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(54) Tool for removing and assembling

(57) Tool for removing and assembling bushings in the strut for supporting the drive shaft of a vessel, with a first disk-shaped element (1) and a second element (2) parallel to the first element (1) comprising a second disk (4) and a third disk (5) parallel and joined to one another, and formed by two separable half-disks (6), and a hollow cylindrical body (7) joined to the third disk (5) and perpendicular thereto, formed by two hollow semi-cylindrical bodies (8), each of them fixed to each of the half-disks (6) forming the third disk (5). For removing or assembling a bushing (12) the first element (1) clamps the drive shaft (14) on one side of said strut (13), and the second element (2) with the cylindrical body (7) moves towards the first element (1) by means of threaded rods (9) joining first and second elements (1,2), driving the bushing (12).

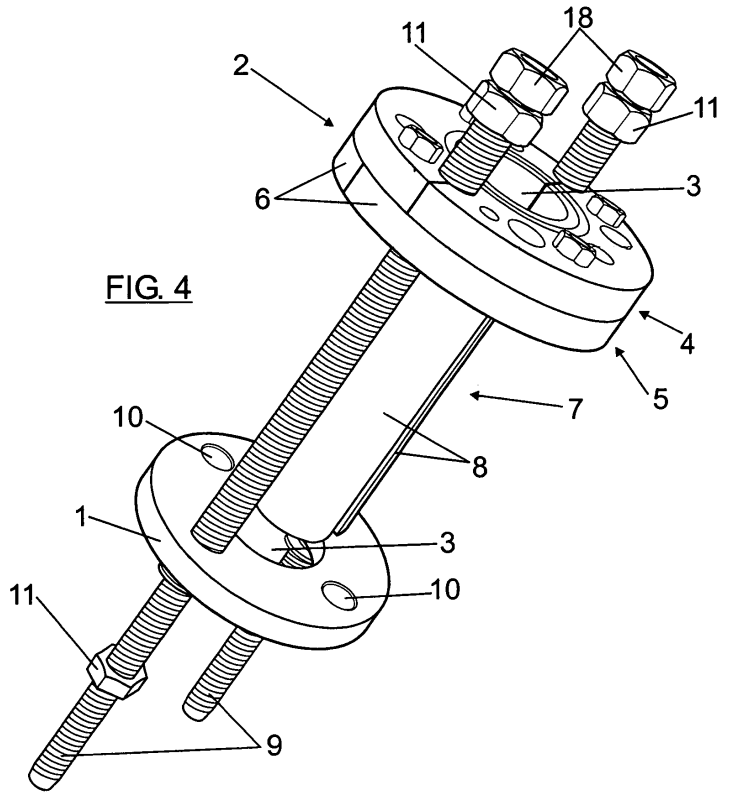

FIG. 4

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Description

Technical Field of the Invention

[0001] The present invention relates to the technical field of tools and implements used for removing and assembling bushings in their housings, and more specifically to the tools used in the nautical field for removing and assembling bushings in the strut for supporting the drive shaft of a vessel.

Background of the Invention

[0002] In the nautical field in certain types of vessels a drive shaft is connected to the engine of the vessel with the propeller, and said drive shaft is secured in the rear part of the vessel by means of a part fixed thereto called a strut. In order for the drive shaft to be able to correctly rotate and transmit the rotation to the propeller, a bushing is arranged between the drive shaft and the strut, which bushing for maintenance or repair reasons, needs to be removed on certain occasions. Up until now, the only way to remove the bushing from the strut was by disassembling the propeller, the drive shaft, and on certain occasions even the rudder, to subsequently reassemble all these elements. On several occasions it is even necessary to cut the drive shaft. All this consumes a great amount of time and implies a tremendous effort and high costs.

Description of the Invention

[0003] The present invention solves the problems existing in the state of the art by means of a tool for removing and assembling bushings in the strut for supporting the drive shaft of a vessel, which is formed by a first disk-shaped element with a central through orifice, and a second element parallel thereto which is formed by a second disk and a third disk, parallel and joined to one another, which also have a central through orifice coaxial with that of the first disk-shaped element. Both the second disk and the third disk are furthermore formed by two separable half-disks, being able to therefore be divided into two halves.

