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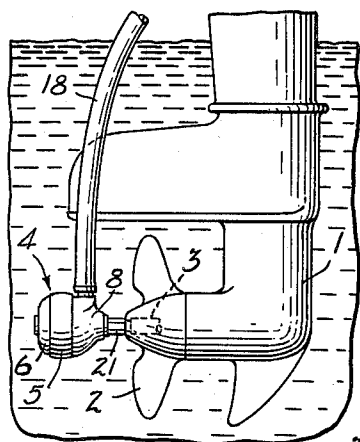
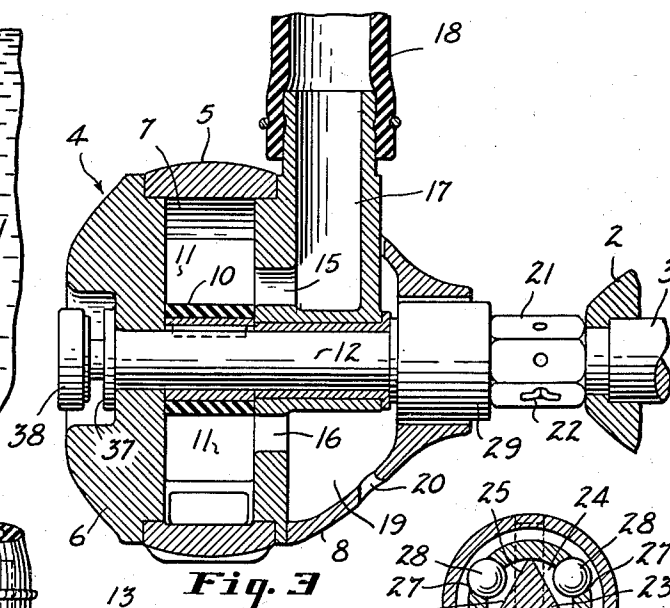
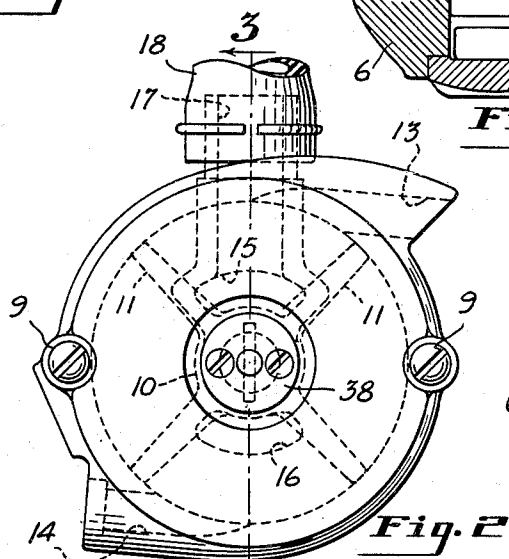
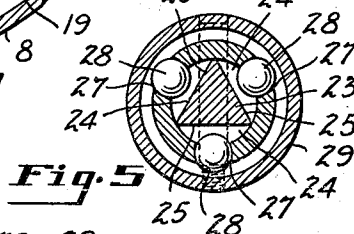
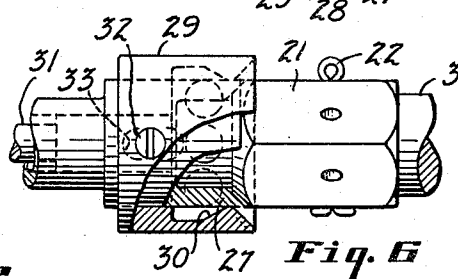
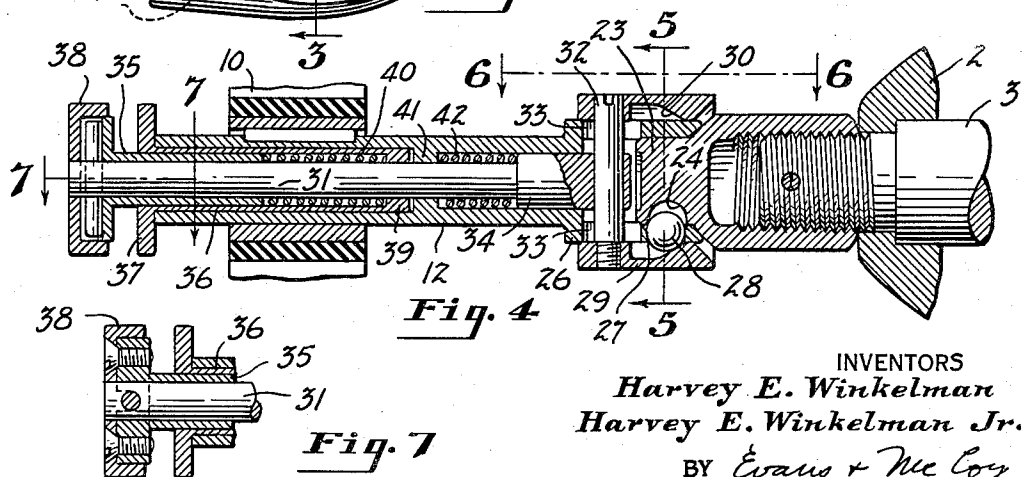
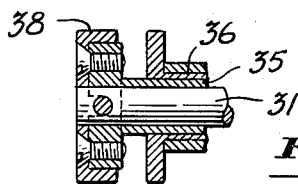
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2,733,679

