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REVERSING GEAR FROM PROPELLER SHAFTS

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Fig. 1

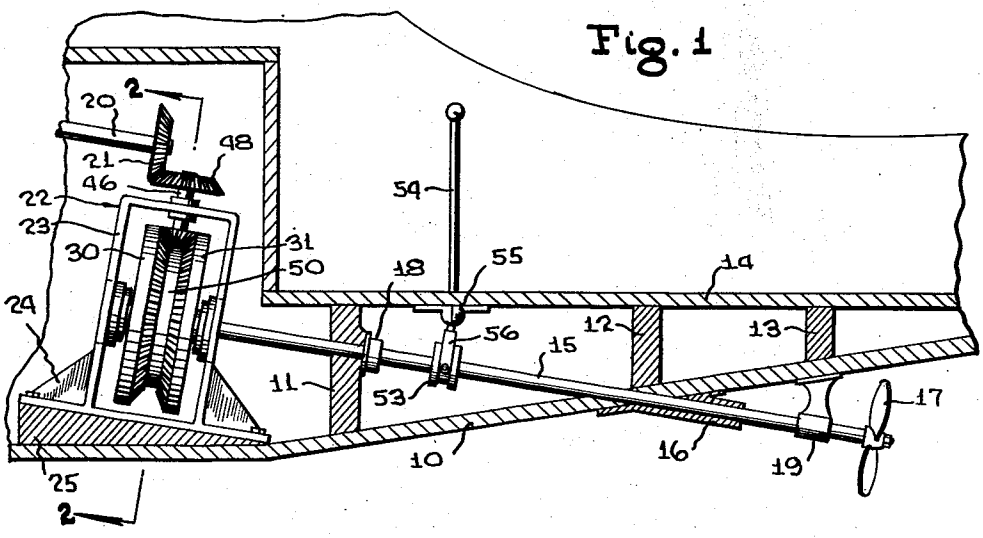


Fig. 3

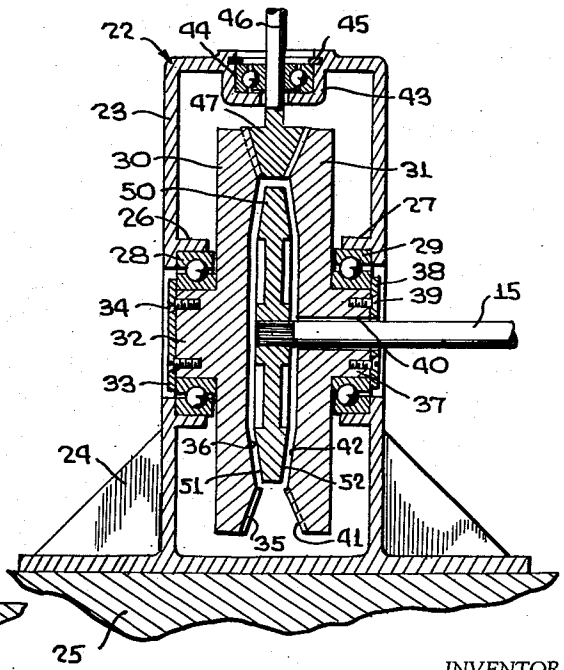
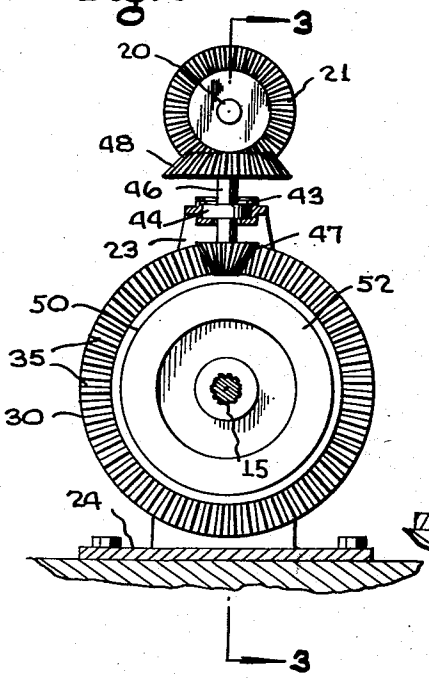


Fig. 2



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REVERSING GEAR FROM PROPELLER SHAFTS

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1 Claim. (Cl. 115—34)

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This invention relates to reversing gears for propeller shafts and more particularly to a friction type reversing gear in which the driving friction is maintained by a longitudinal thrust or pull on the propeller shaft.

