Dec. 5, 1944. J. T. TROTH 2,364,255

COMBINED PROPELLING AND STEERING MEANS FOR VESSELS

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Fig. 1.

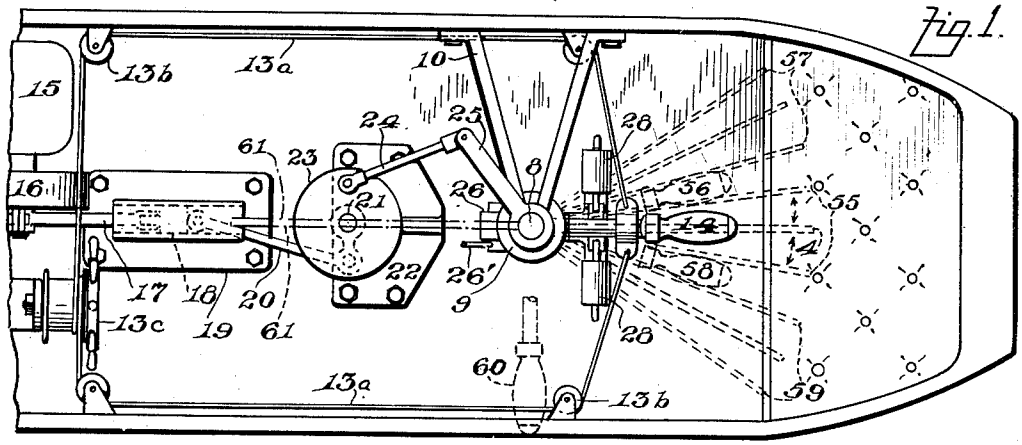


Fig. 2.

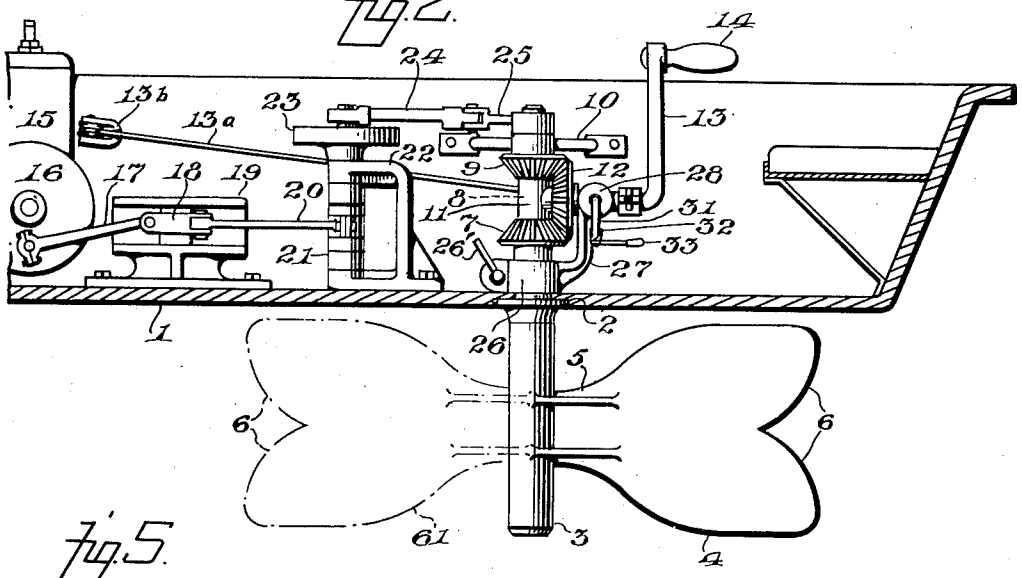


Fig. 5.

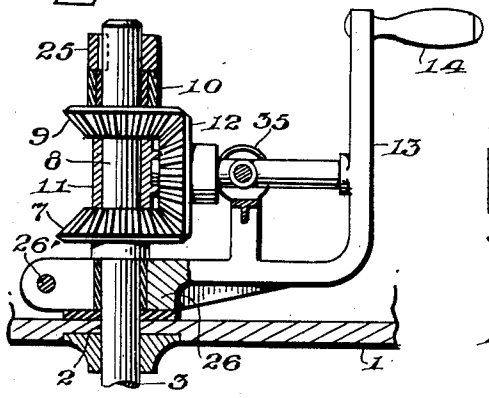
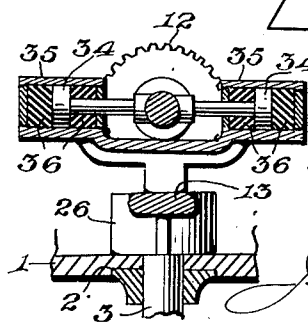


Fig. 6.