PROPELLER AND PUMP ASSEMBLY

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2 Sheets-Sheet 1



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2,733,679

PROPELLER AND PUMP ASSEMBLY

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14 Claims. (Cl. 115—5)

This invention relates to a propeller and pump assembly in which a centrifugal suction pump is detachably mounted on the end of the propeller shaft immediately adjacent the propeller to be submerged with the propeller and which when so attached may be employed to create suction in a drain tube to bail water from the boat while it is being propelled.

The pump of the present invention has a suction inlet to which a flexible hose is attached which may extend up over the side of the boat to bail water from the boat, and has one or more tangential discharge outlets from which water is discharged from the pump into the water in a direction to exert a thrust on the pump casing which is opposed to that of the propeller shaft, so that the pump is easily held against turning with the propeller shaft by means of the flexible hose.

The present invention is a continuation-in-part of our copending application Serial No. 80,504, filed March 9, 1949, now Patent No. 2,684,635, issued July 27, 1954, and relates to a propeller and pump assembly and particularly to a quickly attachable and detachable means for mounting the pump on the propeller shaft.

The invention has for an important object to provide a coupling between the propeller shaft and pump motor which will enable the operator to instantly secure the pump in operative position on the propeller shaft.

Reference should be had to the accompanying drawings forming a part of this specification to which:

Figure 1 is a fragmentary side elevation showing the propeller supporting frame of an outboard motor, the propeller and a pump mounted on the outer end of the propeller shaft;

Fig. 2 is a front elevation of the pump;

Fig. 3 is a section taken on the line indicated at 3—3 in Fig. 2;

Fig. 4 is a fragmentary section through the rotor shaft and the coupling member connecting the rotor shaft to the propeller shaft;

Fig. 5 is a transverse section taken on the line indicated at 5—5 in Fig. 4;

Fig. 6 is a fragmentary plan view of the coupling viewed as indicated at 6—6 in Fig. 4;

Fig. 7 is a section taken on the line indicated at 7—7 in Fig. 4;

Fig. 8 is a sectional view similar to Fig. 4, showing the rotor shaft detached from the propeller shaft;

Fig. 9 is a vertical section showing a modified form of coupling for detachably securing the rotor shaft to the propeller shaft;

Fig. 10 is a fragmentary view showing the combined propeller retaining nut and coupling member; and

Fig. 11 is a front elevation of the pump shown in Fig. 9.

The device of the present invention is a detachable pump mounting by means of which a centrifugal suction pump may be quickly and easily attached to the shaft of a boat propeller in such manner that the pump operates simultaneously with the propeller to create a suction

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which may be used to continuously bail water from a boat.

