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## Rapid Change Vertical Shore


### Abstract

The embodiments described herein include rapid change vertical shore used in the trench safety industry. Particular embodiments facilitate a rapid change between a single cylinder vertical shore and a double cylinder vertical shore.



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### Background/Summary

RELATED APPLICATIONS [0001] This application claims priority to U.S. Provisional Application Ser. No. 63/555,747, entitled “Rapid Change Vertical Shore,” filed Feb. 20, 2020.

TECHNICAL FIELD OF THE INVENTION

[0002] This disclosure generally relates to a vertical shore used in the trench safety industry, and more particularly to rapid change between single and double cylinder vertical shores.

BACKGROUND

[0003] Hydraulic shoring products are designed prevent a trench cave-in. For example, a hydraulic vertical shore is designed to prevent a cave-in by supporting the side walls of a trench through the use of hydraulic pressure. Vertical shores are designed to be installed and removed from the top of the trench; and may be used as spot bracing or and/or for production trenching.

SUMMARY OF THE INVENTION

[0004] The embodiments described herein include rapid change vertical shore used in the trench safety industry. Particular embodiments facilitate a rapid change between a single cylinder vertical shore and a double cylinder vertical shore.

[0005] According to some embodiments, a rapid change vertical shore comprises a first shore rail and a second shore rail oriented parallel to the first shore rail. A first hydraulic cylinder is coupled perpendicularly between the first shore rail and the second shore rail. The first hydraulic cylinder is coupled to the first shore rail via a first cylinder base. The first cylinder base comprises a hose fitting fluidly coupled to the first hydraulic cylinder. The hose fitting comprises a male quick disconnect connector.

[0006] In particular embodiments, the hose fitting is oriented perpendicular to the first cylinder base. The hose fitting is positioned a distance away from the hydraulic cylinder to facilitate manual connection/disconnection of a pressure hose to the hose fitting.

[0007] In particular embodiments, the rapid change vertical shore further comprises a second hydraulic cylinder coupled perpendicularly between the first shore rail and the second shore rail. The second hydraulic cylinder is coupled to the first shore rail via a second cylinder base. The second cylinder base comprises a hose fitting fluidly coupled to the second hydraulic cylinder. The hose fitting comprising a male quick disconnect connector. A pressure hose comprising a female quick disconnect connector at both ends is coupled to the first cylinder base hose fitting and the second cylinder base hose fitting.

[0008] Certain embodiments may provide one or more of the following technical advantages. For example, particular embodiments include a universal hydraulic cylinder for a hydraulic vertical shore in the trench safety industry. Particular embodiments negate the need for re-testing pressure holding ability after reconfiguring a hydraulic vertical shore. Thus, as one example, particular embodiments save rental companies time when converting vertical shores between single cylinder and double cylinders. The time savings is a multiple of the number of vertical shore conversions. In the trench safety industry, end users expect the rental companies to be nimble and fast. The embodiments described herein facilitate cylinder conversion much faster than traditional hydraulic vertical shores, which have been in use for approximately 40 years.

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## Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] A more complete and thorough understanding of the particular embodiments and advantages thereof may be acquired by referring to the following description taken in conjunction with the accompanying drawings, in which like reference numbers indicate like features, and wherein:

[0010] FIG. **1** is a perspective view of vertical shores installed in a trench;

[0011] FIG. **2** is a perspective view of a double cylinder vertical shore;

[0012] FIG. **3** is a perspective view illustrating the installation/removal of a cylinder of a vertical shore;

[0013] FIG. **4** is a perspective view of a rapid change vertical shore, according to a particular

embodiment;
[0014] FIG. **5** is a close up view of a quick disconnect of a rapid change vertical shore, according to a particular embodiment;
[0015] FIG. **6** is a schematic overhead view of a cylinder base of a rapid change vertical shore, according to a particular embodiment;
[0016] FIG. **7** is a schematic cross-section view of a cylinder base of a rapid change vertical shore, according to a particular embodiment;
[0017] FIG. **8** is a flow chart illustrating an example method for converting a single cylinder vertical shore to a double cylinder vertical shore, according to particular embodiments; and
[0018] FIG. **9** is a flow chart illustrating an example method for converting a double cylinder vertical shore to a single cylinder vertical shore, according to particular embodiments.

