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Benford

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(54) **IMPELLER INSTALLATION TOOL**

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F04D 29/60 (2006.01)
F04D 29/18 (2006.01)

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CPC ***F04D 29/607*** (2013.01); ***F04D 29/18*** (2013.01)

(58) **Field of Classification Search**
CPC F04D 29/607; F04D 29/18; B25B 27/02; B25B 27/00; C04B 38/0615; C04B 35/00; B22D 43/004; Y10T 29/53883
See application file for complete search history.

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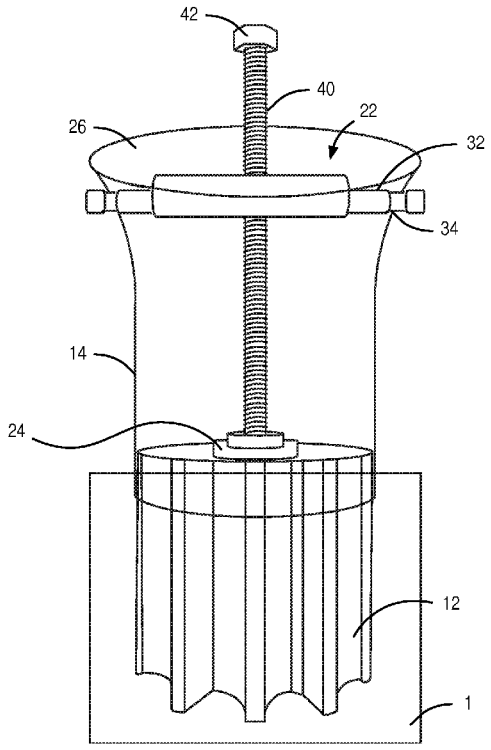
(57) **ABSTRACT**

A tool for installing a flexible impeller within a water pump includes a sleeve having a diameter smaller than an initial diameter of an impeller in a relaxed state, a support extending about an end of the sleeve, and a translation assembly engaged with the support and configured for translating a pushing surface of the translation assembly. In operation, an impeller is contracted into a constrained state and placed in the sleeve, the sleeve is then positioned proximal or in engagement with an opening of the water pump, and the translation assembly is translated such that the pushing surface pushes the impeller into the engine assembly as the translation assembly is translated.

