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(54) **ONE-CONNECTOR PENETRATOR SYSTEM ADAPTABLE TO ANY CABLES USED IN ARTIFICIAL LIFT SYSTEM**

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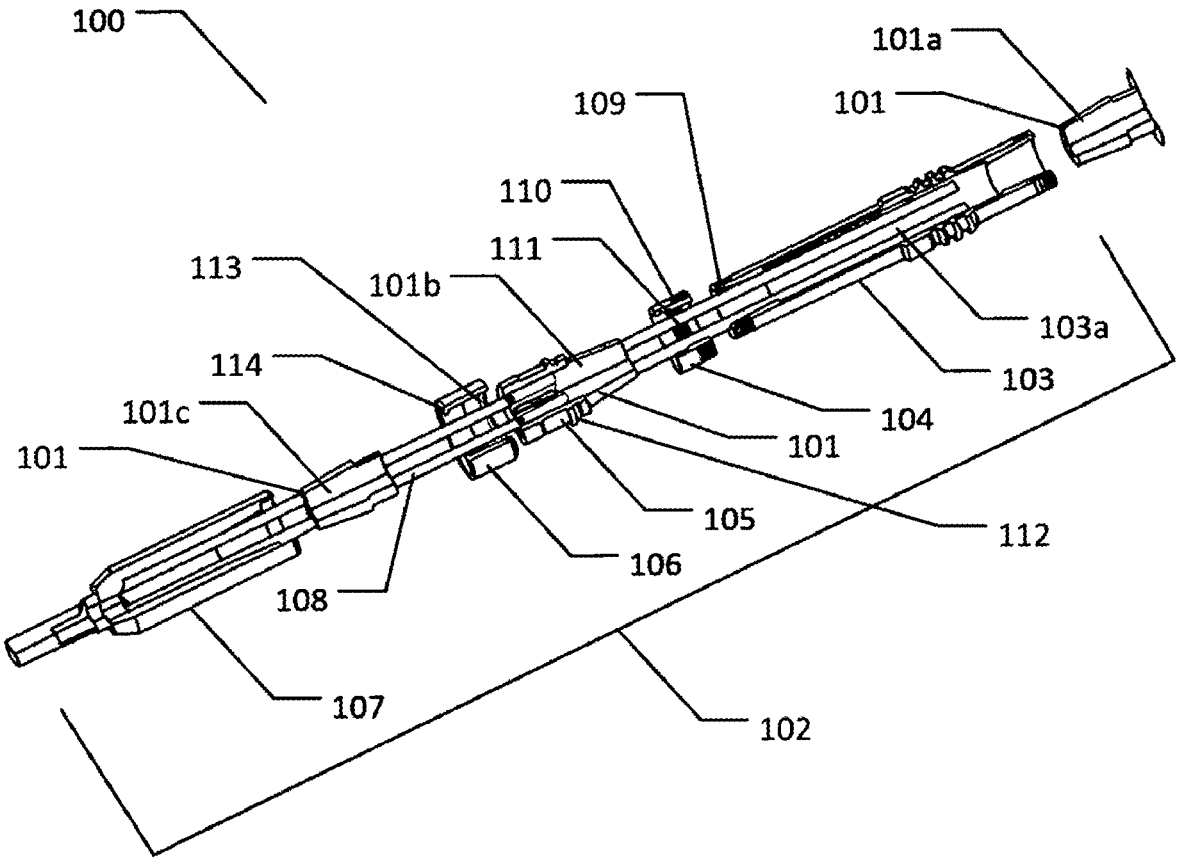
(57) **ABSTRACT**

A one-connector penetrator system that is adaptable to any cables used in artificial lift system is described herein. The one-connector penetrator system can comprise an enclosure and a plurality of seals. The enclosure can have a hollowed interior. The plurality of seals can be housed within the enclosure. The plurality of seals can stabilize a three-phase power cable in a fixed position. The plurality of seals can comprise a first seal, a second seal, and a third seal. The first seal can be placed at the front-end portion of the enclosure. The second seal can be placed within the middle portion of the enclosure. The third seal can be placed at the bottom portion of the enclosure.



