June 8, 1965 T. B. EDWARDS 3,187,709

ADJUSTABLE HEIGHT PROPELLER AND DRIVE ASSEMBLY

Filed March 15, 1963

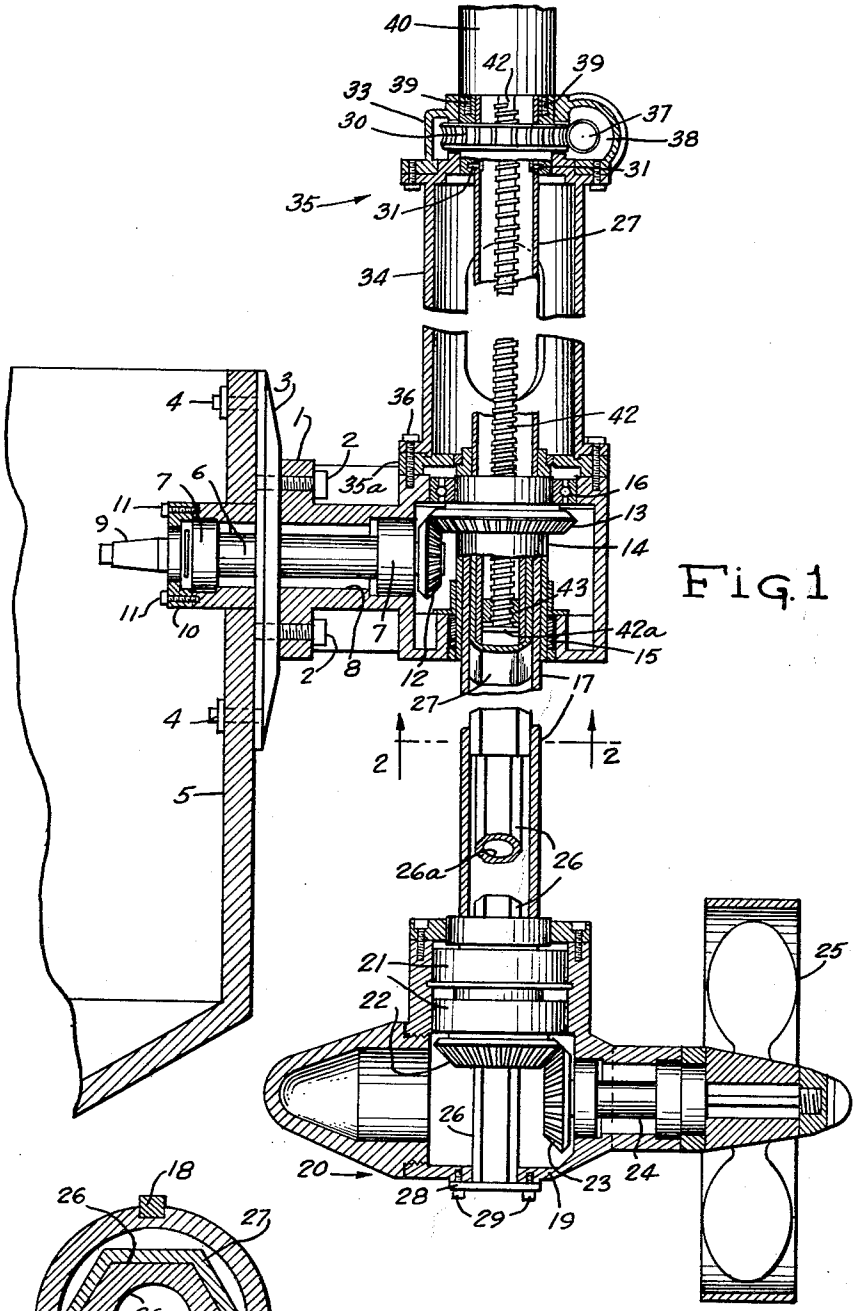



Fig. 1

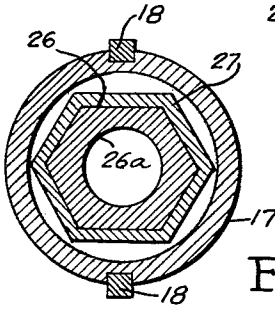



Fig. 2

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3,187,709

Patented June 8, 1965



3,187,709

# ADJUSTABLE HEIGHT PROPELLER AND DRIVE ASSEMBLY

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Filed Mar. 15, 1963, Ser. No. 265,565
2 Claims. (Cl. 115—41)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for govenmental purposes without the payment to me of any royalty thereon.

This invention relates to the field of marine propulsion and steering.