8 Claims, 6 Drawing Sheets



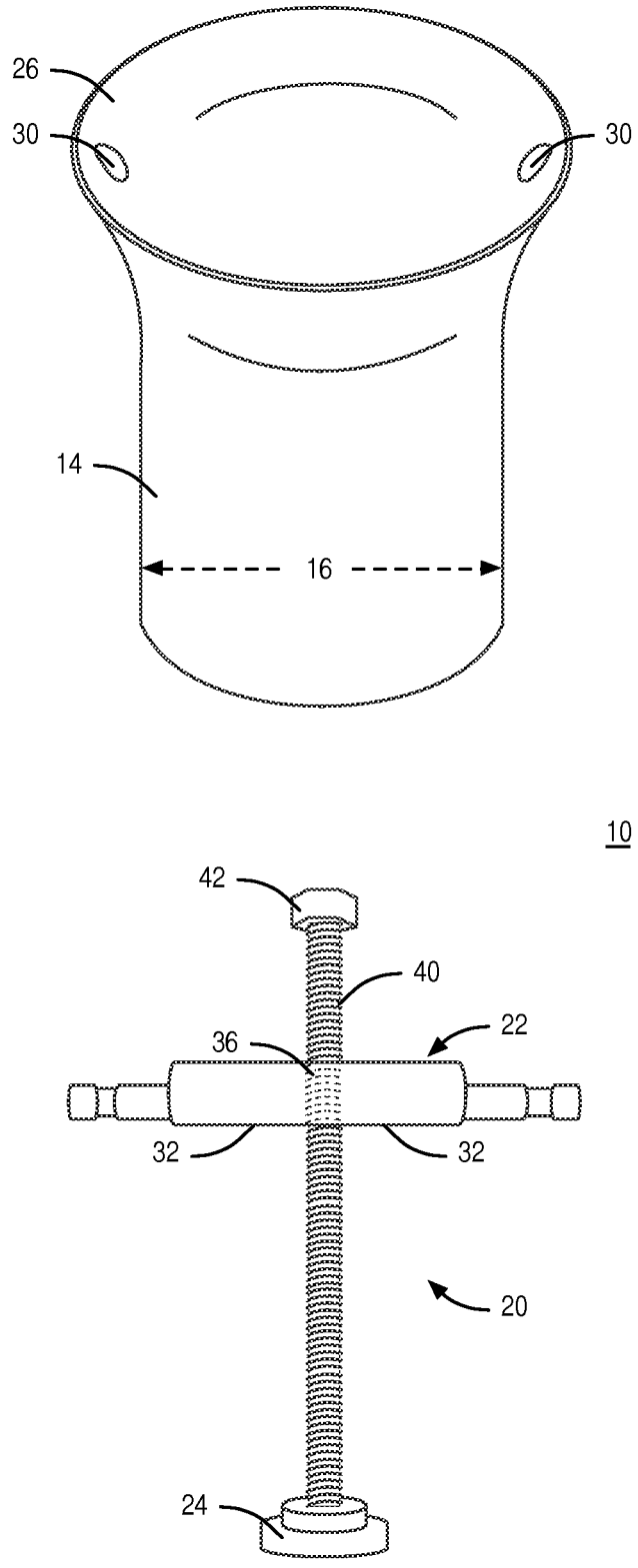


FIG. 1

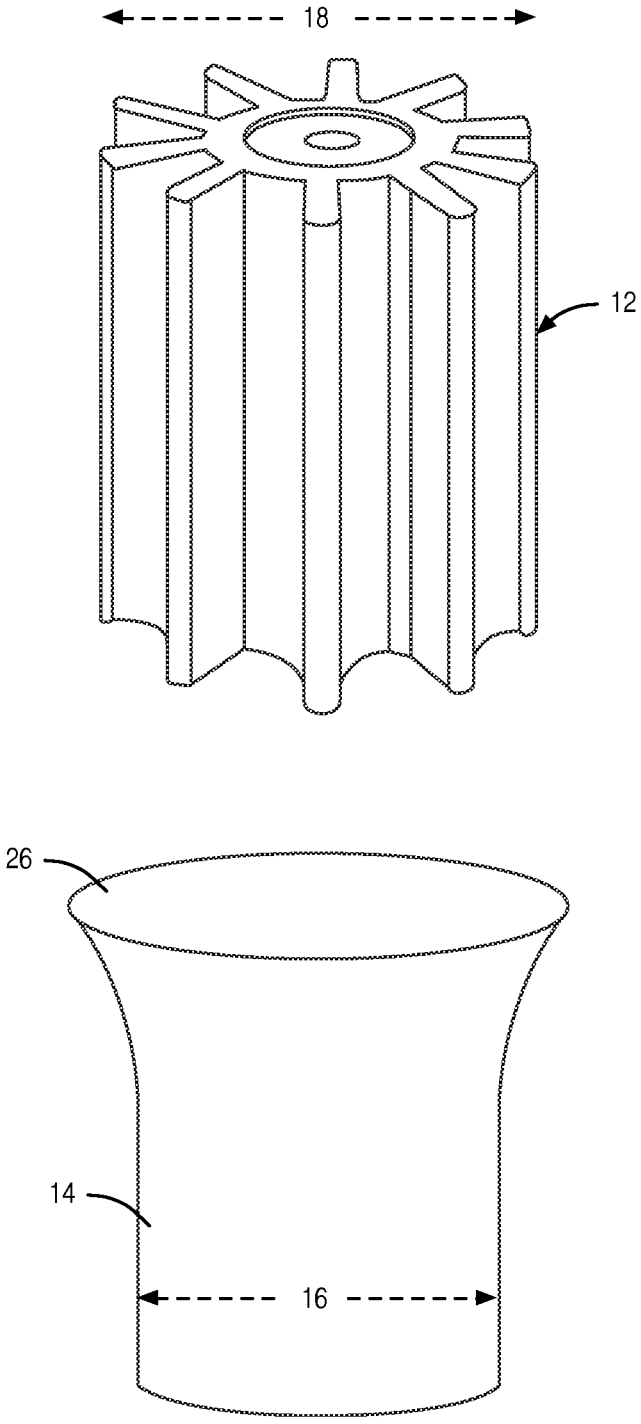


FIG. 2

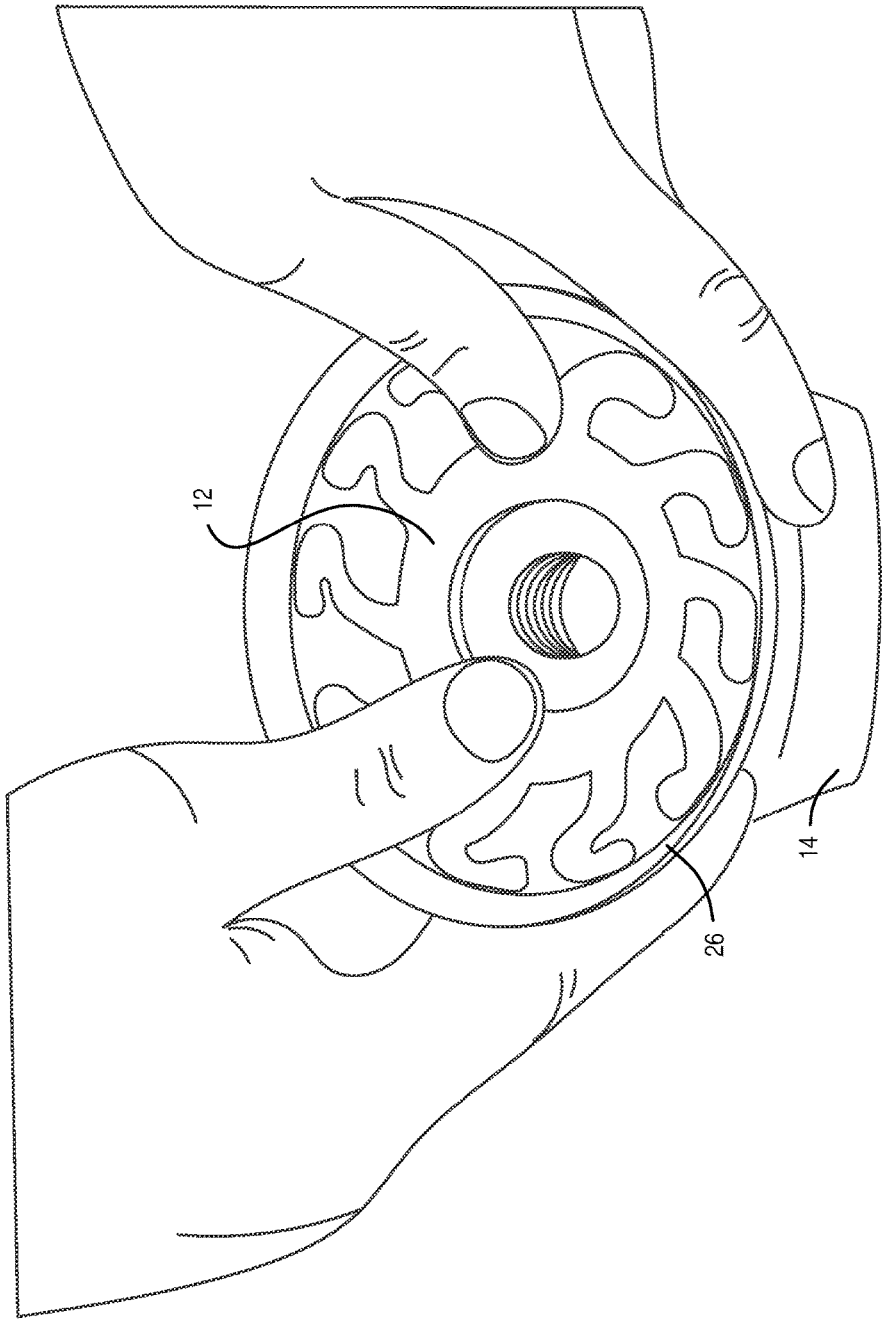


FIG. 3

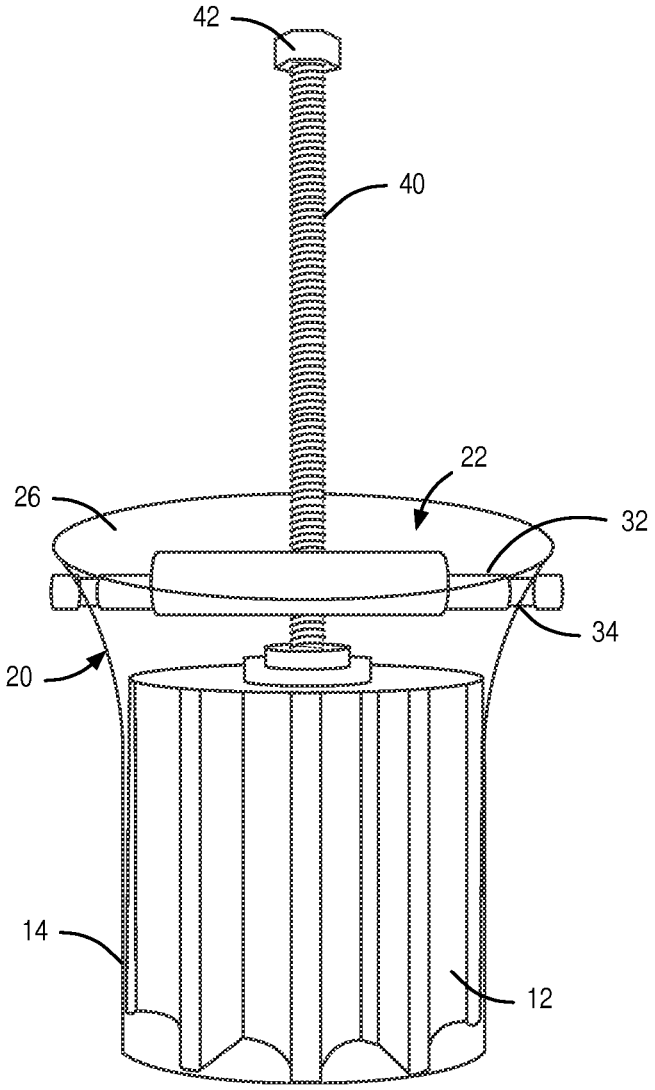


FIG. 4

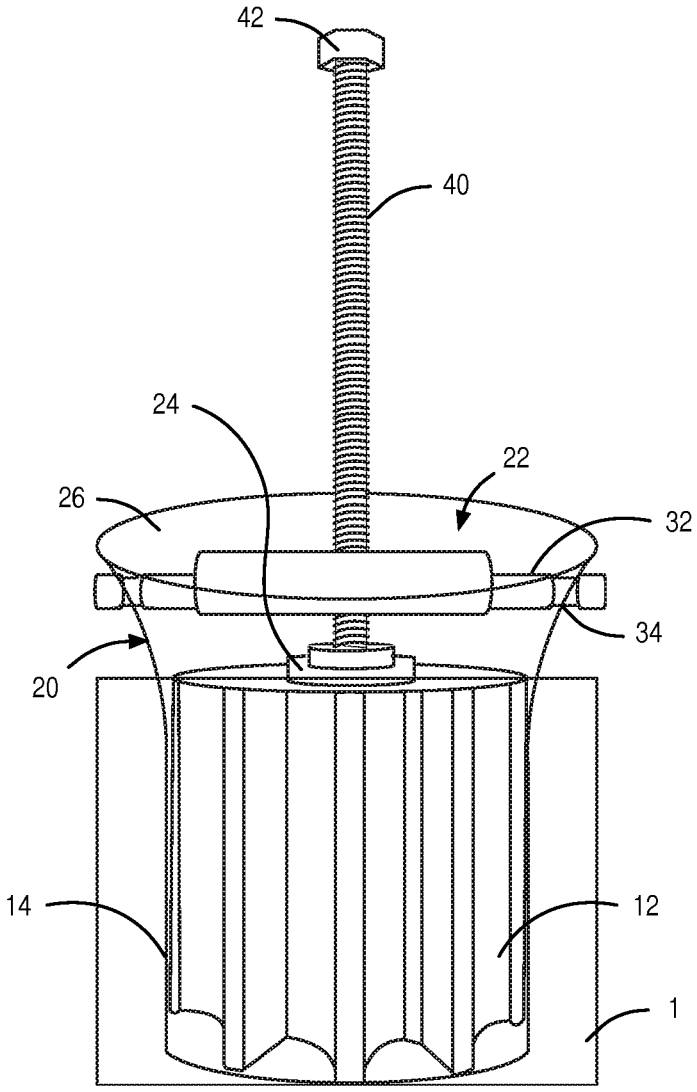


FIG. 5

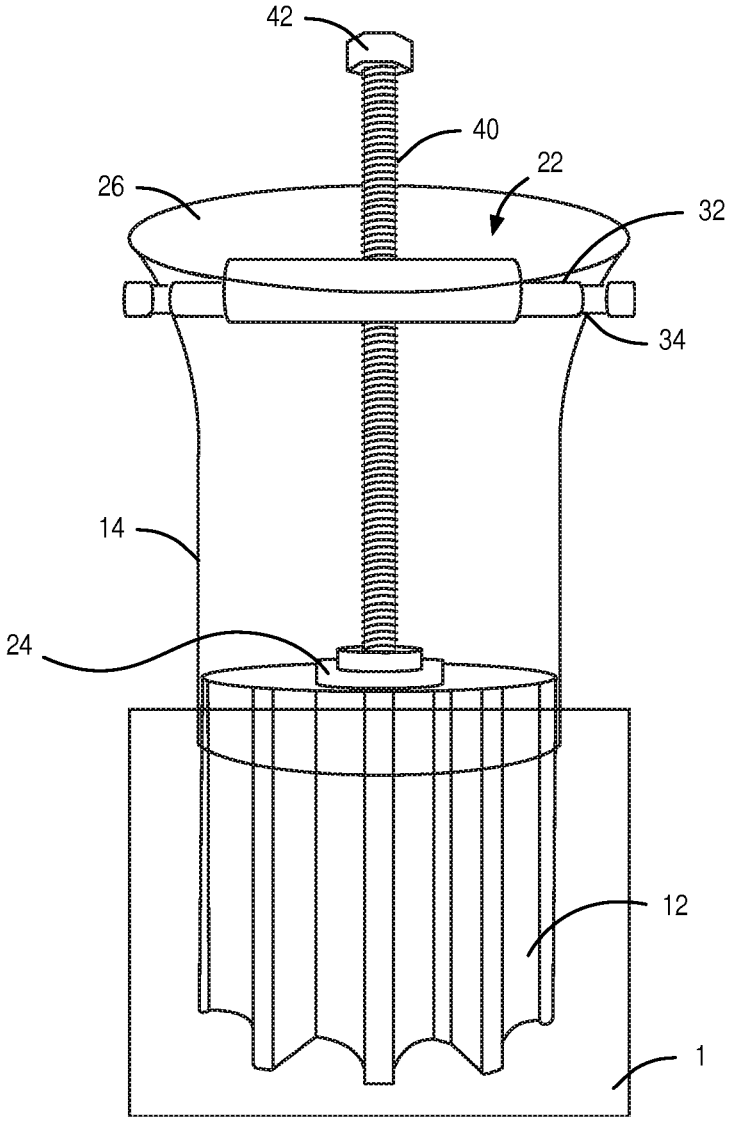


FIG. 6

IMPELLER INSTALLATION TOOL

TECHNICAL FIELD

The presently disclosed subject matter is directed towards a tool for use in installing flexible impellers on a drive shaft or other engine component.

BACKGROUND

This disclosure relates to a tool for installing flexible impellers in water pumps, such as for marine use. These impellers are traditionally installed by hand by pressing the impeller against a cam surface formed on an upper side of an impeller cavity wall in the water pump while rotating the impeller into alignment with the water pump drive shaft until keying or other engagement