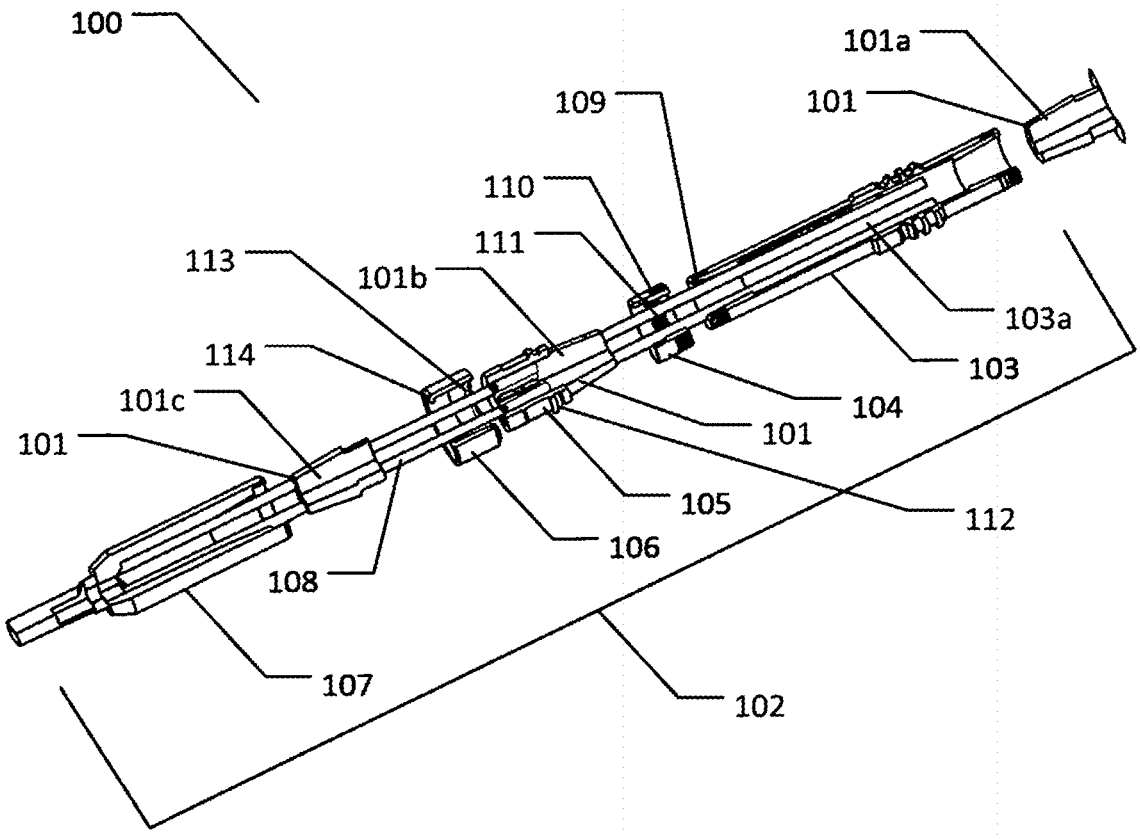

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Fig. 1

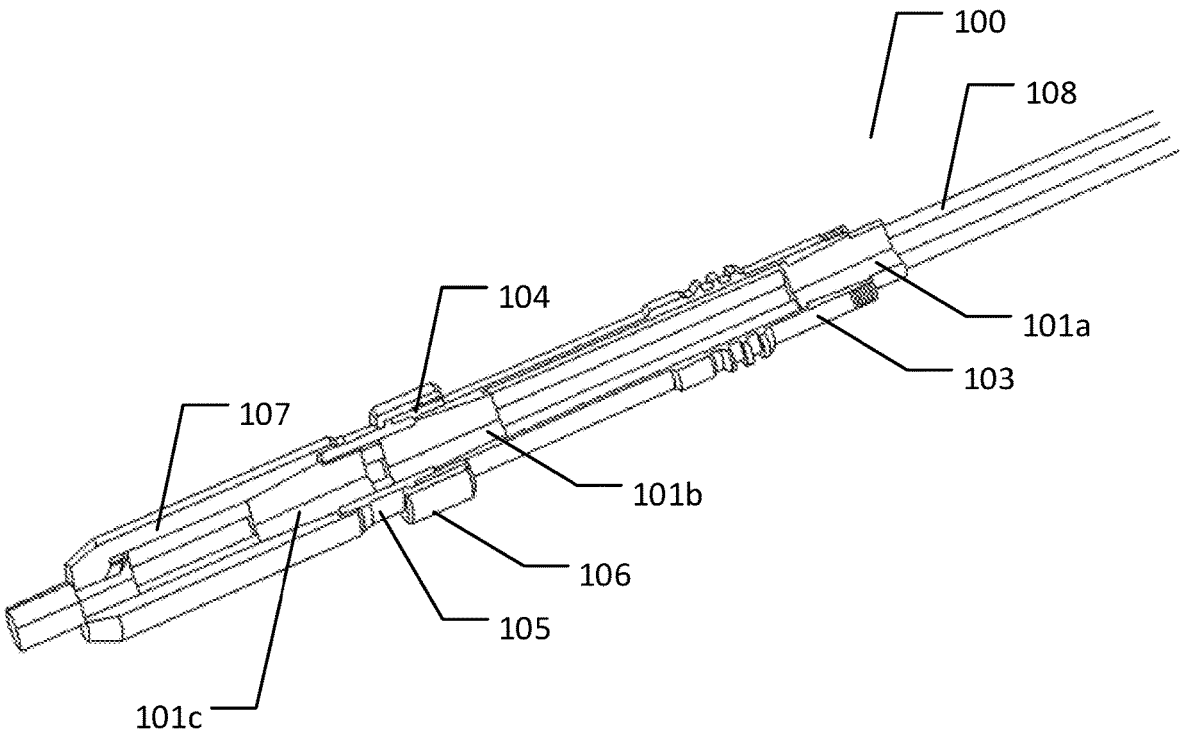

Fig. 2

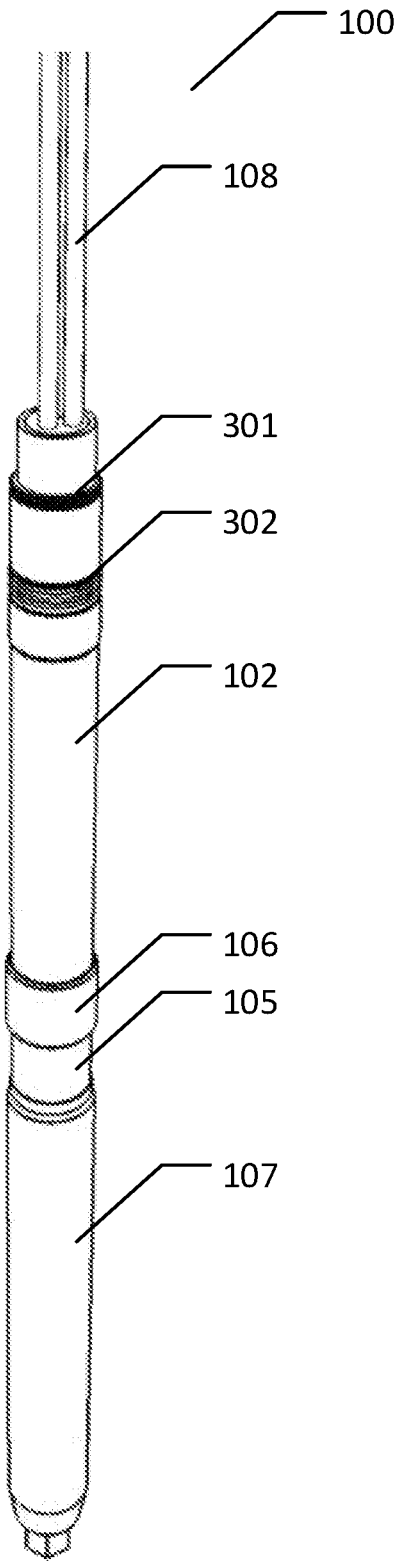

Fig. 3

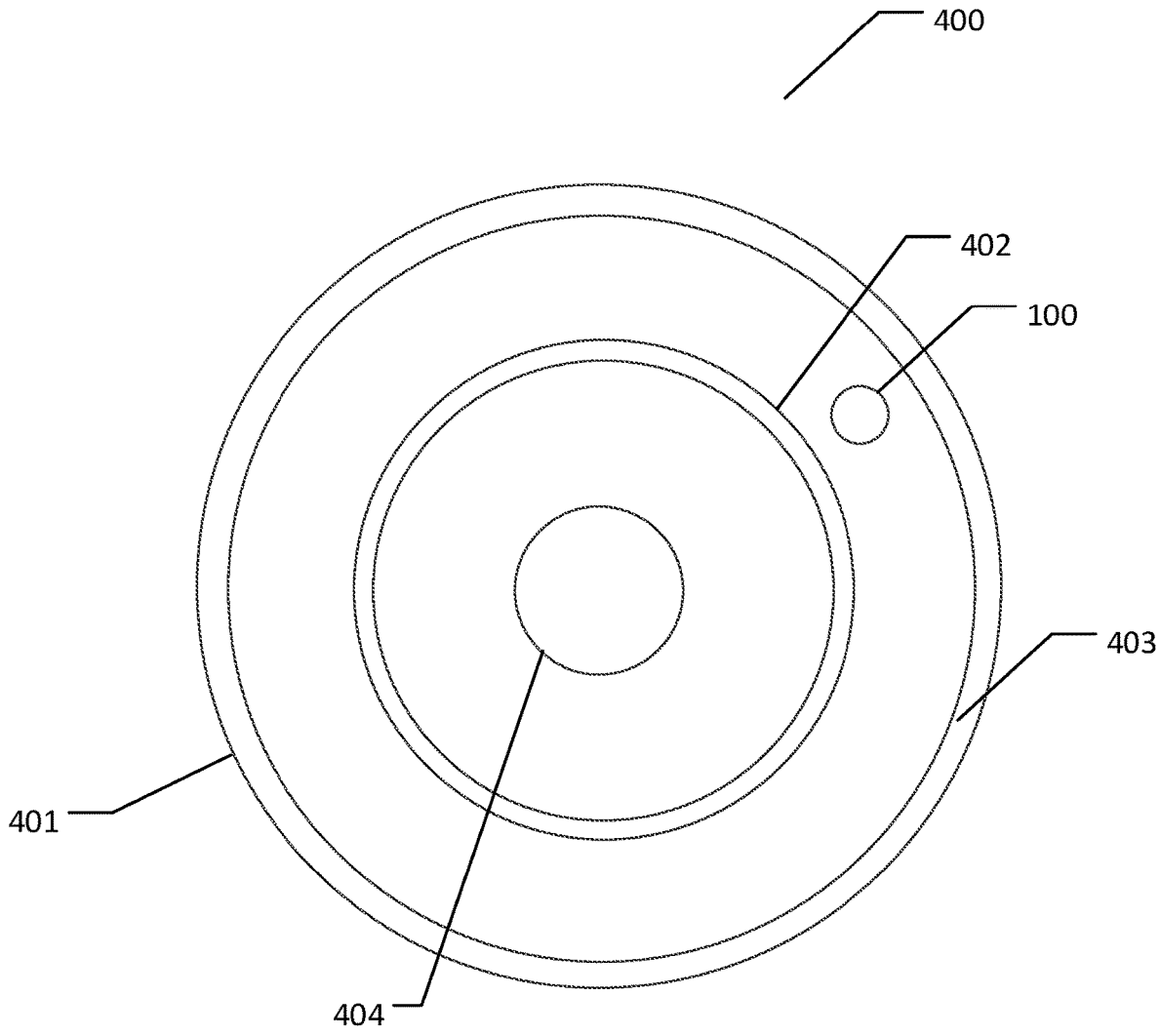

Fig. 4

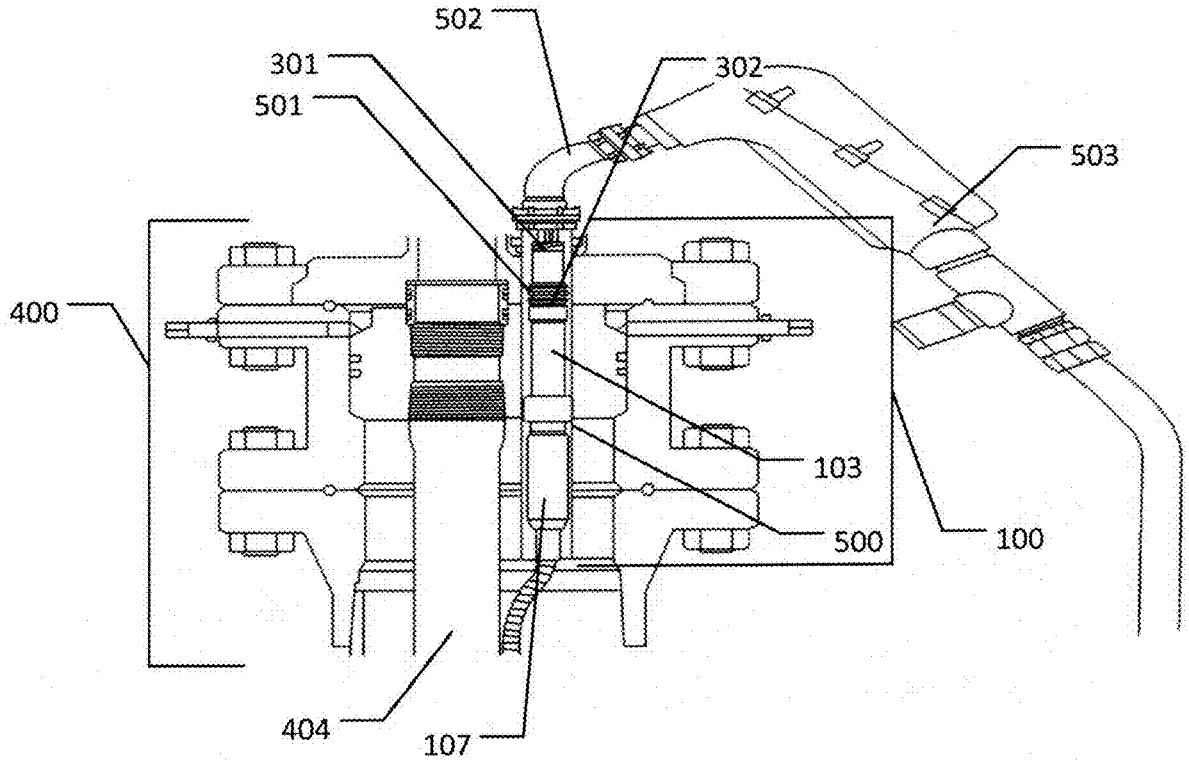

Fig. 5

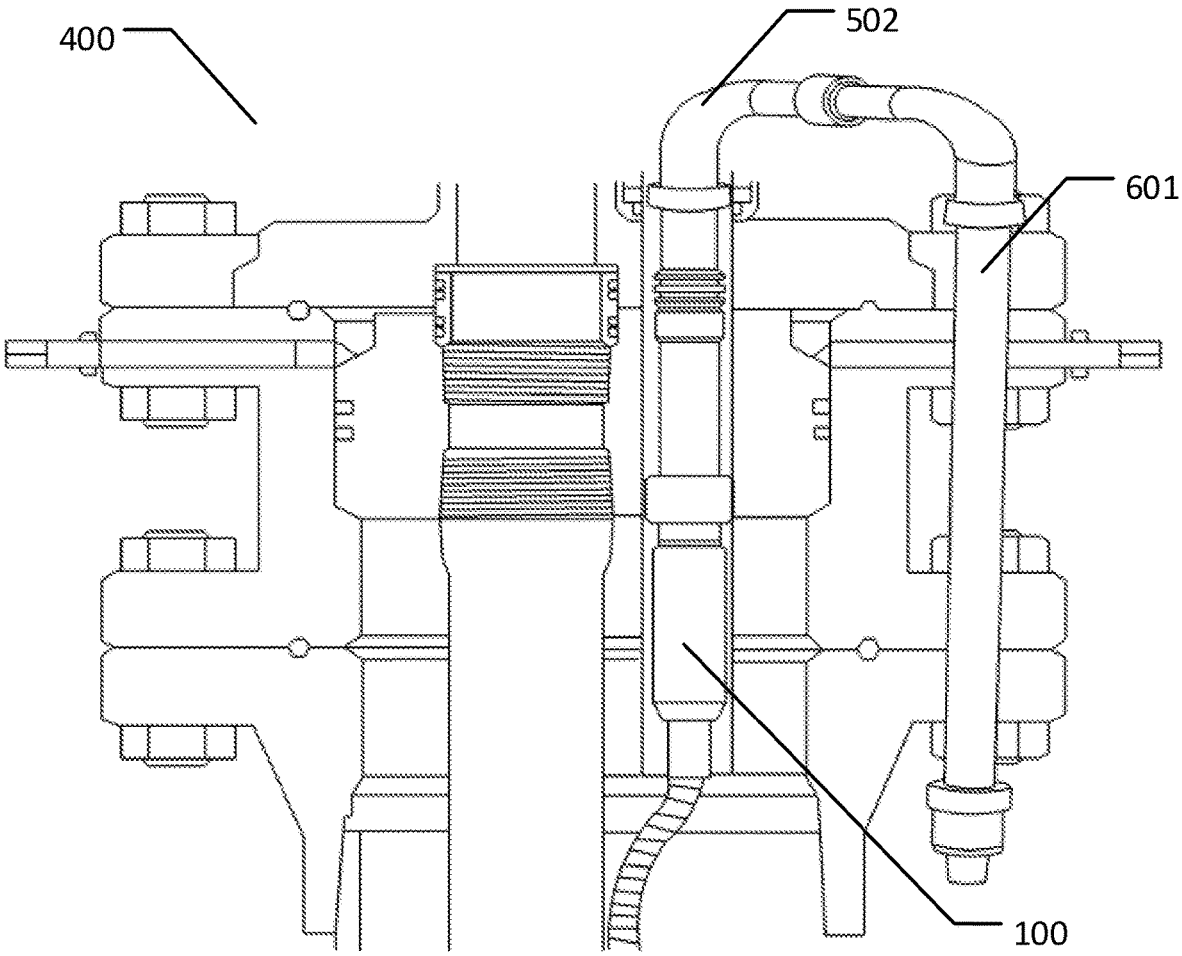

Fig. 6

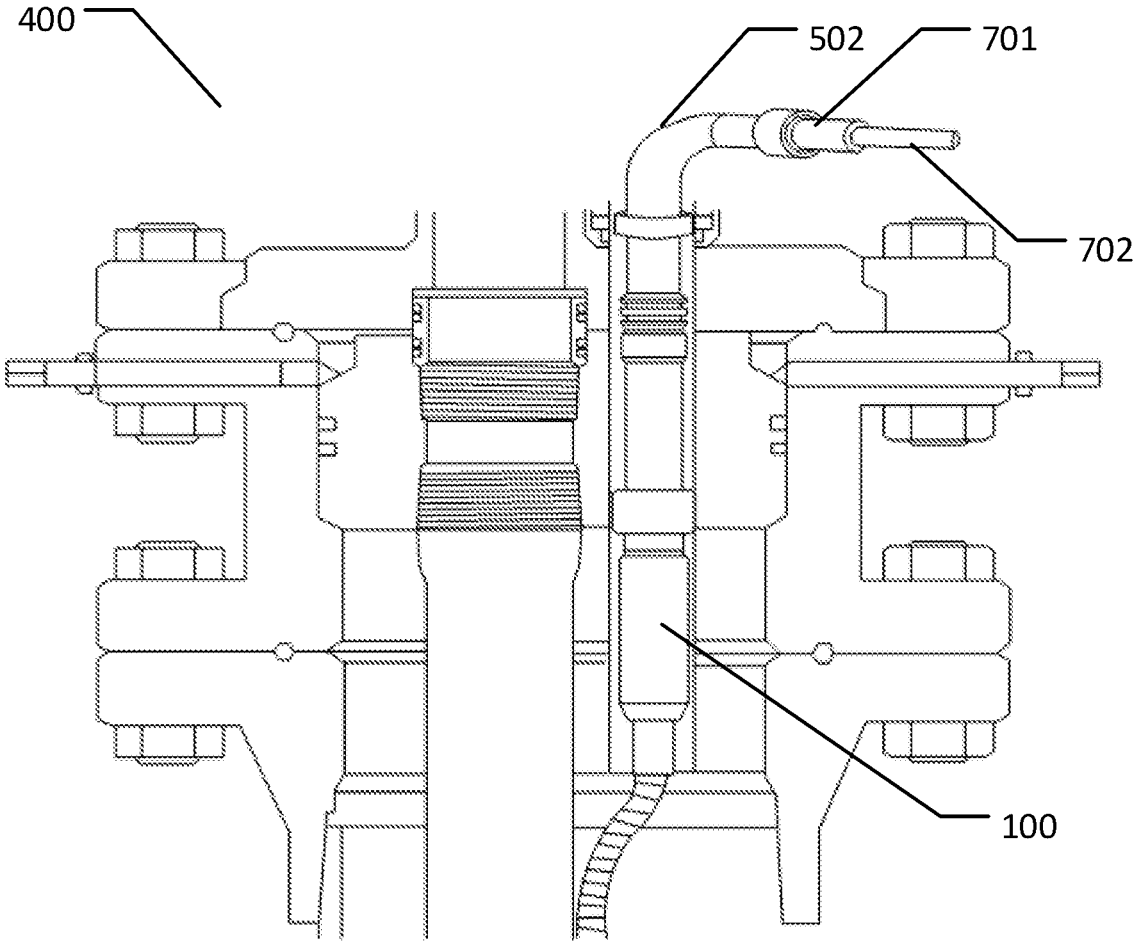

Fig. 7

ONE-CONNECTOR PENETRATOR SYSTEM ADAPTABLE TO ANY CABLES USED IN ARTIFICIAL LIFT SYSTEM

BACKGROUND

[0001] This disclosure relates to a one-connector penetrator system that is adaptable to any cables used in artificial lift system.

[0002] During the production of oil or gas on a wellbore, devices such as pumps are operated down hole. A power line can be used to provide power to such