

APPARATUS AND METHOD FOR HOSE INSTALLATION

BACKGROUND

Technical Field

5 Embodiments of the invention relate to power-assisted apparatus and method for hose installation and/or uninstallation to improve workplace safety and efficiency.

Description of Related Art

 Currently in shipyards and onboard vessels, hose installation or joining a hose
segment to a pipe segment is a tedious task which requires substantial manpower as
10 well as physical labour. Manpower is required to transfer or lift a hose to a
destination, align the hose to a union of the target pipe, and subsequently tighten or
secure the hose to the union to complete the connection between the hose and the
pipe. For example, in order to install a 5-inch hose to a union, the average number of
man-hours required is 1.5 hours. This lengthy process inevitably increases human
15 fatigue level significantly. Further, current installation methods present many pinch
points which may lead to accidental finger or hand injuries. In view of the above,
existing methods of hose installation are inefficient and pose a risk to workplace
safety.

Summary

20 According to one aspect of the invention, a power-assisted apparatus for hose
installation and/or uninstallation is provided. The power-assisted apparatus
comprises:

 a first frame adapted to mount to a hose, and movable between a first
engaged position wherein the first frame engages the hose and a first release
25 position wherein the first frame releases the hose;

a second frame adapted to secure to a pipe, and movable between a second engaged position wherein the second frame engages the pipe and a second release position wherein the second frame releases the pipe; and

5 a plurality of pistons provided on the second frame, each of the plurality of pistons having a pulley provided thereon, wherein during operation, a cable is to be looped over the pulley, the cable having a first end secured to the first frame and a second end secured to the second frame, and the plurality of pistons are actuatable to vertically displace both the hose and the first frame which is mounted to the hose, and align the hose with the pipe.

10 In one embodiment, the first frame may include at least one groove for engaging an end attachment of the first end of the cable, and the second frame includes at least one pad-eye for engaging the second end of the cable.

In one embodiment, a horizontal dimension of the first frame may be larger than a horizontal dimension of the second frame.

15 In one embodiment, wherein the first frame may include at least a first hinge mechanism to allow the first frame move between the first engaged position and the first release position, and wherein the second frame may include at least a second hinge mechanism to allow the second frame move between the second engaged position and the second release position.

20 In one embodiment, the first frame and the second frame may be respectively disposed in the first engaged position and the second engaged position by a plurality of screws or bolts.

According to one aspect of the invention, a power-assisted method of hose installation is provided. The method comprises:

25 mounting a first frame to a hose;

mounting a second frame to a pipe, wherein the second frame includes a plurality of pistons provided thereon, each of the plurality of pistons having a pulley provided thereon;

securing the first frame to the second frame by securing a first end of a cable to the first frame, wherein the cable is looped over the pulley and having a second end secured to the second frame; and

5 while having the second frame support both the first frame and the hose, actuating the plurality of pistons to vertically displace the first frame and align the hose with the pipe.

10 In one embodiment of the above method, securing the first frame to the second frame by securing a first end of a cable to the first frame may include guiding an end attachment provided at the first end of the cable into engagement with a groove at the first frame.

According to one aspect of the invention, a power-assisted method of hose uninstallation is provided. The method comprises:

at a hose which is joined to a pipe, mounting a first frame to the hose;

15 mounting a second frame to the pipe, wherein the second frame includes a plurality of pistons provided thereon, each of the plurality of pistons having a pulley provided thereon;

actuating the pistons to a required elevation;

20 securing the first frame to the second frame by securing a first end of a cable to the first frame, wherein the cable is looped over the pulley and having a second end secured to the second frame;

untightening a union joining the hose and the pipe;

reducing the required elevation of the plurality of pistons to cause the hose and the first frame mounted thereto disconnect from the union;

disengaging the cable from the first frame; and

25 transferring the hose to a required position.

In one embodiment of the above method, securing the first frame to the second frame by securing a first end of a cable to the first frame may include guiding an end attachment provided at the first end of the cable into engagement with a groove at the first frame, and disengaging the cable from the first frame may include
5 guiding the end attachment provided at the first end of the cable into disengagement with the groove at the first frame.

