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Mounting for boat drive

The invention relates to a boat drive for a boat, comprising an underwater pod in which an electric motor is arranged, which drives, via a drive shaft, a propeller attached to the underwater pod, wherein the electric motor can be supplied with power via at least one electrical power line. The invention further relates to a boat with such a boat drive.

The invention relates to a boat drive with an underwater pod mounted below the boat body. In the underwater pod an electric motor is provided which drives at least one propeller. The electric motor is usually supplied with energy via a battery or an accumulator which is located in the interior of the boat body.

The electrical power lines must therefore be guided from the interior of the boat to the outside. For this purpose, in the prior art an aperture is introduced into the bottom of the boat body and the power lines are guided through the aperture. The underwater pod is usually attached to the bottom with screwed connections. A sealing agent is then applied to the points of connection between the bottom of the boat body and the underwater pod, and to the aperture for the power lines, in order to prevent penetration of water into the interior of the boat.

This design has the disadvantage, however, that the underwater pod cannot readily be removed from the boat body. Inspections or repairs to the underwater pod or electric motor thus involve considerable effort and/or expense.

US 4,734,006 A shows a vertically displaceable, electric trolling motor, which extends through the boat body and has a disc positioned on the deck so that the motor can be lowered and rotated with the feet.

The object of the present invention is therefore to provide a boat drive that can be demounted easily and quickly from the boat body, while at the same time sealing or bonding is possible with boat bodies, which typically differ greatly from each other and are curvilinear. Furthermore, a boat with such a boat drive is to be provided.

This object is achieved by a boat drive of the type described in the introduction, which is characterised in that an inner tube is connected to the underwater pod and in that the electrical power line is guided through the inner tube. A mounting body is further provided, which can be attached to the bottom of the boat body, wherein an outer tube is passed through the mounting body. The inner tube is arranged displaceably in the outer tube, wherein between the inner tube and the outer tube an annular sealing element is provided, which seals the inner tube and the outer tube in a radial direction relative to the longitudinal axis of the inner tube.

A boat according to the invention has such a boat drive, wherein the mounting body is attached in a waterproof manner to the bottom of the boat body.

The invention proposes the attachment of a mounting body with an outer tube to the boat body in a waterproof manner. For this purpose, an aperture is introduced in the bottom of the boat body, through which the outer tube and/or the inner tube are inserted. The outer tube is connected to the mounting body in a waterproof manner. The mounting body can have a plate-shaped design, so that a relatively large contact surface is formed between the mounting body and the bottom of the boat body and as stable a connection as possible can be produced between the mounting body and the bottom.

The outer tube is preferably permanently connected with the mounting body, i.e. the connection cannot be released without destroying the outer tube or the mounting body. The outer tube and the mounting body can for example be welded, bolted or bonded to each other.

The mounting body is connected with the bottom of the boat body in a waterproof manner. This connection can be produced for example by a screwed connection or by a welded or bonded connection. A screwed connection between the mounting body and the bottom is usually suitable for this purpose. To provide waterproofing, the point of connection between the mounting body and the bottom of the boat body is for example sealed or bonded with sealing agent and/or adhesive. This point of connection is constantly exposed to the water surrounding the boat body, and must therefore have a good and long-lasting seal.

The boat drive according to the invention can be attached irrespective of the design, shape and configuration of the bottom of the boat body. It is only necessary to provide an aperture in the bottom through which the outer tube and/or the inner tube can be passed and to provide any necessary fastening elements, such as, for example, screws. The quality of the seal between the mounting body and the bottom does not depend on the thickness of the boat bottom. In addition, it is not essential for the boat bottom to be flat at the attachment point. A good and long-lasting seal and attachment can also be achieved if the bottom of the boat, i.e. the boat's body, has a curved shape. The invention further allows attachment at positions on the boat bottom where frames or reinforcing ribs are located. Boats typically have a longitudinal rib in their exact middle, the so-called keel stringer. Attachment at this point also presents no problems according to the invention.

The mounting body can be mounted on the boat body such that the mounting body is at least in part, or entirely, located inside the boat body.

In an alternative embodiment, the mounting body is mounted on the boat body such that the mounting body is at least in part, or entirely, located outside the boat body.

Finally, the mounting body can also be connected with the boat body such that an interior part of the mounting body is located inside the boat body and an exterior part of the mounting body is located outside the boat body.

According to the invention, the boat drive is divided into two parts, one comprising the mounting body with the outer tube and the other comprising the underwater pod with the inner tube, which are connected with each other such that the electrical connecting line from the interior of the underwater pod can be routed into the inner tube. In order to connect the two parts of the boat drive, the inner tube with the underwater pod can be inserted into the outer tube. The annular gap between the inner tube and the outer tube is sealed by means of one or more annular sealing elements, so that no water can penetrate into the interior of the boat through the annular gap. In a preferred embodiment, the annular sealing element is designed as an O-ring.

