March 20, 1962 W. L. TENNEY 3,025,822

OUTBOARD MOTOR TRANSMISSION

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Fig. 1

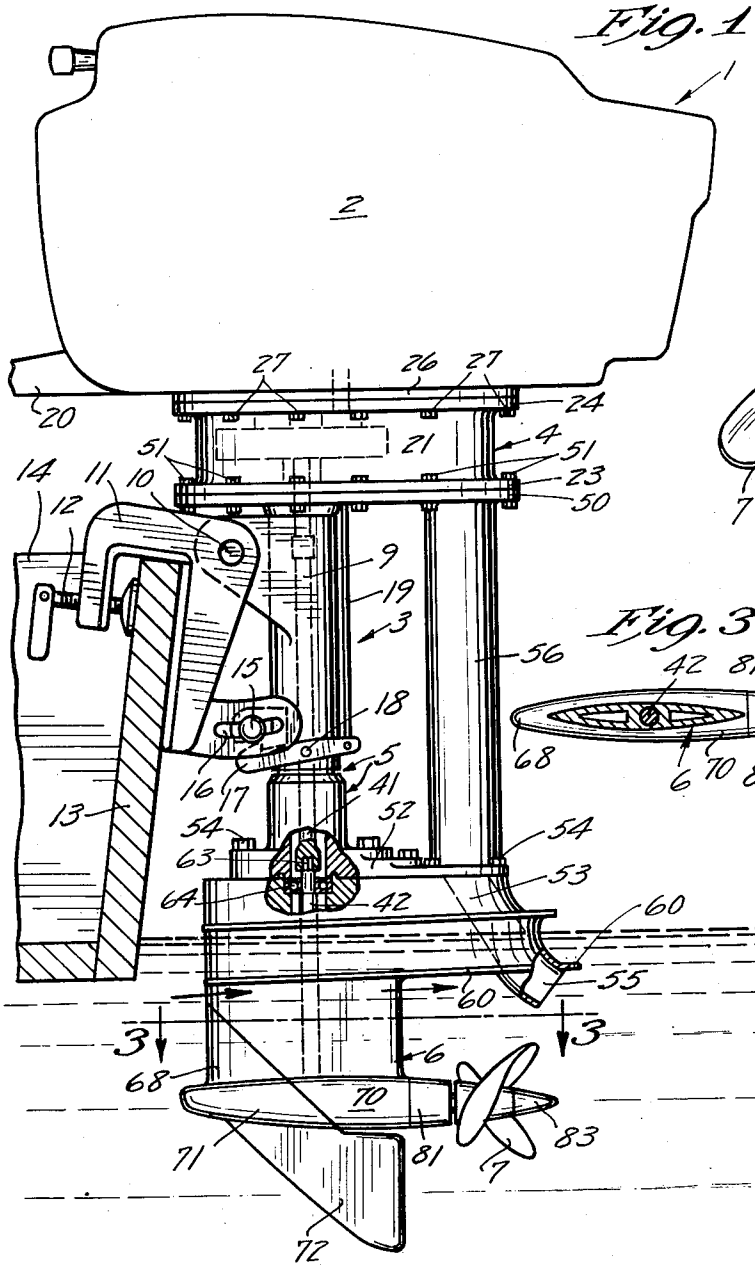

Fig. 2

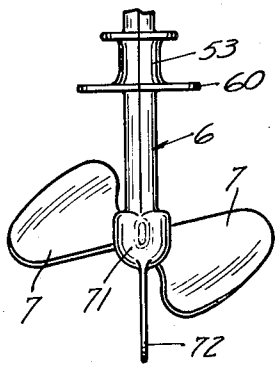

Fig. 3

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OUTBOARD MOTOR TRANSMISSION

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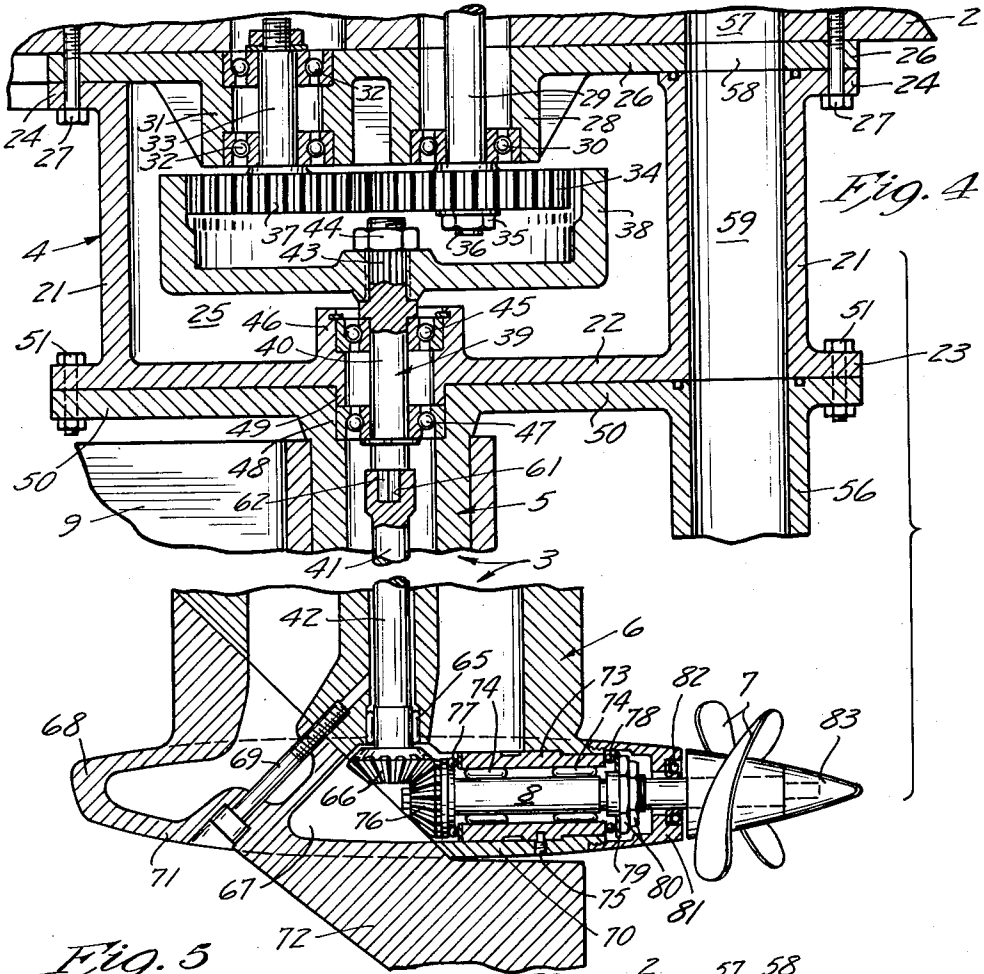