Brief Description of the Drawings

Embodiments of the invention are disclosed hereinafter with reference to the drawings, in which:

10 FIG. 1A is an exploded view of a power-assisted apparatus for hose installation and/or uninstallation according to one embodiment of the invention;

FIG. 1B is a top view of the power-assisted apparatus of FIG. 1A;

FIG. 2A is a perspective view of the first frame in a first engaged position;

15 FIG. 2B is a perspective view of the second frame in a second engaged position; and

FIGs. 3A to 3E illustrate a hose installation procedure according to one embodiment of the invention.

Detailed Description

In the following description, numerous specific details are set forth in order to
20 provide a thorough understanding of various illustrative embodiments of the invention. It will be understood, however, to one skilled in the art, that embodiments of the invention may be practiced without some or all of these specific details. In other instances, well known process operations have not been described in detail in order not to unnecessarily obscure pertinent aspects of embodiments being
25 described. In the drawings, like reference numerals refer to same or similar functionalities or features throughout the several views.

As used in the description and claims, unless otherwise specified, the use of the ordinal adjectives "first", "second", "third", etc., to describe a common element, merely indicate that different instances of like elements are being referred to, and are not intended to imply that the elements so described must be in a given sequence, either temporally, spatially, in ranking, or in any other manner.

Embodiments of the invention provide a power-assisted apparatus and method for hose installation and/or uninstallation, particularly for aligning a hose segment to a pipe segment.

Reference is made to FIGs. 1A, 1B, 2A and 2B which illustrate various views of a power-assisted apparatus according to one embodiment. The power-assisted apparatus comprises a first frame 10 (e.g. bottom jig), a second frame 20 (e.g. top jig), pistons 21 provided on the second frame 20, and a pulley 22 provided on each of the piston 21. The aforementioned and other components of the power-assisted apparatus will be described in detail in the following paragraphs.

The first frame 10 (see FIGs. 1A and 2A) is adapted to mount to a hose 30. The first frame 10 is movable between a first engaged position (see FIG. 2A) wherein the first frame 10 engages or secures to the hose 30, and a first release position (see FIG. 1A) wherein the first frame 10 releases or disengages the hose 30. The first frame 10 may be provided as detachable halves 12a, 12b and includes an inner annulus 14 which is adapted to encircle the circumference of a hose 30 to mount to the hose 30 in the first engaged position. The detachable halves 12a, 12b of the first frame 10 may be held together in the first engaged position by bolt nuts or other suitable fasteners.

The second frame 20 (see FIGs. 1A and 2B) is adapted to mount to a pipe 40. The second frame 20 is movable between a second engaged position (FIG. 2B) wherein the second frame 20 engages or secures to the pipe 40, and a second release position (FIG. 1A) wherein the second frame 20 releases or disengages the pipe 40. The second frame 20 may be provided as detachable halves 22a, 22b and includes an inner annulus 24 which is adapted to encircle the circumference of a pipe 40 to mount to the pipe 40 in the second engaged position. The detachable

halves 22a, 22b of the second frame 20 may be held together in the second engaged position by bolt nuts or other suitable fasteners.

The pistons 21 (see FIG. 1A) are provided on the second frame 20. Particularly, piston holders 23 are provided on the second frame 20 and each piston holder 23 is to retain a piston 21 therein. In FIG. 1A, three piston holders 23 are provided, wherein each piston holder is arranged at equal angular displacement from adjacent piston holders. This placement of the pistons 21 enables the weight of a lifted hose 20 to be equally distributed among the three pistons 21. The pistons 21 may be actuable by hydraulic pumps (not shown). In some embodiments, hydraulic pumps may be preferred over pneumatic pumps as hydraulic pumps can develop higher pressure and hydraulic fluid is incompressible.

A pulley 22 (see FIG. 1A) is provided on each piston 21. Particularly, the pulley 22 is mounted on each piston 21, such as at or near an end of the each piston 21, so that upon actuation of the piston 21, the piston 21 and the pulley 22 are both displaced. A cable (or other suitable line or rope) is to be looped over the pulley 22 (see FIG. 3B), where the cable has a first end to be secured to the first frame 10 and a second end secured to the second frame 20. When the first frame 10 is secured to the second frame 20 via the cables, the displacement motion of the pistons 21 and the pulleys 22 vertically displaces (i.e. jacks-up or lifts) both the first frame 10 and the hose 30. Due to the freely-hanging first frame 10 and relative arrangement of the first and second frames, the hose 30 is thereby aligned to the pipe 40. The hydraulic pump is connected to a manifold which includes three outputs to each individual piston. The manifold regulates fluid flow between the hydraulic pump and the pistons to provide equal distribution of hydraulic pressure to each piston during the alignment process.

