suitable for installing the reducer (1).

10. The power head according to claim 9, wherein the reducer base (4) comprises a first receiving portion (41) and a second receiving portion (42) connected to each other, one end of the first receiving portion (41) away from the second receiving portion (42) is connected to the reducer (1), and one end of the second receiving portion (42) away from the first receiving portion (41) is connected to the installation box (2).

11. The power head according to claim 10, wherein the first receiving portion (41) and the second receiving portion (42) are both arranged in a cylindrical shape, an outer diameter of the first receiving portion (41) is larger than an outer diameter of the second receiving portion (42), and an inner diameter of the first receiving portion (41) is larger than an inner diameter of the second receiving portion (42); geometric centers of the first receiving portion (41) and the second receiving portion (42) are on an axis of the input shaft (3).

12. The power head of claim 10, wherein the first receiving portion (41) is connected to the reducer (1) by a bolt.

13. The power head of claim 10, wherein the second receiving portion (42) is welded to the installation box (2).

14. A power head, comprising:

a reducer (1), comprising a sleeve-shaped output end and a bearing supporting an outer

side of the output end;

an input shaft (3), a portion of the input shaft (3) located between the first end and the second end being formed as a gear portion (33) for power output;

wherein, the output end of the reducer (1) is sleeved on the second end of the input shaft (3), and the output end meshes with the second end of the input shaft (3) so that the output end drives the input shaft (3) to rotate.

15. A rotary drilling rig, comprising a power head according to any one of claims 1 to 13.