mechanisms are aligned and engaged. The impeller is then urged downwardly onto the shaft while being rotated to uniformly deform and align the impeller blades within the impeller cavity. The impeller is then pressed to the bottom of the cavity for rotation therein with the impeller blades uniformly pressing against the impeller cavity wall. This task can be somewhat difficult when conducted on a bench or other horizontal surface and is very difficult when the pump is engine mounted where visibility is limited. In larger pump applications, the impeller blades are less flexible and overly rigid and more difficult to bend in place.

Some methods may employ a screw driver or blade to help with bending the impeller into place, however, these methods are undesirable due to possible damage caused to the impeller. Accordingly, there remains a need for a device that addresses the various disadvantages associated with previous devices.

SUMMARY

According to one or more embodiments, a tool for installing a flexible impeller within a water pump is provided. The tool includes a sleeve having a diameter smaller than an initial diameter of an impeller in a relaxed state, a support extending about an end of the sleeve, and a translation assembly engaged with the support and configured for translating a pushing surface of the translation assembly. In operation, an impeller is contracted into a constrained state and placed in the sleeve, the sleeve is then positioned proximal or in engagement with an opening of the water pump, and the translation assembly is translated such that the pushing surface pushes the impeller into the engine assembly as the translation assembly is translated.

According to one or more embodiments, the sleeve has a flanged portion about an end thereof for guiding the impeller into the sleeve.

