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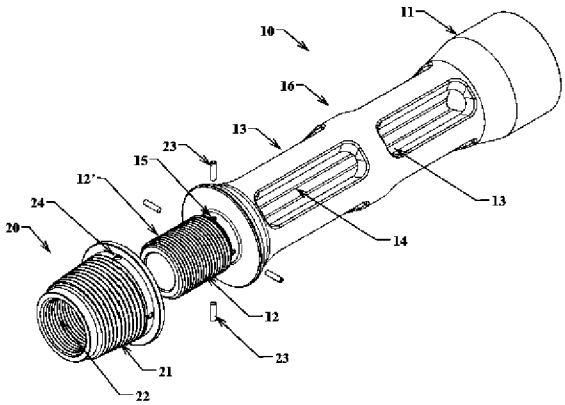
(54) Title **A lifting tool**

(57) Abstract

A lifting tool (10) comprises an elongated body having a first end portion (11), a second end portion (12), and an intermediate portion (16). The first end portion is configured for connection to a lifting device, and the second end portion comprises a first connection device (12') for connection to a tool or structure or to an interface member (20). The intermediate portion comprises a wall (17) with a plurality of recessed portions (13) and an internal support structure (14). The lifting tool may be lifting sub formed of a low-density metal, such as aluminium. A lifting assembly comprises the invented lifting tool and an interface member (20) releasably connected to the first connection device (12').



A lifting tool

Technical field of the invention

The invention concerns tools for handling elongated objects, such as tubulars, drill strings, and the like, particularly in the oil and gas industry. Specifically, the invention concerns a lifting tool as set out by the preamble of claim 1

Background of the invention

A so-called "lifting sub" is generally a short drill string component that may be temporarily connected to the top of an object (e.g. a tool assembly) that is to be lifted vertically, such as when running or retrieving a tool string. A typical lifting sub may between 70 and 110 cm long, and be made of a stainless steel material. Typical weights range between 70 kg and 210. The prior art lifting subs are therefore normally handled by cranes or other lifting equipment. The external profile on the upper section of the lifting sub is similar to that of the completion tubing, enabling the rig elevators to lift the assembled tool string safely. The external profile on the lower section of the lifting sub is configured for connection to the object to be lifted, and may for example comprise an externally threaded section. It is a need for lifting sub which is lighter, and thus may be handled manually, i.e. by an on-site worker.

Summary of the invention

The invention is set forth and characterized in the main claim, while the dependent claims describe other characteristics of the invention.

It is thus provided a lifting tool comprising an elongated body having a first end portion, a second end portion, and an intermediate portion, wherein the first end portion is configured for connection to a lifting device, characterized in that the second end portion comprises a first connection device for connection to a tool or structure or to an interface member; and the intermediate portion comprises a wall with a plurality of recessed portions and an internal support structure.

In one embodiment the lifting tool is rotationally non-symmetric. The lifting tool may be formed of a low-density metal, such as aluminium. The lifting tool may be a lifting sub.

It is also provided a lifting assembly, characterized by the lifting tool according to the invention; and an interface member releasably connected to the first connection device via a second connection device on the interface member; the interface member also comprising a third connection device for connection to a tool, tool string, or tubular.

The interface member may be formed of a stainless steel material, and may be a sleeve configured for mating engagement with the second end portion.

Brief description of the drawings

These and other characteristics of the invention will become clear from the following description of an embodiment of the invention, given as a non-restrictive example, with reference to the attached schematic drawings, wherein:

Figure 1 is a exploded perspective view of an embodiment of the invention, and illustrates the invented lifting tool and the invented interface member;

Figure 2 corresponds to figure 2, and shows the lifting tool and the interface member in an assembled state;

Figure 3 is a longitudinal sectional drawing of an embodiment of the interface member;:

Figure 4 is a cross-sectional drawing in the plane A-A in figure 5;

Figure 5 is a side view of the lifting tool;

Figures 6 and 7 illustrate the lifting tool's rotational non-symmetry when subjected to bending moments.

Detailed description of embodiments of the invention

The following description may use terms such as "horizontal", "vertical", "lateral", "back and forth", "up and down", "upper", "lower", "inner", "outer", "forward", "rear", etc. These terms generally refer to the views and orientations as shown in the drawings and that are associated with a normal use of the invention. The terms are used for the reader's convenience only and shall not be limiting.

