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(54) **CAN SYSTEM AND DUAL ELECTRIC SUBMERSIBLE PUMP DEVICE**

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See application file for complete search history.

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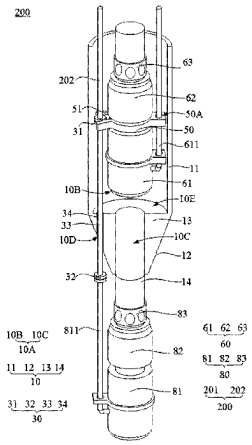
(57) **ABSTRACT**

Disclosed are a can system and a dual electric submersible pump device, applied to the technical field of dual electric submersible pump devices for oil well development. The dual electric submersible pump device includes an upper pump assembly and a lower pump assembly. The can system includes a can body and a connector assembly. The can body is provided with an accommodating cavity and a connecting hole in communication with the accommodating cavity. The connector assembly is passing through the connecting hole. One end of the connector assembly is located in the accommodating cavity and electrically connected to a first power supply cable, and another end of the connector assembly is disposed outside the accommodating cavity and is electrically connected to a lower pump electrical cable.

13 Claims, 5 Drawing Sheets



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F04D 13/06	(2006.01)
F04D 13/08	(2006.01)
F04D 13/12	(2006.01)
F04D 29/40	(2006.01)
F04B 53/16	(2006.01)

