This invention relates to rudders generally, and more specifically to the combination of an outdrive on a boat. In boats having an outdrive of the type to which the present invention applies, the propeller is turned about a horizontally extending axis for steering the boat, reliance being placed mainly upon the direction of the thrust of the water moved past the propeller for turning the boat.

Whether the motor, in the present instance is inboard or outboard is not particularly important. In the instance where the propeller is used for steering, there is a vertical axis (and also a horizontal axis for the usual skeg) which passes through the motor. The usual skeg at corresponds to skeg 4 in FIG. 1. The above mentioned motor and steering gear, in both inboard and outboard type, are not the subject matter of this invention.

One of the objects of the present invention is the provision of a rudder in combination with the propeller and movable with turning of the propeller to effect changes in the direction of the boat, that will result in an immediate and strong response together with substantial elimination of cavitation, and also which rudder materially increases the efficiency of the propeller in a straight-away operation and also during turning thereof.

Other objects and advantages will appear in the description and in the drawings.

In the drawings:

FIG. 1 is a side elevational view of an outboard motor having the rudder of the present invention in a position, enabling the propeller and movable therewith, the transom and part of the bottom of the boat being in cross section.

FIG. 2 is a side elevational view of an inboard motor and an outboard drive in which the portion of the outboard drive carrying the propeller is movable in substantially the same manner as the outboard motor and drive.

FIG. 3 is an enlarged rear elevation view of the propeller and rudder and this view is consistent with either FIG. 1 or FIG. 2.

FIG. 4 is a vertical cross-sectional view along line 4-4 of FIG. 3, showing the rudder only in cross section, the propeller, skeg and part of the propeller support being shown in elevation.

In detail, referring to FIG. 1, the outboard motor is generally indicated at 1, which motor carries the propeller support and drive housing 2 depending therefrom. The propeller 3 is at the lower end of the support 2 is rearwardly of the usual protecting skeg 4 that may be in the form of a vertical plate (FIG. 3).

The foregoing structure, including mounting means 5 for securing the motor to the transom 6 of a boat 7, are conventional.

In FIG. 2, the motor 8 is inside the boat 9, and has a horizontal drive shaft (not shown) that extends through a horizontal housing 10 to the outside of the transom 11 rearwardly of the latter. Vertical housing 14 encloses a shaft (not shown) that is operatively connected with the propeller 15 and with the shaft in housing 10 for driving the latter. Housing 14 is coupled at 16 with housing 10, and the shafts within housings 10, 14 are coupled to permit rotation of the housing 14 about a vertical axis while the propeller 15 is being driven by the motor. The usual skeg 17 corresponds to skeg 4 in FIG. 1. The above structure is conventional.

It should be noted that in FIG. 1 and FIG. 2, provision is made for tilting the housings 2, 14 to enable the propellers to clear obstructions.

In FIGS. 1 and 2, a cylindrical, horizontally disposed, open ended tubular rudder 20 is rigidly secured to each propeller support, such as the lower end of housing 2 or 14. Rudder 20 in each instance is coaxial within the inner open end of each rudder, said inner end being the forward or leading end that is adjacent to the transom of the boat. There may be a relatively small clearance between the propeller and the inner surface of the rudder at the forward end of the latter, although the exact clearance is not critical. The inside diameter progressively decreases in a rearward direction to the rear or discharge end of the rudder as seen in FIG. 4, and said discharge end is substantially more remote from the boat than the inlet end.

In operation, the water passing through the rudder will have a substantially higher velocity at the discharge end than at the inlet end, with a correspondingly increased thrust over the thrust that would be developed were the inner sides of the rudder parallel in direction axially thereof.

Conventional means, such as a tiller bar 21 (FIG. 1) or a Bowden cable 22 may be used to turn the propeller and its support for steering, and no matter what the position of the propeller may be or what changes in direction thereof are made, there will be no cavitation or lack of thrust since the body of water within the rudder and enclosing the propeller will move with the rudder as a unit therewith, insofar as it may be affected by the water radially outwardly of the propeller.

The inner surfaces of the rudder may be straight axially thereof, or may be convexly curved axially of the rudder, with the minimum diameter adjacent to the propeller. In any case, the rudder protects the propeller, and also offers protection against injury to other outside objects or persons, and eliminates objectionable propeller torque.

While the present invention is not to be restricted necessarily to dimensions, a decrease of approximately one inch to the foot in a rudder diameter of approximately one foot in length and having an inside diameter of approximately fourteen inches at the inlet end has been found to be satisfactory.

I claim:

1. In an outboard motor drive on the rear end of a boat, said motor drive having a propeller rotatable about a horizontally extending axis, propeller supporting means supporting said propeller for said rotation and for movement therewith about a vertically extending axis, the improvement that consists of:

(a) a cylindrical, open-ended, tubular rudder having a leading end and a trailing end and which leading end is positioned around and coaxial with said propeller and is the end of the rudder that is leading when said propeller is rotated for driving said boat in a forward direction;

(b) the outer surface of said rudder being of substantially uniform diameter from end to end thereof;

(c) the leading end of said rudder terminating in a relatively thin edge and the inner surface of said rudder being of progressively decreasing diameter from its leading edge to substantially the opposite trailing end of said rudder;

(d) means connecting said rudder with said propeller support for holding said rudder coaxial therewith at all times during bodily movement of said rudder about said vertical axis.
2. In an outboard motor drive on the rear end of a boat, said motor drive having a propeller rotatable about a horizontally extending axis, vertically disposed propeller supporting means extending upwardly from said propeller supporting said propeller for said rotation about a horizontally extending axis, means mounting said propeller supporting means for swinging thereof in a vertical plane to different angular positions of the axis of said propeller in said plane for controlling the angular position of said boat in said plane relative to horizontal when said propeller is driving said boat in the water in a forward direction, the improvements comprising:

(a) a cylindrical, open-ended, tubular rudder having a leading end and a trailing end,
(b) means securing said rudder rigid relative to said propeller coaxial with the latter and with said propeller within said leading end of said rudder, said leading end being the end thereof that is leading when said propeller is rotated to drive said boat in a forward direction,
(c) the outer surface of said rudder being of uniform diameter from the leading edge thereof at said leading end to said trailing end,
(d) the inside surface of said rudder being straight axially thereof and of uniformly decreasing diameter from said leading end to substantially said trailing end,
(e) the said leading end of said rudder being relatively thin and sharp,
(f) the inside diameter of said rudder at its leading end substantially in the plane of said rudder being slightly greater than the diameter of a circular line defining the path of travel of the outermost ends of said propeller when the latter is rotated,
(g) the degree of taper of the inner surface of said rudder from said leading end thereof toward said trailing end being slight relative to the central axis of said rudder and the inside diameter of said rudder at said trailing end approximately the diameter of said circle.

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