The sealing element or elements seal the inner tube and outer tube in a radial direction. 'Radial' here refers to a direction perpendicular to the longitudinal axis of the inner tube and/or the outer tube. The inner tube and the outer tube run parallel to each other, and the sealing element is located between the two tubes. The inner tube and the outer tube are thus displaceable relative to each other in the axial direction, i.e. in their longitudinal direction, wherein the annular gap between the two tubes remains sealed at all times. This significantly facilitates the assembly of the two parts of the boat drive, namely the mounting body with the outer tube and the underwater pod with the inner tube, since it is not necessary to keep the two tubes in a precise position relative to each other in order to prevent leaks.

The outer tube additionally provides a good guideway for the inner tube, with the result that the inner tube with the underwater pod is secured against tilting.

The inner tube and underwater pod can also be secured against slipping out of the outer tube. This securing can be achieved for example by means of one or more screws, sleeves, bolts and/or pins. The securing can be both inside the boat body and outside the boat body.

The underwater pod can be mounted such that it is pivotable relative to the boat body, in particular pivotable through 360°, or rigidly mounted.

In one embodiment of the invention, two or more, in particular four, sealing elements are provided. It is particularly expedient for at least one of the sealing elements to be in contact with the first end piece of the outer tube and at least one of the sealing elements to be in contact with the second end piece of the outer tube. In each case, the first end piece and the second end piece of the outer tube should here comprise in particular a third, a fourth, a fifth, an eighth or a tenth part of the length of the outer tube.

In one embodiment of the invention, the outer tube can also be passed though the mounting body such that, after attachment of the mounting body to the boat body, an inner portion of the outer tube is located inside the boat body and an outer portion of the outer tube is located outside the boat body. In this case at least one sealing element can be provided in the region of the inner portion of the outer tube and at least one sealing element can be provided in the region of the outer portion of the outer tube. One of the

sealing elements is then located inside the boat body and one of the sealing elements is located outside the boat body. Advantageously, two sealing elements are provided in contact with the inner portion of the outer tube and two sealing elements are provided in contact with the outer portion of the outer tube.

The underwater pod is a substantially streamlined housing in which an electric motor which drives a drive shaft is provided. The drive shaft passes through the wall of the underwater pod and turns a propeller disposed outside the underwater pod. The electric motor is supplied with energy from a battery or an accumulator. For this purpose, the electric motor is connected in a current-conducting manner with the battery or accumulator via one or more electrical power lines. Control lines for controlling the electric motor can also be provided.

The electrical power line and any control lines must therefore be routed from the electric motor located in the underwater pod into the interior of the boat. For this purpose, the inner tube and the underwater pod are connected with each other such that a passageway is created from the interior of the underwater pod into the interior of the inner tube. For example, the inner tube protrudes through an aperture in the wall of the underwater pod into the interior of the underwater pod. It is also possible to provide an intermediate element, or a spacer, which has a hollow space that connects with both the interior of the underwater pod and the inner tube.

The electrical power lines are routed from the underwater pod through the inner tube into the interior of the boat. The electrical power lines (including any control lines) are advantageously provided with a plug connection which can be disconnected or reconnected. The plug connector is advantageously provided on the portion of the power line that has been fed through the inner tube and is located in the interior of the boat.

If the underwater pod needs to be removed from the boat, for example in order to repair or inspect the electric motor, the electrical connection can be simply disconnected by unplugging the plug connection.

In order for the electric motor, the underwater pod or other connected parts to be maintained or repaired, the underwater pod together with the inner tube can easily be

separated from the mounting body and removed, without damaging the sealing or bonding on the boat itself.

In order to close the outer tube in the event of lengthy maintenance or repair work, the outer tube can be closed with a specially manufactured closing element ('stopper'), which has the same type of sealing elements as the inner tube. By this means, even if a lengthy repair of the drive is necessary, the boat can quickly—possibly with the aid of an auxiliary drive such as an outboard motor—be made ready for continued use and refloated. Annoying idle periods in a dry dock can thereby be avoided. It is also possible to use a replacement drive (underwater pod and inner tube) in the event of a repair, and by this means reduce downtime to a minimum.

The invention and further advantageous aspects of the invention are explained in greater detail below with the aid of the schematic drawings. Here, Figs. 1 to 3 show various views of a boat drive according to the invention.

The boat drive according to the invention consists of a first part 1 fixedly attached to the boat and a second detachable part 2. The first part 1 is screwed to the bottom 3 of the boat body. In the bottom 3 a central hole, through which the outer tube (see below) can pass and, for example, two additional holes, are drilled. Bolts are passed through the additional holes in order to attach a mounting body 5 to the bottom 3. Any gap between the mounting body 5 and the bottom 3 is sealed with sealing agent and/or adhesive. An adaptable part, formed for example from plastic, can also be provided.

