

Nov. 29, 1949

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2,489,478

OUTBOARD MOTOR UNIT CONSTRUCTION

Filed Jan. 11, 1947

2 Sheets-Sheet 1

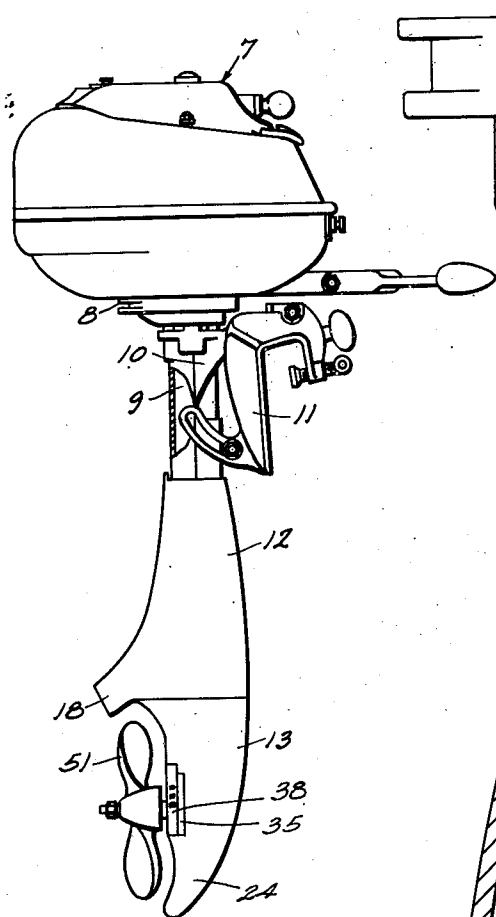


Fig. 1

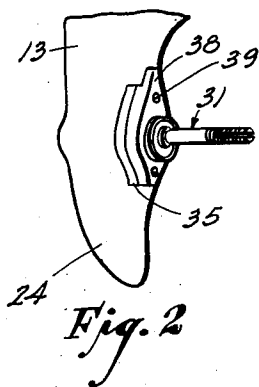


Fig. 2

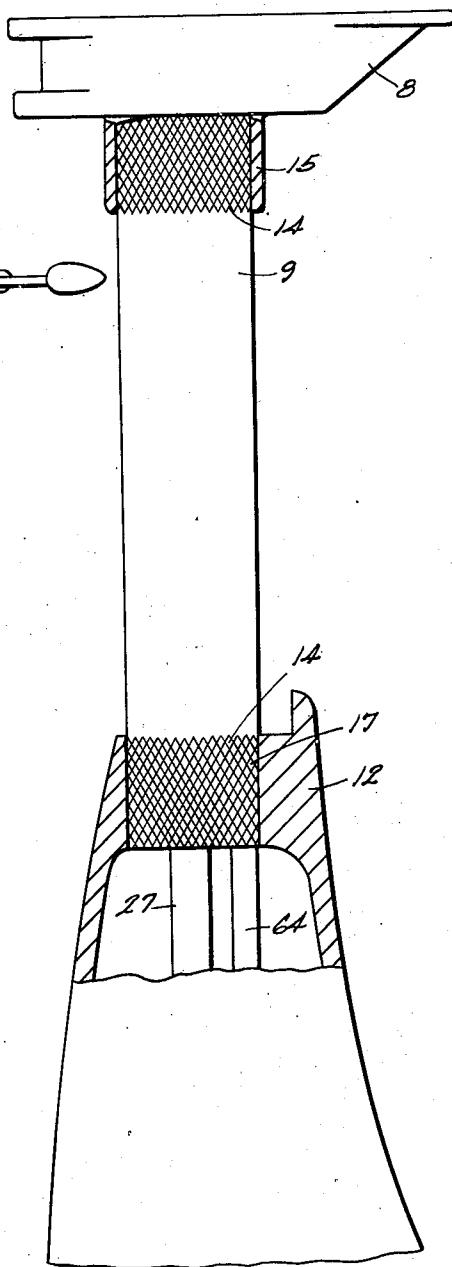


Fig. 3

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UNITED STATES PATENT OFFICE

2,489,478

OUTBOARD MOTOR UNIT CONSTRUCTION

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Application January 11, 1947, Serial No. 721,595

9 Claims. (Cl. 115-17)

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This invention relates to outboard motor units, and has to do more particularly with the motor tube support assembly of such a unit.

