

Feb. 4, 1947.

B. D. LAW

2,415,183

BOAT PROPELLING AND STEERING UNIT

Filed March 22, 1943

2 Sheets-Sheet 1

Fig. 1

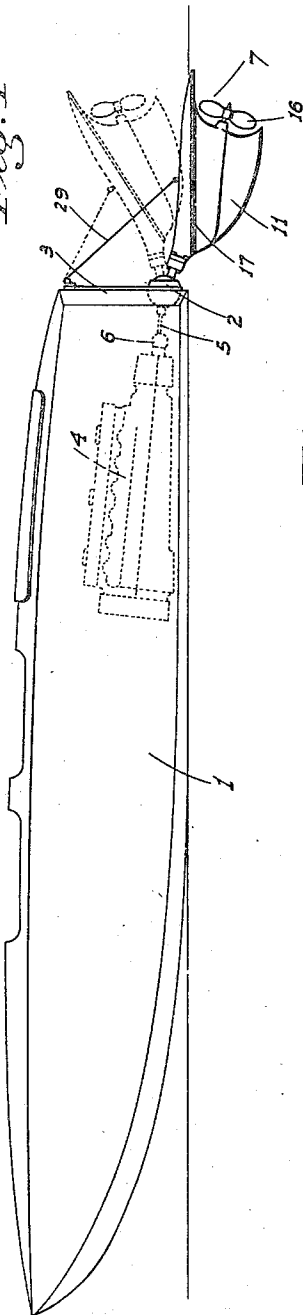


Fig. 6

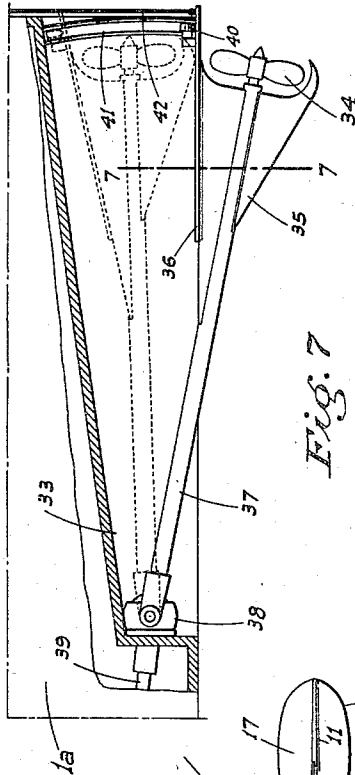


Fig. 7

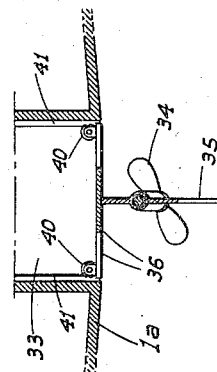
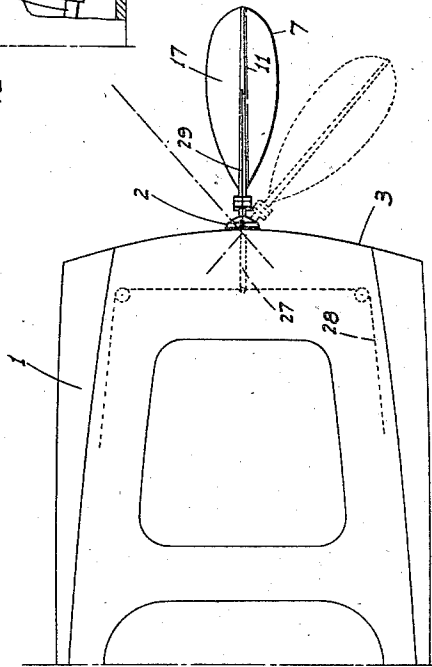