In the embodiment shown in the figures, the mounting body 5 is located outside the boat body. It is however equally possible to provide the mounting body in the interior of the boat body, and to pass the bolts or screws for attaching the mounting body from the interior of the boat outwards through the bottom 3.

An outer tube 6 is attached to the mounting body 5 and passes through the bottom 3 via the central drilled hole described above. The outer tube 6 is attached in a waterproof manner to the mounting body 5. For example, the outer tube 6 is attached to the mounting body 5 by means of a welded, screwed or bonded connection. In every case, after attachment of the mounting body 5 to the bottom 3, the interior of the outer tube 6 is the only connection between the interior of the boat and the exterior of the boat body.

Aside from this, the interior of the boat and the exterior of the boat body are separated from each other in a waterproof manner.

The second part of the boat drive comprises an underwater pod 7, in which an electric motor (not shown) is located. The electric motor drives a drive shaft 8, to which, outside the underwater pod 7, a propeller is attached. For reasons of clarity the propeller is also not shown.

A spacer 9 is connected to the underwater pod 7. The spacer 9 has a continuous hollow space with which an inner tube 10 is connected, or into which an inner tube 10 is inserted. In the outer wall of the underwater pod 7, an aperture is provided which creates a connection between the interior of the underwater pod 7 and the interior of the inner tube 10. The underwater pod 7, the spacer 9 and the inner tube 10 are otherwise connected with each other in a waterproof manner.

One or more electrically conductive cables 11 are attached to the electric motor. The cables 11 can be disconnected by means of a plug connection 12.

The first and second parts 1, 2 of the boat drive are connected to each other in that the inner tube 10 is inserted in the outer tube 6. The sealing between the inner tube 10 and the outer tube 6 is achieved by means of O-rings 13, 14. After the inner tube 10 and the outer tube 6 are put together, O-rings 13, 14 are disposed between the two tubes 10, 6, and are compressed in a radial direction. By this means the gap between the inner tube 10 and the outer tube 6 is sealed.

It is expedient to provide one or more grooves, each of which accommodates one O-ring, around the circumference of the inner tube 10 and/or the outer tube 6, either on the outside of the inner tube 10 or on the inside of the outer tube 6.

The inner tube 10 and the outer tube 6 are preferably sealed against each other, in each case at their end which faces towards the underwater pod 7, by means of one or two O-rings 13. In addition, the inner tube 10 and the outer tube 6 are preferably sealed against each other, in each case at their end which faces away from the underwater pod 7, by means of one or two O-rings 14. The term ‘ends’ refers here in particular to the third,

fourth, fifth, eighth or tenth part of the length of the inner tube 10 and/or the outer tube 6 in each case.

Fig. 2 shows the boat drive according to the invention in the assembled state. For the purposes of repair or inspection of the underwater pod 7, the electric motor, the propeller or another element or component that is disposed in the underwater pod, the second part 2 of the boat drive can be detached from the boat.

For this purpose, both screws 16 are released. The plug connection 12 is also released and the electric cable 11 is disconnected. The second part 2 of the boat drive thereby remains inserted in the outer tube 6 only and can simply be pulled out downwards.

The assembly of the boat drive accordingly takes place in the reverse sequence. First the inner tube 10 is inserted in the outer tube 6. Due to the radial sealing by means of the O-rings 13, 14 according to the invention, it is not necessary to keep the inner tube 10 and the outer tube 6 in a precise position relative to each other in an axial direction. The seal between the inner tube 10 and the outer tube 6 exists over a wide area, namely as long as at least one of the O-rings 13, 14 is disposed between the two tubes 10, 6.

After the two parts 1, 2 have been pushed together, it is only necessary in addition to secure the lower, second part 2 of the boat drive against falling out. For this purpose, the screws 16 are screwed into the mounting body 5. Electrical connection of the electric motor is achieved by connecting the plug connection 12.

Both assembly and disassembly of the boat drive are easy to accomplish and can also be carried out by a non-specialist. In particular, no danger of leakage exists following disassembly and subsequent reassembly of the boat drive.