(52) **U.S. Cl.**

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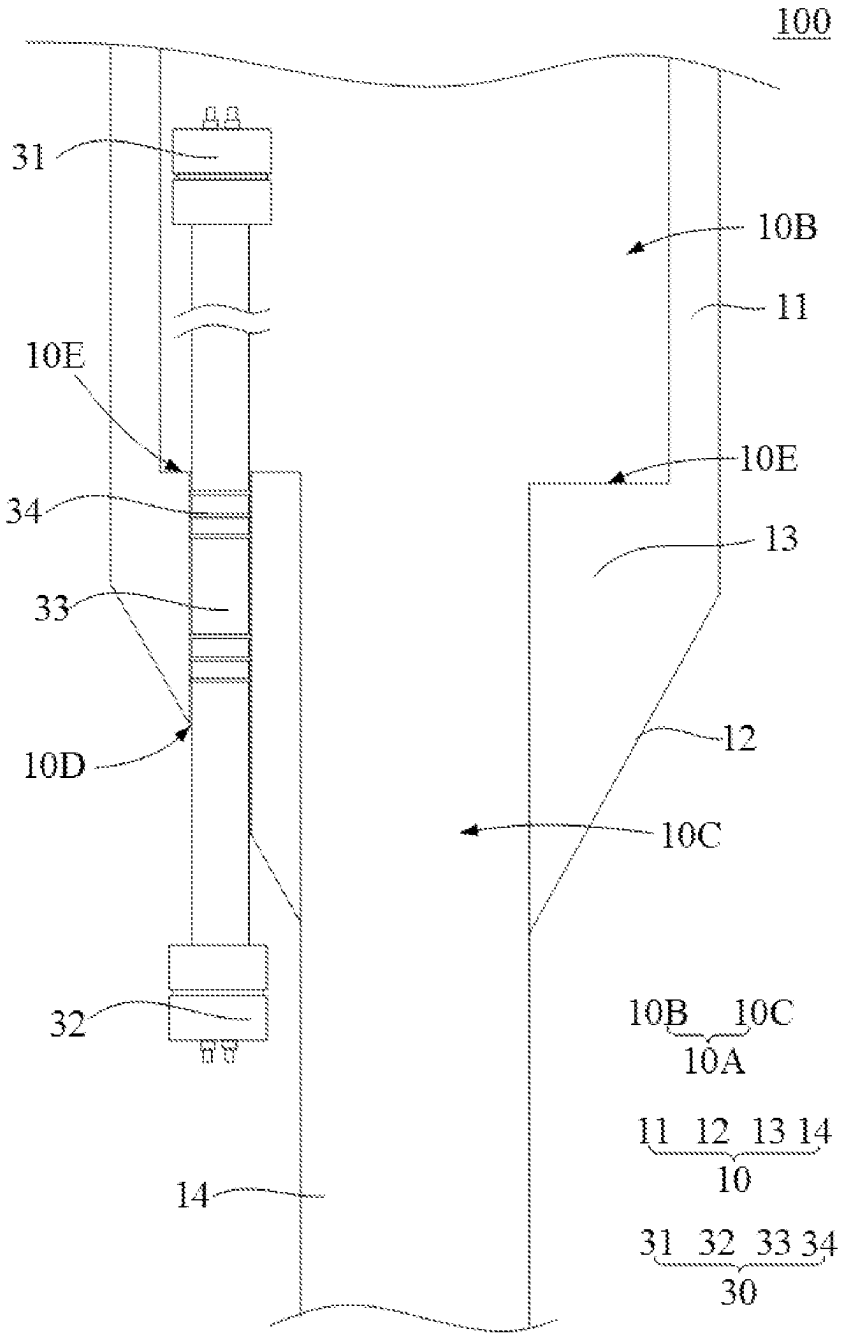
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10B
11
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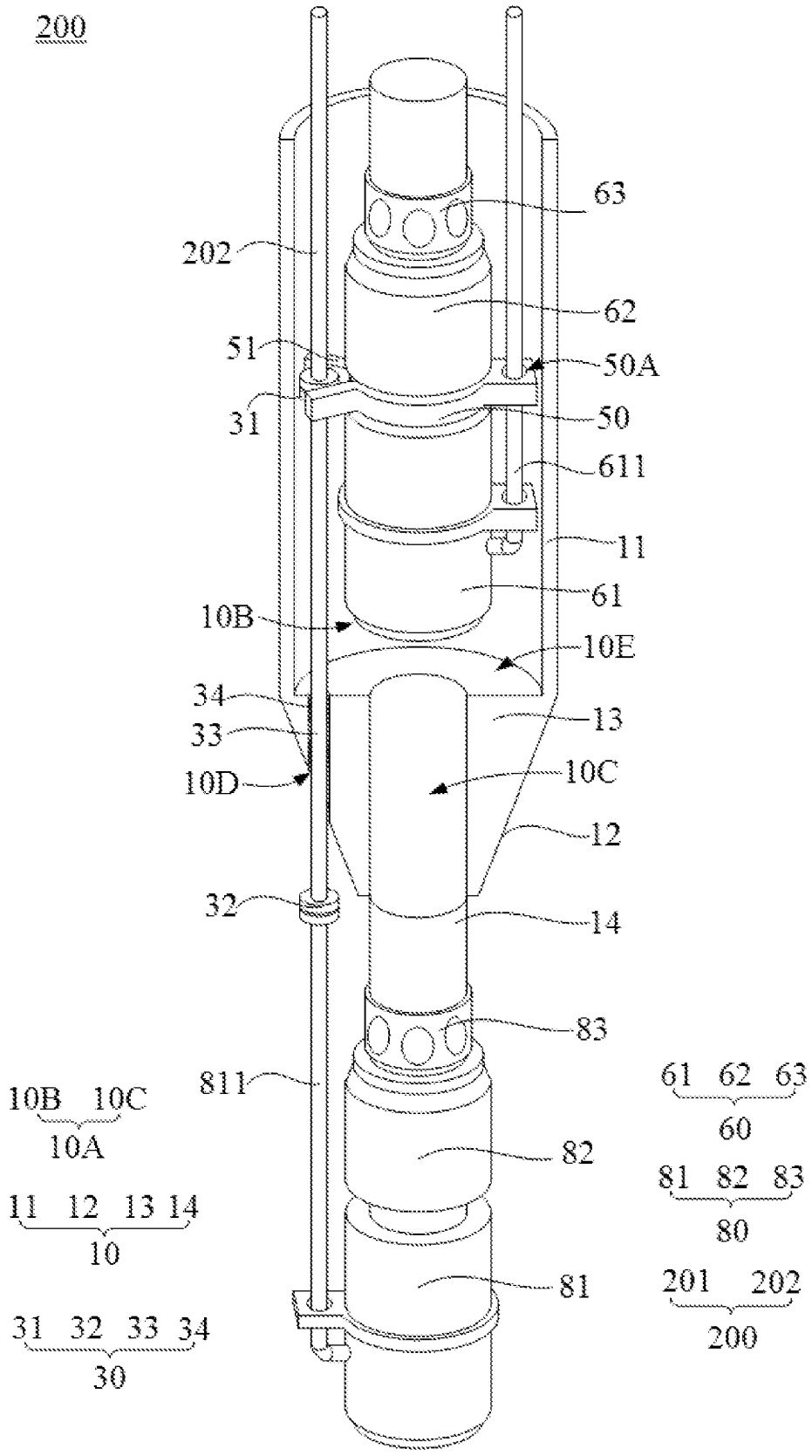
FIG. 1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202
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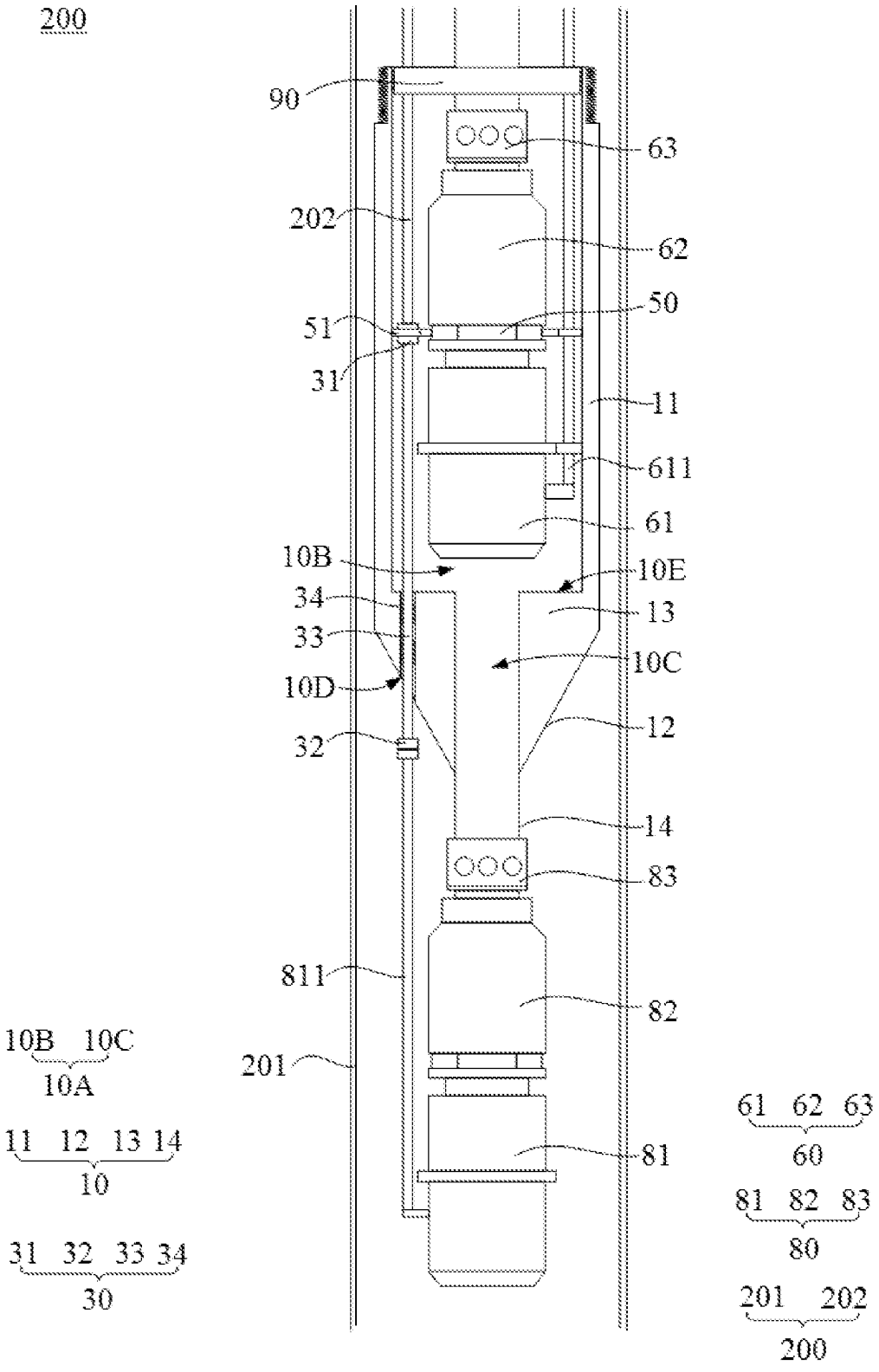
FIG. 2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811
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201
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10B 10C
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11 12 13 14
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31 32 33 34
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61 62 63
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81 82 83
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201 202
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FIG. 3