It is among the objects of the invention to provide an improved propeller shaft reversing gear mechanism having oppositely rotating components in which the propeller shaft is selectively coupled manually to either component and is held in driving engagement with the selected component by the thrust or pull exerted by the propeller on the propeller shaft; in which the shaft driving components are driven by a suitable power plant through a gear train which constitutes both a speed reducing and reversing drive; which transmits the thrust and pull of the propeller shaft directly to the power plant or the vehicle, such as a boat, in which the propeller shaft reversing gear is mounted, so that no additional thrust bearings are required for the propeller shaft; and which is simple and durable in construction, economical to manufacture, easy to install, and positive and effective in operation.

Other objects and advantages will become apparent from a consideration of the following description and the appended claim in conjunction with the accompanying drawing wherein:

Figure 1 is a longitudinal cross sectional view of a fragmentary intermediate portion of a boat showing propeller shaft reversing gear mechanism illustrative of the invention operatively mounted therein;

Figure 2 is a cross sectional view on a somewhat enlarged scale on the line 2—2 of Figure 1; and

Figure 3 is a cross sectional view on an enlarged scale on the line 3—3 of Figure 2.

With continued reference to the drawing, the boat illustrated has a hull including a bottom 10 secured to transverse timbers or ribs, as illustrated at 11, 12 and 13, and a cockpit deck 14 supported on the transverse ribs. A propeller shaft 15 extend through an aperture in the transverse rib 11 and through a packing bearing 16 secured to the bottom 10 of the boat hull surrounding an opening in the bottom through which the propeller shaft extends and carries a propeller 17 on its end disposed beneath the boat hull and near the rear end of the latter. The propeller shaft is inclined rearwardly and downwardly relative to the horizontal and is supported at spaced apart locations in suitable bearings, one of which, as indicated at 18, is mounted on the transverse rib 11, and the other of which, as indicated at 19, is secured to the bottom surface of the hull bottom 10 near the rib 13 and depends

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from the bottom of the hull to receive the propeller shaft at a location spaced below the bottom of the hull.

A suitable power plant, such as an internal combustion engine, is mounted in the boat, but is not illustrated in the accompanying drawing, and a drive shaft 20 extends rearwardly from the engine to a location above the forward end of the propeller shaft 15, the rotational axes of the propeller shaft and the drive shaft being substantially in a common vertical plane which also includes the longitudinal center line of the boat hull. A beveled gear 21 is secured on the rearward end of the drive shaft 20 for driving the propeller shaft 15 in a manner presently to be described.

A propeller shaft reversing gear mechanism, generally indicated at 22, is interposed between the beveled gear 21 on the drive shaft and the forward end of the propeller shaft and includes a hollow housing 23 of generally rectangular shape having a base 24 secured to the upper surface of a wedge shaped mounting block on bedplate 25 secured to the inner surface of the bottom 10 of the boat hull adjacent the forward end of the propeller shaft.

The housing is provided on the inner sides of two opposite sides thereof with bearing receiving bosses 26 and 27 and antifriction bearings 28 and 29 are mounted in the bosses 26 and 27, respectively. These bearings are adapted to support both radial and axial loads and have a common axis of rotation which is substantially coincident with the axis of rotation of the propeller shaft 15.

A pair of beveled ring gears 30 and 31 are disposed in the housing 23 in mutually opposed relationship and for rotation about the common axis of the bearings 28 and 29 and the propeller shaft 15. The ring gear 30 has a centrally located hub 32 of cylindrical shape received in the inner race of the antifriction bearing 28 and retained in the bearing by a retaining plate 33 secured to the end of the hub by suitable means, such as the screws 34, and marginally overlapping the hub to engage the outer side of the inner race of the associated bearing. This gear also has an annular set of gear teeth 35 extending therearound at its outer edge and an annular, beveled friction face 36 disposed inwardly of the gear teeth 35.

The ring gear 31 has a centrally disposed hub 37 of cylindrical shape projecting from one side thereof and received in the inner race of the bearing 29. This hub is retained in the associated bearing by a retaining plate 38 secured to the end of the hub by suitable means, such as the

screws 39 and overlapping the outer side of the inner race of the bearing to retain the hub in the bearing. This hub 37 is provided with a bore 40 extending coaxially therethrough and receiving the forward end portion of the propeller shaft 15.

The gear 31 has an annular set of gear teeth 41 extending therearound at its outer edge and opposed to the teeth 35 of the gear 30, and a beveled annular friction face 42 extending therearound within the gear teeth 41.

An antifriction bearing receiving boss or receptacle 43 is provided in the housing 23 at the end of the housing opposite the base 24 and an antifriction bearing 44 is disposed in the bearing receptacle 43 and retained therein by suitable means, such as the snap ring 45.

A pinion shaft 46 extends through and is journalled in the bearing 44 and a pinion gear 47 is secured on one end of the shaft 46 and meshes with the gear teeth 35 and 41 of both of the ring gears 30 and 31, so that when the pinion shaft 46 is rotated the ring gears 30 and 31 will be driven in respectively opposite directions at the same speed.