[0004] There is a hollow cylindrical body joined to the second element by the third disk, and perpendicular thereto, which body is concentric with the central through orifices of the first and second disk-shaped elements. As with the second and third disks, this cylindrical body is also formed by two hollow semi-cylindrical bodies, each of them being fixed to each of the half-disks forming the third disk.

[0005] The tool also has a plurality of threaded rods acting as elements for joining the first element and the second element, and such rods are perpendicular to the disks, traversing a plurality of perimetric orifices existing therein. These threaded rods have nuts for positioning and moving the first and second elements, thus being able to move closer to or further from said first and second elements.

[0006] By means of this configuration the tool for removing or assembling bushings in the strut of a vessel can be used without having to remove the drive shaft. Thus, only the propeller needs to be removed, and the first element can thus be arranged at the end of the shaft where said propeller was, clamping the drive shaft by means of the central orifice on one side of the strut. The second element can clamp the drive shaft on the opposite side of the strut, therefore separating the half-disks of the second and third disk and joining them together once they clamp the drive shaft.

[0007] For removing the bushing, the second element clamps the drive shaft with the cylindrical body oriented towards said bushing. By means of actuating the nuts the second element moves towards the first element and drives the bushing, passing it through the central orifice of the first element and removing it from the strut.

[0008] For assembling the bushing in the strut, the first element is arranged in the same position as for removing it, i.e., once the propeller is removed the first element will be arranged clamping the drive shaft by means of the central orifice on one side of the strut. The second element clamps the drive shaft on the opposite side of the strut, in this case with the cylindrical body oriented in a direction opposite the bushing. Thus, by means of actuating the nuts the first element moves towards the second element and drives the bushing, introducing it in the strut.

[0009] The hollow cylindrical body can be welded to the third disk, although in a preferred embodiment, said hollow cylinder is separable from the third disk, different hollow cylinders with different diameters being able to be used for removing bushings with different diameters. The first element furthermore has a disk-shaped housing coaxial with it for coupling different washers with different inner diameters; therefore a single tool can be coupled to different drive shafts with different thicknesses and remove bushings with different diameters.

Description of the Drawings

[0010] In order to facilitate the understanding of the invention, an embodiment of the invention will be described below in an illustrative and non-limiting manner making reference to a series of figures.

[0011] Figure 1 is a view of a strut and a drive shaft with the propeller of a vessel, an area in which the present invention is applied for removing the bushing arranged inside the strut and clamping the drive shaft.

[0012] Figure 2 is a schematic view of the strut and the drive shaft with the propeller of the previous figure with the tool object of the present invention arranged in a removal position for removing the bushing.

[0013] Figure 3 shows a schematic view of the strut and the drive shaft with the propeller, along with the tool object of the present invention arranged in an assembly position for assembling the bushing.

[0014] Figure 4 shows the tool object of the present invention in detail.

[0015] Figure 5 schematically shows an elevational sectional view of the first disk-shaped element according to a preferred embodiment of the invention with the housing and removable washers with different diameters.

[0016] Figure 6 schematically shows an elevational sectional view of the third disk of the second element according to the preferred embodiment of the previous figure.

[0017] These figures make reference to the following set of elements:

1. first element
2. second element
3. central orifice of the disks
4. second disk
5. third disk
6. half-disk
7. cylindrical body
8. semi-cylindrical body
9. threaded rod
10. perimetric orifice
11. nut
12. bushing
13. strut
14. drive shaft
15. propeller
16. first housing
17. second housing
18. lock nut
19. removable washer

Description of Preferred Embodiments of the Invention

[0018] Figure 1 shows the area for applying the tool of the present invention in which the drive shaft 14 connects the engine with the propeller 15 and the strut 13 supporting said drive shaft 14 in a vessel. The bushing 12 to be removed by means of the tool is arranged inside the strut 13 clamping the drive shaft 14. This tool also allows assembling the bushing 12 inside the strut 13, preventing the disassembly of the drive shaft 14.

[0019] Figure 2 shows the same elements as Figure 1, but in this case with the tool arranged in a removal position for removing the bushing 12.