According to one or more embodiments, the flanged portion defines opposing apertures for receiving the translation assembly.

According to one or more embodiments, the translation assembly includes a post extending into the apertures.

According to one or more embodiments, the post defines recessed chamfers for resting against the apertures and constraining side-to-side movement of the translation assembly when engaged with the apertures.

According to one or more embodiments, the translation assembly is selectively engageable.

According to one or more embodiments, the translation assembly includes a threaded recess and the pushing surface is engaged with a threaded rod that engages with the threaded recess.

According to one or more embodiments, the tool further includes a fastener head on the threaded rod for imparting movement to the threaded rod.

According to one or more embodiments, a method includes using a tool having a sleeve having a diameter smaller than an initial diameter of an impeller in a relaxed state, a support extending about an end of the sleeve, and a translation assembly engaged with the support and configured for translating a pushing surface of the translation assembly, compressing the impeller and positioning within the sleeve, engaging the translation assembly with the compressed impeller, positioning the sleeve proximal or into engagement with a water pump cavity, and actuating the translation assembly to impart movement to the impeller until the impeller is received within the water pump cavity.

According to one or more embodiments, the translation assembly is selectively engaged with the sleeve after the impeller is positioned within the sleeve.

According to one or more embodiments, the sleeve has a flanged portion about an end thereof and the impeller is positioned within the sleeve by guiding the impeller within the flanged portion.

