Oct. 28, 1947. G. E. SCHULTZ ET AL 2,429,774

ELECTRIC OUTBOARD MOTOR

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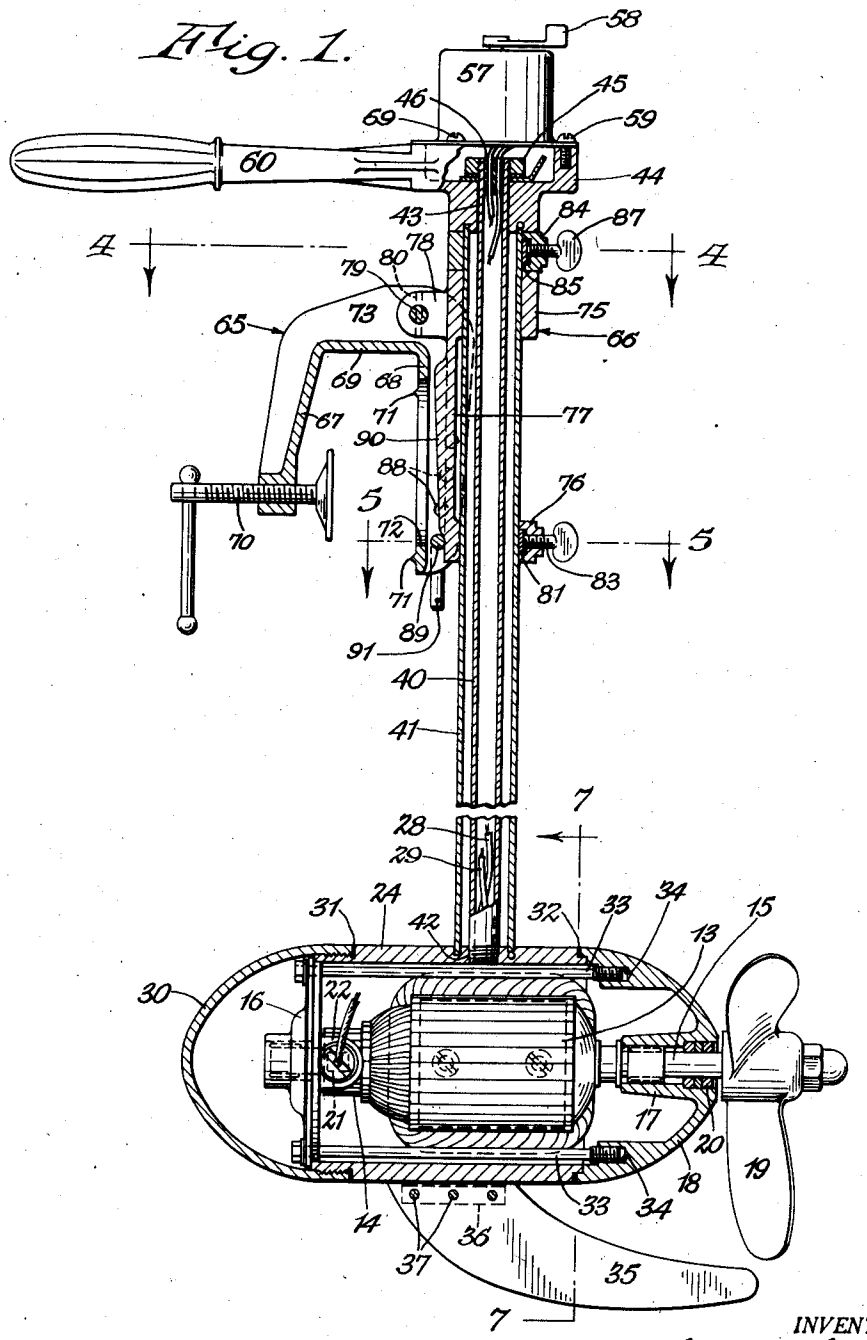
Fig. 1.