[0020] As can be seen in Figures 2 to 4, the tool for removing and assembling bushings 12 in the strut 13 supporting the drive shaft 14 of a vessel is formed by a first disk-shaped element 1 having a central through orifice 3, and a second element 2 parallel thereto, formed by a second disk 4 and a third disk 5, parallel and joined to one another, and having central through orifices 3 coaxial with that of the first element 1. Both the second disk 4 and the third disk 5 are formed by two separable half-disks 6 allowing said disks 4 and 5 to be separated into two halves in order to be able to clamp the drive shaft 14, and to be joined together again forming the disks 4 and 5 of the second element 2.

[0021] The tool further has a hollow cylindrical body 7 acting as drive element for driving of the bushing 12 during the removal thereof, and it is joined to the third disk 5 being perpendicular thereto, and concentric with the central orifices 3 of the disks 1, 4, 5. This cylindrical body 7 is also formed by two hollow semi-cylindrical bodies 8 each of them fixed to one of the half-disks 6 comprising the third disk 5.

[0022] The tool additionally comprises a plurality of threaded rods 9 for joining the first element 1 and the second element 2, perpendicular to the disks 1, 4, 5 and traversing a plurality of perimeter orifices 10 existing therein, these rods 9 having nuts 11 for positioning and moving the first element 1 and second element 2.

[0023] By means of this set of elements, for removing a bushing 12 from the strut 13, the first element 1 clamps, by means of the central orifice 3, the drive shaft 14 at the end in which the propeller 15 was arranged, once it has been disassembled, on one side of the strut 13, whereas the second element 2 clamps the drive shaft 14 on the other side of the strut 13, the cylindrical body 7 being oriented towards the bushing 12. Once the tool is placed in this removal position, which is depicted in Figure 2, by means of actuating the nuts 11 the second element 2 is moved towards the first element 1 in the direction indicated by the arrows in said Figure 2, and in said movement the cylindrical body 7 of the second element 2 drives the bushing 12 and removes it from the strut 13, said bushing 12 passing through the central orifice 3 of the first element.

[0024] Figure 3, in contrast, depicts the tool in an assembly position for assembling the bushing 12, in which first said bushing 12 is placed at the end of the drive shaft 14 where the propeller 15 was once it has been disassembled. The first disk-shaped element 1 is then placed in the same position as for removing the bushing 12, and the second element 2 clamps the drive shaft 14 on the other side of the strut 13, but this time with the cylindrical body 7 oriented in a direction opposite the bushing 12. Once the tool is in this assembly position, by means of actuating the nuts 11, the first element 1 moves towards the second element 2 in the direction indicated by the arrows of Figure 3, and drives the bushing 12, introducing it into the strut 13, carrying out the assembly.

[0025] In a preferred embodiment of the invention, each of the nuts 11 for positioning and moving the first element 1 and second element 2 have a lock nut 18 associated thereto, providing greater security and strength in positioning said elements 1, 2 at the time in which they must be fixed.

[0026] In a particular embodiment of the invention, the hollow cylindrical body 7 can be welded to the third disk, whereby the machining of the tool is simpler.

[0027] Figures 5 and 6 show a preferred embodiment of the tool, in which the first element 1 has a first disk-shaped housing 16 coaxial with it, which allows coupling different removable washers 19 with different inner di-

ameters, and the third disk 5 further has a second disk-shaped housing 17 coaxial with it, which allows coupling different removable cylindrical bodies 7 with different diameters. This embodiment has the advantage of being able to couple a single tool to different drive shafts with different thicknesses and being able to remove bushings with different diameters.

Claims

1. A tool for removing and assembling bushings in the strut for supporting the drive shaft of a vessel, **characterized in that** it comprises