Fig. 2



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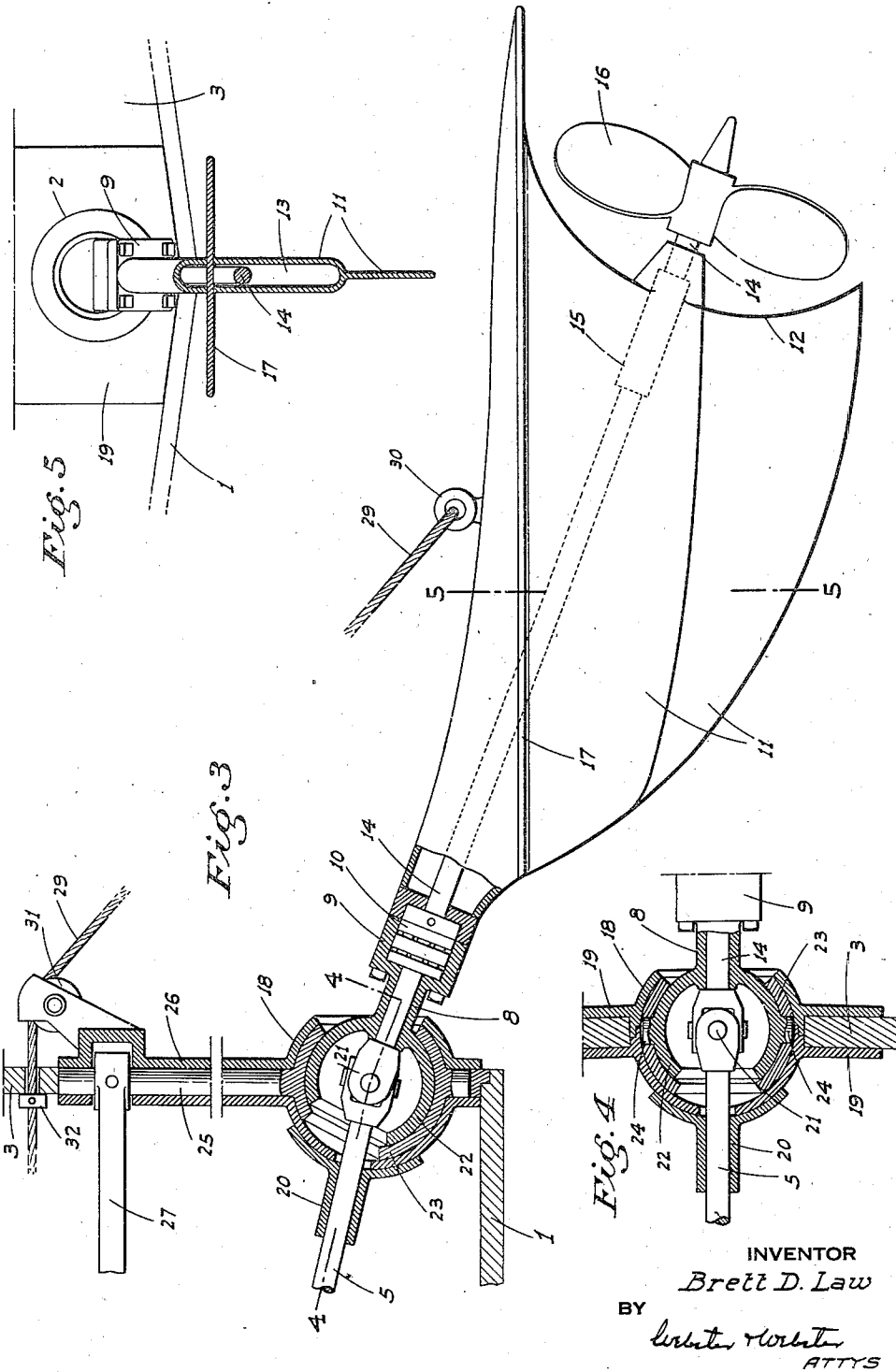
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,415,183

BOAT PROPELLING AND STEERING UNIT

Brett D. Law, Merced, Calif.