Referring initially to figure 1, the invention comprises a lifting tool 10 and an interface member 20. In the illustrated embodiment, the lifting tool 10 is a lifting sub, having a first end portion 11, a second end portion 12, and an intermediate portion 16. The first end portion 11 is configured for connection to a lifting device, such as an elevator (not shown), which is commonly known in the art.

The second end portion 12 comprises a first connection device 12' for connection to a tool or structure or the interface member 20. In the illustrated embodiment, the first connection device is helical threads 12'.

As shown in figures 1, 2, and 3, the interface member 20 is in the illustrated embodiment a sleeve 20 with a second connection device 22, here internally arranged helical threads 22 that are configured for connection with the helical threads of the first connection device 12'. The sleeve 20 may thus be screwed onto the second pin portion, to a state illustrated in figure 2. Removable fasteners, here in form of set screws 23 which are extended through holes 24 and into recesses 15, prevent relative rotation between the lifting sub 10 and the sleeve 20. It should be understood that other types of fasteners may be used. Although not illustrated, other connection means between lifting sub 10 and sleeve 20 are conceivable, for example a J-slot connection.

In the illustrated embodiment, the interface member 20 is a sleeve externally shapes as a truncated cone. The external surface comprises a third connection device 21, here in the form of helical threads that are configured for connection to a tool, tool string, or tubular (not shown), for example in a conventional pin-and-box connection. The invention shall not be limited to this shape.

The lifting sub 10 is formed of a low-density (light-weight) metal, such as titanium or an aluminium alloy. The intermediate portion 16 comprises a wall 17 with a plurality of cut-outs, or recessed portions, 13 and an internal support structure, or stem, 14. The recessed portions effectively provide through-going, axial, cannels through the sub. The internal support structure 14 compensates for the wall 17 being thinner than the wall of a prior art sub. As shown in figures 6 and 7, the lifting sub is rotationally non-symmetric.

The interface member 20 may be formed of a stainless steel, in order for the third connection device (e.g. threads) 21 to be compatible with the connection device on the tool, tool string, or tubular. This also allows the combined lifting sub and interface member assembly to be used multiple times without excessive wear.

In one embodiment, the lifting sub has a length of approximately 819 mm, a diameter of approximately 178 mm, and is formed of an aluminium alloy with a density of 2.89 cm^3, giving a total weight 19.8 kg. The stainless steel sleeve may have a weight in the order of 4 to 5 kg. The invention shall not be limited to these dimensions and/or weights.

The invented assembly of the lifting sub 10 and interface member 20 may be designed to have a mass less than 25 kg, while still being operational as an offshore lifting sub. Tests have shown that an embodiment of the invented lifting sub with a weight of less than 25kg would be able to handle loads of 2000 kg while still performing as well as a traditional lift sub.

Claims

1. A lifting tool (10) comprising an elongated body having a first end portion (11), a second end portion (12), and an intermediate portion (16), wherein the first end portion is configured for connection to a lifting device,
characterized in that
- the second end portion comprises a first connection device (12') for connection to a tool or structure or to an interface member (20);
- the intermediate portion comprises a wall (17) with a plurality of recessed portions (13) and an internal support structure (14).

2. The lifting tool of claim 1, wherein , the lifting tool is rotationally non-symmetric.

3. The lifting tool of claim 1 or claim 2, wherein the lifting tool is formed of a low-density metal, such as aluminium.

4. The lifting tool of any one of claims 1-3, wherein the lifting tool is a lifting sub.

5. A lifting assembly, **characterized by**:
- the lifting tool (10) of any one of claims 1-4;
- an interface member (20) releasably connected to the first connection device (12') via a second connection device (22) on the interface member; the interface member also comprising a third connection device (21) for connection to a tool, tool string, or tubular.

6. The lifting assembly of claim 5, wherein the interface member is formed of a stainless steel material.

7. The lifting assembly of claim 5 or claim 6, wherein the interface member is a sleeve configured for mating engagement with the second end portion (12).