Fig. 4

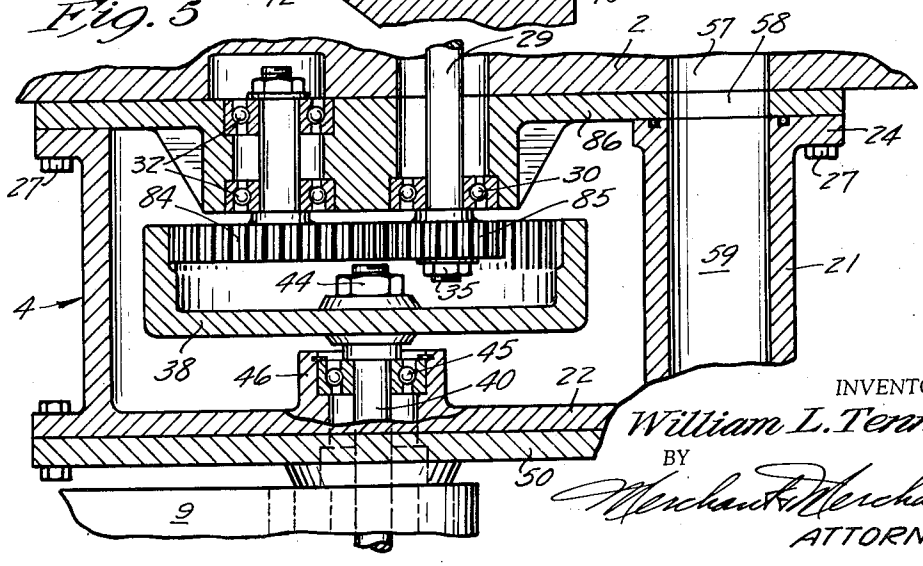

Fig. 5

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OUTBOARD MOTOR TRANSMISSION

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Fig. 7

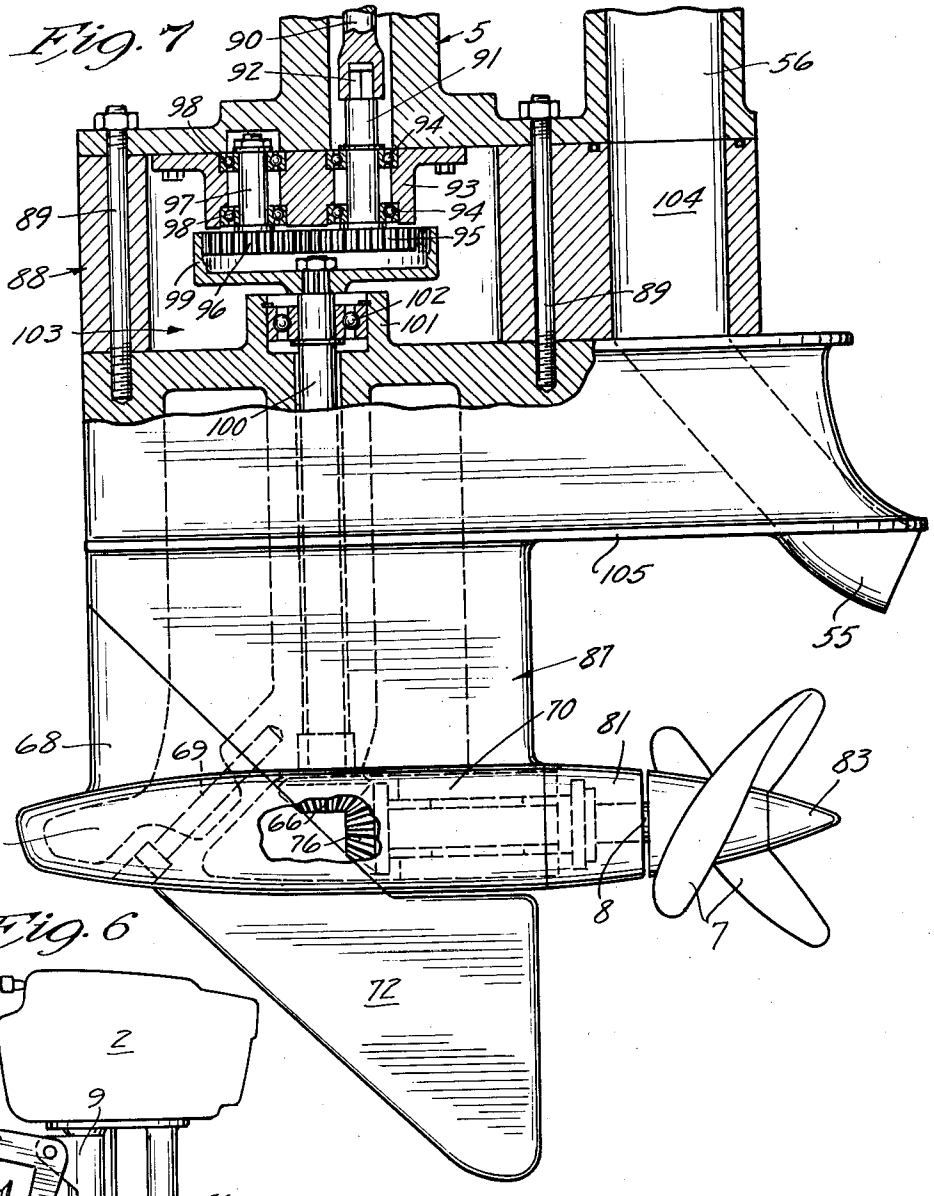

Fig. 6

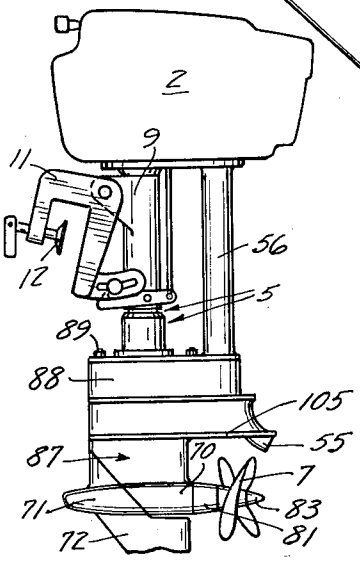

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Fig. 8

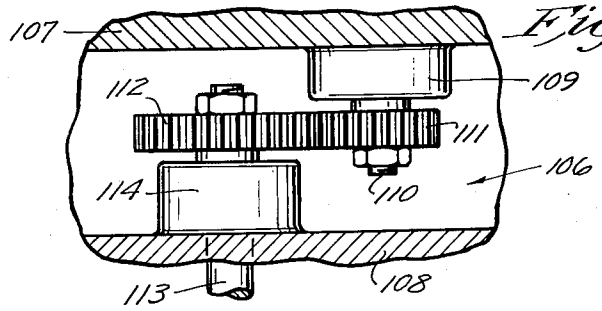
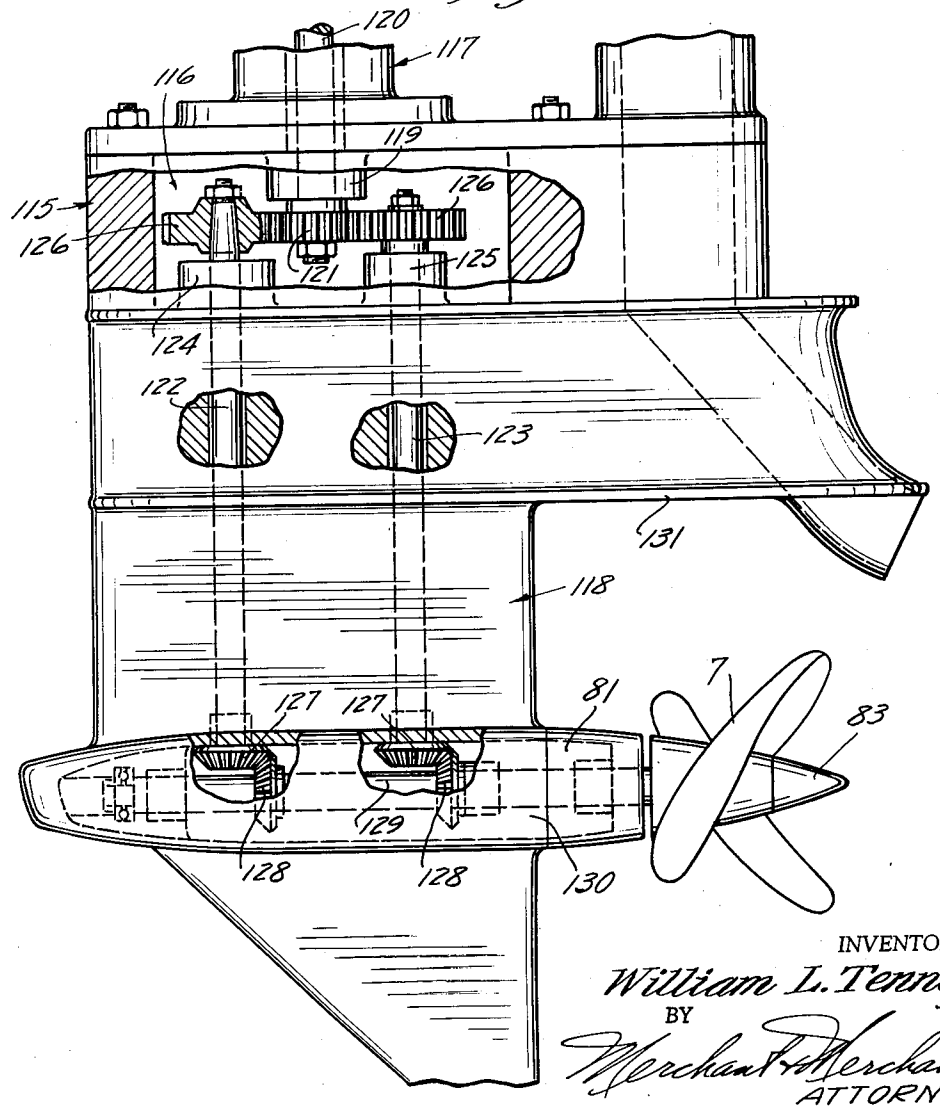


Fig. 9



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United States Patent Office 3,025,822 Patented Mar. 20, 1962

3,025,822

OUTBOARD MOTOR TRANSMISSION

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Filed July 28, 1958, Ser. No. 751,355
5 Claims. (Cl. 115—17)

My invention relates generally to outboard motors and more specifically to improvements in driving connections between the power heads of outboard motors and the propellers thereof, and gear housing structure therefor.