Inventor
John T. Troth
J. Stuart Freeman,
Attorney

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Fig. 4.

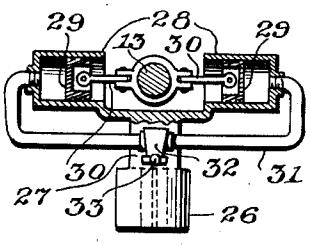


Fig. 3.

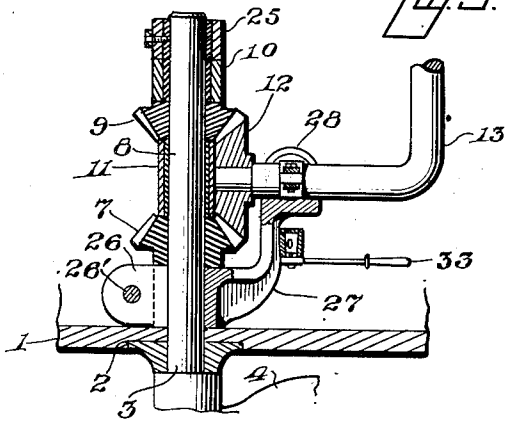


Fig. 7.

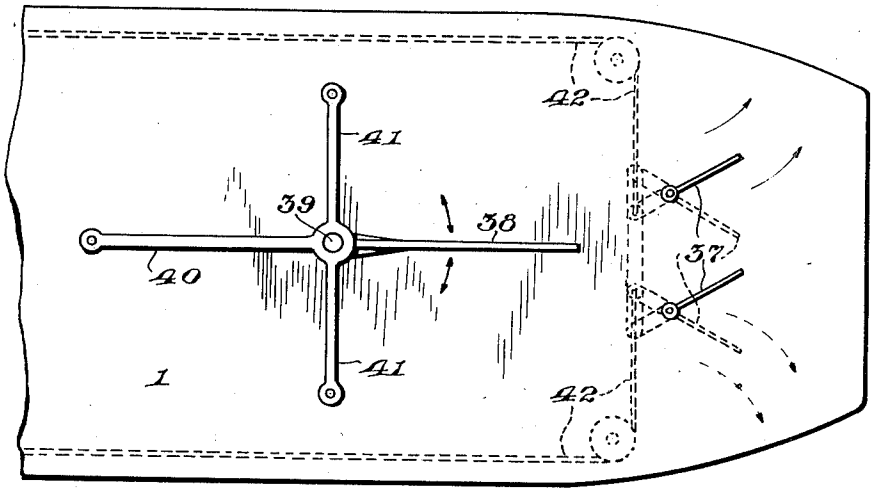


Fig. 8.

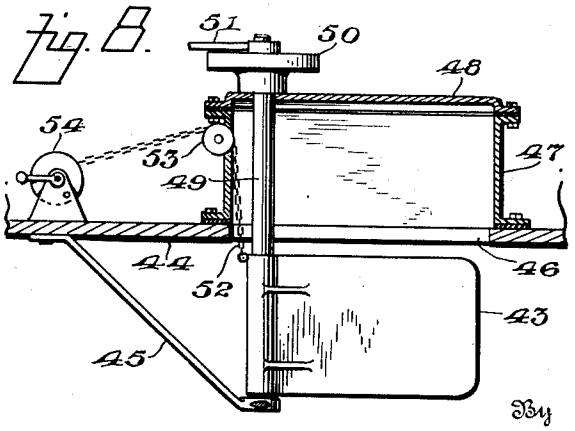
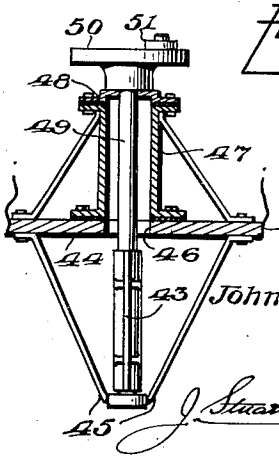


Fig. 9.



Inventor
John T. Troth

By J. Stuart Freeman

Attorney

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UNITED STATES PATENT OFFICE

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COMBINED PROPELLING AND STEERING MEANS FOR VESSELS

John T. Troth, Wayne, Pa.

Application June 17, 1943, Serial No. 491,197

12 Claims. (Cl. 115—29)

The object of the invention is to provide improvements in means for propelling vessels, but more especially in that type which simultaneously operates to steer the vessel as well.