The first end of the cable 50 may be secured to the first frame 10 by guiding the first end into engagement with a groove 16 (see FIG. 1B) provided at the first frame 10. Particularly, the first end of the cable 50 may be provided with an end attachment 51 which has a larger dimension than the groove 16 so that the first frame 10 can be seated upon the end attachment. To this purpose, the first frame 10 may have a larger diameter or horizontal dimension than the second frame 20. This

way, the first end of the cable 50 may be slotted into the groove 16 of the second frame with ease. In this seated arrangement, both the first frame 10 and the hose 30 are supported by the second frame 20 via the cables 50. The second end of the cable may be secured to the second frame 20 by securing to a pad-eye 28 or other
5 suitable devices provided on the second frame 20.

The above-described apparatus may be made of carbon steel, aluminum or other suitable metals or materials.

Various modifications that may be envisaged by a person skilled in the art may be made to the aforementioned apparatus, including but not limited to the
10 following:

In certain embodiments, the first frame and the second frame may include hinge mechanisms to allow each frame move between the respective engaged position and the release position without separating both halves of each frame.

In certain embodiments, the number of the piston holders provided at the second
15 frame may be two or more, and the number of pistons to be provided corresponds to the number of piston holders. As pistons are available in various designs, specifications and capacity, a suitable piston type is to be selected according to the lifting requirements.

The groove on the first frame may be provided in any other shape or configuration
20 as long as the cable can be secured to the second frame by weight of the hose.

A method of hose installation using a power-assisted apparatus is described as follows and with reference to FIG.s 3A to 3E.

FIG. 3A shows a hose 30 which is to be installed to a pipe 40.

In FIG. 3B, a first frame 10 is mounted to the hose 30 (i.e. first engaged
25 position), and a second frame 20 is mounted to the pipe 40 (i.e. second engaged position). The second frame 20 is mounted at a position above a union (not shown) which is mounted to the pipe 40 for joining the hose 30 and pipe 40. The second

frame 20 is provided with a cable 50 looped over each pulley 22. A first end of each cable 50 is unsecured while a second end of each cable 50 is secured to the second frame 20.

5 In FIG. 3C, a lifting crane (not shown) supports and transfers both the hose 30 and the first frame 10 thereto to a position proximate to the pipe 40.

10 In FIG. 3D, while the lifting crane supports both the hose 30 and the first frame 10 mounted thereto, the first frame 10 is secured to the second frame 20 by securing the first end of each cable 50 to the first frame 10. Particularly, a near-end portion of each cable 50 is guided into engagement with a receiving groove 16 at the first frame 10.

15 In FIG. 3E, support from the lifting crane is removed from both the hose 30 and the first frame 10 which are now supported by the second frame 20 via the cables 50. The pistons 21 on the second frame 20 are actuated to vertically displace (i.e. jack up or lift) both the first frame 10 and the hose 30 towards the pipe 40, and align the hose 30 to the pipe 40.

20 After the hose 30 is aligned to the pipe 40 and lifted to a suitable proximity, union (not shown) may be tightened to join the hose 30 and pipe 40. The first frame 10 and the second frame 20 may then be released from the hose 30 and the pipe 40 (i.e. disposed in the first release position and the second release position respectively).

25 The power-assisted apparatus can be employed to uninstall a hose which is joined to a pipe. At a hose 30 which has been installed to a pipe 40, the first frame 10 is mounted to the hose 30 (i.e. first engaged position), and the second frame 20 is mounted to the pipe 40 (i.e. second engaged position). The hydraulic pump is actuated to dispose the pistons 21 disposed at a required elevation. With the pistons 21 at the required elevation, a cable 50 is looped over the pulley 22 to secure the first frame 10 to the second frame 20, such that the cable 50 is disposed to support the weight of the first frame 10 and the hose 30 upon release of the hose 30 from the pipe 40. The union, which joins the hose 30 to the pipe 40, is loosened or

untightened. After the union is untightened, pressure in the hydraulic pump is allowed to release which results in disposing the pistons 21 at a reduced elevation and, accordingly, the hose 30, together with the first frame 10 mounted thereto, disconnects or falls away from the union. The disconnected hose 30 and the first
5 frame 10 would be supported from the second frame 20 and the pipe 40. Using a lifting crane to support the hose 30 and/or the first frame 10, the cable 50 is disengaged from the first frame 10, and the hose 10 is transferred away to a required position using the lifting crane.