In the accompanying drawings the invention is shown applied to the propeller supporting outboard arm or frame 1 which supports a propeller 2 that is attached to the rear end portion of the propeller shaft 3 that is mounted in the arm 1 and that projects rearwardly therefrom, a pump 4 being shown attached to the shaft immediately adjacent the propeller to the rear and downstream with respect thereto. The pump casing has a central internally cylindrical ring 5 and a side member 6 that forms the outer wall of the casing. The pump has a chamber 7 within the ring 5 the inner wall of which is formed by an inner side member 8. The casing members 5, 6 and 8 are held together by bolts 9 and the ring 5 is reversible between the side members 6 and 8 to accommodate the pump to propellers which rotate clockwise or counterclockwise.

A rotor 10 is mounted in the chamber 7 and has a series of vanes 11 which have a close running fit within the sides and periphery of the pump chamber. The rotor 10 is mounted on a tubular rotor shaft 12 that is journaled in the rear and front side members 6 and 8. The cylindrical ring 5 is provided with two diametrically opposite tangential outlets 13 and 14 which direct fluid streams into the enveloping body of water in directions such that they exert a torsional thrust on the pump casing which counteracts the torsional thrust of a propeller shaft.

Two inlet openings 15 and 16 are provided for the pump chamber 7 at the inner side thereof, one above the rotor shaft and the other below the rotor shaft. The upper opening 15 communicates with a casing inlet 17 to which a flexible hose 18 may be attached, the hose 18 being of a length to extend up into the boat to draw water from the boat into the pump casing. The second inlet 16 communicates with a chamber 19 formed in the side member 8 which has openings 20 which permit water to flow continuously into the chamber. The fluid entering the pump through the inlet 17 is discharged tangentially through the outlet 13 and the liquid entering the pump through the chamber 19 is discharged tangentially through the outlet 14. A mixture of air and water or air alone may be drawn into the pump through the inlet 15. A full flow of water, however, is maintained through the inlet 16 and outlet 14 to continuously prime the pump.

The pump 4 being positioned in axial alignment with the propeller 2 and downstream or to the rear thereof, is in the path of the water stream created by the propeller 2 and water enters the openings 20 under pressure because of the fact that these openings are on the side of the pump casing that faces the propeller 2. The increased pressure at the priming inlet due to the action of the propeller 2 increases the volume of priming water that is passed through the pump per unit of time and also increases the suction at the main suction inlet 15.

For supporting the pump on the propeller shaft, a propeller retaining nut 21 is provided which screws onto the end of a propeller shaft to clamp the propeller shaft in place thereon. The nut 21 may be locked against turning movement on the propeller shaft by suitable means such as a cotter pin 22. The nut 21 is provided with a reduced outer end 23 which serves as the plug of a plug and socket coupling for supporting the pump 4. The reduced end 23 of the nut may be cylindrical and is provided with one or more peripheral recesses 24. The recesses 24 are preferably in the form of grooves that extend transversely of the axis of the propeller shaft and have straight bottoms 25 which may form sides of a polygon as shown in Fig. 5.

The tubular rotor shaft 12 has an enlarged inner end 26 which provides a socket in which the reduced plug portion 23 of the nut 21 fits. The enlarged socket portion

26 of the shaft has circumferentially spaced openings 27 in each of which a ball detent 28 is mounted. The openings 27 are so formed that they permit the balls 28 to project into the interior of the socket but will not permit the balls to pass inwardly through the openings. A sleeve 29 is slidably mounted on the socket portion 26 and is provided with an internal cam 30 which extends circumferentially and which engages with the balls 28 simultaneously to press the same inwardly. The recesses 24 are shaped to receive the balls 28 and, since these recesses are elongated transversely of the shaft axis, the balls will engage the recesses regardless of the angular position of the propeller shaft and serve to automatically position the coupling members when engaged with the recesses. The balls 28 not only lock the rotor shaft against axial movement with respect to the propeller shaft, but also provide a driving connection between the propeller shaft and the rotor shaft. The cam sleeve 29 is operated by means of a rod 31 extending axially through the rotor shaft and connected at its inner end to the sleeve 29 by means of a cross pin 32 which extends through axially extending slots 33 in the enlarged socket portion 26 of the shaft. Outward movement of the rod 31 draws the cam 30 into engagement with the balls 28 to force them into the recesses 24 and to hold them there.