Another object is to provide a simple mechanism, whereby the reciprocatory motion derived from an internal combustion engine or equivalent source of power, through flywheel and connecting link, is transformed into an angularly oscillatory motion in a horizontal plane, for the angular oscillation of a propelling vane or fin.

A further object is to provide a suitable differential mechanism, whereby the neutral position of the propelling vane can be readily shifted, either by hand, motor, or auxiliary engine, so that resulting changes in the general direction of operation of said vane develops an angular thrust and thereby effects a turning of the vessel.

Still another object is to provide a mechanism of this nature, wherein the angular shift of the amplitude of oscillation of the vane is a multiple of that of the angular displacement of the tiller or equivalent steering device, and thereby effects a complete reversal of the propelling vane and its characteristic function upon the steering device being angularly altered only a fraction of the same arc from its normal rearward position.

A still further object is to provide means for locking the steering device in a given position, so as to thereby maintain a predetermined course of the vessel, and also means to damp the vibration which would otherwise be imparted to the steering device by the source of reciprocatory power.

And a still further object is to provide means for lifting the propelling vane out of the water and into the protected confines of a so-called centerboard housing, whereby drag of the propellor when idle, as in the case of a sailing vessel under sail, will not offer a deterrent to the otherwise free motion of the vessel under the impulse of the wind.

With the objects thus briefly stated, the invention comprises further details of construction and operation, which are hereinafter fully brought out in the following description, when read in conjunction with the accompanying drawings, in which Fig. 1 is a plan view of the stern portion of a vessel equipped with one embodiment of the invention; Fig. 2 is a central vertical section of the same; Fig. 3 is an enlarged fragmentary sectional view of the propelling and steering gear train; Fig. 4 is a longitudinal section of a hydraulic vibration-damping means; Fig. 5 is a view similar to Fig. 3, but showing a modified form of the device; Fig. 6 is a sectional view similar to that of Fig. 4, but showing the resilient cushioning shock-absorber used in the device shown in Fig. 5; Fig. 7 is a bottom plan view of the stern of a vessel provided with the improved propelling mechanism, but with a double rudder for steering said vessel; Fig. 8 is a central section showing how the propelling vane can be raised into the protection of a centerboard housing; and Fig. 9 is a vertical transverse section of the same.

Referring to Figs. 1 to 5 of the drawings, the hull 1 of a vessel is shown as being provided with an aperture 2, through which rotatably extends a shaft 3, upon the lower protruding end portion of which is secured a preferably flexible vane 4. This vane may be of various shapes, but a shape simulating that of the average fish tail has been found to give best results, due to the fact that there is a minimum height of the relatively inflexible portion 5 of the vane adjacent to said shaft, while there is provided a maximum height or width at the relatively flexible free end portion 6 farthest from said shaft.

Shortly above the inner surface of said hull, a bevel gear 7 is secured to said shaft, while above said gear a portion 8 of said shaft extends freely upwardly and supports a loosely mounted bevel gear 9, above which said shaft is journalled in a suitable bracket 10, secured to one or both of the sides of said hull. Between said bevel gears a sleeve 11 is also loosely mounted upon said shaft, and a radially extending lug upon said sleeve carries an intermediate or differential bevel gear 12, beyond which said lug preferably merges into a tiller lever 13 carrying a handle grip 14.

A motor 15 is also mounted within said vessel, and from its flywheel 16 extends a link 17, connected at its opposite end to a crosshead 18, slidable in a rectilinear path between guides 19. From said crosshead also extends a second link 20 to an arm on shaft 21, which shaft extends vertically between the spaced arms of a bracket 22, upon the upper free end portion of said last-mentioned shaft being secured a flywheel or pair of balanced levers 23, which are connected through a link 24 with a lever 25, the radially inner end of which is loosely mounted upon the upper free end of said vane-carrying shaft 3, and secured to and operative to oscillate the upper bevel gear 9.