A variety of different mechanisms have been proposed to link the inboard engine of a marine craft or amphibious vehicle to its propeller so that the propeller is capable of being retracted to a protected position behind the transom of the craft. The designers of these mechanisms also seek in various ways to render the propeller's axis rotatable in a horizontal plane so that the propeller may be used for steering the craft. In some of these mechanisms the propeller is swung through an arc to a position behind the transom; however this method, although it protects the propeller when the craft is beached, does not permit raising the propeller to an intermediate position for continued operation in shallow water. Other mechanisms include a vertical telescoping driving member which through a set of upper bevel gears and lower bevel gears connects the engine to the propeller. Although this arrangement meets the objection previously noted with respect to the mechanisms which swing the propeller through an arc it requires that the engine be placed high in the boat so that the drive shaft will pass through the transom at a relatively high point. This is so because telescoping of the vertical drive member takes place between the upper and lower bevel gears; the two sets of gears must be far apart if the propeller is to be retractable to a point behind the transom.

An object of this invention is to provide an improved adjustable height propeller and drive assembly for use with a marine or amphibious craft equipped with an inboard engine.

Another object is to provide such a unit in which the axis about which the propeller rotates can be turned for steering and in which the propeller can be raised vertically to a position behind the transom of the boat or vehicle.

Another object is to provide such a unit in which the propeller can be selectively raised and lowered, the propeller being operable while it is raised or lowered or at any selected position.

Another object is to provide such a unit which can be employed effectively with a craft whose drive shaft passes through the transom at a relatively low position.

Other objects and advantages will appear from the description and drawings which follow. In the drawings:

FIG. 1 is an elevation of the preferred form of the adjustable height propeller and drive assembly showing the unit largely in section.

FIG. 2 is an enlarged cross-section of the mechanism taken along line 2—2 of FIG. 1.

Referring to the drawings, main casing 1 is attached by a plurality of bolts 2 to flange 3 which is in turn fastened by bolts 4 to the transom 5 of the marine or amphibious craft. Driving member 6 is rotatably supported by bearings 7 in bore 8 of main casing 1. Driving member 6 is directly connected to the engine drive shaft (not shown) by coupling 9. Bore 8 is capped by cover 10 which has a circular opening to permit passage of the



coupling and which is fastened to main casing 1 by bolts 11.

Upper bevel pinion 12 which is rigidly secured to driving member 6 drivingly engages upper bevel gear 13. Upper bevel gear 13 is integrally formed on driving sleeve 14; the driving sleeve is supported for free rotation within main casing 1 by bearings 15 and 16. Vertical drive shaft 17 is slidably received in driving sleeve 14. Longitudinal keys 18 projecting beyond the exterior of vertical drive shaft 17 (see FIG. 2) engage corresponding longitudinal splines in the inner wall of driving sleeve 14 (not shown). Thus vertical drive shaft 17 is free to move up and down in driving sleeve 14 at the same time it is being driven by the driving sleeve.

Vertical drive shaft 17 is supported in lower casing 19 of propeller assembly 20 by bearings 21. The means which prevent the propeller assembly from turning with the vertical drive shaft will be described presently. Lower bevel pinion 22 fixed to or formed on the lower end of the vertical drive shaft 17 drivingly engages lower bevel gear 23 which is in its turn affixed to the same propeller shaft 24 as propeller 25. The various components of the propeller assembly 20 which are conventional are shown in the drawing but are not specifically described herein.

Rotation of propeller assembly 20 under the influence of vertical drive shaft 17 is prevented by the combined action of steering bar 26 and steering tube 27. The steering bar 26 is slidably received in steering tube 27 which in its turn is disposed for vertical movement within vertical drive shaft 17. The steering bar and steering tube may have a hexagonal cross section as shown or any other suitable cross section or may be splined together so that the two members will rotate as a unit. As will appear steering bar 26 and steering tube 27 are elements of the mechanism which turns the propeller assembly 20 for steering the craft and for reversing the direction of travel. Steering bar 26 is attached to lower casing 19 by flange 28 and bolts 29. Steering tube 27 is attached at its upper end to irreversible worm gear 30 by pins 31 which are received in recesses of the worm gear. Worm gear 30 is mounted for rotation in a chamber defined between upper portion 33 and main portion 34 of upper casing 35. Upper casing 35 is attached to flange 35*a* and to main casing 1 by bolts 36. In order to steer the craft worm gear 30 is selectively turned by worm gear 37 which is driven by steering motor 38 affixed to the upper portion 33 of upper casing 35.

Affixed to worm gear 30 by bolts 39 is the combination of reduction gear and elevating motor 40 (not completely shown). The elevating motor is connected by flexible leads (not shown) to the control panel and to a source of current. The elevating motor through the reduction gear turns elevating screw 42 in a clockwise or counterclockwise direction in response to control by the operator. Elevating screw 42 threadedly engages nut 43 which is formed in or affixed to the upper portion of steering bar 26. Steering bar 26 has an internal bore 26*a* to accommodate that part of the elevating screw which projects downward beneath nut 43 when the propeller assembly is raised to an intermediate or to its topmost position. Because the housings of the reduction gear and elevating motor 40 are fixed to worm gear 30 which is stationary except during steering and because steering bar 26 is prevented from rotating by steering tube 27 likewise affixed to worm gear 30 steering bar 26 will be raised or lowered as elevating screw 42 rotates in one direction or another within nut 43. Thus the propeller assembly 20 is raised or lowered in a direction and amount corresponding to the direction of rotation and the number of revolutions effected by the elevating motor. Flange 42*a*, affixed to or integral with the bottom end of elevat-

ing screw 42 prevents the elevating screw from being withdrawn completely from nut 43.