The rod 31 has an enlarged inner end 34 that has a sliding fit within the tubular shaft 12 and has a sleeve 35 thereon at its outer end that slides within a bushing 36 mounted in the outer end portion of the shaft 12. The bushing 36 has a flange 37 beyond the forward end of the shaft 12 for engagement with the side member 6 of the pump casing. The sleeve 35 has an enlarged head 38 attached to its outer end outwardly of the flange 37 which provides a means for manipulating the rod 31 to release the balls 28 to permit the pump to be connected to or disconnected from the propeller shaft. The bushing 36 has a thickened inner end portion 39 which provides a bearing for the rod 31 and a compression coil spring 40 is mounted within the bushing 36 and around the rod 31 between the thickened portion 39 and the inner end of the sleeve 35. The coil spring 40 maintains an outward thrust on the rod 31 which holds the cam 30 in engagement with the balls 28 to maintain locking engagement between the coupling members.

To mount a pump on the propeller shaft all that is necessary is for the operator to grasp the pump 4 in one hand and press the thumb of that hand against the head 38 and to then place the socket portion 26 over the plug portion 23 of the retaining nut and release this thumb from the head 38 to permit the spring 40 to move the cam sleeve outwardly and force the ball detents 28 into the recesses 24 to lock the pump to the propeller shaft.

Inwardly of the bushing 36 the rotor shaft may be provided with a bearing portion 41 in which the rod 31 has a sliding fit and between the bearings 40 and 41 and the enlarged portion 34 of the rod a second coil spring 42 may be placed. The spring 42 is weaker than the spring 40 and opposes the spring 40. The use of the second spring permits the use of a relatively strong actuating spring 40 and lessens the radial pressure on the balls 28 when the pump is disconnected.

In Figs. 9 to 11 a modified form of mounting is shown. The pump is identical and the pump parts are indicated by the same reference numerals as in Figs. 1 to 8. In this modification a rotor shaft 43 is provided which has an interlocking plug and socket connection with the propeller shaft, the rotor shaft and propeller shaft having interengaging portions that are interlocked by the driving thrust of the propeller shaft and that can be disengaged by a relative turning movement in the direction of the driving thrust. The rotor shaft 43 has an enlarged inner end 44 that provides a shoulder 45 for engagement with the pump bearing. The enlarged inner end 44 is provided with a socket 46 which forms a part of the coupling connecting the propeller shaft 2 and the rotor shaft 43, the

socket 46 having internal torque transmitting and retaining means in the form of screw threads 47.

The outer face of the side member 6 of the pump casing is provided with a recess 48 within which a finger grip 49 attached to the outer end of the rotor shaft 43 is mounted. For attaching the rotor shaft 43 to the propeller shaft, a coupling member 50 is provided which may also serve as the propeller retaining nut. The member 50 has a reduced end portion 51 which provides a plug to enter the socket 46 of the rotor shaft and which is provided with an external thread 52 for engagement with the internal thread 47 of the socket 46. The threads 47 and 52 are preferably coarse pitch threads so that only a small turning movement is required to fasten the shaft to the coupling member. The inclination of the threads 47 and 52 is such that the torsion applied to the propeller shaft 2 during the operation thereof will tighten the threaded connection between the coupling members. To facilitate the assembly of the coupling members, a pilot pin 53 coaxial with the rotor shaft is mounted in the bottom of the socket 46 and the plug portion 51 of the propeller carried coupling member is provided with a socket 54 coaxial with the propeller shaft to receive the pin 53. The thread 52 on the plug 51 preferably terminates short of the outer end of the plug so that the pin 53 will enter the socket 54 before the thread 52 comes into engagement with the thread 47, thereby facilitating the registry of the coupling members when assembling.

As in the modification first described, the tangential outlets 13 and 14 provide discharge streams that react on the pump casing to hold it against turning movement with the propeller shaft. The threads 52 and 47 are so disposed that the rotation of the propeller shaft tends to tighten the threads and maintain a driving connection between the propeller shaft and the rotor shaft.

The pump may be adapted for either a clockwise rotating propeller shaft or a counter-clockwise rotating propeller shaft by reversing the central ring 5 as explained in connection with the modification first described. To assemble the pump on the propeller shaft it is merely necessary to place the socket portion 46 on the projecting plug portion 51 of the member 50 and to then turn the rotor shaft 43 by means of the finger grip 49 in a direction to screw the socket 46 onto the plug 51.