devices. Power line can be run from the top of the well and then connected to the device. However, due to vibrations, or moving of components used for the production, power lines can be susceptible to damage. As such it would be useful to have an improved system and method for providing a one-connector penetrator system that is adaptable to any cables used in artificial lift system.

SUMMARY

[0003] A one-connector penetrator system that is adaptable to any cables used in artificial lift system is described herein. The one-connector penetrator system can comprise and enclosure and a plurality of seals. The enclosure can have a hollowed interior. The plurality of seals can be housed within the enclosure. The plurality of seals can stabilize a three-phase power cable in a fixed position. The plurality of seals can comprise a first seal, a second seal, and a third seal. The first seal can be placed at the front-end portion of the enclosure. The second seal can be placed within the middle portion of the enclosure. The third seal can be placed at the bottom portion of the enclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] FIG. **1** illustrates an exploded view of one-connector penetrator system.

[0005] FIG. **2** illustrates a section view of one-connector penetrator system.

[0006] FIG. **3** illustrates a side view of one-connector penetrator system.

[0007] FIG. **4** illustrates a top view of one-connector penetrator system installed within a well.

[0008] FIG. **5** illustrates a section view of one-connector penetrator system within a well.

[0009] FIG. **6** illustrates a section view embodiment of one-connector penetrator system connected to a power cable electrical splicing through a cable guide.

[0010] FIG. **7** illustrates a surface-electrical power cable that connects to one-connector penetrator system through a completion cone and cable guide.

DETAILED DESCRIPTION

[0011] Described herein is a one-connector penetrator system that is adaptable to any cables used in artificial lift system. The following description is presented to enable any person skilled in the art to make and use the invention as claimed and is provided in the context of the particular examples discussed below, variations of which will be readily apparent to those skilled in the art. In the interest of clarity, not all features of an actual implementation are described in this specification. It will be appreciated that in the development of any such actual implementation (as in any development project), design decisions must be made to achieve the designers' specific goals (e.g., compliance with system- and business-related constraints), and that these goals will vary from one implementation to another. It will also be appreciated that such development effort might be complex and time-consuming, but would nevertheless be a routine undertaking for those of ordinary skill in the field of the appropriate art having the benefit of this disclosure. Accordingly, the claims appended hereto are not intended to be limited by the disclosed embodiments, but are to be accorded their widest scope consistent with the principles and features disclosed herein.