    - a first disk-shaped element (1) with a central through orifice (3),
    - a second element (2) parallel to the first element (1) comprising
    - a second disk (4) and a third disk (5), parallel and joined to one another, with central through orifices (3) coaxial with that of the first element (1), each of the two disks being formed by two separable half-disks (6), and
    - a hollow cylindrical body (7) joined to the third disk (5) and perpendicular thereto, and concentric with the central through orifices (3), formed by two hollow semi-cylindrical bodies (8), each of them fixed to each of the half-disks (6) forming the third disk (5),
    - a plurality of threaded rods (9) joining the first element (1) and the second element (2), perpendicular to the disks (1, 4, 5) and traversing a plurality of perimetric orifices (10) existing therein, said threaded rods (9) comprising nuts (11) for positioning and moving the first element (1) and second element (2),

    such that for removing a bushing (12) from the strut (13) the first element (1) clamps, by means of the central orifice (3), the drive shaft (14) on one side of said strut (13), through the end in which the propeller (15) is arranged once it is disassembled, and the second element (2) clamps the drive shaft (14) on the other side of the strut (13) with the cylindrical body (7) oriented towards the bushing (12), and by means of actuating the nuts (11) the second element (2) moves towards the first element (1), the bushing (12) being removed from the strut (13) and passing through the central orifice (3) of the first element (1) upon being driven by the cylindrical body (7),
    and for assembling a bushing (12) in the strut (13) the first element (1) is arranged in the same position as for removing, with the bushing (12) between the first element (1) and the strut (13), and the second element (2) clamps the drive shaft (14) with the cylindrical body (7) oriented in the direction opposite the bushing (12), and by means of actuating the nuts (11) the first element (1) moves towards the second element (2), the bushing (12) being introduced into the strut (13) upon being driven by said first element (1).

2. The tool for removing and assembling bushings in the strut for supporting the drive shaft of a vessel according to claim 1, **characterized in that**

    - the first element (1) comprises a first disk-shaped housing (16) coaxial with it for coupling removable washers (17) with different inner diameters,
    - **in that** the third disk (5) comprises a second disk-shaped housing (17) coaxial with it for coupling removable cylindrical bodies (7) with different diameters.

3. The tool for removing and assembling bushings in the strut for supporting the drive shaft of a vessel according to claim 1, **characterized in that** the hollow cylindrical body (7) formed by two semi-cylindrical bodies (8) is welded to the third disk (5).

4. The tool for removing and assembling bushings in the strut for supporting the drive shaft of a vessel according to any one of the previous claims, **characterized in that** it additional comprises lock nuts (18) associated to the nuts (11).