Patentkrav

1. Bådedrev til en båd, omfattende en undervandsgondol (7), i hvilken der befinder sig en elektromotor, som over en drivaksel driver en til undervandsgondolen (7) fastgjort skrue, idet elektromotoren kan forsynes med strøm gennem mindst en elektrisk forsyningsledning (11), **kendetegnet ved,**

- **at** et indre rør (10) er forbundet med undervandsgondolen (7), og at den elektriske forsyningsledning (11) er ført gennem det indre rør (10),
- **at** der er tilvejebragt et fastgørelseslegeme (5), som er udformet til at anbringes uden på skrogets bund (3), idet et ydre rør (6) er ført gennem fastgørelseslegemet (5), og
- **at** det indre rør (10) er anbragt forskydeligt i det ydre rør (6), idet der mellem det indre rør (10) og det ydre rør (6) er tilvejebragt et ringformigt tætningselement (13, 14), som tætner det indre rør (10) og det ydre rør (6) i radial retning i forhold til det indre rørs (10) længdeakse,

idet fastgørelseslegemet (5) og det ydre rør (6) udgør en del (1), der skal forbindes fast med båden, og idet det indre rør (10) og undervandsgondolen (7) udgør en udskiftelig del (2),
idet udskiftelige del (2) er anbragt aftageligt på fastgørelseslegemet (5).

2. Bådedrev ifølge krav 1, **kendetegnet ved, at** det ringformige tætningselement (13, 14) er udformet som O-ring.

3. Bådedrev ifølge et af de foregående krav, **kendetegnet ved, at** der er tilvejebragt to eller flere, især fire tætningselementer (13, 14).

4. Bådedrev ifølge krav 3, **kendetegnet ved, at** det ydre rør (6) omfatter et første endestykke og et andet endestykke, og at mindst et af tætningselementerne (13) står i kontakt med det første endestykke og mindst et af tætningselementerne (14) med det andet endestykke.

5. Bådedrev ifølge krav 4, **kendetegnet ved, at** det første endestykke og det andet endestykke hver især omfatter en trediedel, en fjerdedel, en femtedel, en ottendedel eller en tiendedel af det ydre rørs (6) længde.

6. Bådedrev ifølge et af de foregående krav, **kendetegnet ved, at** der er tilvejebragt en sikring (16) til fastgørelse af undervandsgondolen (7) på fastgørelseslegemet (5).

7. Bådedrev ifølge et af de foregående krav, **kendetegnet ved, at** den elektriske forsyningsledning (11) er forsynet med en stikprop (12).

8. Bådedrev ifølge et af de foregående krav, **kendetegnet ved, at** der er tilvejebragt en afstandsholder (9) mellem undervandsgondolen (7) og det indre rør (10).

9. Båd med et bådedrev ifølge et af de foregående krav, **kendetegnet ved, at** båden har et skrog med en bund (3), og at fastgørelseslegemet (5) er fastgjort vandtæt uden på skrogets bund (3).

10. Båd ifølge krav 9, **kendetegnet ved, at** fastgørelseslegemet (5) i det mindste delvis befinder sig inde i skroget.

11. Båd ifølge et af kravene 9 eller 10, **kendetegnet ved, at** fastgørelseslegemet (5) i det mindste delvis befinder sig uden for skroget.

12. Båd ifølge et af kravene 9 til 11, **kendetegnet ved, at** fastgørelseslegemet (5) er skruet sammen med skrogets bund (3), og at fastgørelseslegemet (5) og skrogets bund (3) er tætnet ved hjælp af en tætningsmasse.

13. Båd ifølge et af kravene 9 til 12, **kendetegnet ved, at** det ydre rør (6) er låst af et låseelement, som er tætnet af det eller de ringformige tætningselementer (13, 14).

14. Båd ifølge et af kravene 9 til 13, **kendetegnet ved, at** undervandsgondolen (7) sammen med det indre rør (10) er lejret drejeligt i forhold til fastgørelseslegemet (5) og det ydre rør (6).

Fig. 3

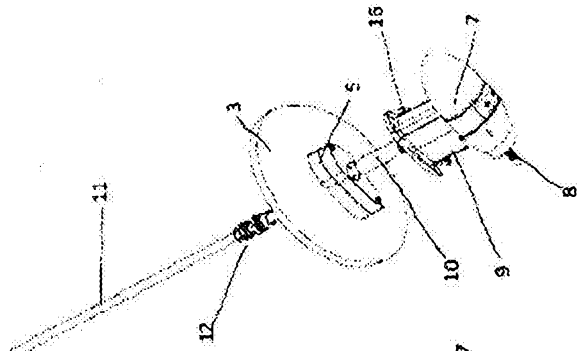


Fig. 2

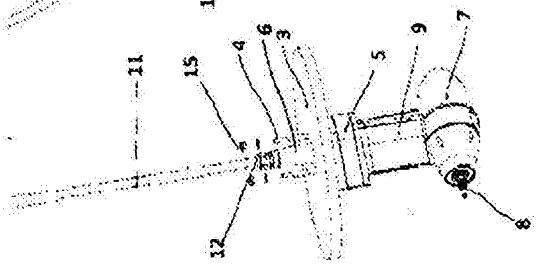


Fig. 1