According to one or more embodiments, the translation assembly includes a threaded rod received within a threaded recess, and actuating the translation assembly includes rotation of the threaded rod.

This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter. Further, the claimed subject matter is not limited to implementations that solve any or all disadvantages noted in any part of this disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing summary, as well as the following detailed description of preferred embodiments, is better understood when read in conjunction with the appended drawings. For the purposes of illustration, there is shown in the drawings exemplary embodiments; however, the presently disclosed subject matter is not limited to the specific methods and instrumentalities disclosed. In the drawings:

FIG. **1** is a front view of a impeller tool according to one or more embodiments;

FIG. **2** is a front view of the impeller tool where an impeller is positioned proximal a sleeve of the impeller tool according to one or more embodiments;

FIG. **3** is a perspective view of the impeller being positioned within the sleeve of the impeller tool according to one or more embodiments;

FIG. **4** is a front view of the impeller tool where a translation assembly is engaged with the sleeve according to one or more embodiments;

FIG. **5** is a front view of the impeller tool positioned proximal a water pump according to one or more embodiments; and

FIG. **6** is a front view of the impeller tool where the impeller has been translated into the water pump according to one or more embodiments.

DETAILED DESCRIPTION

The presently disclosed subject matter now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodi-

ments are shown. Indeed, this invention may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

A tool for installing a flexible impeller within a water pump is disclosed herein, where the tool is indicated as **10**. The impeller is indicated as **12** and may be installed on a splined water pump shaft as is conventional. The water pump is indicated as **1**. The tool may be used for installing any flexible impeller device within any appropriately configured equipment. The tool **10** includes a sleeve **14** having a diameter **16** smaller than an initial diameter **18** of the impeller **12** in a relaxed state. The impeller **12** is flexible in nature and includes a plurality of radially extending ribs that form a fan or similar surface for moving water in a water pump. The impeller **12** can thus be constricted by pressing the radially extending ribs to constrain or otherwise compress the ribs to reduce the diameter of the impeller **12**.

A support **20** extends about an end of the sleeve. A translation assembly **22** is engaged with the support **20** and is configured for translating a pushing surface **24** of the translation assembly **22**. The pushing surface **24** is shown as a swivel plate on an end of the translation assembly **22** but may be any appropriately configured surface or mechanism.

In operation, the impeller **12** is contracted into a constrained state by bending or otherwise contorting the ribs to reduce the diameter of the impeller. The reduced diameter impeller **12** is then placed in the sleeve **14**. This may be done by pushing with an operator's hands onto the impeller **12** and forcing the impeller **12** into the sleeve **14**, or a tool such as a blade, press, or the like may also be employed. This is illustrated with reference to FIG. **3**. The translation assembly **22** is then installed about the sleeve **14** as illustrated in FIG. **4**. The sleeve **14** is then positioned proximal or in engagement with an opening of the water pump **1**. The sleeve **14** should be positioned such that, upon egress of the impeller **12**, the impeller **12** is positioned at or proximal to a desired installation location. The translation assembly **22** is then translated such that the pushing surface **24** pushes the impeller **12** into the water pump **1** as the translation assembly **22** is translated as illustrated in FIG. **6**.

The sleeve **14** has a flanged portion **26** about an end thereof for guiding the impeller **12** into the sleeve **14**. In one or more embodiments, the flanged portion **26** defines opposing apertures **30** for receiving the translation assembly **22** or the support **20**. This advantageously allows for selective engagement of the translation assembly **22** with the sleeve, such that the impeller **12** can be first installed within the sleeve **14** and then the translation assembly **22** can be installed and the translation assembly **22** does not impede installation or insertion of the impeller **12** within sleeve **14**.

This is effectuated because the translation assembly **22** includes posts **32** that extend into apertures **30**. The posts **32** may further define recessed chamfers or cutouts **34** for resting against a surface of the sleeve **14** defined by the apertures **30** and constraining side-to-side movement of the translation assembly **22** when engaged with the apertures **30**.