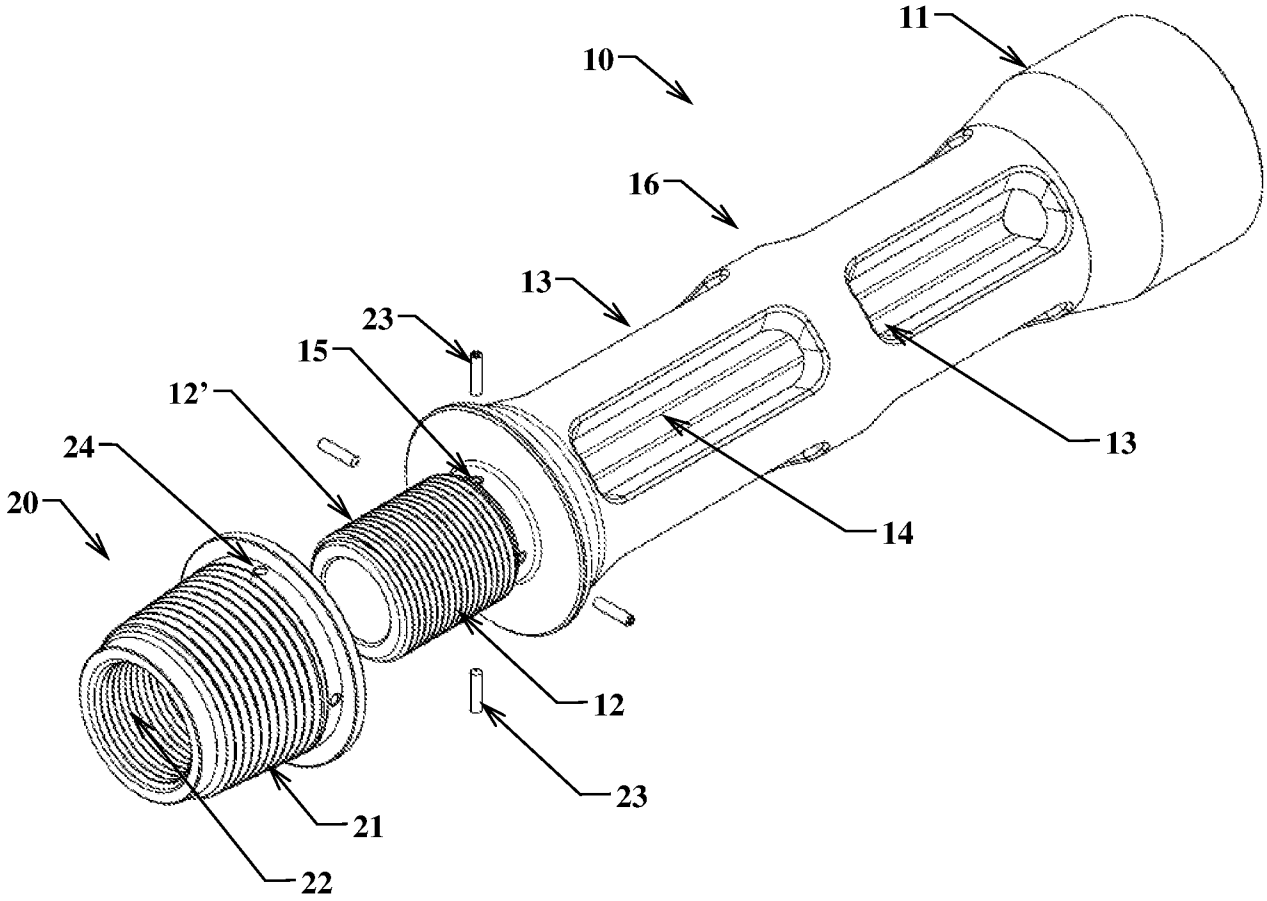


Fig. 1

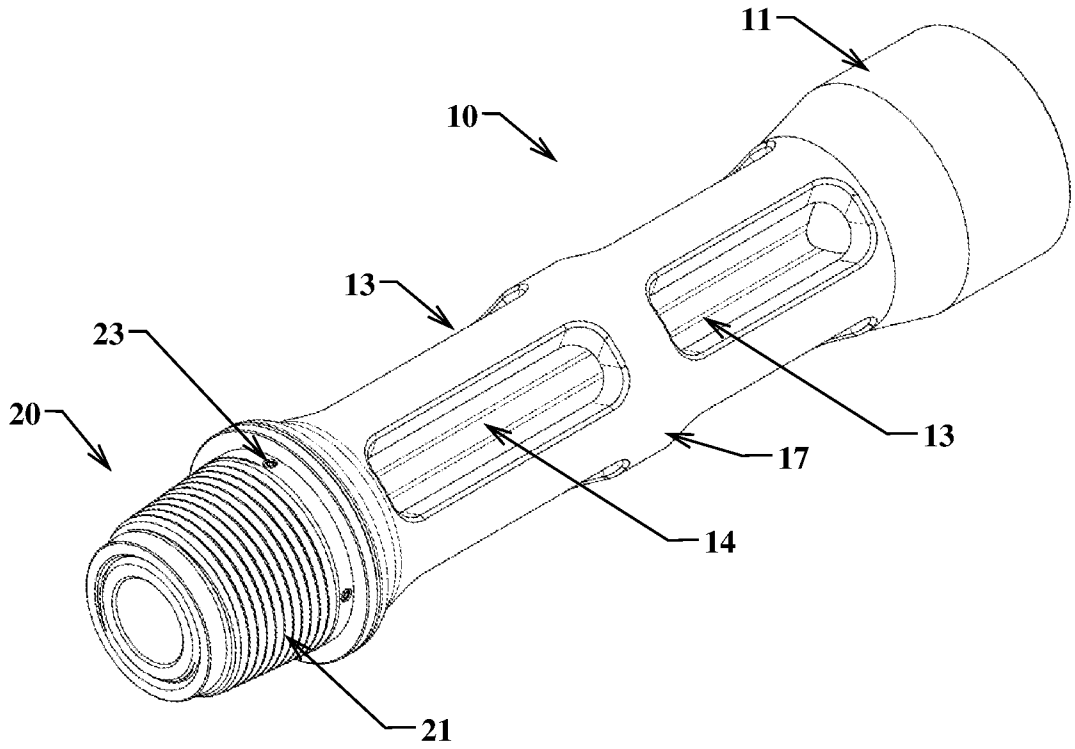


Fig. 2