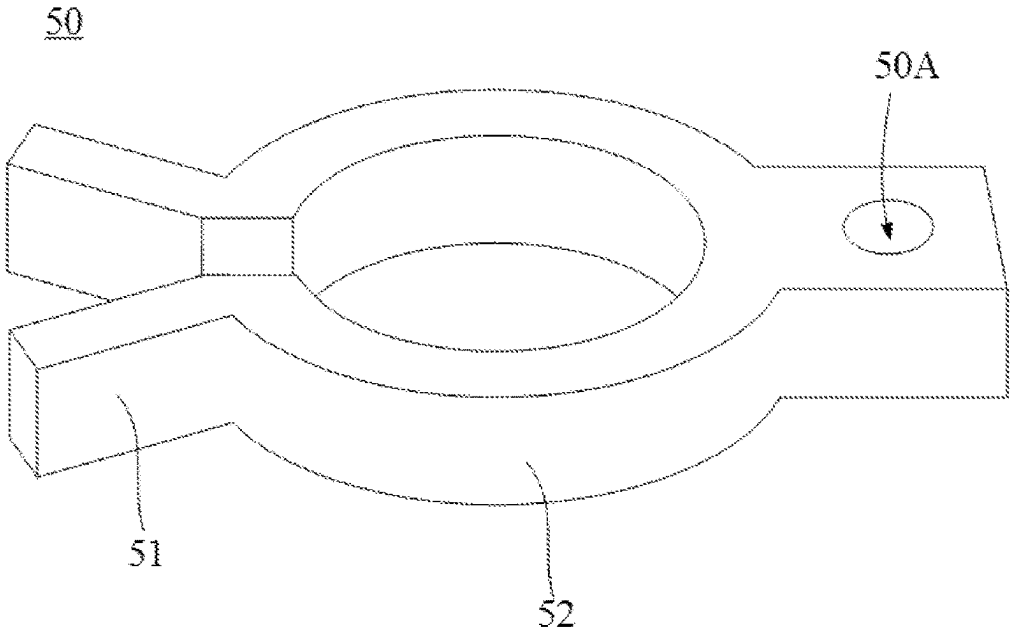

FIG. 4

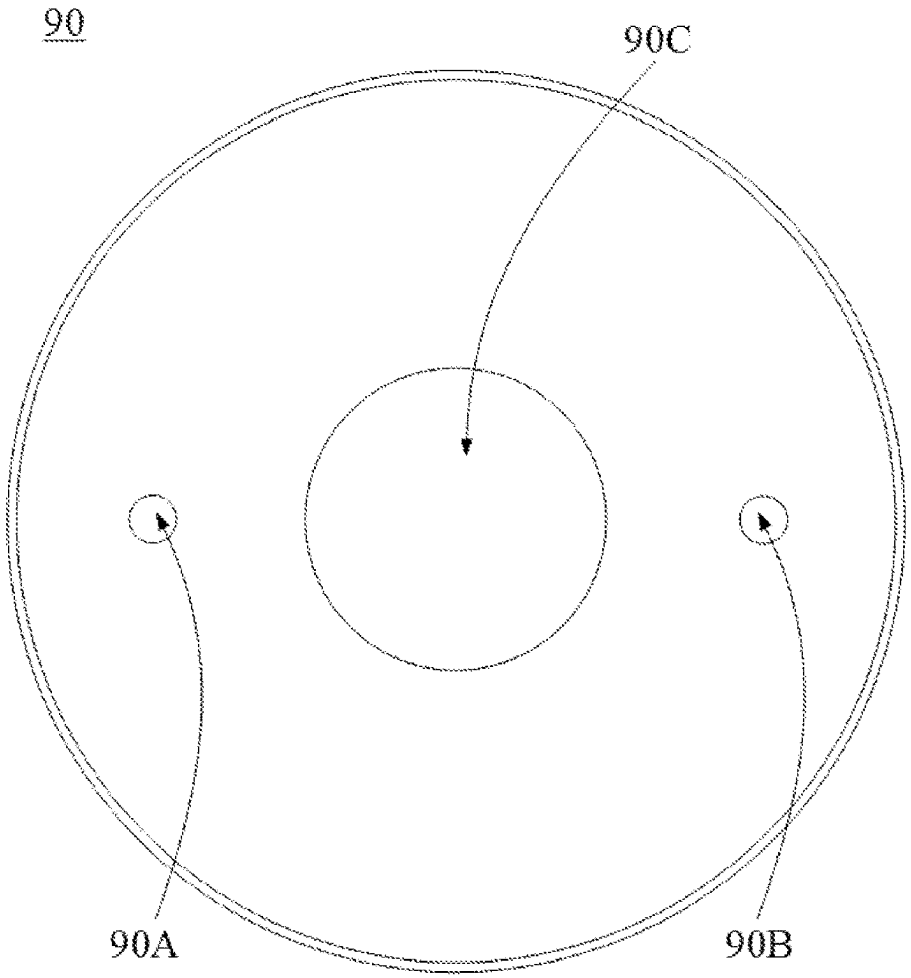

FIG. 5

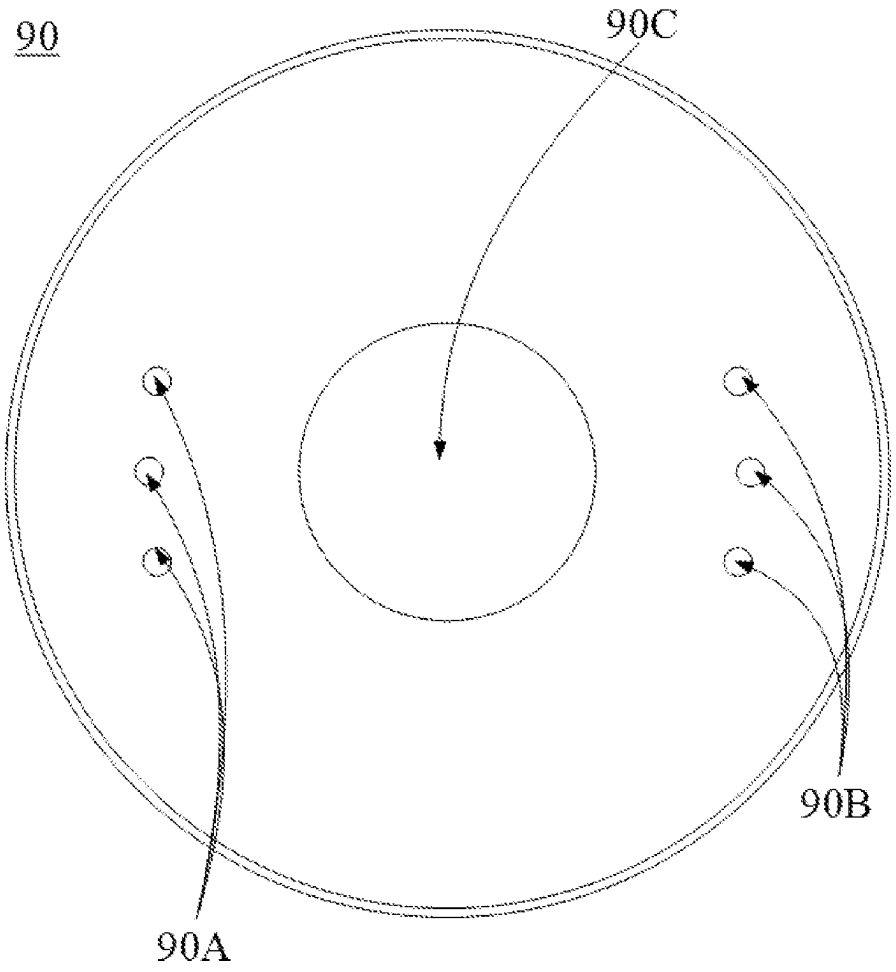

FIG. 6

CAN SYSTEM AND DUAL ELECTRIC SUBMERSIBLE PUMP DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation application of International Application No. PCT/CN2022/118181, filed on Sep. 9, 2022, which claims priority to Chinese Patent Application No. 202111675401.3, filed on Dec. 31, 2021. The disclosures of the above-mentioned applications are incorporated herein by reference in their entireties.

TECHNICAL FIELD

The present application relates to the technical field of oil well development, and in particular to a can system and a dual electric submersible pump device.

