

APPARATUS FOR TIGHTENING AND/OR UNTIGHTENING UNION WING NUT

BACKGROUND

Technical Field

5 Embodiments of the invention relate to power-assisted apparatus and method for tightening and/or untightening union wing nuts during connecting or disconnecting hose and/or pipe segments to improve workplace safety and efficiency.

Description of Related Art

10 Currently in shipyards and onboard vessels, hose installation or joining a hose segment to a pipe segment is a tedious task which requires a lot of manpower as 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
15 man-hours required is 1.5 hours. This lengthy process inevitably increases human fatigue level significantly. Eventually, when the hose is to be tightened to the union by hammering, the workers' alertness would have become impaired, thereby leading to high propensity of accidental finger or hand injuries as well damaged unions. In view of the above, existing methods of installing hoses reduce productivity and, more
20 importantly, pose a risk to workplace safety.

Brief Description of the Drawings

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

 FIG. 1 is a top view of a power-assisted apparatus for tightening and/or
25 untightening union wing nuts according to one embodiment of the invention;

 FIG. 2 is an exploded view of the power-assisted apparatus of FIG. 1;

FIG. 3 is a perspective view of the power-assisted apparatus of FIG. 1 in a closed position;

FIG. 4 is a perspective view of the power-assisted apparatus of FIG. 1 in an open position.

5 **Detailed Description**

In the following description, numerous specific details are set forth in order to 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
10 other instances, well known process operations have not been described in detail in order not to unnecessarily obscure pertinent aspects of embodiments being described. In the drawings, like reference numerals refer to same or similar functionalities or features throughout the several views.

Embodiments of the invention provide a power-assisted apparatus for
15 tightening and/or untightening union wing nuts during connecting of hose and/or pipe segments and/or disconnecting the segments.

Reference is made to FIGs. 1 to 3 which illustrate one embodiment of a power-assisted apparatus 10. The power-assisted apparatus 10 comprises a body 20 adapted to encircle a union wing nut, a pinion gear 30, and a power-assisted
20 actuator 40 to drive the pinion gear 30. The body 20 is movable between a closed position (See FIGs. 1 and 3) wherein the body 20 engages the union wing nut, and an open position (FIG. 4) wherein the body 20 releases the union wing nut.

The body 20 comprises an inner annulus 100 and an outer casing 200. The inner annulus 100 has an inner circumference 101 adapted to encircle a union wing
25 nut and a plurality of lug slots 102 adapted to receive into engagement a plurality of lugs of the union wing nut when the inner annulus 100 is mounted onto the union wing nut. The inner annulus 100 has an outer circumference having a gear-teeth profile 104 to engage with a pinion gear 30. The outer casing 200 is suitably shaped and adapted to retain the inner annulus 100. The outer casing 200 also includes a

pinion gear slot 106 for receiving the pinion gear 30 therein and a piston slot 108 for receiving a hydraulic piston 42. The hydraulic piston 42 forms part of the power-assisted actuator 40 which is adapted to drive the pinion gear 30. The outer casing 200 may further provide one or more slots (not shown) for receiving one or more handles 202 which allow workers to lift and move the apparatus 10. The outer casing 200 may further provide a suitable hinge mechanism to allow the outer casing 200 move between an open position and a closed position. The outer casing 200 may further provide a suitable securing mechanism, e.g. screws and bolts, to secure the outer casing 200 in the closed position to prevent inadvertent opening of the outer casing 200.

When the apparatus 10 is mounted on a union wing nut, the apparatus 10 is in a closed position. In particular, the inner annulus 100 encircles the union wing nut and engages with the lugs of the union wing nut while the outer casing 200 retains the inner annulus 100, thereby securely engaging the union wing nut within the body 20 of the apparatus 10. Also, the pinion gear 30 is mechanically coupled to the outer circumference of the inner annulus 100 and to the hydraulic piston 42. To tighten or untighten the union wing nut, the hydraulic piston 42 is actuated to drive the pinion gear 30 into turning the inner annulus 100 together with the union wing nut. Accordingly, the turning of the inner annulus 100 with the union wing nut tightens or untightens the union wing nut to complete joining or disconnecting pipe and/or hose segments.

The above-described apparatus 10 may be made of cast iron, stainless 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. For example, the hydraulic piston 42 may be replaced with an electric motor or a pneumatic gun.

A method of installing hose and/or pipe segments using the power-assisted apparatus 10 of the present invention is described in the following sequence. Two hose and/or pipe segments are brought into alignment and proximity such that a union wing nut of one of the segments overlaps both segments. The power-assisted

apparatus 10 is mounted onto the union wing nut. Particularly, the inner annulus 100 is mounted onto the union wing nut such that inner circumference encircles a union wing nut and the lugs of the union wing nut are engaged with the lug slots 102 of the inner annulus 100. The outer casing 200 is mounted onto the inner annulus 100 to retain the inner annulus 100 therein. The outer casing 200 is then secured to render the apparatus 10 in a closed position before proceeding to tighten the union wing nut. The power-assisted actuator 40 is then activated to drive the pinion gear 30 which turns the inner annulus 100 together with the union wing nut that is engaged therewith. The power-assisted actuator 40 may be inactivated when the pinion gear 30 reaches a predetermined location defined by a stopper. The rotation of the union wing nut tightens itself relative to the joining hose and/or pipe segments and thereby completes installation of the segments. The outer casing 200 and the inner annulus 100 may then be moved into an open position to release the union wing nut.