In practice, it has been found that submerged objects or submerged portions thereof encounter resistance of the submerging medium, such as water, when in motion relative thereto, the resistance or drag increasing generally as the square of the speed. It has been further found that the power necessary to impart motion to the object increases generally as the cube of the speed. In traveling at high speed, an outboard motor boat of the stepped or planing type, in and of itself, is not subject to the above increase in drag as far as water is concerned, inasmuch as the boat hull is substantially out of the water and is subject substantially only to the lesser resistance of planing over the surface of the water. It has been found that the drag of planing bodies varies in general as a function of the weight supported, and that with constant weight, their drag will remain substantially constant, or even decrease, as a result of increasing speeds. Hence, under high speed operating conditions coming into existence with the newer higher powered outboard motors, the amount of resistance or drag caused by the under water gear housing portion of the motor moving submerged in the water, becomes a principal factor in both the speed and fuel consumption of outboard powered craft. In the usual present day outboard motors wherein the underwater housing portions contain drive pinions of small diameter and driven propeller shaft gears of substantially greater diameter, the housings thereabout present frontal areas which at higher speeds seriously affect the overall efficiency. Hence, an important object of my invention is the provision of means for delivering power from the power head or engine of an outboard motor to the propeller thereof, which enables the portion of the motor below the working water line thereof to be compactly arranged so as to present a minimum frontal or cross sectional area, whereby to effect a minimum displacement in the water and a minimum drag therein.

Another object of my invention is the provision of speed reducing transmission mechanism and mounting means therefor above the working water line of the motor, in order to permit an efficient speed ratio between engine and propeller, while at the same time enabling the use of gearing in the under water unit of the motor, having a ratio of substantially one to one, such gearing being of a minimum size capable of transmitting the driving power in a satisfactory manner.

Still another object of my invention is the provision of drive shaft housing structure comprising housing sections one of which defines the sidewalls of a gear chamber above the working water line of the motor, and of means releasably securing the sections together whereby easy access is had to the gear chamber wherein gears may be quickly and easily changed to provide different gear ratios suited to give maximum propeller efficiency under different operating conditions.

Another object of my invention is the provision of outboard motor structure having speed reduction gear transmission above the working water line and a pair of secondary drive shafts in parallel relationship and spaced apart in the direction of movement of the motor, whereby both of said secondary shafts carry the working load equally to the propeller shaft and permit smaller gears, shafts, and bearings to be utilized therebetween and the propeller, resulting in an under water housing having a minimum frontal area.

The above, and still further highly important objects and advantages of my invention will become apparent from the following detailed specification, appended claims and attached drawings.

Referring to the drawings, which illustrate the invention, and in which like characters indicate like parts throughout the several views:

FIG. 1 is a view in side elevation of an outboard motor made in accordance with my invention, some parts being broken away and some parts shown in section;

FIG. 2 is a fragmentary view in front elevation of the lower end portion of FIG. 1;

FIG. 3 is a view partly in plan and partly in section taken on the line 3—3 of FIG. 1;

FIG. 4 is an enlarged fragmentary view according to a portion of FIG. 1, but showing portions thereof in axial section, some parts being removed;

FIG. 5 is a view corresponding to a portion of FIG. 4 but showing a modified gear arrangement;

FIG. 6 is a view in side elevation of a further modified form of the motor of FIG. 1;

FIG. 7 is an enlarged fragmentary view corresponding to the lower end portion of FIG. 6, some parts being broken away and some parts being shown in section;

FIG. 8 is a fragmentary detail corresponding to a portion of FIG. 7 but showing a modified gear arrangement; and

FIG. 9 is a view corresponding to FIG. 7 but showing a still further modified form of my invention.

In the preferred embodiment of my invention, illustrated in FIGS. 1–5 inclusive, the numeral 1 indicates in its entirety an outboard motor comprising, a power head section 2, housing means 3 depending from the power head section 2 and including an upper housing section 4, an intermediate housing section 5, a lower unit or under water housing section 6, and a propeller 7 that is secured to the rear outwardly projected end of a propeller shaft 8. As shown in FIG. 1, the intermediate housing section 3 is provided with a bracket 9 having pivotally mounted thereon, as indicated at 10, a clamp 11 for swinging movements of the bracket 9 and motor 1 with respect to the clamp 11 on a horizontal axis. The clamp 11 is preferably provided with one or more clamping screws 12 by means of which the clamp 11 is rigidly secured to the transom 13 at the rear end of a boat 14, the rear end portion of which is shown fragmentarily in FIG. 1. The bracket 9, clamp 11 and clamping screw 12 are conventional, the intermediate section 3 being mounted in the bracket 9 in the usual manner, for pivotal steering movements of the motor on a generally vertical axis. The lower end portion of the bracket 9 is adapted to engage a cross pin or the like 15 adjustably mounted on the lower end portion 16 of the clamp 11, and, as shown in FIG. 1, a hook 17 pivotally mounted as at 18 to the lower end portion of the bracket 9, is movable by a control rod 19 into and out of engagement with the pin 15 when the motor is operated to move the boat in reverse. The control rod 19 may be assumed to be operatively coupled to control elements, not shown, on a steering and control handle 20 shown fragmentarily in FIG. 1 as projecting forwardly from the power head 2. The bracket 9 and clamp 11 as well as the control elements carried thereby and the control handle 20, do not in themselves comprise the instant invention and further detailed showing and description thereof is believed unnecessary. Hence, for the sake of brevity, such detailed showing and description is omitted.