INVENTORS
George E. Schultz
by Edward A. Morrissey
Popp and Popp
Attorneys.

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Fig. 2.

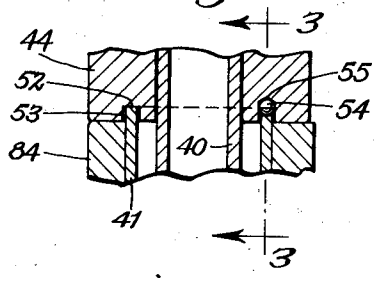


Fig. 3.

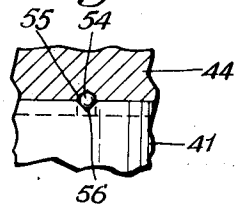
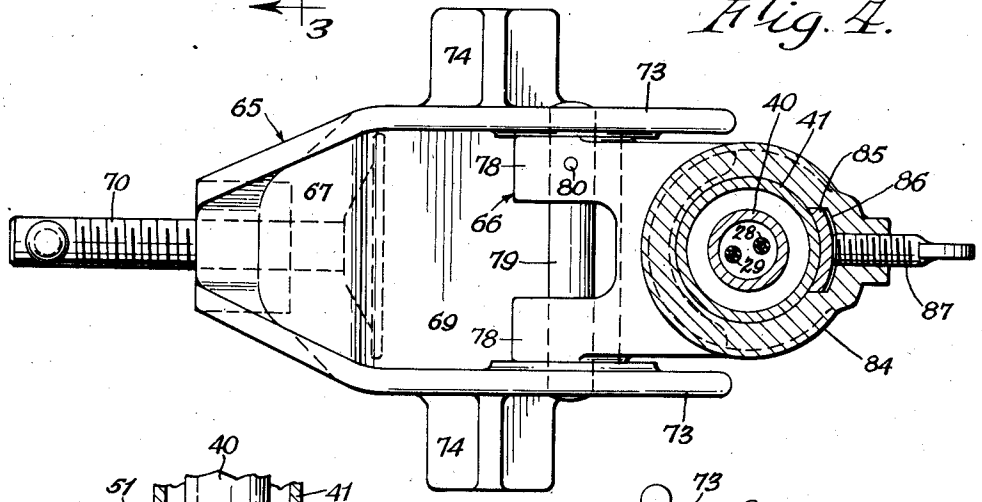


Fig. 4.



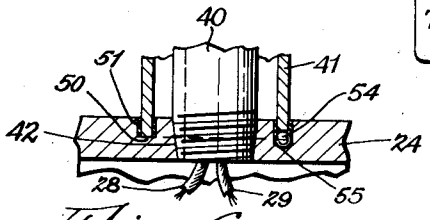


Fig. 6.

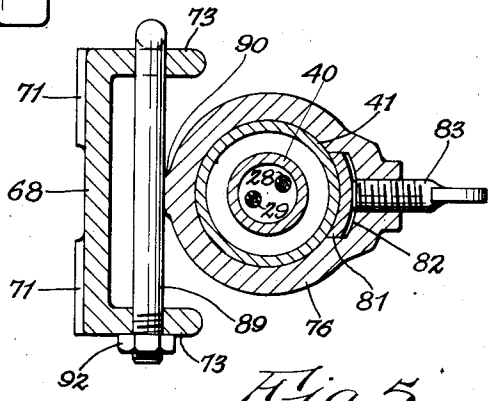


Fig. 5.

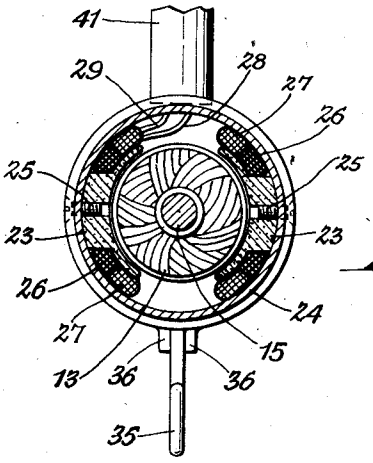


Fig. 7.