In outboard motor units of known type, it is the usual practice to mount the power head, including the motor and associated parts, on a mounting plate at the upper end of a motor support tube mounted for turning movement in a bearing member or sleeve having associated therewith a clamp bracket structure for securing the unit to the transom or sill of a boat. It is desirable that the submerged portion of the motor support tube assembly, when the unit is in use, be so formed as to present minimum resistance to passage thereof through the water. To that end, in certain known outboard motor units the motor support tube proper is rather short and has secured to its lower end a housing of proper form to present low resistance to its passage through the water, there being secured to the lower end of this housing a gear case which carries the propeller shaft, with the propeller thereon, suitable gearing for driving the propeller shaft and a pump for supplying cooling water to the motor or engine. The motor support tube, together with the housing and the gear case, constitute the motor support tube assembly. In the known units referred to, the housing and the gear case are secured together and to the motor support tube by screw studs of considerable length passing through a fitting secured on the lower end of the tube and through the housing into the gear case, the studs having threaded engagement with the gear case. The housing and the gear case thus provide, in effect, a column of substantial length anchored at its lower end to the long screw studs and at its upper end to the lower end of the motor support tube. The use of long studs adds substantially to the weight of the structure as a whole, since the studs should be formed of steel or like metal having adequate strength to withstand the tension and vibration to which they are subjected in use. In addition, the use of the long studs referred to results in objectionable loss of time in assembling the parts, since the studs must be inserted with care and accuracy through the various parts and secured thereto. In view of the fact that outboard motor units are frequently used for propelling boats in shallow water through heavy growth of grasses and weeds, it is of importance that the submerged portion of the unit be free of projecting studs, nuts, or like elements, such as would be apt to catch grass, weeds, or other growth through which the boat is propelled.

My invention is directed to the provision of an outboard motor unit which avoids the objections to the known units above referred to. To that end, I provide a motor support tube assembly of comparatively light weight comprising a housing

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secured to the lower end of the motor support tube and a gear case seating on and secured to the lower end of the housing, the means for securing the gear case to the housing being disposed within the latter and the gear case, so as to avoid objectionable projections at the under water area of the assembly. By securing the gear case to the lower end of the housing, comparatively short securing screws of light weight may be utilized, thereby effecting a substantial saving in weight of the assembly and, since the gear case is secured to the lower end of the housing which is fixed at its upper end to the lower end of the motor support tube, providing a rigid structure of adequate mechanical strength and which is not subject to objectionable vibration. More specifically, the means for securing the gear case to the bottom of the housing comprises a first securing screw which may be fixed to the housing, onto which the gear case may be threaded so as to seat against the bottom of the housing, and a second securing screw cooperating with the housing and the gear case for securing them together, this second screw having an abutment member disposed within an outwardly opening recess in the gear case, so as to be accessible from the exterior thereof for detaching the second screw and permitting of the gear case being unthreaded from the housing when desired. That renders it possible to remove and replace the gear case as a unit with expedition and facility, as conditions may require. That is advantageous, since, in general, the gear case is the only part of the assembly which may require to be removed for replacement, repair or cleaning of parts. The securing screw onto which the gear case is threaded has associated therewith means cooperating with means on the gear case for accurately positioning the latter on the housing, and the other screw for securing the gear case to the housing conveniently is disposed adjacent the rear or stern of the gear case with its abutment member disposed in a recess of the gear case opening rearward thereof, this recess being adapted for reception of the pump unit removably mounted therein and providing a closure for the recess. Further objects and advantages of my invention will appear from the detail description.