The upper section 4 of the housing means 3 is formed to provide a peripheral side wall 21 and a flat bottom wall 22 which extends outwardly beyond the side wall

21 to form a peripheral mounting flange 23. A similar peripheral mounting flange 24 projects laterally outwardly from the upper end of the peripheral wall 21, said wall 21 defining the side wall of a gear chamber 25. The lower end of the chamber 25 is closed by the bottom wall 22, the upper end of the chamber being defined by a plate-like bearing support 26 that is interposed between the bottom portion of the power head 2 and the upper housing section 4. The housing section 4 and support 26 are rigidly but removably secured to the power head 2 by suitable means such as bolts 27 that extend upwardly through the flange 24 and the marginal portion of the support 26 and screw threaded into the power head 2. The plate-like bearing support 26 is formed to provide a boss 28 having an aperture therethrough for reception of a primary drive shaft 29, and forms a seat for an anti-friction bearing 30 which supports the lower end portion of the primary drive shaft 29. The primary drive shaft 29 extends downwardly from the power head 2 and may be assumed to be suitably connected to the crank shaft, not shown, of the power head 2 for common rotation therewith. If desired, the shaft 29 may be an extension of said crank shaft. A second tubular boss 31 integrally formed with the bearing support 26, provides a seat for a pair of axially spaced anti-friction bearings 32 which journal an idler shaft 33 for rotation on a vertical axis in spaced parallel relation to the axis of the primary drive shaft 29. An input gear or pinion 34 is releasably mounted on the lower end of the primary drive shaft 29, and held thereon by means of a washer equipped lock nut 35 screw threaded on the lower threaded end 36 of the primary drive shaft 29. The input gear 34 has meshing engagement with an idler gear 37 that is rigidly secured to the lower end of the idler shaft 33, the idler gear 37 having meshing engagement with an internally toothed ring gear 38 that is rigidly secured to the upper end of a secondary drive shaft indicated in its entirety at 39. As shown in FIGS. 1 and 4, the secondary drive shaft 39 comprises an upper shaft section 40, an intermediate section 41 and a lower section 42. The internal gear 38 is splined or otherwise rigidly but releasably secured to the upper end of the upper secondary drive shaft section 40, as indicated at 43, and held against axial movement by a lock nut 44 screw threaded on the upper threaded end of the shaft section 40. Said shaft section 40 is mounted, by means of an anti-friction bearing or the like 45, in a tubular boss 46, integrally formed with the bottom wall 22 of the housing section 4, and in a second anti-friction bearing 47 seated in a recess 48 in the upper end of the intermediate housing section 5, said recess 48 also receiving a depending portion 49 of the boss 46. With reference to FIGURES 1 and 4 it will be seen that the upper end of the intermediate housing section 5 is formed to provide a plate-like portion 50 which abuts the bottom wall 22 of the upper housing section 4 and which is removably held thereagainst by nut equipped screws or the like 51 extending through aligned apertures in the plate-like portion 50 and the flange 23.

The intermediate housing section 5 is provided at its lower end with a mounting flange 52, to the flat under surface of which is rigidly but detachably secured the enlarged upper end 53 of the lower unit or housing section 6, by means of screws or the like 54. The enlarged upper end 53 of the housing section 6 defines an exhaust passage 55 which communicates with the lower end of an exhaust pipe 56 integrally formed with the intermediate housing section 5, and communicating at its upper end with aligned exhaust passages 57, 58 and 59 defined by the power head 2, plate-like bearing support 26, and the side wall 21 of the upper housing section 4, respectively. The exhaust outlet passage 55 is disposed above and behind the rear end of the propeller 7 and immediately below the rear end of an anti-cavitation plate 60 integrally formed with the lower housing section 6 and disposed at or near the so-called working water line of the motor. This working water line is somewhat below the normal water line of the boat 14 when the boat 14 is at rest, the working water line being substantially at a level with or slightly above, the bottom of the boat at the central portion of the rear end thereof. During movement of the boat through the water, the working water line slopes upwardly and rearwardly as the water moves in to fill the space created by the displacement of the forwardly moving boat. At cruising or racing speeds, this slope is such that the anti-cavitation plate 60 usually lies just below the adjacent surface of the water. With reference to FIGURES 1–3, it will be seen that the portion of the lower housing section 6 adjacent and below the anti-cavitation plate 60 is elongated in the direction of movement of the boat and motor, and of a minimum transverse width, as will hereinafter more fully appear.

The upper end of the intermediate secondary drive shaft section 41 defines an axial recess 61 that is preferably cross sectionally rectangular, and which receives a correspondingly rectangular axial stem 62 extending downwardly from the lower end of the shaft section 40. At its lower end, the shaft section 41 is provided with a downwardly opening cross sectionally rectangular axial recess for the reception of a cooperating upwardly extended cross sectionally rectangular axial portion 63 of the lower secondary shaft section 42, whereby rotation is imparted to the lower shaft section 42 from the upper shaft section 40. With reference to FIG. 1, it will be seen that the upper end of the lower shaft section 42 is journalled in an anti-friction bearing 64 seated in the upper enlarged end portion 53 of the lower or under water housing section 6. At its lower end portion, the secondary shaft section 42 is supported by a conventional needle bearing 65, and terminates in a bevel gear 66 within a gear chamber 67. The lower unit or housing section 6 includes a nose piece 68 shown in FIG. 4 as being bolted or otherwise rigidly secured to the main portion of the housing section 6 by an anchoring bolt or the like 69. The gear chamber 67 is defined by cooperating elongated hollow portions 70 and 71 which extend longitudinally of the direction of travel of the motor. The nose piece 68 is further formed to provide a depending fin or skeg 72, see FIGURES 1 and 2.