INVENTORS
George E. Schultz
Edward A. Morrissey
by Popp and Popp
Attorneys.

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UNITED STATES PATENT OFFICE

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ELECTRIC OUTBOARD MOTOR

George E. Schultz and Edward A. Morrissey, Silver Creek, N. Y., assignors to Silver Creek Precision Corporation, Silver Creek, N. Y., a corporation of New York

Application May 23, 1946, Serial No. 671,705

4 Claims. (Cl. 172—36)

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This invention relates to outboard motors and in particular to improvements in an electric outboard motor.

One object of the present invention is to provide such an outboard motor the angular position of which with respect to the boat transom on which the motor is mounted may be adjusted in a novel manner so that the motor can be used on any boat adapted for an outboard motor regardless of the slant or angularity of the boat transom.

Another object is to provide such an outboard motor in which the vertical column is of improved and lightweight design.

Another object is to provide such an outboard motor in which the housing for the electric motor and the manner in which such motor is mounted in its housing is of improved design so as to provide a watertight housing and yet be capable of being dismantled readily and easily to permit access to the electric motor.

Other objects are to provide such an outboard motor which is silent in operation, dependable, light in weight, not liable to get out of order and require repair, inexpensive to manufacture and having the advantages of being vertically adjustable for varying boat depths and also for shallow water, 360° directional steering with fixed steering, if desired, and adapted to be operated at different speeds.

In the accompanying drawings:

Fig. 1 is a vertical central partial section of the electric outboard motor forming the subject of the present invention.

Fig. 2 is an enlarged vertical fragmentary section showing the manner in which the upper end of the vertical column engages the head.

Fig. 3 is a sectional view thereof taken along line 3—3, Fig. 2.

Fig. 4 is a horizontal transverse sectional view taken along the line 4—4, Fig. 1.

Fig. 5 is a horizontal transverse sectional view taken along line 5—5, Fig. 1.

Fig. 6 is an enlarged vertical fragmentary sectional view showing the manner in which the lower end of the vertical column engages the housing for the electric motor.

Fig. 7 is a vertical transverse section taken along line 7—7, Fig. 1.

The electric outboard motor forming the subject of the present invention comprises an electric motor assembly arranged at the lower end of a column assembly on the upper end of which are arranged speed control and steering means, the outboard motor being supported by a transom bracket assembly which is mounted on the rear transom of a boat (not shown).

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The electric motor assembly comprises an armature 13 having the usual core and windings connected to the segments of a commutator 14 and mounted on a shaft 15. One end of the armature shaft is suitably journaled in the central bore of a supporting member or front end bell 16 and the opposite end of the shaft is suitably journaled in the bore of an inwardly projecting neck 17 centrally formed on a rear housing member or rear end bell 18. The rear end of the shaft 15 extends exteriorly of the rear end bell 18 and a propeller 19 is non-rotatably secured to the extreme outer end of this shaft in any suitable manner. A suitable packing 20 is interposed between the shaft 15 and the neck 17 so as to prevent water from entering the housing for the electric motor. Any suitable means for maintaining the axial alignment of the armature may be employed and for this purpose a spacing collar is shown as being arranged on the shaft 15 between the rear end of the armature 13 and the front end of the neck 17.

The commutator 14 is engaged by a pair of brushes 21 which are mounted in holders 22 connected to the rear side of the front end bell 16.

As best shown in Fig. 7, a pair of diametrically opposed pole pieces 23 of usual form are mounted on the inside of an intermediate housing member 24 by screws 25. A coarse winding 26 and a fine winding 27 are arranged on the pole pieces 23 in the usual manner and have lead wires 28 and 29, respectively. The leads to the brushes 21 are electrically connected in any conventional manner.