Between the floor of said hull and the lowermost bevel gear 7, a split collar 26 surrounds said last-mentioned shaft and is normally free to move thereon, but may be locked in any angular position by the clamp 26'. From this collar an arm 27 extends upwardly and is provided upon

its uppermost portion with a pair of cylinders 28 in axial alignment upon the opposite sides of said tiller by links 30. The interiors of said cylinders are connected together by means of a tube or pipe 31, in which is positioned a retarding valve 32, the orifice of which can be adjusted and even closed entirely, the passageway through said valve being manually adjustable by means of a suitable lever 33. This structure serves as a shock absorber or dampener of the sudden reversal in direction of the lever 25 and gear 9, so that by not yielding to such vibrations or oscillations, the gear transmits substantially all of the oscillatory power from the driving gear 9 to the driven gear 7, and thereby causes the full power of the engine to be effectively transmitted to the shaft 3 and the vane 4 supported thereby. By clamping the lever 26', the collar 26 and the tiller 13 are secured in any desired position, thereby maintaining the vessel on a given course, especially for periods during which it is necessary to relinquish the tiller. From a forward position in said vessel the tiller may be operated within certain limits by means of the usual steering cable over pulleys 13b and regulated by a steering wheel 13c.

A modified form of this device is shown in Fig. 6, wherein pistons 34 are yieldingly maintained in their central positions as to the surrounding cylinders 35 by means of rubber packing 36 or its equivalent, such as various forms of springs and rubber substitutes. This form is more simple than that first described, since it requires no piping or valve, but on the other hand does not offer an opportunity to vary the resistance which it offers to vibrations, that is, by permitting in effect a tensioning of the vibration-resisting medium by means of a valve, as is possible in the first instance.

Referring to Fig. 7, there is here shown a modified form of steering means, comprising a plurality of spaced rudders 37 that are maintained at all times in parallel relation by any suitable means, and are positioned symmetrically and to the rear of the propelling vane 38, which is driven in any suitable manner (as by the engine hereinbefore described), so as to oscillate angularly about its supporting shaft 39, which is fixedly positioned by means of a central forward strut 40 and a pair of lateral struts 41, having the relative angular positions as those shown in Figs. 8 and 9. Said rudders may be manipulated in any suitable manner, as for instance by means of the steering cable 42, to which they are attached at a distance apart equal to that of their axes.

Referring to Figs. 8 and 9, there is here shown means for retracting or elevating the propelling and/or steering vane 43 above the level of the hull 44, when not in use, as for instance when said vane is not required as a propelling means on a sailboat, and there is separate steering means present. In such case, by lifting said vane, it does not act as a retarding factor in the passage of the hull through the water, while its positioning struts 45 are streamlined so as to still further minimize such resistance. Essentially this device comprises a centrally positioned and longitudinally elongated aperture 46 in said hull, while above said aperture is a housing 47 having a removable cover 48. The vane-carrying shaft 49 passes upwardly thru said housing and through said cover, above which it is provided with or is connected to any suitable driving (i. e., oscillating) means represented by the head 50 and lever 51. Such driving mechanism may combine the double feature of causing said vane to both propel and steer the vessel, if desired, in a manner similar to that hereinbefore described. When not in use, said vane is elevated by means of a chain 52, which passes over a pulley 53 and around a suitable winding device 54, which may be either hand- or engine-driven.

In the operation of the invention, as illustrated by Figs. 1 to 6 inclusive, rotary motion of the flywheel 16 by the engine 15 is changed to reciprocatory motion of the crosshead 18, from which angularly oscillatory motion is imparted to the shaft 3 and vane 4 through the lever 24 and gears 9, 12 and 7. If the tiller 14 is in central position, the oscillation of the vane is equal upon each side of the central line of symmetry of the vessel, as indicated by the pair of dotted lines 55. If it is desired to deflect the course of the vessel to the starboard, the tiller is moved angularly into the position indicated at 56, wherein the vane oscillates between the limits indicated by the dotted lines 57. In any case, the angular movement of the tiller is only a fraction of the displacement of the neutral position of the vane laterally of the center line of the vessel.

From this fact, it will be apparent, for example, that by shifting the tiller 90° to a position at right angles to and upon either side of the center line of the vessel, as indicated at 60, the neutral position of the vane will be shifted or displaced forwardly to the central position indicated at 61, thereby causing the same motion of the engine, without alteration, to cause the vessel to move rearwardly or towards the stern. As the operation is the same upon either side of its central rearward position, only one reverse position of the tiller is shown, the corresponding reverse position of the vane being the same in both cases.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:

1. The combination of a vessel, with a shaft, a vane carried by said shaft, a motor, an oscillatory member driven by said motor, a differential between said member and said shaft to vary the mid-position of the oscillations of said shaft with respect to said member to steer said vessel.

2. The combination of a vessel, with an upright shaft, a vane carried by said shaft, a motor, an oscillatory gear driven by said motor, a gear carried by said shaft, and a differential gear connecting said first gears, whereby angular movement of said last-mentioned gear shifts the mid-position of said shaft gear with respect to the mid-position of said motor-driven gear to steer said vessel.