The propeller shaft 8 extends longitudinally of the gear chamber 67 and is journalled for rotation in a bearing sleeve 73, by means of needle bearings 74, said bearing sleeve being snugly received in the rear end of the chamber 67 and held against movement by means of a set screw or the like 75. A bevel gear 76 is rigidly secured to the front end of the propeller shaft 8 and has meshing engagement with the bevel gear 66. Heretofore, the usual practice has been to provide for reduction in speed of the propeller shaft 8 from that of the power head by providing a relatively small bevel pinion on the lower end of the drive shaft and a cooperating relatively large bevel gear on the propeller shaft. By locating the reduction gearing between the primary drive shaft 29 and the secondary drive shaft means 39, the intermeshing bevel gears 66 and 76 are enabled to be of substantially the same diameter, so as to provide a drive ratio of substantially one to one within the gear chamber 67. Preferably, the gears 66 and 76 are of a minimum diameter capable of transmitting the full power of the motor. Inasmuch as the size of the bevel gears in the lower unit determines to a great extent the cross-sectional area of the lower unit, by providing a substantially one to one gear ratio in the lower unit I am enabled to provide a underwater unit or portion of the motor which offers a minimum of resistance to the water at cruising or racing speeds. The propeller shaft 8 is held against axial movement by a thrust bearing 77 between the bevel gear 76 and the front end of the bearing sleeve 73, and by a second thrust bearing 78 between the rear end of the bearing sleeve

73 and a thrust washer 79 that is held in place on the propeller shaft 8 by stop nuts 80. The rear end portion of the propeller shaft 8 between the propeller 7 and the rear end of the housing portion 70, is enclosed by a tubular extension 81 screw threaded on to the rear end of the housing portion 70 and which is provided with a conventional grease seal 82 which encompasses the propeller shaft 8 at the rear end of the sleeve 81. The propeller 7 is mounted on the rear end portion of the propeller shaft 8 in the usual manner and is held in place by a conventional rearwardly tapered lock nut or the like 83.

The walls of the lower housing section 6 adjacent the lower secondary drive shaft section 42, as well as adjacent the bevel gears 66 and 76, and the bearing sleeve 73, are of a minimum thickness necessary to provide adequate strength in the lower unit, so that the under water portion of the motor, namely the lower housing section 6, presents a minimum frontal area and, together with the streamlined shape of the lower housing section 6, provides a lower unit which moves through the water at high speeds with a minimum of drag.

Inasmuch as different boats using outboard motors are designed for different load and speed requirements, an ideal arrangement would necessitate different gear ratios for each class of operation. For instance, with light, fast runabouts and racing craft, it is desirable to utilize a small propeller rotating at comparatively high speeds, whereas for lower boat speeds with heavy loads, best results are obtained by using a large propeller rotating at low speeds. With present day outboard motors, a gear ratio is utilized which provides a compromise between those which are most efficient for boats designed for high speed, light load operating conditions, such as fast runabouts, and boats designed for low speed, heavy load conditions, such as cruisers and work boats. Providing housings of a size below the water line to permit changing of gear ratios between the generally vertical drive shaft and the propeller shaft therein adds to the frontal area of the unit to a point where an inefficient structure results. Hence, a compromise arrangement of fixed gear ratio is generally used. The speed reduction transmission mechanism within the upper housing section 4 may be varied with a minimum of effort, to provide for the widely different types of boat operation for which the modern, higher powered outboard motors are used, as desired. This is accomplished by removing the screws 51, after which the motor section 2 together with the housing section 4 may be raised from the drive shaft housing section 5, after which the housing section 4 may be removed from the power head section 2 by unscrewing the anchoring bolts 27. If desired, the housing section 4 may be left secured to the housing section 5, and only the power head section 2 and bearing support 26 may be removed from the housing section 4 without separating the section 4 from the housing section 5. The several gears, 34, 37 and 38 provide for a relatively low speed differential between the primary drive shaft 29 and the secondary drive shaft means 39. This relatively low speed differential is utilized when the motor is operated with higher speed craft such as light runabouts. When the motor is to be used with heavily loaded and correspondingly low speed craft such as cruisers and work boats, the gearing in the chamber 25 may be of the type illustrated in FIG. 5. As there shown, the internal or ring gear 38 has meshing engagement with a relatively larger idler gear 84 that has meshing engagement with a relatively small drive pinion 85 mounted on the primary drive shaft 29. Several different gear ratios may be had with the use of the ring gear 38 and without changing the center distance between the primary drive shaft 29 and the idler shaft 33. Other gear ratios require that this center distance be altered, in which event I provide a different bearing support 86 differing only from the bearing support 26 in that the idler shaft 33 is located differently with respect to the primary drive shaft 29 from that shown in FIG. 4. The gear chamber 25 is preferably of a size to admit an internally toothed ring gear of greater diameter than that of the gear 38, if such is desired. When the power head section 2 is removed from the housing section 4, it is an easy matter to remove the several gears from their respective mountings and replace the same with other gears of the desired sizes. Parts shown in FIG. 5 which correspond to identical parts shown in FIG. 4, are identified by the same reference character.