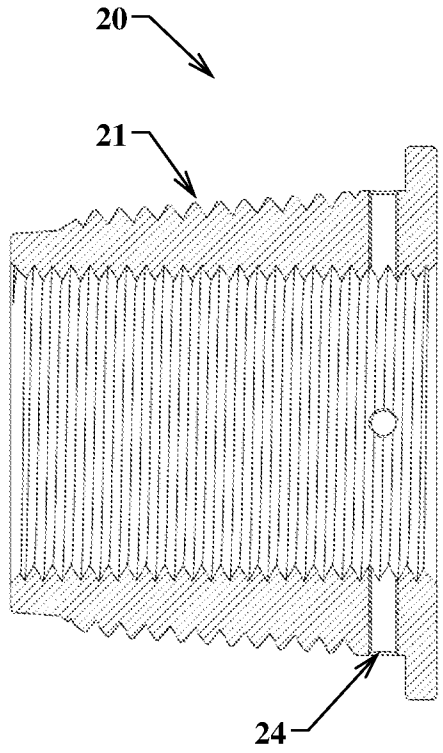


Fig. 3

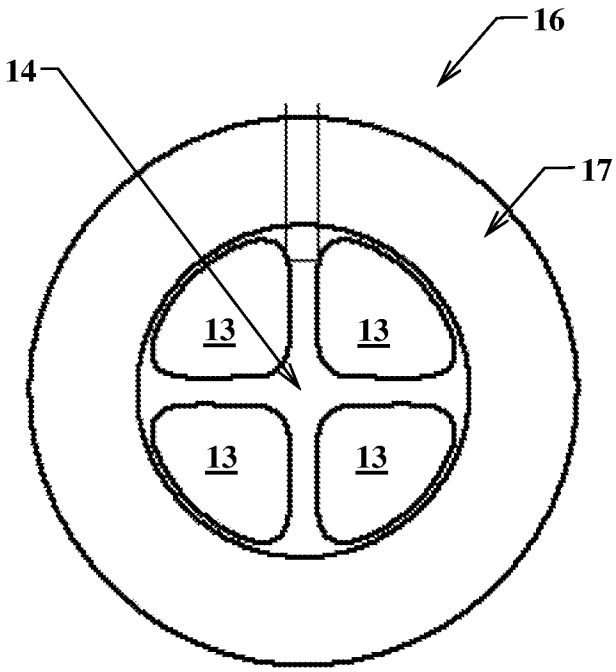


Fig. 4

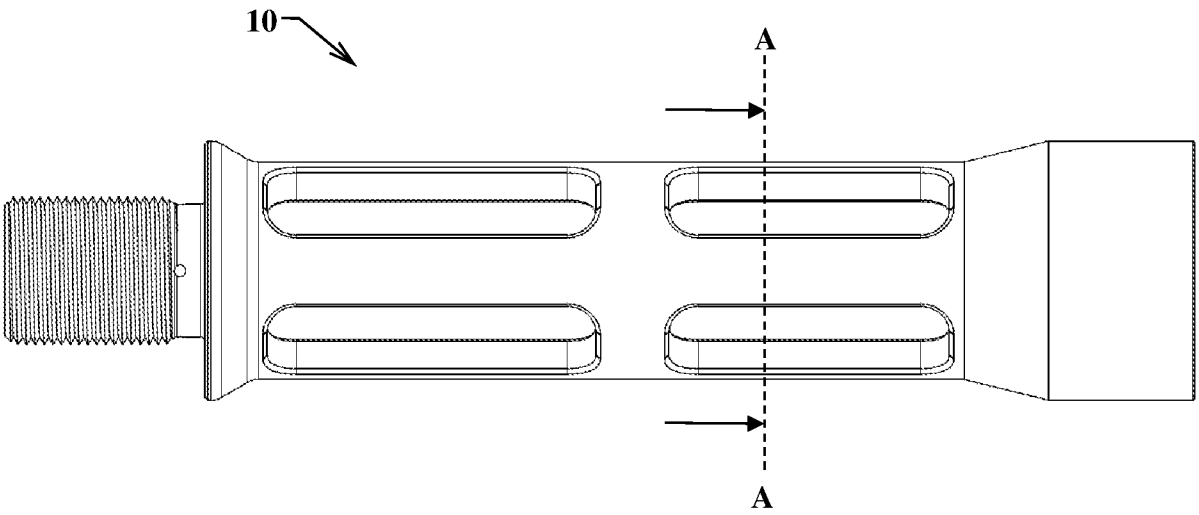