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7 Claims. (Cl. 115—35)

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This invention relates in general to boat propulsion and steering mechanism, and in particular the invention is directed to, and it is an object to provide, a unique boat propelling and steering unit, which while being adaptable to many types of boats, is especially designed for use in connection with racing and runabout type hulls.

Another object of the instant invention is to provide a boat propelling and steering unit which comprises, in unique arrangement, a propeller and a shaft, a vertically disposed protective fin leading the propeller, and a stabilizing and anti-cavitation plate disposed above the propeller. This assembly, hereinafter referred to as the propeller assembly, is connected at its forward end with, and in trailing relation from, a universal unit of the ball and socket type mounted in the transom of the boat centrally of its sides and adjacent the bottom; the propeller shaft being driven through said ball and socket unit and the propeller assembly, by virtue of its connection with said ball and socket unit, being vertically swingable and horizontally steerable. The combination stabilizing and anti-cavitation plate functions not only to prevent cavitation of the propeller but with forward movement of the boat causes the propeller assembly to constantly maintain a predetermined level position relative to horizontal or the surface of the water, regardless of the planing or riding angle of the boat, which changes with water conditions, speed, etc. By so stabilizing the propeller assembly, the propeller is always maintained at the correct position for most effective operation, reducing power loss to a minimum, while maintaining high propeller efficiency.

A further object of this invention is to provide a boat propelling and steering unit, as in the preceding paragraph, in which said ball and socket unit is of novel design whereby to permit of the drive of the propeller shaft and manual steering of the trailing propeller assembly by means extending through or included in said unit. Such drive of the propeller shaft and steering of the trailing propeller assembly is accomplished without restricting upward vertical swinging or tilting of said propeller assembly when the propeller is under power or otherwise, and regardless of the steering angle of said assembly. This is an important feature, as it effectively prevents damage to the under-water portion of the propeller assembly, i. e. such assembly if it strikes a sunken object or rides over a sand bar or the like is free

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to swing or tilt upwardly at any time and clear the object.

An additional object of this invention is to provide, in combination with a trailing vertically swingable propeller assembly as described, a flexible cable which extends from said propeller assembly upwardly and thence forwardly; said cable being arranged so as to enable the propeller assembly to be raised wholly out of the water but normally functioning to support said assembly at a depth with the stabilizing and anti-cavitation plate substantially horizontal and the propeller in correct driving position.

It is also an object to provide a boat propelling and steering unit as described in which the ball and socket unit is hollow, the drive mechanism for the propeller including a universal joint within said ball and socket unit; there being a drive shaft extending from said universal joint into the boat for connection with the motor unit, and another universal joint connected between said drive shaft and said motor unit. This arrangement of universal joints assures a smooth drive of the propeller shaft regardless of motor vibration and without necessity of precision motor alinement.

The invention has for a further object the provision, as a modification of the invention, of a boat propelling assembly substantially as described, but which does not include the steering feature yet retains the vertical swinging or tilting feature; the boat including a longitudinal tunnel in its bottom extending from amidships to the stern and the propeller assembly being mounted to swing upwardly into the tunnel, though when in operation normally being mainly below said tunnel.

A further object of the invention is to provide a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a somewhat diagrammatic elevation of a runabout type boat embodying my improved boat propelling and steering unit; said unit being shown in operative position in full lines and in raised position in dotted lines.

Figure 2 is a fragmentary diagrammatic plan

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view illustrating different steering angles of the unit.

Figure 3 is an enlarged fragmentary elevation partly in section of the unit as attached to the transom of a boat.

Figure 4 is an enlarged fragmentary sectional plan of the transom-mounted ball and socket unit from which the propeller assembly trails, and through which the propeller shaft is driven.

Figure 5 is a fragmentary cross section of reduced scale, on line 5—5 of Fig. 3.