50 In the drawings:

Figure 1 is a side view of an outboard motor unit embodying my invention, the bearing sleeve for the motor support tube being in part broken away and shown in section;

55 Figure 2 is a perspective stern view, on an enlarged scale, of the gear case and the parts carried thereby of the motor support tube assembly of my invention, the propeller being omitted for clearness of illustration:

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Figures 3 and 3A, taken together, constitute a view, on an enlarged scale, partly in vertical section and partly in elevation, of the motor support tube assembly.

Figure 4 is a fragmentary, sectional view taken substantially on line 4—4 of Figure 3A; and

Figure 5 is a plan view of the gear case, taken substantially on line 5—5 of Figure 3A.

I have illustrated my invention, by way of example, as embodied in an outboard motor unit comprising a power head 7, which includes the engine or motor and its appurtenances, mounted on a suitably formed mounting plate 8 secured, in a manner to be explained more fully presently, on the upper end of a motor support tube 9 mounted for turning movement in a lengthwise split sleeve 10 carrying a clamp bracket 11 by means of which the unit may be secured to the transom or sill of a boat in a known manner. A housing 12 is secured to the lower end of tube 9 and a gear case 13 seats at its upper end on the lower end or bottom of housing 12, to which it is secured. The mounting plate 8, tube 9, housing 12 and gear case 13, together constitute the motor support tube assembly with which my invention is concerned.

The upper end portion of motor support tube 9 is knurled exteriorly at 14. The mounting plate 8 is formed as a casting of aluminum or other light weight alloy, and has an integral depending neck 15 which is cast about the knurled area 14 of tube 9 and thereby directly secured to this tube. The lower portion 17 of tube 9 is also knurled exteriorly and has cast thereabout the upper end portion of housing 12, which also is in the form of an aluminum or other light weight alloy casting. The mounting plate 8 and the motor support tube 9 and the housing 12 are thus secured together without the use of screw studs or other members of like character and provide a unitary structure of light weight and adequate mechanical strength.

The housing 12 flares downward, as shown in Figures 3 and 3A, and is of substantially flattened elliptical shape in cross section for the major portion of its length, merging into the more or less rounded upper portion which receives and is secured on the lower end portion of tube 9. At its rear, or stern, the housing 12 is formed to provide a downwardly inclined and rearwardly opening discharge nozzle 18, through which cooling water and exhaust gases are discharged, such water and gases passing to housing 12 through tube 9 in a manner well known in the art.

Housing 12 is provided, at the bottom thereof, with a transverse bottom wall 20 extending forward a substantial distance from the downwardly and rearwardly inclined bottom wall 19 of the discharge nozzle 18. Wall 20 is provided, at the front thereof, with an upwardly extending boss 21 and housing 12 is further provided, at the front of its bottom, with an interior relatively thick boss 22. The lower faces of wall 20 and of boss 22 are disposed in a common plane with the lower edges of the side walls of housing 12, and provide therewith a flat or planar seating surface for reception of a corresponding flat or planar seating surface at the upper end of gear case 13, conforming to the seating surface at the bottom of housing 12, that is, the surface extending forwardly from the inclined bottom wall 19 of the discharge nozzle

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18. The gear case 13 is of substantially flattened elliptical cross section at its upper portion and is of increased width or thickness at its lower portion to accommodate the propeller shaft and associated gearing, as will appear more fully presently, and is provided with a downwardly extending skeg 24.