In one or more embodiments, the translation assembly **22** includes a threaded recess **36** and the pushing surface **24** is engaged with a threaded rod **40** that engages with the threaded recess **36**. In this manner, rotation of the threaded rod **40** within threaded recess **36** causes translation of the pushing surface **24** in order to cause translation thereof, and thus impart translation to the impeller **12**. There may be provided a fastener head **42** on the threaded rod **40** for imparting movement thereto.

In this manner, one or more methods of using the device **10** are provided. The method includes compressing the impeller **12** and positioning within the sleeve **14**. The method includes engaging the translation assembly **22** with the compressed impeller **12**. In one or more embodiments, if the impeller **12** is positioned within sleeve **14** while the translation assembly **22** is not engaged therewith, the translation assembly **22** is then engaged with the sleeve **14**. The method may include positioning the sleeve **14** proximal or into engagement with a water pump cavity. The method may then include actuating the translation assembly **22** to impart movement to the impeller **12** until the impeller **12** is received within the water pump cavity **1**. The flanged portion **26** of the sleeve **14** provides guiding characteristics for the impeller **12** being positioned within sleeve **14**. The actuation assembly **22** may be actuated with a power tool engaged with the fastener head **42**.

While the embodiments have been described in connection with the preferred embodiments of the various figures, it is to be understood that other similar embodiments may be used or modifications and additions may be made to the described embodiment for performing the same function without deviating therefrom. Therefore, the disclosed embodiments should not be limited to any single embodiment, but rather should be construed in breadth and scope in accordance with the appended claims.

What is claimed:

1. A tool for installing a flexible impeller within a water pump of an engine assembly, the tool comprising:

a sleeve having a diameter smaller than an initial diameter of an impeller in a relaxed state;

a support extending about an end of the sleeve; and

a translation assembly engaged with the support and configured for translating a pushing surface of the translation assembly,

wherein, in operation, an impeller is contracted into a constrained state and placed in the sleeve, the sleeve is then positioned proximal or in engagement with an opening of the water pump, and the translation assembly is translated such that the pushing surface pushes the impeller into the engine assembly as the translation assembly is translated,

wherein the sleeve has a flanged portion about an end thereof for guiding the impeller into the sleeve,

wherein the flanged portion defines opposing apertures for receiving the translation assembly,

wherein the translation assembly includes a post extending into the apertures.

2. The tool according to claim **1**, wherein the post defines recessed chamfers for resting against the apertures and constraining side-to-side movement of the translation assembly when engaged with the apertures.

3. The tool according to claim **1**, wherein the translation assembly is selectively engageable.

4. The tool according to claim **1**, wherein the translation assembly includes a threaded recess and the pushing surface is engaged with a threaded rod that engages with the threaded recess.

5. The tool according to claim **4**, further including a fastener head on the threaded rod for imparting movement to the threaded rod.

6. A method comprising:

using a tool having a sleeve having a diameter smaller than an initial diameter of an impeller in a relaxed state,

a support extending about an end of the sleeve, and a translation assembly engaged with the support and configured for translating a pushing surface of the translation assembly, compressing the impeller and positioning within the sleeve,

wherein the sleeve has a flanged portion about an end thereof for guiding the impeller into the sleeve,

wherein the flanged portion defines opposing apertures for receiving the translation assembly,

wherein the translation assembly includes a post extending into the apertures;

engaging the translation assembly with the compressed impeller by inserting the post into the apertures;

positioning the sleeve proximal or into engagement with a water pump cavity; and

actuating the translation assembly to impart movement to the impeller until the impeller is received within the water pump cavity.

7. The method of claim **6**, wherein the translation assembly is selectively engaged with the sleeve after the impeller is positioned within the sleeve.

8. The method of claim **6**, wherein the translation assembly includes a threaded rod received within a threaded recess, and actuating the translation assembly includes rotation of the threaded rod.

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