BACKGROUND

In the oil extraction industry, dual electric submersible pump systems (one in use and one in standby) are widely used in situations where well workover costs are high, such as deepwater oil field development, unmanned platforms and so on. The electric pump needs to supply power from above ground to the well. Since the gap between the upper sealing system and the completion casing is very small, the challenge of the dual pump system during the descending process is that the power supply cable of the lower pump needs to pass outside the upper sealing system, the phenomenon of cables getting squeezed often occurs, thus causing well completion of the entire well to fail, delaying time and increasing the cost of repeated operations. In the related technology, the lower pump power supply cable is made into a flat shape, during the descending process, it is necessary to ensure that the flat surface is uniform and cannot be twisted, operation requirements are high operational requirements, the completion efficiency is low and the cable is easily damaged.

SUMMARY

The main purpose of the present application is to provide a can system and a dual electric submersible pump device, aiming to solve the technical problem that the pump cable is easily damaged when going down the well and thus resulting in low completion efficiency.

In order to achieve the above purpose, the present application proposes a can system, which is applied to a dual electric submersible pump device. The dual electric submersible pump device includes an upper pump assembly and a lower pump assembly. The can system includes:

- a can body provided with an accommodating cavity and a connecting hole in communication with the accommodating cavity, the upper pump assembly is located in the accommodating cavity, and a bottom end of the can body is connected to the lower pump assembly; and
- a connector assembly disposed passing through the connecting hole, one end of the connector assembly is electrically connected to a lower pump cable of the lower pump assembly, and another end of the connector assembly extends into the accommodating cavity and is electrically connected to a first power supply cable.

In an embodiment, the can body is provided with a first cavity and a second cavity communicated with each other the first cavity and the second cavity form the accommodating cavity, and the first cavity is located on a side of the can body away from the lower pump assembly, the second cavity is located on a side of the can body adjacent to the lower pump assembly, and the upper pump assembly is disposed inside the first cavity, a connection between the first cavity and the second cavity forms a step surface, and the connecting hole is disposed through the step surface.

In an embodiment, a diameter of the first cavity is larger than a diameter of the second cavity, and a diameter of the second cavity is larger than a diameter of the connecting hole.

In an embodiment, the can body includes:

- a diameter section opened in the first cavity;
- a variable diameter section located at one end of the diameter section facing the lower pump assembly and connected to the lower pump assembly, the variable diameter section being opened in the second cavity;
- where in a direction from the diameter section toward the lower pump assembly, an outer diameter of the variable diameter section gradually decreases and forms a variable diameter outer surface, and the connecting hole is configured to sequentially penetrate the step surface and the variable diameter outer surface.

In an embodiment, a reinforcing portion is provided at a connection between the diameter section and the variable diameter section, the reinforcing portion and an inner wall of the diameter section form the step surface, and the reinforcing portion and an inner wall of the variable diameter section are enclosed to form the second cavity; and

- the connecting hole is opened in the reinforcing portion, and an axial direction of the connecting hole is parallel to and provided apart from an axial direction of the second cavity.

In an embodiment, the diameter section, the reinforcing portion and the variable diameter section are provided as an integrated structure.

In an embodiment, the connector assembly includes:

- a penetrating member disposed passing through the connecting hole and sealingly connected to a hole wall of the connecting hole, an electric conductor is provided inside the penetrating member;
- an upper connector connected to one end of the penetrating member that extends into the accommodating cavity and provided apart from the upper pump assembly; and
- a lower connector connected to another end of the penetrating member located outside the accommodating cavity, and the upper connector is electrically connected to the lower connector through the electric conductor.

In an embodiment, an outer wall of the penetrating member is provided with a groove; and

- the connector assembly further includes a sealing member sleeved on the outer wall of the penetrating member and limited in the groove.

In an embodiment, a plurality of the sealing members are provided, and the plurality of the sealing members are provided at intervals.

In an embodiment, the hole wall of the connecting hole is provided with a limiting groove, an inner ring of the sealing member is limited in the groove of the penetrating member, and an outer ring of the sealing member is limited in the limiting groove.

In an embodiment, the upper pump assembly is provided with an upper pump cable, the can system further includes a sealing cover body located on a top of the can body, the sealing cover body is provided with at least one first through

hole and at least one second through hole, the at least one first through hole is configured for the first power supply cable to pass through, the at least one second through hole is provided apart from the at least one first through hole, and the at least one second through hole is configured for the upper pump cable to pass through.

In an embodiment, the can system further includes a limiting member located in the accommodating cavity and detachably connected to the upper pump assembly, a limiting portion is provided on at least one side of the limiting member away from the upper pump assembly, and the limiting portion is configured to limit one end of the connector assembly extending into the accommodating cavity.

In an embodiment, the upper pump assembly is provided with an upper pump cable, the limiting member is further provided with a wire passing hole, and the wire passing hole is configured to limit the upper pump cable of the upper pump assembly.

The present application further proposes a dual electric submersible pump device, including:

- a pipe casing being hollow to form a downhole passage;
- the can system as described above, and the can system being located in the downhole passage;
- an upper pump assembly located in the accommodating cavity of the can system; and
- a lower pump assembly located in the downhole passage and detachably connected to a bottom end of the can system, the lower pump assembly is provided with the lower pump cable, and the lower pump cable is detachably connected to one end of the connector assembly of the can system.

In the technical solution of the present application, the connector assembly is arranged in the can system, and the technical problem of low well completion efficiency because of the lower pump cable being prone to damage during descent into the well is solved. A can system is applied to a dual electric submersible pump device, the dual electric submersible pump device includes an upper pump assembly and a lower pump assembly; the can system includes a can body and a connector assembly; the can body is provided with an accommodating cavity and a connecting hole in communication with the accommodating cavity; the connector assembly is disposed passing through the connecting hole; one end of the connector assembly is located in the accommodating cavity and used for being electrically connected with a first power supply cable, and the other end of the connector assembly is disposed outside the accommodating cavity and is electrically connected to a lower pump electrical cable. In a well completion process, the first power supply cable is electrically connected to the other end of the connector assembly in the can system, the lower pump cable introduces an electrical cable wire into the can system by means of the connector assembly; thus the shape requirements and the operation requirements of the lower pump cable are both reduced, while the probability that the lower pump cable is damaged due to small space is also reduced, and low well completion efficiency is increased.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to explain the embodiments of the present application or the technical solutions in the existing technology more clearly, the accompanying drawings needed to be used in the description of the embodiments or the existing technology will be briefly introduced below. Obviously, the accompanying drawings in the following description are only some embodiments of the present application, other accompanying drawings can be obtained based on the provided accompanying drawings without exerting creative efforts for those of ordinary skill in the art.

FIG. **1** is an internal structural schematic view of a can system according to an embodiment of the present application.

FIG. **2** is an internal three-dimensional structural schematic view of a dual electric submersible pump device according to an embodiment of the present application.

FIG. **3** is an internal structural schematic view of a dual electric submersible pump device according to an embodiment of the present application.

FIG. **4** is a structural schematic view of a limiting member of a dual electric submersible pump device according to an embodiment of the present application.

FIG. **5** is a structural schematic view of a sealing cover body of a dual electric submersible pump device according to an embodiment of the present application.

FIG. **6** is a structural schematic view of another sealing cover body of a dual electric submersible pump device according to an embodiment of the present application.