Gear case 13 is provided with an interior boss 25 extending from its upper end, in which seats an oil seal 26 of known type disposed about a drive shaft 27 having driving connection at its upper end to the motor and extending downward through the motor support tube assembly, as is known. The lower portion of shaft 27 extends through a bearing bushing 28 mounted in hub 25. A bevel gear 29 is splined on the lower end of shaft 27 and meshes with a bevel gear 30 fixed on the inner or forward end of propeller shaft 31. Gear 30 is mounted in a bushing 32 suitably mounted in gear case 13, and propeller shaft 31 extends from gear 30 through a bearing bushing 33 carried by a tubular boss 34 of a mounting plate 35 disposed in a recess 36 in the rear or stern portion of gear case 13. Recess 36 opens into a recess 37 of substantially greater height than recess 36, this recess 37 receiving a pump unit 38 removably secured therein by counter sunk screws 39 passing through unit 38 and plate 35 and threading into gear case 13. The pump unit 38 is of known type and comprises a suitable rotor or impeller 40 operated by an eccentric 41 fixed to propeller shaft 31. The discharge of the pump unit 38 is connected by a passage 42, port 43, passage 44 and passage 45, to a bore 46 extending from the upper end of boss 25 at the rearward or stern portion thereof. The passage 42 is formed in the pump unit 38 and is closed at its upper end by a cap 48, the port 43 also is formed in the pump unit 38 and the passages 44 and 45 and bore 46 are formed in the boss 25 of gear case 13, as will be clear from Figure 3A. Suitable gaskets and seals may be provided where required, as will be clear. A water supply tube 50 fits snugly at its lower end portion in bore 46 and extends upward through the assembly to the motor or engine for supplying water thereto from the pump unit 38, as is known. A propeller 51 (Figure 1), of suitable type, is secured on the propeller shaft 31 in a suitable manner, and when the motor or engine is in operation is driven therefrom by means of the shaft 27 and associated gearing in the gear case 13, in an obvious manner, and cooling water is then supplied by the pump 38 through tube 50 to the engine.

The boss 22 receives a securing cap screw 52 inserted therethrough and extending downward within the forward portion of gear case 13. The latter is provided with a web element 53 extending transversely thereof and forwardly from boss 25, this web element being provided with an upwardly extending interiorly threaded boss 54. Head 55 of cap screw 52 seats on a washer 56 which seats on the upper face of boss 22. An annular positioning member 57, conveniently in the form of a washer, fits snugly in a corresponding recess 58 in the under face of boss 22. The member 57 is of substantial thickness, is concentric with screw 52 and projects downward a substantial distance below the lower end or bottom of housing 12. The gear case 13 is provided, at the top of each side and adjacent the front thereof, with an interior thickened element or

boss 60 provided in its upper face with an arcuate recess 61 disposed to receive snugly the positioning member or washer 57 as the gear case 13 approaches its position seating upon the lower end of housing 12, as will appear more fully presently.

Gear case 13 is provided at the stern or rear thereof with a thickened web element 63 extending from boss 25. This web element 63 is suitably bored for reception of a second securing cap screw 65 inserted therethrough, with its head 65 disposed at the under face of web 63 with an intervening lock washer 66 of known type. The screw 65 threads into boss 21 of housing 12 and, in cooperation therewith and with web 63, provides additional means for securing gear case 13 to housing 12. It will be noted that the recess 37 is of adequate height to accommodate the head 65 of screw 64, and that the pump unit 38 provides an effective closure for recess 37, so that screw 64 is disposed within gear case 13 and housing 12, so as to be effectively shielded thereby, while being readily accessible by removal of the pump unit, which may be accomplished by removal of the securing screws 39 for that unit. The securing screw 52 and the parts associated therewith are also disposed within the housing 12 and gear case 13 so as to be shielded thereby while avoiding objectionable projections exteriorly of those members.