It is to be understood that in accordance with the provisions of the patent statutes, variations and modifications of the specific devices herein shown and described may be made without departing from the spirit of the invention.

What we claim is:

1. A submersible propeller and pump assembly comprising a support, a propeller shaft mounted in said support and having an end projecting therefrom, a propeller mounted on the projecting end of said shaft, and a pump supported on said shaft rearwardly of and downstream with respect to said propeller, said pump having a rotor detachably connected to said propeller shaft rearwardly of said propeller to rotate therewith and a pump casing in which said rotor is journaled, said casing and rotor being supported solely by said propeller shaft and being detachable as a unit from said shaft.

2. A submersible propeller and pump assembly comprising a support, a propeller shaft mounted in said support and having an end projecting therefrom, a propeller attached to the projecting end of said shaft, and a pump supported on said shaft rearwardly of and downstream with respect to said propeller, said pump having a rotor attached to and supported solely by said propeller shaft rearwardly of said propeller and a pump casing in which said rotor is journaled, said casing being rotatably supported on said propeller shaft, said casing having an inlet and a tangentially directed peripheral outlet for discharging a stream of fluid tangentially into the body of liquid in which the casing is submerged and for subjecting the casing to a torque opposed to that caused by rotation of the rotor.

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3. A submersible propeller and pump assembly comprising a support, a propeller shaft mounted in said support and having an end projecting therefrom, a propeller mounted on the projecting end of said shaft, a propeller retaining member attached to the said end of said propeller shaft, and a pump supported on said retaining member, said pump having a rotor provided with a shaft detachably secured to said retaining member to turn therewith in axial alinement with said propeller shaft, and a rotatably supported pump casing enclosing the rotor and having journals which receive the rotor shaft, said casing having an inlet and a peripheral tangentially directed outlet for discharging a stream of fluid tangentially into the body of liquid in which the casing is submerged and subjecting the casing to a thrust which is opposed to that of the propeller shaft.

4. A submersible propeller and pump assembly comprising a support, a propeller shaft mounted in said support and having an end projecting therefrom, a propeller mounted on the projecting end of said shaft, a pump comprising a casing providing a pump chamber with an inlet and a peripheral outlet and having side walls with alined openings, a rotor within said casing and a shaft to which the rotor is attached journaled in and projecting through said openings, a detachable connection between the said end of said propeller shaft and an end of said rotor shaft comprising a plug and socket, one attached to said propeller shaft and the other attached to said rotor shaft and means for holding the shafts in axial alinement and limiting relative axial and turning movements thereof comprising interengaging parts carried by the plug and socket.

5. A submersible propeller and pump assembly comprising a support, a propeller shaft mounted in said support and having an end projecting therefrom, a propeller attached to the projecting end of said shaft, a pump comprising a casing providing a pump chamber with an inlet and a peripheral outlet and having side walls with alined openings, a rotor within said casing and a shaft to which the rotor is attached journaled in and projecting through said openings, a pair of coupling members attached one to the propeller shaft and one to the rotor shaft and having parts movable into and out of locking engagement, and means for adjusting the coupling member on the rotor shaft to lock or release said coupling members comprising an actuating member mounted within the rotor shaft and connected to one of said coupling members, said actuating member being accessible at said end of said rotor shaft.

6. In a propeller and pump assembly, a propeller shaft, a propeller mounted on said shaft, said shaft having a coupling portion of reduced diameter at its outer end that is provided with circumferentially spaced peripheral recesses, a tubular shaft having an inner end portion in which said coupling portion fits, a pump rotor mounted on said tubular shaft, circumferentially spaced ball detents mounted for radial movements in the inner end of said rotor shaft and engageable in said recess to lock said rotor shaft to said coupling portion, a sleeve slidable on the inner end of said rotor shaft and having an internal cam portion engageable with said detents to move the same to locking position, an actuating rod mounted for axial movements in said rotor shaft and attached to said sleeve, and a spring exerting an axial thrust on said rod in a direction to move said detents to locking position.