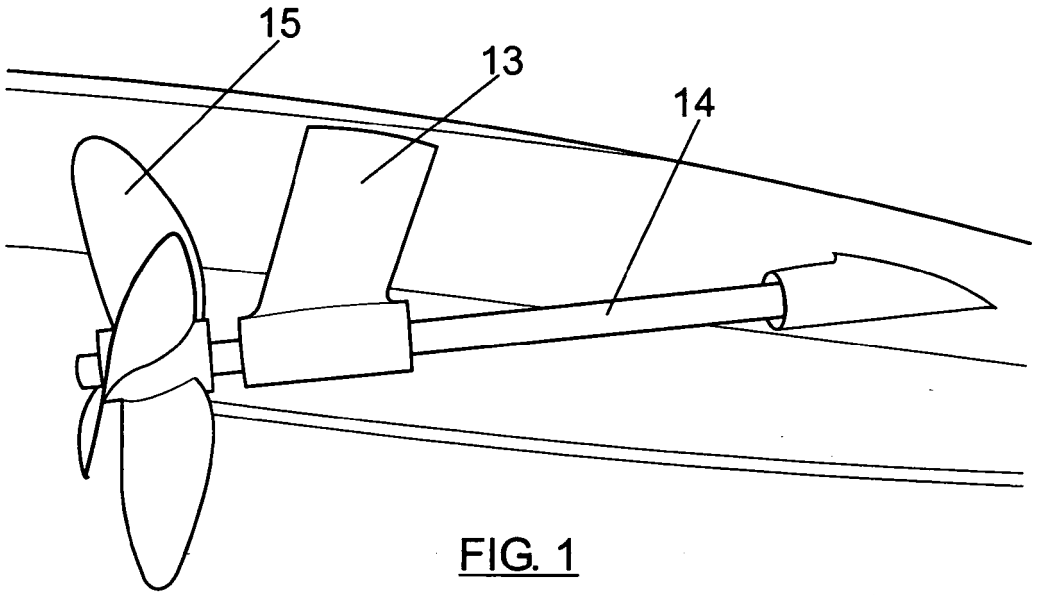

FIG. 1

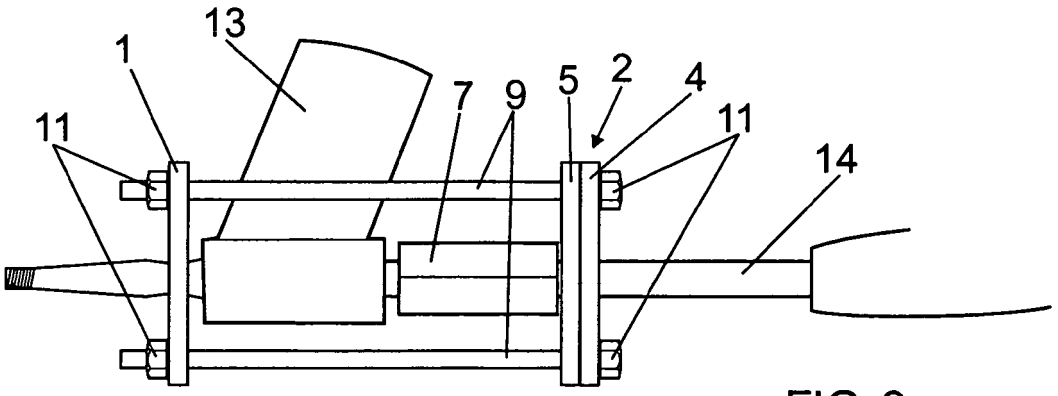

FIG. 2

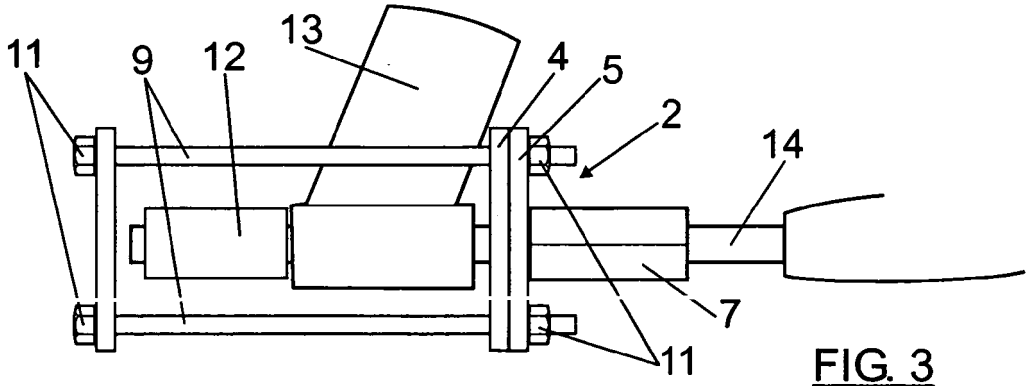