A beveled gear 48 is mounted on the other end of the pinion shaft 46 and meshes with the beveled gear 21 on the drive shaft 20 to provide a driving connection from the drive shaft 20 to the pinion shaft 46.

A friction disc 50 is disposed between the ring gears 30 and 31 and has a central aperture receiving the adjacent end of the propeller shaft 15. The end of the propeller shaft is provided with splines and the bore or aperture in the friction disc is correspondingly grooved to receive the splined end of the propeller shaft, so that a driving connection is provided between the friction disc and the propeller shaft. The disc is also mounted on the propeller shaft against movement longitudinally of the latter.

The friction disc has a thickness somewhat less than the distance between the ring gears 30 and 31 and has on its opposite sides beveled friction faces 51 and 52 which are selectively engageable with the friction faces 36 and 42 on the ring gears 30 and 31 upon longitudinal movement of the propeller shaft 15.

A grooved collar 53 is secured on the propeller shaft at the side of the bearing 13 remote from the reversing gear mechanism and a hand lever 54 is pivotally mounted at one end in the cockpit floor 14 by means of a socket joint 55 and carries a fork 56 which straddles the collar 53 and has rollers engaged in the groove of the collar, so that the propeller shaft can be moved longitudinally in either direction by manually moving the upper end of the lever 54 in the corresponding direction.

With this arrangement, when it is desired to propel the boat forwardly, the upper end of the lever 54 is manually pulled backwardly, forcing the propeller shaft to move forwardly and bring the friction disc 50 into driving engagement with the friction face of the gear 30. Once the friction connection between the friction disc and the gear 30 has been initially established, and the propeller caused to rotate, the forward thrust exerted by the propeller on the propeller shaft 15 will force the friction disc into firmer engagement with the gear 30 and maintain the driving connection between this gear and the friction disc.

When it is desired to discontinue the forward drive through the propeller shaft, it is necessary merely to retard the speed of the power plant until the speed of the propeller is slowed down to an extent such that the forward momentum of the boat will produce a rearward drag or pull on the propeller shaft. This will automatically discontinue the forward driving connection to the propeller. The reverse drive is established by forcing the upper end of the lever 54 forwardly to initially engage the friction disc 50 with the friction face of the ring gear 31 to cause the propeller to turn in the reverse direction. Once the operation of the propeller is started the resultant pull on the propeller shaft will maintain the friction disc in driving engagement with the gear 31 until the driving engagement is discontinued by slowing or stopping the power plant. If desired, the friction disc may be held in an intermediate or neutral position, as illustrated in Figure 3, out of engagement with both of the ring gears by holding the hand lever 54 at the proper position. In this case, there will be no driving connection from the drive shaft 20 to the propeller shaft 15 until the friction disc is moved into engagement with one or the other of the ring gears.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claim rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claim are, therefore, intended to be embraced therein.

What is claimed is:

In combination with a propeller shaft, a propeller on said propeller shaft effective to impart a force in either direction longitudinally of said propeller shaft, and a drive shaft, propeller shaft reversing gear mechanism comprising a hollow housing adapted to be mounted on a fixed support and having bearing receiving bosses disposed one at each of two opposite sides thereof and in alignment with each other, a pair of beveled ring gears mounted in said housing in opposition to each other for rotation about a common axis and each having a hub journaled in a corresponding bearing receiving boss of said housing and each having an annular set of gear teeth at its outer edge and a beveled annular friction face disposed inwardly of said gear teeth, a bearing carried by said housing with its axis disposed between said ring gears and substantially perpendicular to the axis of rotation of the latter, a pinion shaft journalled in the last mentioned antifriction bearing, a beveled pinion gear on one end of said pinion shaft meshing with the gear teeth on both of said ring gears, a beveled gear on the other end of said pinion shaft, a beveled gear on said drive shaft meshing with the beveled gear on the other end of said pinion shaft, said pinion gear being smaller than said ring gears and driving the latter in respectively opposite directions at a speed less than the speed of said drive shaft and one of said ring gears having a bore extending coaxially through the hub thereof and receiving one end of said propeller shaft, a friction disc disposed between said ring gears and coaxially mounted on said one end of said propeller shaft, said friction disc having beveled annular friction faces one on each side thereof selectively engageable with the friction faces on said ring gears to provide driving connections between said ring gears and said propeller shaft, and manually

operated means connected to said propeller shaft for imparting longitudinal movement in each direction to the latter to initially engage said friction disc with a selected ring gear, said friction disc being held in driving engagement with the selected ring gear after initial engagement thereof by the thrust or pull imparted by said propeller to said propeller shaft.

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