DETAILED DESCRIPTION OF THE EMBODIMENTS

The technical solutions in the embodiments of the present application will be clearly and completely described below in conjunction with the accompanying drawings in the embodiments of the present application. Obviously, the described embodiments are only some of the embodiments of the present application, but not all of the embodiments. Based on the embodiments of the present application, all other embodiments obtained by those of ordinary skill in the art without any creative work fall within the protection scope of the present application.

It should be noted that in the embodiment of the present application, all directional indications are only used to explain the relative positional relationship, movement and so on between various components in a specific posture. If the specific posture changes, the directional indication will also change accordingly.

In the present application, unless otherwise clearly stated and limited, the terms "connection", "fixed" and so on should be understood in a broad sense. For example, "connection" can be a fixed connection, a detachable connection or an integral body; it can be a mechanical connection or an electrical connection; it can be a direct connection or an indirect connection through an intermediate medium; it can be an internal connection between two components, or the interaction between two components, unless otherwise expressly limited. For those of ordinary skill in the art, the specific meanings of the above terms in the present invention can be understood according to specific circumstances.

In addition, descriptions such as "first", "second" or the like in the present application are only for descriptive purposes and cannot be understood as indicating or implying the relative importance or implicitly indicating the quantity of the technical features indicated. Therefore, features defined as "first" and "second" may explicitly or implicitly include at least one of these features. In addition, the meaning of "and/or" appearing in the entire text includes three parallel solutions, taking "A and/or B" as an example, it includes solution A, or solution B, or a solution that satisfies both A and B at the same time. In addition, the technical solutions of various embodiments can be combined with each other, but it must be based on that those of ordinary skill in the art can realize. When the combination

of technical solutions is contradictory or cannot be realized, it should be considered that such combination of technical solutions does not exist and is not within the protection scope claimed by the present application.

Referring to FIG. **1** to FIG. **6**, the present application proposes a can system **100**, which is applied to a dual electric submersible pump device **200**.

It is defined that the upper pump assembly **60** is disposed above the lower pump assembly **80**, and each embodiment will be described below based on this upper and lower position.

Specifically referring to FIG. **1** to FIG. **3**, the dual electric submersible pump device **200** includes an upper pump assembly **60** and a lower pump assembly **80**, the can system **100** includes a can body **10** and a connector assembly **30**. The can body **10** is provided with an accommodating cavity **10**A and a connecting hole **10**D in communication with the accommodating cavity **10**A, the upper pump assembly **60** is located in the accommodating cavity **10**A, and a bottom end of the can body **10** is connected to the lower pump assembly **80**. A connector assembly **30** is passed through the connecting hole **10**D, one end of the connector assembly **30** is electrically connected to a lower pump cable **811** of the lower pump assembly **80**, and the other end of the connector assembly **30** extends into the accommodating cavity **10**A and is electrically connected to a first power supply cable **202**.

In this embodiment, the can system **100** is applied to the dual electric submersible pump device **200**, the dual electric submersible pump device **200** includes an upper pump assembly **60** and a lower pump assembly **80**, the can system **100** includes a can body **10** and a connector assembly **30**, the can body **10** is provided with an accommodating cavity **10**A and a connecting hole **10**D in communication with the accommodating cavity **10**A, a connector assembly **30** is passed through the connecting hole **10**D, one end of the connector assembly **30** is located in the accommodating cavity **10**A and is provided apart from the upper pump assembly **60**, one end of the connector assembly **30** is located in the accommodating cavity **10**A for electrical connection with the first power supply cable **202**, and one end of the connector assembly **30** away from the upper pump assembly **60** is located outside the accommodating cavity **10**A and is electrically connected to the lower pump cable **811**. During the well completion process, the first power supply cable **202** is electrically connected to the end of the connector assembly **30** that is deep into the accommodating cavity in the can system **100**, the lower pump cable **811** introduces an electrical cable wire into the can system **100** by means of the connector assembly **30**, the shape requirements and the operation requirements of the lower pump cable **811** are both reduced, while the probability that the lower pump cable is damaged due to small space is also reduced, and low well completion efficiency is increased.

It should be noted that a pipe casing **201** is provided on the wall of the oil well to form a downhole passage **20**A, the can system **100** of the traditional well completion process includes multiple casing pipes of a certain length connected to each other. In order to protect the lower pump cable **811**, a cable protection card will be installed on the can system **100**, then there is a second challenge in the well completion process: since the gap between the inner wall of the downhole passage **20**A of the oil well and the can system **100** is small, casings with couplings may not be used in the material selection of the can system **100**, which reduces the strength of the connections of each casing of the can system **100**, thereby limiting the hanging weight under the casings.

The technical solution of the present application is to open a connecting hole **10**D on the can system **100** and set the connector assembly **30** in the connecting hole **10**D to solve the technical problem that the lower pump cable **811** is prone to damage during descent into the well and results in low completion efficiency, and allow the material selection of the can system **100** to use a casing with a coupling at the same time, thereby breaking through the hanging weight limit under the casing, and improving the connection strength of the can system **100**.

In an embodiment, the can body **10** is provided with a first cavity **10**B and a second cavity **10**C communicated with each other the first cavity **10**B and the second cavity **10**C form the accommodating cavity **10**A, and the first cavity **10**B is located on a side of the can body **10** away from the lower pump assembly **80**, the second cavity **10**C is located on a side of the can body adjacent to the lower pump assembly **80**, and the upper pump assembly **60** is disposed inside the first cavity **10**B, a connection between the first cavity **10**B and the second cavity **10**C forms a step surface **10**E, and the connecting hole **10**D is disposed through the step surface **10**E.

In this embodiment, the dual electric submersible pump device **200** includes a first power supply cable **202** and a second power supply cable, one end of the first power supply cable **202** is connected to the underground pump power supply device above the well, the other end extends into the downhole passage **20**A and extends into the can system **100** and is electrically connected to one end of the connector assembly **30** in the can system **100** to power the lower pump assembly **80**. One end of the second power supply cable is connected to the surface pump power supply device above the well, and the other end extends into the downhole passage **20**A and is electrically connected to one end of the upper pump cable **611** to power the upper pump assembly **60**. The can body **10** is provided with a first cavity **10**B and a second cavity **10**C that are arranged up and down and connected with each other to form an accommodating cavity **10**A; the upper pump assembly **60** is disposed in the first cavity **10**B, and one end of the connecting assembly extending into the accommodating cavity **10**A is also located in the first cavity **10**B for connecting the first power supply cable **202**. The step surface **10**E is formed at the connection between the first cavity **10**B and the second cavity **10**C, and the connecting hole **10**D penetrates the cavity wall of the second cavity **10**C and is disposed through the step surface **10**E at the same time, the connector assembly **30** is passed through the connecting hole **10**D and is configured to connect the first power supply cable **202** and the lower pump cable **811**, thus making the routing of the lower pump cable **811** is located in the can system **100**, ensuring that the entire casing string can be descended smoothly and the cable is not subject to potential extrusion damage, thereby reducing cable extrusion damage caused by space limitations and improving completion efficiency.