[0012] FIG. **1** illustrates an exploded view of one-connector penetrator system **100**. One-connector penetrator system **100** can comprise a plurality of seals **101**, and an enclosure **102**. One-connector penetrator system **100** can stabilize and protect a three-phase power cable **108** at the wellhead. Moreover, one-connector penetrator system **100** can be adaptable to different types of cable guides used in artificial lift systems with electro-submersible equipment. Thus, one-connector penetrator system **100** can be adaptable to replace existing penetrator systems. As an example, one-connector penetrator system **100** can be adaptable to be used in applications that require the use of Blowout Preventer (BOP Cans). Seals **101** can prevent leakage within one-connector penetrator system **100**. Furthermore, seals **101** can be configured in a conical shape that ensures the interior surface of one-connector penetrator system **100** has a constant interior radius. Moreover, seals **101** can stabilize three-phase power cable **108** within one-connector system **100**. Seals **101** can be made of elastomer material such as Aflas or HNBR (Hydrogenated Nitrile Butadiene Rubber). Seals **101** can comprise a first seal **101***a*, a second seal **101***b*, and a third seal **101***c*. Enclosure **102** can be a housing having a hollowed interior surface capable of securing the components of one-connector penetrator system **100**, such as seals **101** and three-phase power cable **108**. Enclosure **102** can comprise a penetrating mandrel **103**, a mandrel crossover **104**, a conical insurance adapter **105**, a crossover adapter **106**, and a conic cone **107**. Penetrating mandrel **103** can be the top portion of enclosure **102**. Penetrating mandrel **103** can comprise an opening **103***a*, and a first outer thread **109**. Opening **103***a* can be a hole at the front-end portion of penetrating mandrel **103**. A portion of first seal **101***a* can fit snugly within opening **103***a* thus, sealing the front-end portion of enclosure **102**. First outer thread **109** can be placed at the rear end exterior surface of penetrating mandrel **103**. Second seal **101***b* can fit snugly within the middle interior wall of one-connector penetrator system **100**. Mandrel crossover **104** can connect penetrating mandrel **103** with crossover adapter **106**. Mandrel crossover **104** can comprise a second outer thread **110** and a first inner thread **111**. Conical insurance adapter **105** can connect mandrel crossover **104**, crossover adapter **106**, and conic cone **107** together. Conical insurance adapter **105** can comprise a plurality of front ridges **112**. Front ridges **112** can be protruding portions at the front-end exterior surface of conical insurance adapter **105**. Crossover adapter **106** can comprise a second inner thread **113** and a lip **114**. Second inner thread **113** can be within the front-end interior surface of crossover adapter **106** while lip **114** can be within the rear end interior surface of crossover adapter **106**. Lip **114** can be compatible with the front-end portion of conical insurance adapter **105**. Furthermore, crossover adapter **106** can connect penetrating mandrel **103** with conic cone **107**. The

front-end of conic cone **107** can be compatible with the rear-end portion of conical insurance adapter **105**. Thus, conic cone **107** can be positioned at the rear portion of enclosure **102**. Conic cone **107** can be adaptable for flat or round electo-immersible power cable. Moreover, conic cone **107** can secure three-phase power cable **108** and convert it to be a single connector.

[0013] FIG. **2** illustrates a section view of one-connector penetrator system **100**. The bottom portion of first seal **101***a* can cover the top end portion of penetrating mandrel **103**. The rear end of penetrating mandrel **103** can connect with the inner surface of mandrel crossover **104**. As such, first outer thread **109** can be mateable with first inner thread **111**. Then, crossover adapter **106** can slide towards the front-end outer surface of conical insurance adapter **105**. In such structure, lip **114** can snag front ridges **112** of conical insurance adapter **105**. The rear end of mandrel crossover **104** can then slide into crossover adapter **106**. Once in place, second outer thread **110** can be fastened with second inner thread **113**. As such, crossover adapter **106** can attach mandrel crossover **104** and conical insurance adapter **105** together. Second seal **101***b* can be placed within mandrel crossover **104** and conical insurance adapter **105**. In such structure, crossover adapter **106** can enclose mandrel crossover **104** and conical insurance adapter **105**, and providing compression on second seal **101***b*. The rear end of conical insurance adapter **105** can attach snugly within the front-end of conic cone **107**. Third seal **101***c* can be placed at the bottom portion of enclosure **102**. As such, conical insurance adapter **105** can compress third seal **101***c* and ensure that power cable **101** is secured at the bottom of one-connector penetrator system **100**. In one embodiment, conical insurance adapter **105** can have a compression limit as an abutment within conic cone **108**.