7. A submersible pump attached to a propeller shaft comprising a housing having a rotor chamber, an outer wall having a recess in its outer face centrally of said chamber and an opening centrally of said recess and an inner wall having an opening alined with the opening in the outer wall, a rotor shaft having an enlarged tubular inner end portion providing a shoulder and having internal screw threads, a head detachably secured to the opposite end of said shaft and positioned in said recess, and bearings for said shaft retained by said head and shoulder,

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said propeller shaft forming the sole support for said pump.

8. A submersible pump attached to a propeller shaft comprising a housing having a rotor chamber and openings in its opposite side walls coaxial with said chamber, a rotor shaft having end portions in said openings, said shaft having an internally screw threaded socket at one end and a head at the opposite end by means of which the shaft may be turned manually, and a coupling member fastened upon the end of a propeller shaft to form the sole support for the pump and having a reduced threaded end portions screwed into said pocket.

9. A submersible pump attached to a propeller shaft comprising a housing having a rotor chamber and openings in its opposite side walls coaxial with said chamber, a rotor shaft having end portions in said openings, said shaft having an internally screw threaded socket at one end and a head at the opposite end by means of which the shaft may be turned manually, a cylindrical pilot pin in said socket and coaxial therewith, and a coupling member fastened to the end of a propeller shaft and having a reduced end portion, said propeller shaft forming the sole support for said pump.

10. A submersible propeller and pump assembly comprising a propeller shaft, a support for said shaft, a propeller attached to said shaft, and a centrifugal pump mounted on said propeller shaft downstream with respect to said propeller, said pump having a casing provided with an inlet opening on the side thereof facing said propeller through which water is forced under pressure created by said propeller.

11. A submersible propeller and pump assembly comprising a propeller shaft, a support for said shaft, a propeller attached to said shaft, a centrifugal pump mounted on said propeller shaft downstream with respect to said propeller, said pump having a casing provided with a main suction inlet and a priming inlet opening in the side thereof facing said propeller through which water is forced under pressure created by said propeller, and a suction hose connected to said main suction inlet.

12. A submersible propeller and pump assembly comprising a support, an outwardly projecting cantilever shaft mounted in said support and supported solely by said support, a propeller mounted on said shaft adjacent said support, said shaft projecting beyond said propeller and having a coupling portion of reduced diameter at its end that is provided with a peripheral recess, a tubular rotor shaft having a coupling portion of enlarged diameter at its inner end to receive the coupling portion of the propeller shaft, a pump comprising a casing and a rotor within said casing mounted on said rotor shaft, said pump being supported solely by said propeller shaft and being spaced from and unconnected to said support, a locking detent mounted in said coupling portion of the rotor shaft for radial movement into its locking position in engagement with said recess, a sleeve slidably mounted on said enlarged portion and having an internal cam portion engageable with said detent to move the same to locking position, a rod slidably mounted in said rotor shaft, said rod having its inner end attached to said sleeve and its outer end projecting past the outer end of said rotor shaft, and a spring exerting an axial thrust on said rod in a direction to hold said detent in its locking position.

13. A submersible propeller and pump assembly comprising a support, a cantilever shaft mounted in said support and projecting outwardly therefrom, a propeller mounted on said shaft adjacent said support, said shaft having an end that projects outwardly from said propeller, a pump comprising a pump casing with a rotor chamber and alined openings in its side walls centrally of said chamber, a rotor shaft journaled in said casing and having opposite end portions disposed in said openings, means for supporting said pump solely on said propeller shaft including a coupling member at the inner end

of said rotor shaft attached to the projecting end of said propeller shaft, and means for manipulating said coupling member to attach the rotor shaft to or disconnect the same from the propeller shaft including a handle at the outer end of the rotor shaft.

14. A submersible propeller and pump assembly comprising a support, a cantilever shaft projecting outwardly from said support, a propeller mounted on said shaft, a pump comprising a housing having a rotor chamber and side walls, one of which has a centrally disposed recess in its outer face and an opening centrally of said recess and the other of which has an opening alined with the first mentioned opening, a rotor shaft journaled in the housing and having end portions in said openings, said rotor shaft having a screw threaded coupling portion at one end for attaching said rotor shaft to said propeller shaft, and a handle member attached to the opposite end of the rotor shaft and positioned in said recess.

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