FIG. 3

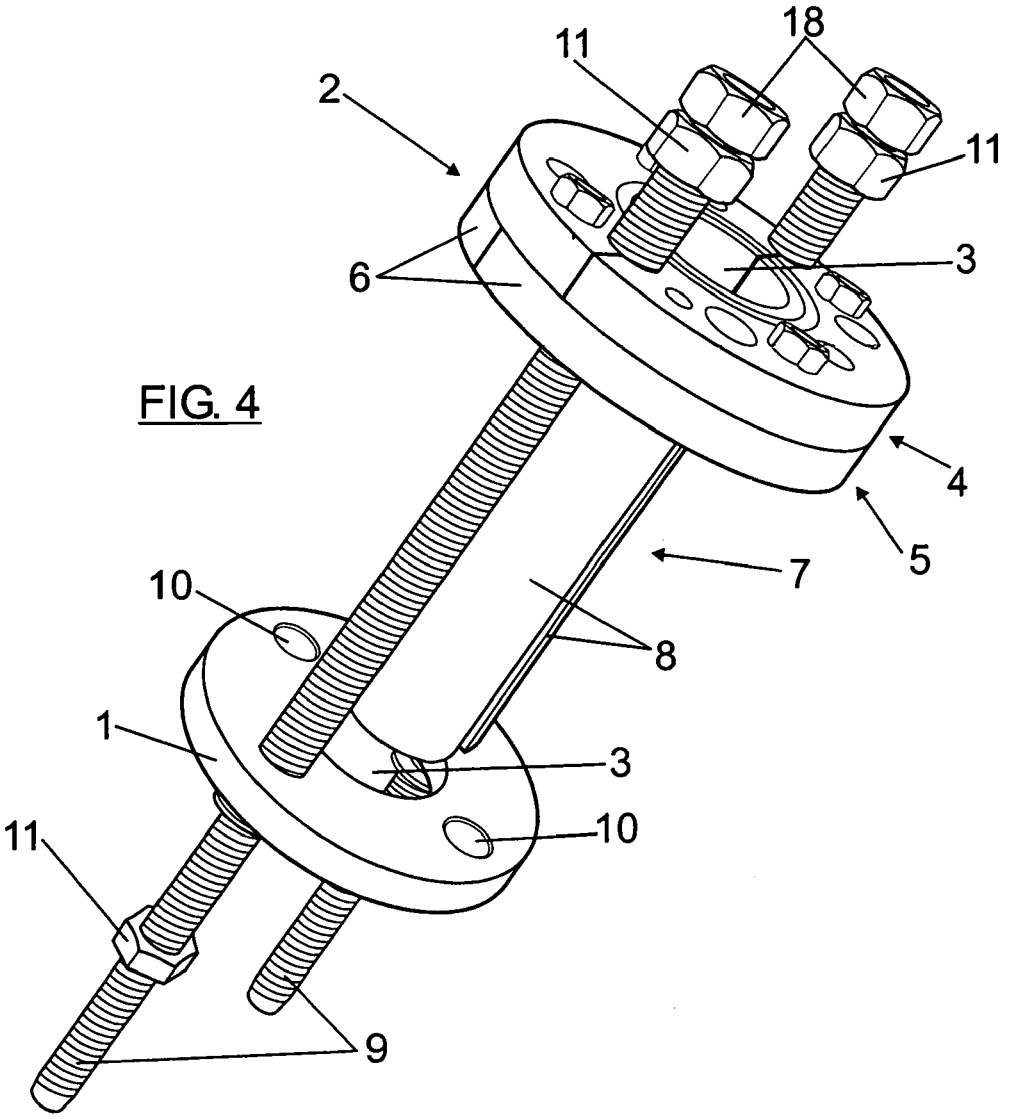

FIG. 4

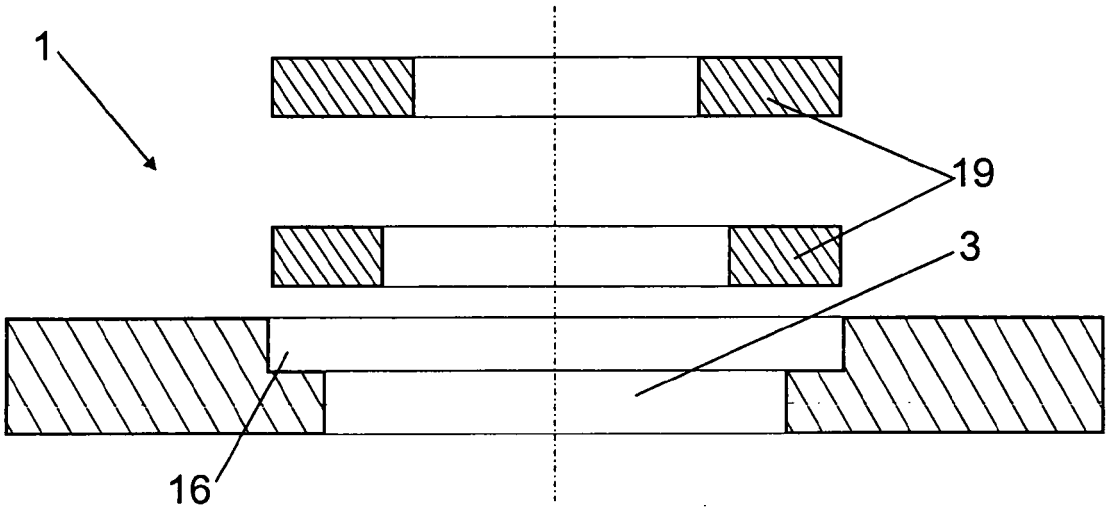

FIG. 5

FIG. 6