The boss 22 is suitably bored and tapped from one side of the housing 12 for reception of a socket headed set screw 66 of known type. In applying the gear case 13 to housing 12, after washer 56 has been placed about screw 52, the latter is inserted through boss 22 and is fixed therein by means of the set screw 66. The positioning member or washer 57 is then placed about screw 52 and the gear case 13 is then inserted over screw 52 and is turned so as to thread boss 54 onto the lower end of this screw. As the gear case 13 approaches seating position on the lower end of housing 12, the washer 57 enters recesses 61 of the bosses 60, thus accurately positioning gear case 13 relative to housing 12 transversely thereof, it being understood that at this time the washer 57 is also seated in recess 58 of boss 22. The gear case 13 is threaded onto screw 52 until it seats tightly at its upper end against the under face or bottom of housing 12. When that occurs, the upper end of gear case 13 may not be in accurate register with the lower end or bottom of housing 12. By loosening the set screw 66, so as to release screw 52 for turning movement in boss 22, gear case 13 may readily be turned into position in which it is in accurate register with the bottom of the housing 12, being held seated tightly against the housing by the screw 52. When gear case 13 is thus accurately positioned, the second securing screw 64 may be inserted through the web element 63 and threaded tightly through boss 21, thus securing the housing and the gear case tightly together at the rear or stern portion thereof, the pump unit 38 being, of course, removed temporarily for that purpose. After that has been done, the pump unit 38 is replaced and the set screw 66 is then turned in tight so as to again lock or fix the forward securing screw 52 in boss 22.

It will be seen that the motor support tube assembly comprising the mounting plate 8, tube 9, housing 12 and gear case 13, provides a rigid structure of comparatively light weight and adequate mechanical strength, which is not subject to objectionable vibrations and in which the gear

case may be removed and replaced with expedition and facility and without disturbing other parts of the assembly. It will be understood that changes in detail may be made without departing from the field and scope of my invention, and I intend to include all such variations, as fall within the scope of the appended claims, in this application in which the preferred form only of my invention has been disclosed.

I claim:

1. In an outboard motor unit, a motor support tube assembly comprising a substantially vertical tube, a motor mounting plate fixed on the upper end of said tube, a unitary housing directly secured at its upper end on the lower end of said tube, said housing having at its lower end an opening for discharge of exhaust gases, a gear case seating on the lower end of said housing, and means detachably securing said gear case to said housing, said means being disposed within said gear case and housing and shielded thereby.

2. In an outboard motor unit, a motor support tube assembly comprising a substantially vertical tube, a motor mounting plate fixed on the upper end of said tube, a unitary housing directly secured at its upper end on the lower end of said tube, said housing having at its lower end an opening for discharge of exhaust gases, a gear case seating on the lower end of said housing, and securing members disposed within said gear case shielded thereby and in cooperation therewith and with said housing detachably securing said gear case to said housing.

3. In an outboard motor unit, a unitary housing adapted to be secured at its upper end to a motor support tube and having at its lower end an opening for discharge of exhaust gases, a gear case seating at its upper end on the lower end of said housing, a securing screw fixed to said housing with its upper portion disposed therein, said screw extending downward from said housing within said gear case in threaded engagement therewith, said gear case having an outwardly opening water pump receiving recess remote from said screw and removable closure means therefor, and a headed securing screw passing through a part of said gear case and threading into said housing with its head disposed in said recess accessible therethrough upon removal of said closure means.

4. In an outboard motor unit, a unitary housing adapted to be secured at its upper end to a motor support tube and having a planar seating surface at its lower end, said housing having at its lower end an opening for discharge of exhaust gases, a gear case having a planar seating surface at its upper end seating on the lower end of said housing, a securing screw passing through an interior element of said housing fixed thereto and extending downward within said gear case in threaded engagement therewith, and means comprising a second screw having an abutment member at its lower end passing through elements of said gear case and housing and in cooperation therewith securing them together, said second screw being disposed within said housing and gear case and the latter having an outwardly opening water pump receiving recess accommodating said abutment member and giving access thereto from the exterior of said gear case.

5. In an outboard motor unit, a unitary housing adapted to be secured at its upper end to a motor support tube and having a planar seating surface at its lower end, said housing having at its lower end an opening for discharge of exhaust

gases, a gear case having a planar seating surface at its upper end seating on the lower end of said housing, the latter having an interior boss adjacent its lower end, a headed securing screw passing through said boss with its head at the upper face thereof, said screw extending downward within said gear case into threaded engagement therewith, means operable exteriorly of said housing for optionally fixing said screw to said boss, said gear case having a web element therein remote from said screw and an outwardly opening water pump receiving recess extending from the under face of said web element, and a second headed securing screw passing through said web element with its head at the under face thereof and threading into said housing.