The intermediate housing member 24 is of cylindrical form and has its front end of reduced exterior diameter and threaded to receive a generally semi-spherically shaped front housing member or nose 30, a gasket 31 of suitable material being interposed between the edge of the nose and the shoulder on the member 24 to prevent water from entering the housing. The rear end of the member 24 is provided with an annular shoulder which receives a forwardly projecting annular tongue on the rear end bell 18, a gasket 32 of suitable material being interposed between this shoulder and tongue.

The rear end bell 18 is firmly secured to the intermediate housing member 24 by a plurality of longitudinally arranged tie bolts 33, two being shown, the rear threaded ends of which screw into threaded holes 34 provided in the rear end bell. The tie bolts 33 extend through openings

provided in the front end bell 16 and the heads of these tie bolts hold the front end bell against the front end of the intermediate housing member 24. Thus it will be seen that when the tie bolts 33 are tightened down the front and rear end bells 16 and 18, respectively, will be drawn toward each other, the rear end bell engaging the rear end of the intermediate housing member 24 and the front end bell engaging the front end of the same. If access to the electric motor is desired, for repair or maintenance purposes, it will be seen that this is readily and easily accomplished by first unscrewing and removing the semi-spherically shaped closure or nose 30 and then unscrewing and removing the tie bolts 33, thereby permitting removal of the front end bell 16 and rear end bell 18.

A skeg 35 of the usual form is mounted in any suitable manner on the bottom of the intermediate housing member 24, the fastening means shown including a pair of spaced longitudinally extending lugs 36 depending from the member 24 between which the upper end of the skeg is arranged and rivets 37 securing the skeg to the lugs.

The column assembly includes inner and outer tubes 40 and 41, respectively, the lower end of the inner tube 40 being provided with exterior threads which screw into a threaded hole 42 provided in the top of the intermediate housing member 24 so as to firmly secure these parts together. The upper end of the inner tube 40 extends through a bore 43 provided in a head member 44 and is provided with exterior threads to receive a nut 45. Any suitable type of lock washer may be employed to insure against the nut 45 loosening. A plug 46 is arranged in the upper end of the inner tube 40, through which the lead wires 28 and 29 extend.

As best shown in Fig. 6, the intermediate housing member 24 is provided with an annular groove 50 which is preferably arranged concentric with the bore 42 to receive the lower end of the outer tube 41, a suitable sealing material 51 being provided to insure a leak-proof connection. The upper end of the outer tube 41 is similarly seated in an annular groove 52 which is concentric with the bore 43 and a suitable sealing material 53 may be used to prevent leakage. The outer tube 41 is locked against rotation by a locking device at either end of the tube which includes a ball 54, preferably of lead, a portion of which extends into a recess 55 provided in the grooves 50 and 52 and an opposite portion of which extends into a notch 56 provided in the corresponding end of the outer tube 41. The lead balls 54 may be partially deformed in filling the recesses 55 and corresponding notches 56.

It will thus be seen that the bi-tubular column construction provides a strong, light-weight and water-tight support for the electric motor assembly mounted on the lower end thereof. The outer tube 41 acts as a spacer between the intermediate housing member 24 and the head 44 and the inner tube 40 acts as a tie bolt which rigidly connects the member 24 and head 44 together. The inner tube is a conduit for the lead wires 28 and 29 and the double tube column construction provides a double seal for these lead wires. Further, this construction has the advantage of placing substantially all of the bending strains of the column on the outer tube 41 which is of larger diameter.

The upper ends of the lead wires 28 and 29 are connected to a two-speed switch 57 having a

switch arm 58 which is shown as being secured to the top of the head 44 by screws 59. The switch 57 may be of any suitable construction and is suitably connected by cables which lead to one or more 6 or 12 volt standard storage batteries (not shown), such as used in automobiles. Depending upon the size and weight of the boat and battery used, greater speeds can be obtained with the use of a 12 volt battery than with a 6 volt battery. Moreover, greater power and speed can be obtained by connecting two or more batteries in series. Greater running time can be obtained by connecting two or more batteries in parallel. Thus, for a given battery hook-up when the switch arm 58 is in the low-speed position, the current passes through the switch 57, through the leads 28 and 29, through the coarse and fine windings 26 and 27, respectively, to ground, one of the brushes 21 being suitably tapped into the circuit and the other grounded. When the switch arm 58 is adjusted to its high speed position, the current passes through the switch 57, through the lead 28, through the coarse winding 27 to ground, and also through one of the brushes 21, the fine winding 27 being cut out.