It should be obvious that other elevating means may be substituted for elevating screw 42 to effect the raising and lowering of steering bar 26. For example a rack and pinion arrangement might be used with the rack affixed to the steering bar and the elevating motor affixed to worm gear 30 but placed off to one side from which point it could drive the rack member in an upward or downward direction by a pinion gear. The elevating screw arrangement illustrated is to be preferred, however, since it is the more compact and less subject to breakdown.

The mode of operation of the adjustable height propeller and drive assembly will be reviewed. The propeller 25 is driven by the craft's engine through driving member 6, upper bevel gears 12 and 13, driving sleeve 14, vertical drive shaft 17, lower bevel gears 22 and 23 and propeller shaft 24. For steering or reversing the craft, the propeller assembly 20 is caused to rotate about a vertical axis by the rotation of steering bar 26. Bar 26 is turned by steering tube 27 and worm gear 30 in response to the action of steering motor 38. Propeller assembly 20 is raised or lowered along a vertical axis by elevating motor 40 which through the interaction of elevating screw 42 and nut 43 causes steering bar 26 to slide up and down within steering tube 27.

Many changes may be made in the mechanism illustrated without departing from the spirit of the invention. For example, the steering and elevating motors might be removed to remote locations and suitable mechanical linkage used to turn steering tube 27 and elevating screw 42; or the steering tube and elevating screw might be operated manually.

I claim:

1. In combination with a water vehicle having a motive power source and a transom; a driving member connected at one end to said motive source and passing horizontally through said transom; a housing means, means for securing said housing means to said transom, the other end of said driving member extending into said housing means; an upper bevel pinion and upper bevel gear, said bevel pinion secured to the last said end of said driving member, a driving sleeve, said driving sleeve secured to said upper bevel gear, a driving shaft, said driving shaft slideably and vertically mounted in said driving sleeve, first keying means between said driving sleeve and said driving shaft for maintaining the driving shaft and driving sleeve in fixed rotational movement and in slideably vertical movement; a propeller assembly including a driving transmission means, a propeller housing means and a propeller, said driving transmission means including a lower bevel pinion and lower bevel gear, said driving shaft being connected to said lower bevel pinion, a propeller shaft connected at one end of said lower bevel gear and at the other end to said propeller, said propeller shaft being horizontally disposed; steering means for said propeller assembly including steering gear means, steering power means for delivering steering power to said steering gear means, a hollow steering bar having a lower and an upper end, said lower end being secured to said propeller housing, said upper end extended within said lower bevel pinion, said driving shaft and said driving sleeve, a steering sleeve surrounding the upper end of said steering bar at its lower end and connected to said steering gear means at its upper end, second keying said steering bar and steering sleeve for locking said propeller assembly from rotation in response to power from said motive power source and for rotation in response to power from said steering power means, said steering power means secured to said frame, said steering gear means operatively connected to said steering power means and bearing means for supporting said steering gear means within said frame; a propeller assembly raising means including a propeller assembly raising power means secured to the top of said frame, flange means rigidly secured to the interior of said hollow steering bar, and elongated raising means connected to said raising power means at its upper end and cooperatively connected to said flange at its lower end whereby said hollow steering bar is raised and lowered in response to power from said raising power means; said elongated raising means extending into said hollow steering bar and said drive shaft extending into said frame when said propeller assembly is raised.



2. In combination with a water vehicle having a motive power source and a transom; power delivery means including first, hollow second, hollow third and fourth driving means, first and second bevel gears, first and second bevel pinions and a propeller, said first driving means connected between said motive power source and said first bevel gear, said second driving means comprising a sleeve connected to said first bevel pinion, said third driving means connected at its lower end to said second bevel gear and extending into said second driving means, first keying means for providing a rotation lock and telescoping movement between said second and third driving means, said fourth driving means connected between said second bevel pinion and said propeller; first and second housing means, first bearing means for mounting said first bevel pinion and said first bevel gear in said first housing means whereby said first and second driving means are substantially right angularly disposed, second bearing means for mounting said second bevel pinion and said second bevel gear in said second housing means whereby said third and fourth driving means are substantially right angularly disposed; propeller steering means including first hollow steering means rigidly fixed to said second housing means and extending through said third driving means, second hollow steering means, steering gears and steering power means, said second hollow steering means connected at one end to said steering gears and said steering gears connected to said steering power means, said second hollow steering means telescoping over said first hollow steering means away from said first end, second keying means for providing rotational lock and telescoping movement between said first and second hollow steering means, said steering power means rigidly mounted on said first housing means; and propeller raising means including a propeller raising power means, a securing means having a mechanical connection therein, said securing means secured to said first hollow steering means in the interior thereof, and mechanical means connected between said raising power means and said mechanical connection whereby said propeller is raised upon the application of power from said raising power means.


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