3. The combination of a vessel, with a shaft, a vane carried by said shaft, a motor, an oscillatory member driven by said motor, a differential between said member and said shaft to vary the mid-position of the oscillations of said shaft with respect to said member to steer said vessel, and means to absorb the vibrations of the axis of said differential gear.

4. The combination of a vessel, with an upright shaft, a vane carried by said shaft, a bevel gear also carried by said shaft, a motor, an oscillatory bevel gear driven by said motor and having an axis coincident with the axis of said shaft gear, and a differential gear connecting said first gears, and a tiller connected to and operative to angularly shift said last-mentioned gear.

5. The combination of a vessel, with an upright

shaft, a vane carried by said shaft, a bevel gear also carried by said shaft, a motor, an oscillatory bevel gear driven by said motor and having an axis coincident with the axis of said shaft gear, and a differential gear connecting said first gears, and a tiller connected to and operative to angularly shift said last-mentioned gear, and means to absorb vibrations imparted to said tiller.

6. The combination of a vessel, with a shaft, a vane secured to said shaft, a bevel gear also secured to said shaft, a second bevel gear loosely mounted upon said shaft, a third and intermediate gear connecting said first gears and loosely mounted to oscillate about the axis of said shaft, a tiller lever secured to and operative to angularly shift said last-mentioned gear with respect to said shaft, a motor, and means to transmit oscillatory power from said motor to said second gear, said vane being operative to propel and steer said vessel when in any angular position with respect to the angular position of said shaft about its axis.

7. The combination of a vessel, with a shaft, a vane secured to said shaft, a bevel gear also secured to said shaft, a second bevel gear loosely mounted upon said shaft, a third and intermediate gear connecting said first gears and loosely mounted to oscillate about the axis of said shaft, a tiller lever secured to and operative to angularly shift said last-mentioned gear with respect to said shaft, an engine, and means to transmit oscillatory power from said motor to said second gear, said vane being operative to propel and steer said vessel when in any angular position with respect to the angular position of said shaft about its axis, and means to absorb angular vibrations of said intermediate gear.

8. The combination of a vessel, with a shaft, a vane secured to said shaft, a bevel gear also secured to said shaft, a second bevel gear loosely mounted upon said shaft, a third and intermediate gear connecting said first gears and loosely mounted to oscillate about the axis of said shaft, a tiller lever secured to and operative to angularly shift said last-mentioned gear with respect to said shaft, a motor, and means to transmit oscillatory power from said motor to said second gear, said vane being operative to propel and steer said vessel when in any angular position with respect to the angular position of said shaft about its axis, and means to lock the angular position of said intermediate gear with respect to the axis of said shaft to maintain said vessel upon a predetermined course.

9. The combination of a vessel, with a shaft, a vane carried by said shaft, a motor, an oscillatory member driven by said motor, a differential between said member and said shaft to vary the mid-position of the oscillations of said shaft with respect to said member to steer said vessel, and means to absorb the vibrations of the axis of said differential gear, said last-named means comprising oppositely positioned resilient media.

10. The combination of a vessel, with an upright shaft, a vane carried by said shaft, a motor, an oscillatory gear driven by said motor, a gear carried by said shaft, and a differential gear connecting said first gears, whereby angular movement of the axis of said last-mentioned gear shifts the mid-position of said shaft gear with respect to the mid-position of said motor-driven gear to steer said vessel, and means to absorb the vibrations of the axis of said differential gear, said last-named means comprising oppositely positioned resilient media.

11. The combination of a vessel, with an upright shaft, a vane carried by said shaft, a motor, an oscillatory gear driven by said motor, a gear carried by said shaft, and a differential gear connecting said first gears, whereby angular movement of the axis of said last-mentioned gear shifts the mid-position of said shaft gear with respect to the mid-position of said motor-driven gear to steer said vessel, and means to absorb the vibrations of the axis of said differential gear, said last-named means comprising oppositely positioned cylinders and pistons, said cylinders being connected by a tube, fluid within said cylinders and said tube, and a flow-retarding valve between said cylinders.

12. The combination of a vessel, with an upright shaft, a vane carried by said shaft, a motor, an oscillatory gear driven by said motor, a gear carried by said shaft, a differential gear connecting said first gears, whereby angular movement of the axis of said last-mentioned gear shifts the mid-position of the arc of oscillation of said shaft gear to steer said vessel, and means to absorb the vibrations of the axis of said differential gear.

JOHN T. TROTH.