As will be appreciated from the above, the power-assisted apparatus and
10 method according to the invention provide several advantages. Manual alignment of hose to pipe is replaced by power-assisted alignment. Accordingly, manpower, hose installation and uninstallation time, exposure of personnel to working at heights, and pinch points of this procedure are all reduced. Consequently, the risk of hand/finger injuries and other injuries is substantially reduced. Using conventional manual
15 alignment methods, hose installation typically requires 6 workers and about 50 minutes. With the invention, hose installation requires 1 to 2 workers and about 20 minutes. This results in improved productivity from 5 man-hours to about 0.67 man-hours.

Other embodiments will be apparent to those skilled in the art from
20 consideration of the specification and practice of the invention. Furthermore, certain terminology has been used for the purposes of descriptive clarity, and not to limit the disclosed embodiments of the invention. The embodiments and features described above should be considered exemplary, with the invention being defined by the appended claims.

What is claimed is:

1. A power-assisted apparatus for hose installation and/or uninstallation, the apparatus comprising:

5 a first frame adapted to mount to a hose, and movable between a first engaged position wherein the first frame engages the hose and a first release position wherein the first frame releases the hose;

a second frame adapted to secure to a pipe, and movable between a second engaged position wherein the second frame engages the pipe and a second release position wherein the second frame releases the pipe; and

10 a plurality of pistons provided on the second frame, each of the plurality of pistons having a pulley provided thereon, wherein during operation, a cable is to be looped over the pulley, the cable having a first end secured to the first frame and a second end secured to the second frame, and the plurality of pistons are actuatable to vertically displace both the hose and the first frame which is mounted to the hose,
15 and align the hose with the pipe.

2. The power-assisted apparatus of claim 1, wherein the first frame includes at least one groove for engaging an end attachment of the first end of the cable, and the second frame includes at least one pad-eye for engaging the second end of the
20 cable.

3. The power-assisted apparatus of any of claims 1 and 2, wherein a horizontal dimension of the first frame is larger than a horizontal dimension of the second frame.

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4. The power-assisted apparatus of any of claims 1 to 3, wherein the first frame includes at least a first hinge mechanism to allow the first frame move between the first engaged position and the first release position, and wherein the second frame includes at least a second hinge mechanism to allow the second frame move
5 between the second engaged position and the second release position.

5. The power-assisted apparatus of any of claims 1 to 3, wherein the first frame and the second frame are respectively disposed in the first engaged position and the second engaged position by a plurality of screws or bolts.

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6. A power-assisted method of hose installation, the method comprising:

mounting a first frame to a hose;

mounting a second frame to a pipe, wherein the second frame includes a plurality of pistons provided thereon, each of the plurality of pistons having a pulley
15 provided thereon;

securing the first frame to the second frame by securing a first end of a cable to the first frame, wherein the cable is looped over the pulley and having a second end secured to the second frame; and

while having the second frame support both the first frame and the hose,
20 actuating the plurality of pistons to vertically displace the first frame and align the hose with the pipe.

7. The power-assisted method of claim 6, wherein securing the first frame to the second frame by securing a first end of a cable to the first frame includes guiding an
25 end attachment provided at the first end of the cable into engagement with a groove at the first frame.

8. A power-assisted method of hose uninstallation, the method comprising:

at a hose which is joined to a pipe, mounting a first frame to the hose;

mounting a second frame to the pipe, wherein the second frame includes a plurality of pistons provided thereon, each of the plurality of pistons having a pulley
5 provided thereon;

actuating the pistons to a required elevation;

securing the first frame to the second frame by securing a first end of a cable to the first frame, wherein the cable is looped over the pulley and having a second end secured to the second frame;

10 untightening a union joining the hose and the pipe;

reducing the required elevation of the plurality of pistons to cause the hose and the first frame mounted thereto disconnect from the union;

disengaging the cable from the first frame; and

transferring the hose to a required position.

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9. The power-assisted method of claim 8, wherein securing the first frame to the second frame by securing a first end of a cable to the first frame includes guiding an end attachment provided at the first end of the cable into engagement with a groove at the first frame, and

20 wherein disengaging the cable from the first frame includes guiding the end attachment provided at the first end of the cable into disengagement with the groove at the first frame.