It can be understood that since the cables are routed through the can system **100**, the space in the closed system in the upper can system **100** is occupied, the flow rate of well fluid flowing through the upper motor is increased objectively, which is beneficial to the heat dissipation of the motor.

In an embodiment, a diameter of the first cavity **10**B is larger than a diameter of the second cavity **10**C, and a diameter of the second cavity **10**C is larger than a diameter of the connecting hole **10**D.

In this embodiment, the first cavity **10**B and the second cavity **10**C are distributed in an up and down direction, an

upper pump cable **611** is provided in the first cavity **10**B, and the first cavity **10**B needs to be connected to the first power supply cable **202** of the lower pump, so the diameter of the first cavity **10**B is larger than the diameter of the second cavity **10**C. The first cavity **10**B is connected to the lower pump assembly **80**, the diameter of the second cavity **10**C is smaller than the diameter of the first cavity **10**B, the structural outer diameter of the can system **100** forming the second cavity **10**C is roughly similar to the outer diameter of the connection of the lower pump assembly **80**, which facilitates connection and reduces weight and space occupation at the same time. The connecting hole **10**D is opened on the can system **100**, in order to ensure the strength of the can system **100**, the hole diameter of the connecting hole **10**D is much smaller than the diameters of the first cavity **10**B and the second cavity **10**C, and the hole diameter of the connecting hole **10**D is sufficient for the connector assembly **30** to pass through, which improves the strength of the can system **100**, changes the routing of the lower pump cable **811**, and protects the lower pump cable **811** from extrusion and wear.

It will be appreciated that since the lower pump cable **811** is connected to the connector assembly **30** and the first power supply cable **202** above the well is connected within the can system **100**, the shape of the lower pump cable **811** is no longer limited to flat, and round cables can be selected to improve selectivity.

In an embodiment, the can body **10** includes a diameter section **11** and a variable diameter section **12**, the diameter section **11** is opened in the first cavity **10**B; the variable diameter section **12** is located at one end of the diameter section **11** facing the lower pump assembly **80** and is connected to the lower pump assembly **80**, the variable diameter section **12** is opened in the second cavity **10**C; in a direction from the diameter section **11** toward the lower pump assembly **80**, an outer diameter of the variable diameter section **12** gradually decreases and forms a variable diameter outer surface, and the connecting hole **10**D is configured to sequentially penetrate the step surface **10**E and the variable diameter outer surface.

In this embodiment, the can body **10** includes a diameter section **11** and a variable diameter section **12**, the diameter section **11** and the variable diameter section **12** are distributed up and down, and the diameter section **11** and the variable diameter section **12** are integrally formed structural parts. The diameter section **11** is opened in the first cavity **10**B, and the variable diameter section **12** is opened in the second cavity **10**C, one end of the variable diameter section **12** away from the diameter section **11** is connected to the lower pump assembly **80**, so that the second cavity **10**C is connected to the lower pump assembly **80** to facilitate oil entering the second cavity **10**C and the second cavity **10**C when pumping oil. The outer diameter of the diameter section **11** is greater than or equal to the maximum outer diameter of the variable diameter section **12**, the variable diameter section **12** is formed with a variable diameter outer surface, and the connecting holes **10**D are respectively provided through the variable diameter outer surface and the step surface **10**E, the outer diameter of the variable diameter section **12** gradually decreases from top to bottom, so that the connector assembly **30** is placed at a larger distance from the inner wall of the downhole passage **20**A, thereby improving the protection of the lower pump cable **811** without affecting the connection between the lower pump assembly **80** and the lowermost end of the variable diameter portion. The provision of the variable diameter section **12** not only reduces the weight of the can body **10** but also increases the matching of the connection between the can body **10** and the lower pump assembly **80**.

It can be understood that the lowermost end of the variable diameter section **12** is provided with a fixed diameter section **14** with a certain length, and the fixed diameter section **14** matches the outer diameter of the connection of the lower pump assembly **80**.

In an embodiment, a reinforcing portion **13** is provided at a connection between the diameter section **11** and the variable diameter section **12**, the reinforcing portion **13** and an inner wall of the diameter section **11** form the step surface **10**E, and the reinforcing portion **13** and an inner wall of the variable diameter section **12** are enclosed to form the second cavity **10**C; the connecting hole **10**D is opened in the reinforcing portion **13**, and an axial direction of the connecting hole **10**D is parallel to and provided apart from an axial direction of the second cavity **10**C.

In this embodiment, a reinforcing portion **13** is provided at a connection between the diameter section **11** and the variable diameter section **12**, the reinforcing portion **13** is provided in the accommodating cavity **10**A and forms the step surface **10**E with the inner wall of the diameter section **11** and is enclosed with the inner wall of the variable diameter section **12** to form the cavity inner wall of the second cavity **10**C, the setting of the reinforcing portion **13** enhances the stability of the connection between the variable diameter section **12** and the diameter section **11**, a connecting hole **10**D is opened in the reinforced part **13** at the same time, which greatly reduces the impact on the strength of the can body **10**, thus breaking through the technical barrier that the existing can system **100** cannot directly drill holes in the side wall or bottom wall of the can system **100** for threading. The axial direction of the connecting hole **10**D is parallel to and provided apart from the axial direction of the second cavity **10**C, increasing the axial length of the connecting hole **10**D as much as possible under the condition of ensuring the strength of the can body **10**, so that when the connector assembly **30** is inserted into the connecting hole **10**D, it can improve the connection reliability of the lower pump cable **811** and the first power supply cable **202**, protect the lower pump cable **811**, improve the smoothness of well descending, and correspondingly reduce the consumption of manpower and working hours and improve the well completion efficiency.

It can be understood that during the actual well completion process, the diameter section **11** will be formed by connecting multiple equal-diameter casings to each other, the variable diameter section **12** and the nearest diameter section **11** connecting the variable diameter section **12** are integrally formed structural parts, the reinforcing portion **13**, the diameter section **11** and the variable diameter section **12** are also integrally formed structural parts. During casting and molding, the accommodating cavity **10**A and the connecting hole **10**D connecting the accommodating cavity **10**A are opened to reduce the number of mold openings and facilitate the assembly of the can body **10**.

In an embodiment, the connector assembly **30** includes a penetrating member **33**, an upper connector **31** and a lower connector **32**, the penetrating member **33** is disposed passing through the connecting hole **10**D and is sealingly connected to a hole wall of the connecting hole **10**D, an electric conductor is provided inside the penetrating member **33**; the upper connector **31** is connected to one end of the penetrating member **33** that extends into the accommodating cavity **10**A and is provided apart from the upper pump assembly **60**; and the lower connector **32** is connected to another end of the penetrating member **33** located outside the accom-

modating cavity **10**A, and the upper connector **31** and the lower connector **32** are electrically connected through the electric conductor.

In this embodiment, the connecting hole **10**D is opened in the reinforced part **13** and is provided through the stepped surface **10**E and the variable diameter surface of the variable diameter portion, the penetrating member **33** is disposed passing through the connecting hole **10**D and is sealingly connected to a hole wall of the connecting hole **10**D, thereby preventing oil from entering the first cavity **10**B through the connecting hole **10**D, thus improving the assembly stability of the connector assembly **30** and the can body **10**, and effectively performing the connection bridge of the cable routing.