Figure 6 is a fragmentary elevation of the propeller assembly with the steering feature omitted, but mounted for vertical swinging movement into a tunnel in the bottom of the boat.

Figure 7 is a fragmentary cross section on line 7—7 of Fig. 6.

Referring now more particularly to the characters of reference on the drawings, and at present to the structure shown in Figs. 1-5, inclusive, the numeral 1 indicates the hull of a boat, here shown diagrammatically as a runabout type. A ball and socket unit, indicated generally at 2, hereinafter described in detail, is mounted in and extends through the transom 3 centrally between the sides and adjacent the lower edge of the latter. A motor and transmission unit, indicated generally at 4, is mounted in the hull 1, a drive shaft 5 extending rearwardly from the motor and transmission unit 4 into the ball and socket unit 2, there being a conventional universal joint 6 interposed between shaft 5 and motor unit 4.

A propeller assembly 7 is mounted at its forward end in connection with the ball and socket unit and trails the latter; said propeller assembly being actuated, i. e. driven and steered through the ball and socket unit. This assembly 7 is constructed and mounted in connection with the ball and socket unit 2, as follows:

At its forward end the propeller assembly includes a neck 8 which projects forwardly from a cylindrical housing 9 which encloses thrust bearings 10. Rearwardly of housing 9 and formed integral therewith, the assembly includes a streamlined fin 11 disposed vertically and which increases in height toward its rear end which is concave as shown at 12. The upper portion of the fin 11 is hollow lengthwise as at 13, and the propeller shaft 14 extends through neck 8, thrust bearings 10, said hollow portion 13 of fin 11, and thence projects rearwardly out of the fin through a water-tight bearing 15 mounted intermediate the ends of the concave portion 12 of said fin. A propeller 16 is secured on said projecting portion of the shaft 14 and is disposed relatively closely adjacent said fin; the fin at its rear end being of a height somewhat greater than the diameter of the propeller 16 whereby to extend above and below the same in protective relation thereto.

Above the propeller and on opposite sides of the fin the latter is formed with a stabilizing and anti-cavitation plate 17 which is normally horizontally disposed. When said stabilizing and anti-cavitation plate 17 is in horizontal position the neck 8, housing 9, and propeller shaft 14 are disposed at a slight downward slope from the ball and socket unit 2, and said plate is disposed so as to ride slightly below the surface of the water.

The ball and socket unit 2 is of special construction and comprises the following:

A fixed outer socket 18 extends through the transom 3 and is secured in connection therewith by means of integral retaining channels 19 which extend radially from said socket. The

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drive shaft 5 extends into the socket 18 through a bearing sleeve 20 fixed in connection therewith, and the propeller shaft 14 likewise projects into the socket 18 through an opening in the opposite side; adjacent ends of shafts 5 and 14 being connected by a conventional universal joint 21 disposed within the hollow ball and socket unit. A hollow ball 22 is formed integrally on the inner end of neck 8 and surrounds the universal joint 21 within the socket 18, the ball 22 being open at the end adjacent shaft 5 to permit passage of the latter in clearance relation. An intermediate ball 23 is disposed with a close running fit between ball 22 and socket 18, and such intermediate ball 23 is open at opposite ends to permit of passage therethrough in clearance relation of the neck 8 and shaft 5 respectively. The ball 22 is pinned to the intermediate ball 23 by trunnions 24 which project horizontally and laterally from opposite sides of ball 22. A vertical stem 25 is formed integral with or secured on the intermediate ball 23 at the top and projects upwardly through a sleeve 26 formed as a unit with the socket 18. Adjacent its upper end the stem 25 is fitted with a radial, forwardly projecting tiller handle 27 which extends into the hull and to which opposed tiller lines 28 are connected.