In the modified arrangement illustrated in FIGS. 6 and 7, the power head section 2 is shown as being mounted directly on the housing section 5. The lower unit or underwater housing section is identified by the numeral 87 and is similar to the lower housing section 6 of FIGS. 1–4. In this form of the device, a gear chamber defining housing section 88 is interposed between the bottom of the housing section 5 and the upper end of the lower unit or housing section 87, these several sections being releasably secured together by nut-equipped studs or the like 89. Primary drive shaft means comprises upper and lower primary drive shaft sections 90 and 91 operatively coupled for common rotation, as indicated at 92. The upper primary drive shaft section 90 may be assumed to be operatively coupled to the crank shaft of the power head 2, the lower primary drive shaft section 91 being journalled in a bearing support 93 through the medium of anti-friction bearings or the like 94, said bearing support 93 being bolted or otherwise rigidly secured to the bottom surface of the drive shaft housing section 5. The lower end of the primary shaft section 91 carries a drive pinion or gear 95 that has meshing engagement with an idler gear 96 rigidly secured to the lower end of an idler shaft 97 journalled in the bearing support 93 by means of anti-friction bearings or the like 98. The idler gear 96 also has meshing engagement with an internally toothed ring gear 99 that is splined or otherwise rigidly but removably secured to the upper end of a vertically disposed secondary drive shaft 100 journalled at its upper end portion in a bearing boss 101 integrally formed with the upper end portion of the lower unit 87, by means of an anti-friction bearing 102. The lower end of the secondary drive shaft 100 is journalled in the lower end portion of the lower unit 87 in the same manner as the lower end of the shaft section 42 of FIG. 4, the connections between the lower end of the shaft 100 and the propeller being identical to those of FIG. 4, corresponding parts illustrated being identified by the same reference characters. The gear chamber containing the gears 95, 96 and 99 is indicated by the numeral 103, the housing section 88 further defiining a passage 104 which communicates at its opposite ends with the exhaust outlet passage 55 of the lower unit 87, and the exhaust pipe 56 of the housing section 5. The gears 95, 96 and 99 may be easily removed from the chamber 103, and replaced by other gears to provide different gear ratios between the power head and propeller, in the same manner as the gears shown in and described in connection with FIGS. 4 and 5. Being disposed above the upper end of the lower unit 87, the gear chamber-defining housing 88 is well above the working water line of the motor, said working water line being near the anti-cavitation plate 105 of the lower unit 87.

FIG. 8 illustrates fragmentarily an alternative gear arrangement which may be utilized in either the gear chamber 55 or the gear chamber 103. In FIG. 8 a gear chamber is indicated generally at 106, the same having a top wall 107 and a bottom wall 108, the top wall 107 being provided with a bearing boss or the like 109 in which is journalled a primary drive shaft 110 which carries a gear 111 that has meshing engagement with a second gear 112 rigidly mounted on the upper end of a secondary drive shaft 113 suitably journalled in a bearing boss 114

projecting upwardly from the bottom wall 108. Although the centers of the shafts 110 and 113 are fixed, this gear arrangement, like those above described, is capable of variation of output shaft speed ratios by substituting for the gears 111 and 112, other pairs of gears having the same center distance as the gears 111 and 112.

In the modified arrangement illustrated in FIG. 9, a housing section 115, which defines the side walls of a gear chamber 116, is interposed between a drive shaft housing section 117 similar to the drive shaft housing section 5, and a lower unit or underwater housing section 118, in much the same manner as the housing section 88 of FIGS. 6 and 7. The lower end of the housing section 117 is formed to provide a bearing boss 119 in which is suitably journalled a primary drive shaft 120 which may be assumed to be operatively coupled to the power head, not shown, the lower end of the shaft 120 terminating within the chamber 116 and having releasably mounted thereon a driving gear 121. A pair of vertically disposed parallel secondary drive shafts 122 and 123 are suitably journalled at their upper end portions in bearing bosses 124 and 125 respectively, within the chamber 116, and are spaced apart in the direction of movement of the motor and equidistant from the axis of the primary drive shaft 120. A pair of like gears 126 are releasably fixed on the upper ends of the shafts 122 and 123 and have meshing engagement with the drive gear on pinion 121. The lower ends of the shafts 122 and 123 are journalled in the lower portion of the lower unit 118 in the same manner as the secondary drive shaft section 42, each of the shafts 122 and 123 carrying identical bevel gears 127 at their lower ends. The bevel gears 127 each have meshing engagement with a different one of a pair of identical bevel gears 128 that are rigidly mounted on a propeller shaft 129 suitably journalled for rotation in a propeller shaft housing portion 130 in the lower unit 118. The bevel gears 128 are of substantially the same diameter as the bevel gears 127 whereby substantially a one to one ratio is obtained between the speeds of the shafts 122 and 123 and the propeller shaft 129. The rearwardly projected end of the propeller shaft 129 carries a propeller 7 which is held thereon by a nut element 83. It will be noted that the upper end of the shaft 122 is tapered to receive a correspondingly tapered central opening in its respective gear 126. With one or both of the shafts 122 and 123 and the central openings in the corresponding gears 126 thus tapered, the gears 126 may be adjusted on their respective shafts so that the driving load is equally divided between the shafts 122 and 123. The arrangement above described with respect to FIG. 9 permit the shafts 122 and 123 and the bevel gears 127 and 128, as well as other component parts not shown in detail, to be of somewhat smaller diameter than that necessary when only one of each thereof is used, to transmit an equal amount of power to the propeller. Further, the use of such smaller components permits the frontal area of that portion of the lower unit 118 adjacent or below the anti-cavitation plate 131, to be held to a bare minimum, so that the resistance of the lower unit 118 to forward movement at relatively high speeds is reduced to a substantial degree. Thus, the above described double or tandem shaft arrangement is particularly adapted for use with present day motors of increasingly higher horsepower and speed ratings. For motors of lower speed and horse power ratings, the gear and single secondary shaft arrangements of FIGS. 1–8 can be used to greatly increase the overall efficiency thereof.

I have omitted showing and description of mechanism for providing neutral and reverse operation of the instant outboard motor, inasmuch as such mechanism forms no part of the instant invention, which invention resides essentially in the obtaining of a more efficient under water housing by the location of interchangeable ratio reduction gears above the working water line of the motor, and the utilizing of gears of fixed ratio and minimum diameters below said working water line. Provision for selective forward, reverse and neutral operating conditions obviously may be included in the instant structure by those skilled in the art.

While I have shown and described a preferred embodiment of my outboard motor structure, and several modifications thereof, it will be understood that the same is capable of further modification without departure from the spirit and scope of the invention as defined in the claims.