Fig. 5

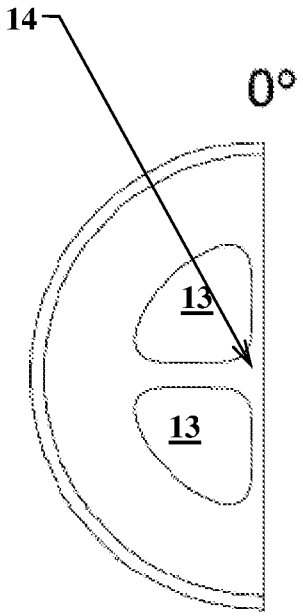


Fig. 6

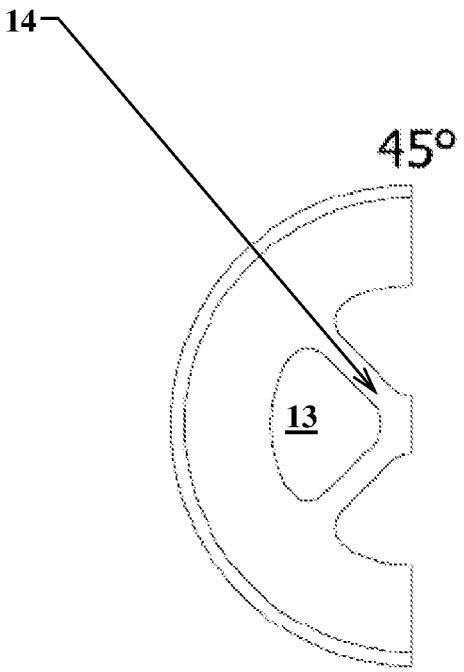


Fig. 7