By virtue of the above described ball and socket assembly it will be apparent that the propeller assembly may swing or tilt vertically with ball 22 rotating within ball 23, even when the propeller is under power from the shaft 5. Consequently when the boat is in operation and moving forwardly, even though at high speed, the stabilizing and anti-cavitation plate 17 will maintain the propeller assembly level and the latter will not respond to changes in the planing or riding angle of the boat which may occur due to water conditions, speed, etc. Thus the plate 17, in addition to its function as an anti-cavitation means, likewise assures that the propeller is always disposed in correct position, which minimizes power loss and results in high propeller efficiency.

The construction of the ball and socket unit also is such that the propeller assembly may be steered horizontally by the tiller handle 27 when said assembly is in operation and regardless of its vertical or tilted angle. This steering motion is transmitted to the ball 22 from the ball 23 by means of the laterally projecting horizontal trunnions 24.

In other words, the ball and socket arrangement is such that the propeller assembly is relatively vertically swingable about said trunnions as an axis, whereby the assembly can remain level, while the tiller handle 27 through the medium of stem 25 and ball 23 functions to swing the ball 22 horizontally whereby to steer the trailing assembly and the boat.

In order to prevent the propeller assembly from swinging downward to a position with plate 17 at an angle below horizontal, i. e. below proper driving angle, a flexible cable 29 is connected at one end with an upstanding eye 30 on the propeller assembly at the top intermediate its ends, and thence extends upwardly and forwardly over a pulley 31 adjacent the transom and above the ball and socket unit. From the pulley 31 the cable extends forwardly to a cable control mechanism (not shown) operative from the driver's seat. A stop element 32 is fixed on the cable 29 ahead of a fixed member such as the transom, whereby to limit lowering movement of the propeller assembly to a point with the stabil-

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izing and anti-cavitation plate 17 substantially horizontal.

In Figs. 6 and 7 there is illustrated a modified mounting for the propeller assembly. In this embodiment the hull 1a is formed with a tunnel 33 which extends from amidships rearwardly to the stern through which it opens. The propeller assembly, indicated generally at 34, and which includes a fin 35 and an anti-cavitation plate 36 in substantially the same arrangement as above described, is mounted for vertical swinging movement into and out of the tunnel 33 by the following arrangement:

In this embodiment the propeller assembly includes an elongated forwardly extending propeller shaft housing 37 which is connected with a ball and socket unit 38 at the head of the tunnel for vertical swinging movement only, the steering feature being eliminated. The drive shaft 39 from the motor and transmission unit drives the propeller shaft through the ball and socket unit 38 in substantially the same manner as previously described.

At its rear end and adjacent its side edges, the stabilizing and anti-cavitation plate 36 is fitted with rollers 40. These rollers ride in vertically disposed arcuate tracks 41 fixed on opposite sides of the tunnel at its rear end. A flexible cable 42 corresponds to the cable 29 and serves the same purpose, namely to normally limit downward movement of the propeller assembly 34, and to raise the latter into the tunnel when desired.

In this embodiment of the invention it will be seen that when the propeller assembly 34 is in operative position as shown in full lines in Fig. 6, said assembly is free to float vertically upwardly from its normal driving position, whereby, although the assembly normally rides level when the boat is moving forwardly, said assembly may swing upwardly should an under-water obstruction be encountered.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention, as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. A propelling and steering unit for a power boat, said unit comprising a separate propeller assembly which includes a shaft having a propeller mounted thereon, and a support for the shaft including a vertical protective fin leading the propeller, and a stabilizing and anti-cavitation plate disposed above the propeller and extending laterally on opposite sides of said fin; a universal unit adapted to connect said propeller assembly in trailing relation from the stern of the boat and for relative swinging movement both vertically and horizontally, and separate means operating through said universal unit to drive said assembly and to independently swing the assembly horizontally to steer the boat; the assembly swinging means including a ball seated in a socket in the universal unit, the ball being exposed to the stern of the boat and said assembly being fixed to said ball, a vertical stem

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fixed on said ball, and a forwardly projecting tiller arm secured to said stem.