DETAILED DESCRIPTION

[0019] A hydraulic vertical shore is designed to prevent a cave-in by supporting the side walls of a trench through the use of hydraulic pressure. An example is illustrated in FIG. **1**.
[0020] FIG. **1** is a perspective view of vertical shores installed in a trench. In the illustrated example, four double cylinder vertical shores **10** are illustrated inside a trench. The vertical shores **10** are lowered into the trench and hydraulic pressure is applied to expand vertical shore **10** to support the side walls of the trench.
[0021] FIG. **2** is a perspective view of a double cylinder vertical shore. Double cylinder vertical shore **10** includes two shore rails **12** parallel to each other and coupled to each other via two hydraulic cylinders **14**. Hydraulic cylinders **14** are oriented perpendicular to shore rails **12**.
[0022] Hydraulic cylinders **14** are hydraulically coupled to each other via pressure hose **16**. Pressure hose **16** facilitates fluid transfer between hydraulic cylinders **14**. Hydraulic cylinders **14** expand to apply pressure to shore rails **12** which in turn apply pressure to the trench wall. Hydraulic cylinders **14** contract to relieve pressure from shore rails **12** to facilitate inserting/removing vertical shore **10** to/from the trench.
[0023] Hydraulic cylinders **14** are coupled to shore rails **12** via cylinder base **18**. Cylinder base **18** includes plumbing (see FIG. **7**) to facilitate fluid transfer between hydraulic cylinder **14** through cylinder base **18** and pressure hose **16**.
[0024] Shore rails **12** may comprise aluminum or any other suitable material. Hydraulic cylinders **14** may comprise various lengths, depending on, e.g., trench width.
[0025] FIG. **2** illustrates a double cylinder vertical shore. A vertical shore is also available as a single cylinder vertical shore, which is similar to vertical shore **10** illustrated in FIG. **2**, except that shore rails **12** are coupled via a single hydraulic cylinder **14** and pressure hose **16** is not needed.
[0026] A vertical shore may be converted from a single cylinder to a double cylinder and vice versa. A problem with existing vertical shores is that converting an existing hydraulic vertical shore between a single cylinder and a double cylinder requires tools for connecting/disconnecting the hydraulic cylinder to/from the shore rails. An example is illustrated in FIG. **3**.
[0027] FIG. **3** is a perspective view illustrating the installation/removal of a cylinder of a vertical shore. In the illustrated example, pressure hose **16** is coupled to a threaded hose fitting on cylinder base **18** and an operator uses a wrench to disconnect/connect pressure hose **16** from the hose fitting of cylinder base **18**. For equipment rental companies, for example, that may perform a large number of cylinder conversions, the conversion time can be costly. In addition, existing hydraulic vertical shores need to be pressure tested after adding or removing hydraulic cylinders.
[0028] Certain aspects of the present disclosure and their embodiments may provide solutions to these or other challenges. For example, particular embodiments include a universal hydraulic cylinder for a hydraulic vertical shore in the trench safety industry. Particular embodiments negate the need for re-testing pressure holding ability after reconfiguring a hydraulic vertical shore. Thus, as on example, particular embodiments save rental companies time when converting vertical shores between single cylinder and double cylinders. The time savings is a multiple of the number of