It can be understood that an outer wall of the penetrating member **33** is provided with a groove; and the connector assembly **30** further includes a sealing member **34** sleeved on the outer wall of the penetrating member **33** and limited in the groove. The sealing member **34** may be a deformable sealing ring or a water-swellable material, and the sealing member **34** has an interference fit with the hole wall of the connecting hole **10**D.

It can be understood that the hole wall of the connecting hole **10**D can be provided with a limiting groove accordingly, the sealing member **34** is respectively limited to the groove of the penetrating member **33** and the limiting groove of the hole wall of the connecting hole **10**D, thereby reducing the gap between the penetrating member **33** and the hole wall of the connecting hole **10**D and improving the installation stability and position limiting reliability of the penetrating member **33**.

It can be understood that a plurality of the sealing members **34** can be provided, and the plurality of the sealing members **34** are provided at intervals. A plurality of grooves are correspondingly provided on the penetrating member **33**, and a plurality of limiting grooves are correspondingly provided on the hole wall of the connecting hole **10**D, thereby improving sealing reliability and enhancing the setting stability of the penetrating member **33**.

Referring to FIG. **5** and FIG. **6**, in an embodiment, the upper pump assembly **60** is provided with an upper pump cable **611**, the can system **100** further includes a sealing cover body **90** located on a top of the can body **10**, the sealing cover body **90** is provided with at least one first through hole **90**A and at least one second through hole **90**B, the at least one first through hole **90**A is configured for the first power supply cable **202** to pass through, the at least one second through hole **90**B is provided apart from the at least one first through hole **90**A, and the at least one second through hole **90**B is configured for the upper pump cable **611** to pass through.

In this embodiment, the upper pump assembly **60** is provided with an upper pump cable **611**, the can system **100** further includes a sealing cover body **90** for the can system **100**. Since the strength of the sealing cover body **90** is related to the sealing performance, the first through hole **90**A and the second through hole **90**B are respectively provided on opposite sides of the sealing cover body **90** and are respectively configured for the first power supply cable **202** and the upper pump cable **611** to pass through, thereby improving the strength of the sealing cover body **90**, and improving the connection stability between the upper pump cable **611** and the second power supply cable and the connection stability between the lower pump cable **811** and the first power supply cable **202**.

It can be understood that three first through holes **90**A and three second through holes **90**B may be provided on the sealing cover body **90**, the three first through holes **90**A are configured for the three strands of the first power supply cable **202** to pass through and are performed sealing treatment, the three second perforations **90**B are configured for the three strands of the upper pump cable to pass through and are performed sealing treatment, thereby reducing the diameter of the perforations, enhancing the strength of the sealing cover body **90** and improving the sealing performance of the can system **100**.

It can be understood that a connector corresponding to the first power supply cable **202** and corresponding to upper pump cable can be provided on the sealing cover body **90**, the first power supply cable **202** or the upper pump cable is detachably connected to the connector. The connector is sealingly passed through the sealing cover body **90**, and two ends of the connector are correspondingly connected to the upper connector **31** and the first power supply cable **202** respectively, or the two ends of the connector corresponding to the upper pump cable **611** are correspondingly connected to the upper pump cable **611** and the second power supply cable, thereby facilitating the adjustment of the cable length.

It can be understood that a third through hole **90**C that passes through the oil pumping pipe is opened in the middle of the sealing cover body **90**, the first through hole **90**A and the second through hole **90**B are both provided around the third through hole **90**C, and the first through hole **90**A, the second through hole **90**B and the third through hole **90**C are spaced apart to maintain the structural strength of the sealing cover body **90**.

Referring to FIG. **4**, in an embodiment, the can system **100** further includes a limiting member **50** located in the accommodating cavity **10**A and detachably connected to the upper pump assembly **60**, a limiting portion **51** is provided on at least one side of the limiting member **50** away from the upper pump assembly **60**, and the upper connector **31** is limited in the limiting portion **51**.

In this embodiment, the connector assembly **30** includes a penetrating member **33**, an upper connector **31** and a lower connector **32**, the upper connector **31** is provided at one end of the penetrating member **33** extending into the first cavity **10**B, the can system **100** further includes a limiting member **50**, the limiting member **50** is sleeved on the upper pump assembly **60** and is detachably connected to the upper pump assembly **60**, the limiting member **50** includes a limiting portion **51** and a noumenon **52**, the limiting portion **51** is provided on the side of the noumenon **52** facing the inner wall of the diameter section **11** and is configured to limit the upper connector **31**, so that the upper connector **31** is limited in the accommodating cavity **10**A and does not move randomly, thereby avoiding entanglement with the upper pump cable **611**, improving safety and security, reducing the possibility of the upper connector **31** being washed away by oil due to movement and damaging the upper connector **31** at the same time, and reducing the number of repairs.

In an embodiment, the upper pump assembly **60** is provided with an upper pump cable **611**, and the limiting member **50** is further provided with a wire passing hole **50**A through it, and the wire passing hole **50**A is configured to limit the upper pump cable **611** of the upper pump assembly **60**.

In this embodiment, the upper pump assembly **60** is provided with an upper pump cable **611**, the installation directions of the upper pump cable **611** and the lower pump cable **811** are provided to be staggered, thereby reducing the space occupancy rate of a certain side of the accommodating cavity **10**A, and improving the uniformity of the space occupancy in the accommodating cavity **10**A. The side of

the noumenon **52** of the limiting member **50** away from the limiting portion **51** is further provided with a wire passing hole **50**A through it, the wire passing hole **50**A and the limiting portion **51** are also provided at intervals on the limiting member **50**, or provided at intervals on opposite sides in some embodiment, thereby reducing the possibility of entanglement between the upper pump cable **611** and the upper connector **31** or entanglement between the upper pump cable **611** and the upper pump cable **611** and the first power supply cable **202**, thus improving the reliability of wiring and the convenience of oil pumping.

It should be noted that there is also a third challenges in the well completion process at the same time: in order to protect the lower pump cable **811**, a cable protection card is provided on the couplingless casing, due to space limitations and casing strength limitations, the cable protection card is easy to fall off, or the cable protection card may be damaged due to friction with the inner wall of the downhole passage **20**A; there is also a fourth challenge at the same time, if cable protection cards are not provided, and some grooves are cut on the casing to fix the cables, the cutting grooves will affect the strength of the casing. The casing mentioned in the above two paragraphs is the diameter section **11** casing forming the can system **100**, which is provided apart from the inner wall of the pipe casing **201** forming the downhole passage **20**A, and belongs to structural members with different diameters. Applying the can system **100** according to the technical solution of the present application, the structure of providing a cable protection card outside the can body **10** of the can system **100** can be omitted, and there is no need to groove the outside of the can body **10** to maintain the strength of the can body **10**. Applying the can body with the reinforcing portion **13** provided with the connecting hole **10**D, and the connector assembly **30** is configured to introduce the wiring of the lower pump cable **811** into the can system to solve the above two challenges. Further, a limiting member **50** is provided inside the can system **100** to limit the upper pump cable **611** and the upper connector **31** respectively, thereby ensuring that the internal wiring of the can system is orderly and improving completion efficiency while maintaining the stability of oil pumping.