2. A propelling and steering unit for a power boat, said unit comprising a propeller assembly which includes a shaft having a propeller secured thereon, and a support for the shaft which includes a vertical protective fin leading the propeller and a stabilizing and anti-cavitation plate above the propeller and extending laterally on opposite sides of the fin; a ball and socket unit adapted to be mounted on the stern of the boat with the ball exposed, said assembly connecting at its forward end with said ball, means driving through said ball and socket unit operative to drive the propeller shaft, and separate means operative to rotate said ball about a vertical axis whereby to swing the propeller assembly horizontally to steer the boat, said last named means being operative without restricting rotation of said ball about a horizontal axis whereby said assembly is free for relative upward tilting from a normal level running position.

3. A propelling and steering unit as in claim 2 in which said ball and socket unit includes an intermediate ball cooperatively engaged between the first named ball and the socket, trunnions projecting transversely from opposite sides of said first named ball and engaging in corresponding bores in said intermediate ball, and means securing said intermediate ball in the socket for selectively controlled rotation about a vertical axis only whereby to correspondingly swing the propeller assembly horizontally and to steer the boat.

4. A propelling and steering unit as in claim 2 in which said ball and socket unit includes an intermediate ball cooperatively engaged between the first named ball and the socket, trunnions projecting transversely from opposite sides of said first named ball and engaging in corresponding bores in said intermediate ball, and means securing said intermediate ball in the socket for selectively controlled rotation about a vertical axis only whereby to correspondingly swing the propeller assembly horizontally and to steer the boat, said means including a stem upstanding from said intermediate ball and projecting upwardly through and from the socket and a tiller handle secured to and projecting forwardly from said stem.

5. A propelling and steering unit for a power boat, said unit comprising a propeller assembly which includes a shaft having a propeller secured thereon, and a support for the shaft which includes a vertical protective fin leading the propeller and a stabilizing and anti-cavitation plate above the propeller and extending laterally on opposite sides of the fin; a ball and socket unit adapted to be mounted on the stern of the boat with the ball exposed, said assembly connecting at its forward end with said ball, and separate means operating through said ball and socket unit to drive said propeller assembly and to independently swing the assembly horizontally to steer the boat, said assembly being relatively vertically swingable, upwardly from a given operating position, independent of said separate means.

6. A propelling and steering unit for a power boat, said unit comprising a propeller assembly which includes a shaft having a propeller secured thereon, and a support for the shaft which includes a vertical protective fin leading the propeller and a stabilizing and anti-cavitation plate above the propeller and extending laterally on opposite sides of the fin; a ball and socket unit adapted to be mounted on the stern of the boat

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with the ball exposed, said assembly connecting at its forward end with said ball, separate means operating through said ball and socket unit to drive said propeller assembly and to independently swing the assembly horizontally to steer the boat, said assembly being relatively vertically swingable, upwardly from a given operating position, independent of said separate means, a flexible cable connected with said propeller assembly some distance rearwardly of the ball and socket unit and thence extending upwardly and forwardly for manually controlled actuation, a stop element on said cable, and a member against which said element is adapted to abut upon predetermined lengthwise movement of said cable in a propeller assembly lowering direction whereby to limit lowering of said assembly to said given operating position.

7. In combination with a boat having a transom, a hollow ball and socket unit mounted on and extending through said transom, a motor unit in the boat including a drive shaft projecting into the ball and socket unit, the ball of the unit being exposed to the outside of the transom, an initially separate propeller assembly including a shaft having a propeller thereon, a protective fin leading the propeller and a stabilizing and anti-cavitation plate above the propeller; means securing said assembly to the ball in trailing relation, the propeller shaft extending from said assembly into the ball, a universal joint connecting adjacent ends of the drive and propeller shafts within the ball, and means to swing

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the ball about a vertical axis whereby to steer the boat, said last-named means being associated with the ball and socket unit and arranged for operation without restricting relative vertical swinging of said propeller assembly.

BRETT D. LAW.

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