vertical shore conversions. In the trench safety industry, end users expect the rental companies to be nimble and fast. The embodiments described herein facilitate cylinder conversion much faster than traditional hydraulic vertical shores, which have been in use for approximately 40 years.
[0029] Particular embodiments and their advantages are best understood by reference to FIGS. **4** through **9**, wherein like reference numbers indicate like features.
[0030] FIG. **4** is a perspective view of a rapid change vertical shore, according to a particular embodiment. Rapid change vertical shore **40** includes shore rails **12** and hydraulic cylinders **14** as described with respect to vertical shore **10** illustrated in FIG. **2**. Rapid change vertical shore **40**, however, is improved so that hydraulic cylinder **14** may be added or removed quickly without tools and without leakage of hydraulic fluid.
[0031] Cylinder base **46** comprises a hose fitting fluidly coupled to hydraulic cylinder **14** with male quick disconnect connector **42**. Each cylinder base **46** may be coupled to the other via pressure hose **48**. Pressure hose **48** comprises female quick disconnect connectors **44** at each end.
[0032] To prevent fluid leakage, male quick disconnect connector **42** is self-sealing when female quick disconnect connector **44** is removed. To prevent accidental disconnects, male quick disconnect connector **42** and female quick disconnect connector **44** may comprise a lock, such as a ball lock, or any other suitable lock. Male quick disconnect connector **42** and female quick disconnect connector **44** may comprise brass fittings, or any other suitable material.
[0033] Because of the self-sealing feature, particular embodiments negate the need for re-testing pressure holding ability after reconfiguring a hydraulic vertical shore.
[0034] FIG. **5** is a close up view of a quick disconnect of a rapid change vertical shore, according to a particular embodiment. In the illustrated example, an operator manually connects/disconnects male quick disconnect connector **42** and female quick disconnect connector **44**. Male quick disconnect connector **42** is positioned far enough away from hydraulic cylinder **14** so that an operator may have unobstructed access to male quick disconnect connector **42** and female quick disconnect connector **44**. Thus, in some embodiments, cylinder base **46** may be wider than a conventional cylinder base to provide adequate distance between male quick disconnect connector **42** and hydraulic cylinder **14**.
[0035] In particular embodiments, male quick disconnect connector **42** is oriented perpendicular to the surface of cylinder base **46** to facilitate ease of connection/disconnection.
[0036] FIG. **6** is a schematic overhead view of a cylinder base of a rapid change vertical shore, according to a particular embodiment. The illustrated example illustrates male quick disconnect connector **42** and a threaded base **50** for accepting a hydraulic cylinder. For example, during conversion between single and double cylinders, hydraulic cylinder **14** may coupled to cylinder base **46** via twisting on/off threaded base **50**. Thus, particular embodiments also facilitate rapid change of different cylinder lengths.
[0037] FIG. **7** is a schematic cross-section view of a cylinder base of a rapid change vertical shore, according to a particular embodiment. FIG. **7** illustrates a cross section of male quick disconnect connector **42**, female quick disconnect connector **44**, and thread base **50** described above.
[0038] FIG. **8** is a flow chart illustrating an example method for converting a single cylinder vertical shore to a double cylinder vertical shore, according to particular embodiments. In particular embodiments, one or more steps of FIG. **8** may be performed with respect to rapid change vertical shore **40** described with respect to FIGS. **4**-**7**.
[0039] At step **812**, an operator couples a second hydraulic cylinder (e.g., hydraulic cylinder **14**) perpendicularly between the first shore rail and the second shore rail (e.g., shore rails **12**) via a second cylinder base (e.g., cylinder base **46**). The second cylinder base comprises a hose fitting fluidly coupled to the second hydraulic cylinder. The hose fitting comprises a male quick disconnect connector (e.g., male quick disconnect connector **42**).
[0040] At step **814**, the operator couples a pressure hose (e.g., pressure hose **48**) comprising a female quick disconnect connector (e.g., female quick disconnect connector **44**) at both ends to the

first cylinder base hose fitting and the second cylinder base hose fitting.
[0041] Modifications, additions, or omissions may be made to method **800** of FIG. **8**. Additionally, one or more steps in the method of FIG. **8** may be performed in parallel or in any suitable order.
[0042] FIG. **9** is a flow chart illustrating an example method for converting a double cylinder vertical shore to a single cylinder vertical shore, according to particular embodiments. In particular embodiments, one or more steps of FIG. **9** may be performed with respect to rapid change vertical shore **40** described with respect to FIGS. **4**-**7**.
[0043] At step **912**, an operator uncouples the pressure hose (e.g., pressure hose **48**) from the first cylinder base (e.g., cylinder base **46**) hose fitting and the second cylinder base (e.g., cylinder base **46**) hose fitting.
[0044] At step **914**, the operator uncouples the second cylinder base (e.g., cylinder base **46**) and second hydraulic cylinder (e.g. hydraulic cylinder **14**) from the first shore rail (e.g., shore rail **12**).
[0045] Modifications, additions, or omissions may be made to method **900** of FIG. **9**. Additionally, one or more steps in the method of FIG. **9** may be performed in parallel or in any suitable order.
[0046] Modifications, additions, or omissions may be made to the systems and apparatuses disclosed herein without departing from the scope of the invention. The components of the systems and apparatuses may be integrated or separated. Moreover, the operations of the systems and apparatuses may be performed by more, fewer, or other components.
[0047] Although embodiments of the present disclosure and their advantages have been described in detail, it should be understood that various changes, substitutions and alternations can be made herein without departing from the spirit and scope of the invention as defined by the following example embodiments.