6. In an outboard motor unit, a unitary housing adapted to be secured at its upper end to a motor support tube and having a planar seating surface at its lower end, said housing having at its lower end an opening for discharge of exhaust gases, a gear case having a planar seating surface at its upper end seating on the lower end of said housing, the latter having an interior boss adjacent its lower end, a headed securing screw passing through said boss with its head at the upper face thereof, said screw extending downward within said gear case into threaded engagement therewith, means operable exteriorly of said housing for optionally fixing said screw to said boss, a positioning member extending downward from said boss concentric with said screw, said gear case having elements cooperating with said positioning member for accurately positioning said gear case relative to said housing as it approaches seating position thereon, and means comprising a second screw having an abutment member at its lower end passing through elements of said gear case and housing and in cooperation therewith securing them together, said second screw being disposed within said housing and gear case and the latter having an outwardly opening water pump receiving recess accommodating said abutment member and giving access thereto from the exterior of said gear case.

7. In an outboard motor unit, a unitary housing adapted to be secured at its upper end to a motor support tube and having a planar seating surface at its lower end, said housing having at its lower end an opening for discharge of exhaust gases, a gear case having a planar seating surface at its upper end seating on the lower end of said housing, the latter having an interior boss adjacent its lower end, a headed securing screw passing through said boss with its head at the upper face thereof, said screw extending downward within said gear case into threaded engagement therewith, means operable exteriorly of said housing for optionally fixing said screw to said boss, the latter having in its under face an annular recess substantially concentric with said screw, an annular positioning member disposed about said screw adapted to seat snugly in said recess and to project downward from said boss below the seating surface of said housing, said gear case having recessed means disposed and adapted for reception of said positioning member and cooperating therewith for accurately positioning said gear case relative to said housing, said gear case having a web element therein remote from said screw and an outwardly opening water pump receiving recess extending from the

under face of said web element, and a second headed securing screw passing through said web element with its head at the under face thereof and threading into said housing.

8. In an outboard motor unit, a unitary housing adapted to be secured at its upper end to a motor support tube and having a planar seating surface at its lower end, said housing having at its lower end an opening for discharge of exhaust gases, a gear case having a planar seating surface at its upper end seating on the lower end of said housing, the latter having an interior boss adjacent the lower end of its forward portion, a headed securing screw passing through said boss with its head at the upper face thereof, said screw extending downward within the forward portion of said gear case into threaded engagement therewith, means operable exteriorly of said housing for optionally fixing said screw to said boss, said gear case having in its stern portion an outwardly opening recess and a web element overlying said recess, said housing having a securing element overlying said web element, a second securing screw having an abutment member at the underface of said web element, said second screw cooperating with said securing element and web element for securing said gear case to said housing, and a removable pump unit mounted in said recess providing a closure therefor.

9. In an outboard motor unit, a unitary housing adapted to be secured at its upper end to a motor support tube and having a planar seating surface at its lower end, said housing having at its lower end an opening for discharge of exhaust gases, a gear case having a planar seating surface at its upper end seating on the lower end of said housing, the latter having an interior boss adjacent the lower end of its forward portion, a headed securing screw passing through said boss with its head at the upper face thereof, said screw extending downward within the forward portion of said gear case into threaded engagement therewith, means operable exteriorly of said housing for optionally fixing said screw to said boss, said gear case having in its stern portion an outwardly opening recess adapted to receive a removable pump unit and a web element overlying said recess, said housing having a securing element overlying said web element, and a second securing screw having an abutment member at the underface of said web element, said second screw cooperating with said securing element and web element for securing said gear case to said housing.

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