To steer the motor, the head 44 is provided with a laterally projecting steering arm 60 which may be of any suitable form, the arm 60 being shown as integrally formed with the head 44.

The transom bracket assembly includes a clamp bracket 65 adapted to be clamped on the boat transom and pivotally mounted on a hinge bracket 66 which embraces the outer tube 41. The clamp bracket 65 is a one-piece member generally in the form of an inverted U having a front part 67 and a rear part 68 depending in fore and aft spaced relation from a horizontal intermediate part 69. The lower end of the front part 67 carries a clamping screw 70 and the front face of the rear part 68 is provided with a series of transverse, horizontal gripping protuberances 71 and the rear part is also provided with an opening 72 to lighten its weight. Vertical, outwardly extending ribs 73 are provided at either side to strengthen the clamp bracket and to increase the stability of its mounting on the boat transom and the horizontal part 69 is laterally extended on each side, as indicated at 74.

The hinge bracket 66 comprises a pair of vertically spaced collars 75 and 76 connected together by a semi-circular part 77 arranged on the front side of the bracket. This bracket also includes a pair of forwardly extending, transversely spaced ears 78 which are arranged between the reinforcing ribs 73. These ribs 73 and ears 73 are provided with coaxial transverse holes which receive a transverse pivot pin 79, the pin being secured in position by a diametral locking pin 80 carried by one ear. The collar 76 carries means for locking the hinge bracket to the outer tube 41 to prevent relative movement between these members when it is desired to fix the steering adjustment, these means including an arcuate locking shoe 81 arranged in a recess 82 provided in the collar 76, and adapted to be urged into firm frictional engagement with the outer tube by a pressure screw 83 carried by a collar 76. When the screw 83 is tightened the inner end thereof forces the locking shoe 81 into fractional engagement with the outer tube 41 and prevents rotation of the outer tube in the hinge bracket. During normal steering by manual operation of the steering arm 60, the screws 83 is loose so as not to prevent the relative rotation of the parts.

The vertical position of the hinge bracket 66 on the outer tube 41 is determined by the position of an adjustable collar 84 which embraces the outer tube and is arranged thereon above the hinge bracket. The collar 84 houses an arcuate locking shoe 85 arranged in a recess 86 provided in one side thereof and carries a radially arranged pressure screw 87 adjacent the locking shoe 85 so that when the screw is tightened it will force the locking shoe into firm frictional engagement with the outer tube 41. The bottom of the adjustable collar 84 rests on the top of the collar 75 of the hinge bracket. In Fig. 1 the bottom of the head 44 is shown as engaging the top of the collar 84 although it will be understood that the collar 84 may be adjusted to a position farther down on the outer tube 41 and locked in this position, depending on the distance below the level of the water that it is desired to position the propeller 19. Factors such as the height of the boat transom and the shallowness of the water will generally determine the vertical position of the collar 84. Inasmuch as the outer tube 41 is vertically slideable in the collars 75 and 76 of the hinge bracket, when the locking screw 83 is loose, it will be seen that the weight of the unit will cause the adjusting collar to rest on the collar 75.