[0014] FIG. **3** illustrates a side view of one-connector penetrator system **100** comprising penetrating mandrel **103**, conical insurance adapter **105**, cross over adapter **106**, and conic cone **107**. The exterior surface of penetrating mandrel **103** can comprise a front outer thread **301**, and a plurality of outer ridges **302**. Front outer thread **301** can be a threaded portion at the exterior front-end surface of penetrating mandrel **103**. Outer ridges **302** can be protruding portion at the exterior surface of penetrating mandrel **103**. Furthermore, outer ridges **302** can be placed at the middle exterior surface of penetrating mandrel **103**, in between first outer thread **109** and front outer thread **301**.

[0015] FIG. **4** illustrates a top view of one-connector penetrator system **100** installed within a well **400**. One-connector penetrator system **100** can be installed within well **400** to increase the sealing safety at the wellhead. Well **400** can comprise a casing **401**. Casing **401** can comprise an inner wall **402** and an outer wall **403**. A production pipe **404** can be installed within inner wall **402** while one-connector penetrator system **100** can be installed within outer wall **403**.

[0016] FIG. **5** illustrates a section view of one-connector penetrator system **100** within well **400**. One-connector penetrator system **100** can be placed within a tubing hanger **500**. Tubing hanger **500** can comprise of O-rings **501**. O-rings **501** can fit within outer ridges **302** of penetrating mandrel **103**. Thus, O-rings **501** and outer ridges **302** can seal the gap between one-connector penetrator system **100** and the inner walls of tubing hanger **500**. Further, front outer thread **301** can be mateable with different types of cable guide **502**. As an example embodiment shown in FIG. **5**, one-connector penetrator system **100** can be connected to a vent box **503** through cable guide **502**. Conic cone **107** can enclose three-phase power cable **108** together such that three-phase power cable **108** can form a single device, thus only having a single connector at the bottom of one-connector penetrator system **100**.

[0017] FIG. **6** illustrates a section view embodiment of one-connector penetrator system **100** connected to a power cable electrical splicing **601** through cable guide **502**.

[0018] FIG. **7** illustrates a surface-electrical power cable **701** that connects to one-connector penetrator system **100** through a completion cone **702** and cable guide **502**.

[0019] Various changes in the details of the illustrated operational methods are possible without departing from the scope of the following claims. Some embodiments may combine the activities described herein as being separate steps. Similarly, one or more of the described steps may be omitted, depending upon the specific operational environment the method is being implemented in. It is to be understood that the above description is intended to be illustrative, and not restrictive. For example, the above-described embodiments may be used in combination with each other. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein."

What is claimed is:

1. A one-connector penetrator system comprising

an enclosure having a hollowed interior; and

a plurality of seals housed within said enclosure, said plurality of seals capable of stabilizing a three-phase power cable in a fixed position, wherein said plurality of seals comprises

a first seal placed at a front-end portion of said enclosure;

a second seal placed within a middle portion of said enclosure; and

a third seal placed at a bottom portion of said enclosure;

further wherein said enclosure comprises

a penetrating mandrel at the top portion of said enclosure, the front-end portion of said penetrating mandrel houses a portion of said first seal;

a conic cone at the rear end portion of said enclosure, wherein said conic cone receives said three-phase power cable;

a crossover adapter that connects said penetrating mandrel with said conic cone;

a mandrel crossover that connects said penetrating mandrel with said crossover adapter, further wherein said second seal placed within the interior walls of said mandrel crossover; and

a conic insurance adapter that connects said mandrel crossover, said crossover adapter and said conic cone together, further wherein said third seal is placed within the interior walls of said conic insurance adapter.

2. (canceled)

3. The one-connector penetrator system of claim **1** wherein said penetrating mandrel comprises

an opening, said portion of said first seal fits snugly on said opening;

a first outer thread at the rear end exterior surface of said penetrating mandrel, said first outer thread connectable with said mandrel crossover; and

a front outer thread at the exterior front-end surface of said penetrating mandrel; and

a plurality of outer ridges at the middle exterior surface of said penetrating mandrel.

4. The one-connector penetrator system of claim **3** wherein said front-end outer thread are mateable with different types of cable guide.

5. The one-connector penetrator system of claim **3** wherein said plurality of outer ridges configured to fit O-rings of a tubing hanger.

6. The one-connector penetrator system of claim **1** wherein said mandrel crossover comprises

a first inner thread that is mateable with said first outer thread; and

a second outer thread connectable with said crossover adapter.

7. The one-connector penetrator system of claim **1** wherein said conical insurance adapter comprises a plurality of front ridges, said plurality of ridges connectable with said crossover adapter.

8. The one-connector penetrator system of claim **7** wherein said crossover adapter slidably connectable at the front-end outer surface of said conical insurance adapter.

9. The one-connector penetrator system of claim **1** wherein said conic cone is adaptable for flat electo-immersible power cable.

10. The one-connector penetrator system of claim **1** wherein said conic cone is adaptable for a round electo-immersible power cable.

11. The one-connector penetrator system of claim **1** wherein each of said plurality of seals are in a conical shape.

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