A method of uninstalling hose and/or pipe segments using the power-assisted apparatus 10 of the present invention is described in the following sequence. The union wing nut of the joined hose and/or pipe segments is located and mounted with the power-assisted apparatus 10. Particularly, the inner annulus 100 is mounted onto the union wing nut such that the inner annulus encircles a union wing nut and the lugs of the union wing nut are engaged with the lug slots 102 of the inner annulus 100. The outer casing 200 is mounted onto the inner annulus 100 to retain the inner annulus 100 therein. The outer casing 200 is then secured to render the apparatus 10 in a closed position before proceeding to untighten the union wing nut. The power-assisted actuator 10 is then activated to drive the pinion gear 30 which turns the inner annulus 100 together with the union wing nut that is engaged therewith. The rotation of the union wing nut (in a direction opposite to the tightening rotation) untightens itself relative to the joining hose and/or pipe segments and thereby completes uninstallation of the segments. The outer casing 200 and the inner annulus 100 may then be moved into an open position to release the union wing nut.

As will be appreciated from the above, the power-assisted apparatus eliminates the need for hammering in the tightening/untightening process. Consequently, the risk of hand and finger injuries due to hammering is eliminated. Also, the process of installing hose and/or pipe segments has been shortened and

become more efficient. Tightening union wing nuts may now require just only two workers and approximately three minutes, and this productivity level may be further improved by changing to more lightweight materials for the apparatus.

Other embodiments will be apparent to those skilled in the art from 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.

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What is claimed is:

1. A power-assisted apparatus for tightening and untightening union wing nuts, the apparatus comprising:

5 a body adapted to encircle a union wing nut and movable between a closed position wherein the body engages the union wing nut, and an open position wherein the body releases the union wing nut, the body including:

10 an inner annulus having a gear-teeth outer circumference and a plurality of lug slots adapted to receive into engagement with a plurality of lugs of the union wing nut when the inner annulus engages the lugs during the closed position, and

an outer casing adapted to be mounted onto the inner annulus to retain the inner annulus therein and securable to render the body in the closed position;

15 a pinion gear disposed at the outer casing and adapted to engage with the gear-teeth of the inner annulus during the closed position; and

a power-assisted actuator adapted to drive the pinion gear into turning the inner annulus together with the union wing nut during the closed position.

20 2. The power-assisted apparatus of claim 1, wherein the power-assisted actuator includes one of a hydraulic piston, an electric motor and a pneumatic gun.

3. The power-assisted apparatus of any of claims 1 to 2, wherein the outer casing includes at least a handle.

25 4. The power-assisted apparatus of any of claims 1 to 3, wherein the outer casing includes a hinge mechanism to allow the outer casing move between the open position and the closed position.

5. The power assisted apparatus of any of claims 1 to 4, wherein the outer casing is securable in the closed position by screws or bolts.

6. A method of installing hose and/or pipe segments using a power-assisted
5 apparatus, the method comprising:

aligning two proximate hose and/or pipe segments such that a union wing nut
of one of the two segments overlaps the two segments;

mounting an inner annulus of the power-assisted apparatus onto the union
wing nut by having the inner annulus encircle the union wing nut, and having a
10 plurality of lug slots of the inner annulus engage with a plurality of lugs of the union
wing nut;

mounting an outer casing of the power-assisted apparatus onto the inner
annulus to retain the inner annulus therein;

securing the outer casing in a closed position wherein the power-assisted
15 apparatus engages the union wing nut and wherein a pinion gear provided at the
outer casing engages with a gear-teeth outer circumference of the inner annulus;
and

using a power-assistor actuator of the power-assisted apparatus, driving the
pinion gear to turn the inner annulus together with the union wing nut engaged
20 therewith.

7. The method of claim 6, further comprising:

moving the outer casing and the inner annulus to an open position wherein
the union wing nut is released from the power-assisted apparatus.

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8. The method of any of claims 6 to 7, wherein using a power-assistor actuator of the power-assisted apparatus includes using one of a hydraulic piston, an electric motor and a pneumatic gun.

5 9. A method of uninstalling hose and/or pipe segments using a power-assisted apparatus, the method comprising:

mounting an inner annulus of the power-assisted apparatus onto a union wing nut of two joined hose and/or pipe segments by having the inner annulus encircle the union wing nut, and having a plurality of lug slots of the inner annulus engage with a plurality of lugs of the union wing nut;

10 mounting an outer casing of the power-assisted apparatus onto the inner annulus to retain the inner annulus therein;

securing the outer casing in a closed position wherein the power-assisted apparatus engages the union wing nut and wherein a pinion gear provided at the outer casing engages with a gear-teeth outer circumference of the inner annulus;
15 and

using a power-assistor actuator of the power-assisted apparatus, driving the pinion gear to turn the inner annulus together with the union wing nut engaged therewith.

20 10. The method of claim 9, further comprising:

moving the outer casing and the inner annulus to an open position wherein the union wing nut is released from the power-assisted apparatus.

25 11. The method of any of claims 9 to 10, wherein using a power-assistor actuator of the power-assisted apparatus includes using one of a hydraulic piston, an electric motor and a pneumatic gun.