Means are provided to adjust the angular position of the hinge bracket 66 with respect to the clamp bracket 65 about the axis of the transverse pivot pin 79, which means include a series of generally vertically spaced apart holes 88 provided in each of the reinforcing ribs 73 adjacent the rear part 68 of the clamp bracket, each corresponding pair of holes 88 being adapted to receive a rod 89, and an inclined vertical rib 90 formed centrally on the adjacent part 77 of the hinge bracket and adapted to engage the rod 89. The front edge of the rib 90 inclines upwardly and forwardly while lines drawn through the centers of each series of holes 88 incline upwardly and rearwardly. The rod 89 has one bent end 91 and a nut 92 screwed on its opposite end to retain the rod in the holes, although any other suitable rod-retaining means may be employed. When it is desired to adjust the angularity of the hinge bracket relative to the clamp bracket one of these parts is rotated about the axis of the pivot pin 79 and the rod 89 is inserted in that set of holes 88 which gives the desired angularity between the brackets when the rod engages the rib 90, the rod being retained in the holes by applying the nut 92 to the threaded end thereof. For most efficient operation, it is desirable to have the propeller rotate about a horizontal axis and therefore to accomplish this the amount of adjustment necessary will depend upon the angularity or slant of the boat transom upon which the outboard motor is mounted. It will also be noted that the rib 90 may be on the clamp bracket 65 and the holes 88 provided in the hinge bracket 66.

We claim:

1. In an electric outboard motor in which the electric motor is arranged at the lower end of a substantially vertical column assembly, the combination of a housing for said electric motor comprising a hollow imperforate intermediate housing member which surrounds said electric motor, a supporting member for one end of the armature shaft and having a marginal portion adapted to abut the corresponding end of said housing member, a second imperforate supporting member for the opposite end of said shaft which

extends through said second supporting member and having a marginal portion adapted to abut the corresponding end of said housing member, tie bolts connecting said supporting members together and maintaining abutting engagement of said supporting members with the corresponding ends of said housing member, and an imperforate closure member surrounding said first supporting member and secured to said housing member.

2. In an electric outboard motor in which the electric motor is arranged at the lower end of a substantially vertical column assembly, the combination of a housing for said electric motor comprising a hollow imperforate intermediate housing member which surrounds said electric motor, a supporting member for one end of the armature shaft and having a marginal portion adapted to abut the corresponding end of said housing member, a sealing element on the opposite end of said housing member, a second imperforate supporting member for the opposite end of said shaft which extends through said second supporting member and having a marginal portion adapted to about the opposing face of said sealing element, sealing means interposed between said second supporting member and said shaft, tie bolts connecting said supporting members together and maintaining abutting engagement of said first supporting member with the corresponding end of said housing member and of said second supporting member with said sealing element, a second sealing element engaging a shoulder on the housing member adjacent its first mentioned end, and an imperforate closure member surrounding said first supporting member and screwed to said housing member and engaging said second sealing element.

3. In an electric outboard motor in which the electric motor is normally submerged in use, the combination of a housing for said electric motor comprising a hollow imperforate intermediate housing member which surrounds said electric motor, a supporting member for one end of the armature shaft and adapted to be clamped against one end of said housing member, a second imperforate supporting member for the opposite end of said shaft which extends therethrough and adapted to be clamped against the opposite end of said housing member, means for clamping said supporting members against the corresponding ends of said housing member, and an imperforate closure member covering said first supporting member and secured to said housing member.

4. In an electric outboard motor having a submergible housing for an electric motor and a head carrying an electric switch connected to said electric motor by lead wires, the combination therewith of a support interposed between said housing and said head and comprising inner and outer tubes, said housing being provided with a continuous groove to receive one end of said outer tube, said head being provided with a continuous groove to receive the opposite end of said outer tube, sealing means in said grooves to prevent the entrance of liquid into the interior of said outer tube, means for locking said outer tube against rotation relative to said housing and said head and comprising opposed recesses provided in said housing and said head and the corresponding ends of said outer tube and a ball substantially filling each pair of said opposing recesses, one end of said inner tube being connected to said housing, the opposite end of said inner tube being threaded and extending through an opening provided in

said head, and a nut on the outer end of said threaded end of said inner tube and operatively engaging said head, said inner tube and said nut maintaining said head and said housing in clamping engagement with said outer tube, said inner tube serving as a conduit for said lead wires.

GEORGE E. SCHULTZ.
EDWARD A. MORRISSEY.

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