## Claims

**1**. A rapid change vertical shore comprising: a first shore rail; a second shore rail oriented parallel to the first shore rail; a first hydraulic cylinder coupled perpendicularly between the first shore rail and the second shore rail, the first hydraulic cylinder coupled to the first shore rail via a first cylinder base; and the first cylinder base comprises a hose fitting fluidly coupled to the first hydraulic cylinder, the hose fitting comprising a male quick disconnect connector.
**2**. The rapid change vertical shore of claim 1, wherein the hose fitting is oriented perpendicular to the first cylinder base.
**3**. The rapid change vertical shore of claim 1, wherein the hose fitting is positioned a distance away from the hydraulic cylinder to facilitate manual connection/disconnection of a pressure hose to the hose fitting.
**4**. The rapid change vertical shore of claim 1, further comprising: a second hydraulic cylinder coupled perpendicularly between the first shore rail and the second shore rail, the second hydraulic cylinder coupled to the first shore rail via a second cylinder base; the second cylinder base comprises a hose fitting fluidly coupled to the second hydraulic cylinder, the hose fitting comprising a male quick disconnect connector; and a pressure hose comprising a female quick disconnect connector at both ends coupled to the first cylinder base hose fitting and the second cylinder base hose fitting.
**5**. A rapid change cylinder base for a hydraulic vertical shore comprising: a threaded base for accepting a hydraulic cylinder; and a hose fitting fluidly coupled to the hydraulic cylinder, the hose fitting comprising a male quick disconnect connector.
**6**. The rapid change cylinder base of claim 5, wherein the hose fitting is oriented perpendicular to the cylinder base.
**7**. The rapid change cylinder base of claim 5, wherein the hose fitting is positioned a distance away from the hydraulic cylinder to facilitate manual connection/disconnection of a pressure hose to the hose fitting.

**8**. A method for converting a single cylinder vertical shore to a double cylinder vertical shore, the single cylinder vertical shore comprising: a first shore rail; a second shore rail oriented parallel to the first shore rail; a first hydraulic cylinder coupled perpendicularly between the first shore rail and the second shore rail, the first hydraulic cylinder coupled to the first shore rail via a first cylinder base; and the first cylinder base comprises a hose fitting fluidly coupled to the first hydraulic cylinder, the hose fitting comprising a male quick disconnect connector; the method comprising: coupling a second hydraulic cylinder perpendicularly between the first shore rail and the second shore rail via a second cylinder base, wherein the second cylinder base comprises a hose fitting fluidly coupled to the second hydraulic cylinder, the hose fitting comprising a male quick disconnect connector; and coupling a pressure hose comprising a female quick disconnect connector at both ends to the first cylinder base hose fitting and the second cylinder base hose fitting.

**9**. A method for converting a double cylinder vertical shore to a single cylinder vertical shore, the double cylinder vertical shore comprising: a first shore rail; a second shore rail oriented parallel to the first shore rail; a first hydraulic cylinder coupled perpendicularly between the first shore rail and the second shore rail, the first hydraulic cylinder coupled to the first shore rail via a first cylinder base; and the first cylinder base comprises a hose fitting fluidly coupled to the first hydraulic cylinder, the hose fitting comprising a male quick disconnect connector; a second hydraulic cylinder coupled perpendicularly between the first shore rail and the second shore rail, the second hydraulic cylinder coupled to the first shore rail via a second cylinder base; and the second cylinder base comprises a hose fitting fluidly coupled to the second hydraulic cylinder, the hose fitting comprising a male quick disconnect connector; and a pressure hose comprising a female quick disconnect connector at both ends coupled to the first cylinder base hose fitting and the second cylinder base hose fitting; the method comprising: uncoupling the pressure hose from the first cylinder base hose fitting and the second cylinder base hose fitting; and uncoupling the second cylinder base and second hydraulic cylinder from the first shore rail.