What I claim is:

1. Power transmission mechanism for an outboard motor comprising, a power head including downwardly extending primary drive shaft means, housing means extending downwardly with respect to said power head and terminating at its lower end in an underwater housing section elongated in the direction of travel of the motor, a generally horizontally disposed propeller shaft journalled in said underwater housing section, and a propeller mounted on said propeller shaft; said power transmission mechanism comprising, a transmission housing section interposed in said housing means and releasably mounted between said power head and said underwater housing section, said housing section defining the side walls of a gear chamber into which said primary drive shaft means extends, secondary drive shaft means extending downwardly from said chamber to said underwater housing section, one end of said transmission housing section providing a bearing support for one of said drive shaft means, a second bearing support releasably mounted at the opposite end of said transmission housing section, a drive pinion in said chamber, means for releasably mounting said drive pinion on said drive shaft means, an internal gear in said chamber, means for releasably mounting said internal gear on the upper end of said secondary drive shaft means, said drive pinion being operatively coupled to said internal gear, said pinion and internal gear and said means for releasably mounting the same on said primary and secondary shaft means providing a quick change arrangement whereby cooperating pinions and internal gears of different sizes may be utilized for various speed differentials between said primary and secondary shaft means, and meshing gears on said propeller shaft and the secondary drive shaft means and having a ratio of substantially one to one.

2. Power transmission mechanism for an outboard motor comprising, a power head including downwardly extending primary drive shaft means, housing means extending downwardly with respect to said power head and terminating at its lower end in an under-water housing section elongated in the direction of travel of the motor, a generally horizontally disposed propeller shaft journalled in said underwater housing section, and a propeller mounted on said propeller shaft; said power transmission mechanism comprising, a transmission housing section interposed in said housing means in closely spaced overlying relation to said under-water housing section and releasably secured to said housing means, said transmission housing section defining the side walls of a gear chamber into which said primary drive shaft means extends, secondary drive shaft means extending downwardly from said chamber to said under-water housing section, input and output gearing in said chamber, means for releasably mounting said input gearing on said primary drive shaft means, and means for releasably mounting said output gearing on said secondary drive shaft means, said input and output gearing and said means for releasably mounting the same on said primary and secondary drive shaft means providing a quick change arrangement whereby cooperating input and output gearing of different sizes may be utilized for various speed differentials between said primary and secondary shaft means, and meshing gears on said propeller shaft and the secondary

drive shaft means and having a ratio of substantially one to one.

3. Power transmission mechanism for an outboard motor comprising, a power head including downwardly extending primary drive shaft means, housing means extending downwardly with respect to said power head and terminating at its lower end in an underwater housing section elongated in the direction of travel of the motor, a generally horizontally disposed propeller shaft journalled in said underwater housing section, and a propeller mounted on said propeller shaft; said power transmission mechanism comprising, a transmission housing section interposed in said housing means and releasably mounted between said power head and said underwater housing section, said housing section defining the side walls of a gear chamber into which said primary drive shaft means extends, a pair of generally vertically disposed parallel secondary drive shafts having their upper ends disposed in said chamber, like pairs of meshing bevel gears on the lower ends of said secondary drive shafts and said propeller shaft, each pair providing a ratio of substantially one to one, an input gear in said chamber, means for releasably mounting said input gear on said primary drive shaft means, a pair of like diameter output gears in said chamber in meshing engagement with said input gear, means for releasably mounting one of the said output gears on the upper end of one of said secondary shafts, the upper end portion of the other of said secondary shafts being tapered, the other of said output gears having a central mounting aperture tapered according to the taper on the upper end portion of said other secondary shaft, screw means for releasably locking said other one of the output gears on the tapered portion of its respective secondary shaft, whereby said other output gear may be adjusted relative to said one of the output gears to provide for equal gear tooth pressure of said input gear on both of said output gears, said input and output gears and said means for releasably securing the same to said primary and secondary drive shafts providing a quick change arrangement whereby cooperating input and output gears of different sizes may be utilized for various speed differentials between said primary and secondary shafts.

4. A power transmission mechanism for an outboard motor, comprising a power head including a downwardly extending primary drive shaft means, housing means extending downwardly with respect to said power head and terminating at its lower end in an underwater housing section elongated in the direction of travel of the motor, a generally horizontally disposed propeller shaft journalled in said underwater housing section, and a propeller mounted on said propeller shaft, said housing means including a downwardly extending exhaust means extending from said power head to a position adjacent said propeller, said power transmission mechanism comprising a transmission housing section interposed in said housing means and releasably mounted between said power head and said underwater housing section, and said transmission housing section including a releasably mounted portion of said exhaust means.

5. Power transmission mechanism for an outboard motor comprising, a power head including downwardly extending primary drive shaft means, housing means extending downwardly with respect to said power head and terminating at its lower end in an underwater housing section elongated in the direction of travel of the motor, a propeller shaft journalled in said underwater housing section, and a propeller mounted on said propeller shaft; said power transmission mechanism comprising, a transmission housing section interposed in said housing means and releasably mounted between said power head and said underwater housing section, said housing section defining the side walls of a gear chamber into which said primary drive shaft means extends, a pair of generally vertically disposed parallel secondary drive shafts having their upper ends disposed in said chamber, like pairs of meshing bevel gears on the lower ends of said secondary drive shafts and said propeller shaft, each pair providing a ratio of substantially one to one, an input gear in said chamber, means for releasably mounting said input gear on said primary drive shaft means, a pair of like diameter output gears in said chamber in meshing engagement with said input gear, means for releasably mounting one of the said output gears on the upper end of one of said secondary shafts, and means whereby said other output gear may be adjusted relative to said one of the output gears to provide for equal tooth pressure of said input gear on both of said output gears, said input and output gears and said means for releasably securing the same to said primary and secondary drive shafts providing a quick change arrangement whereby cooperating input and output gears of different sizes may be utilized for various speed differentials between said primary and secondary shafts.

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