The present application further proposes a dual electric submersible pump device **200**, which is applied in the technical field of oil well development. The dual electric submersible pump device **200** includes a pipe casing **201**, a can system **100** as described above, an upper pump assembly **60** and a lower pump assembly **80**, the specific structure of the can system **100** refers to the above-mentioned embodiments. Since the dual electric submersible pump device **200** according to the present application adopts all the technical solutions of all the above-mentioned embodiments, it has at least all the beneficial effects brought by the technical solutions of the above embodiments, which will not be described again one by one here. The pipe casing **201** is hollow to form a downhole passage **20**A; the can system **100** is located in the downhole passage **20**A; the upper pump assembly **60** is located in the accommodating cavity of the can system **100**; and the lower pump assembly **80** is located in the downhole passage **20**A and is provided with a lower pump cable **811**; the lower pump cable **811** is detachably connected to one end of the connector assembly **30** of the can system **100** away from the upper pump assembly **60**. By opening a connecting hole **10**D on the can system **100** and disposing the connector assembly **30** in the connecting hole **10**D, the technical problem of low well completion efficiency because of the lower pump cable being prone to damage during descent into the well is solved, and at the same time, the material selection of the can system **100** can use a casing with a coupling, breaking through the hanging weight limit under the casing, and improving the connection strength of the can system **100**.

It can be understood that the upper pump assembly **60** includes an upper pump motor **61**, an upper protector **62** and an upper reversing valve **63**, the upper pump motor **61**, the upper protector **62** and the upper reversing valve **63** are provided in sequence from the direction of the can system **100** toward the wellhead and communicate with each other. The limiting member can be sleeved between the upper pump motor **61** and the upper protector **62** to fix the upper connector **31**, and the upper pump cable **611** is electrically connected to the upper pump motor **61**. The lower pump assembly **80** includes a lower pump motor **81**, a lower protector **82** and a lower reversing valve **83**, the lower reversing valve **83**, the lower protector **82** and the lower pump motor **81** are provided in sequence from the direction of the can system **100** away from the wellhead and communicate with each other. One end of the lower pump cable **811** is electrically connected to the lower pump motor **81**, and the other end is electrically connected to the lower connector **32**.

It can be understood that the lower pump assembly **80** may be equipped with a seal pot on its exterior, or may not be provided with a seal pot, which is not specifically limited in the present application.

The above are only some embodiments of the present application, and are not intended to limit the scope of the present application. Under the inventive concept of the present application, any equivalent structure transformation made by using the description and accompanying drawings of the present application, or directly or indirectly applied in other related technical fields, is included within the scope of the present application.

What is claimed is:

1. A can system, applied to a dual electric submersible pump device, wherein the dual electric submersible pump device comprises an upper pump assembly and a lower pump assembly, the can system comprises:

a can body provided with an accommodating cavity and a connecting hole in communication with the accommodating cavity, wherein the upper pump assembly is located in the accommodating cavity, and a bottom end of the can body is connected to the lower pump assembly; and

a connector assembly passing through the connecting hole, wherein one end of the connector assembly is electrically connected to a lower pump cable of the lower pump assembly, and another end of the connector assembly extends into the accommodating cavity and is electrically connected to a first power supply cable;

wherein the can system further comprises a limiting member located in the accommodating cavity and detachably connected to the upper pump assembly, a limiting portion is provided on at least one side of the limiting member away from the upper pump assembly, and the limiting portion is configured to limit one end of the connector assembly extending into the accommodating cavity.

2. The can system according to claim **1**, wherein the can body is provided with a first cavity and a second cavity communicated with each other, the first cavity and the second cavity form the accommodating cavity, the first cavity is located on a side of the can body away from the lower pump assembly, the second cavity is located on a side of the can body adjacent to the lower pump assembly, the

upper pump assembly is disposed inside the first cavity, a connection between the first cavity and the second cavity forms a step surface, and the connecting hole is disposed through the step surface.

3. The can system according to claim **2**, wherein a diameter of the first cavity is larger than a diameter of the second cavity, and a diameter of the second cavity is larger than a diameter of the connecting hole.

4. The can system according to claim **2**, wherein the can body comprises:

a diameter section opened in the first cavity; and

a variable diameter section located at one end of the diameter section facing the lower pump assembly and connected to the lower pump assembly, the variable diameter section being opened in the second cavity;

wherein in a direction from the diameter section toward the lower pump assembly, an outer diameter of the variable diameter section gradually decreases and forms a variable diameter outer surface, and the connecting hole is configured to sequentially penetrate the step surface and the variable diameter outer surface.

5. The can system according to claim **4**, wherein:

a reinforcing portion is provided at a connection between the diameter section and the variable diameter section, the reinforcing portion and an inner wall of the diameter section form the step surface, and the reinforcing portion and an inner wall of the variable diameter section are enclosed to form the second cavity; and

the connecting hole is opened in the reinforcing portion, and an axial direction of the connecting hole is parallel to and provided apart from an axial direction of the second cavity.

6. The can system according to claim **5**, wherein the diameter section, the reinforcing portion and the variable diameter section are provided as an integrated structure.

7. The can system according to claim **1**, wherein the connector assembly comprises:

a penetrating member passing through the connecting hole and sealingly connected to a hole wall of the connecting hole, wherein an electric conductor is provided inside the penetrating member;

an upper connector connected to one end of the penetrating member that extends into the accommodating cavity and provided apart from the upper pump assembly; and

a lower connector connected to another end of the penetrating member located outside the accommodating cavity, wherein the upper connector is electrically connected to the lower connector through the electric conductor.

8. The can system according to claim **7**, wherein:

an outer wall of the penetrating member is provided with a groove; and

the connector assembly further comprises a sealing member sleeved on the outer wall of the penetrating member and limited in the groove.

9. The can system according to claim **8**, wherein a plurality of the sealing members are provided, and the plurality of the sealing members are provided at intervals.

10. The can system according to claim **8**, wherein the hole wall of the connecting hole is provided with a limiting groove, an inner ring of the sealing member is located in the groove of the penetrating member, and an outer ring of the sealing member is located in the limiting groove.

11. The can system according to claim **1**, wherein the upper pump assembly is provided with an upper pump cable, the can system further comprises a sealing cover body located on a top of the can body, the sealing cover body is provided with at least one first through hole and at least one second through hole, the at least one first through hole is configured for the first power supply cable to pass through, the at least one second through hole is provided apart from the at least one first through hole, and the at least one second through hole is configured for the upper pump cable to pass through.

12. The can system according to claim **1**, wherein the upper pump assembly is provided with an upper pump cable, the limiting member is further provided with a wire passing hole, and the wire passing hole is configured to limit the upper pump cable of the upper pump assembly.

13. A dual electric submersible pump device, comprising:

a pipe casing being hollow to form a downhole passage;

the can system according to claim **1**, wherein the can system is located in the downhole passage;

the upper pump assembly located in the accommodating cavity of the can system; and

the lower pump assembly located in the downhole passage and detachably connected to the bottom end of the can system, wherein the lower pump assembly is provided with the lower pump cable, and the lower pump cable is detachably connected to one end of the connector assembly of the can system.

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