Nov. 10, 1959 E. C. KIEKHAEFER 2,911,936

RESILIENT MOUNTING FOR AN OUTBOARD MOTOR

Filed June 3, 1955 3 Sheets-Sheet 1

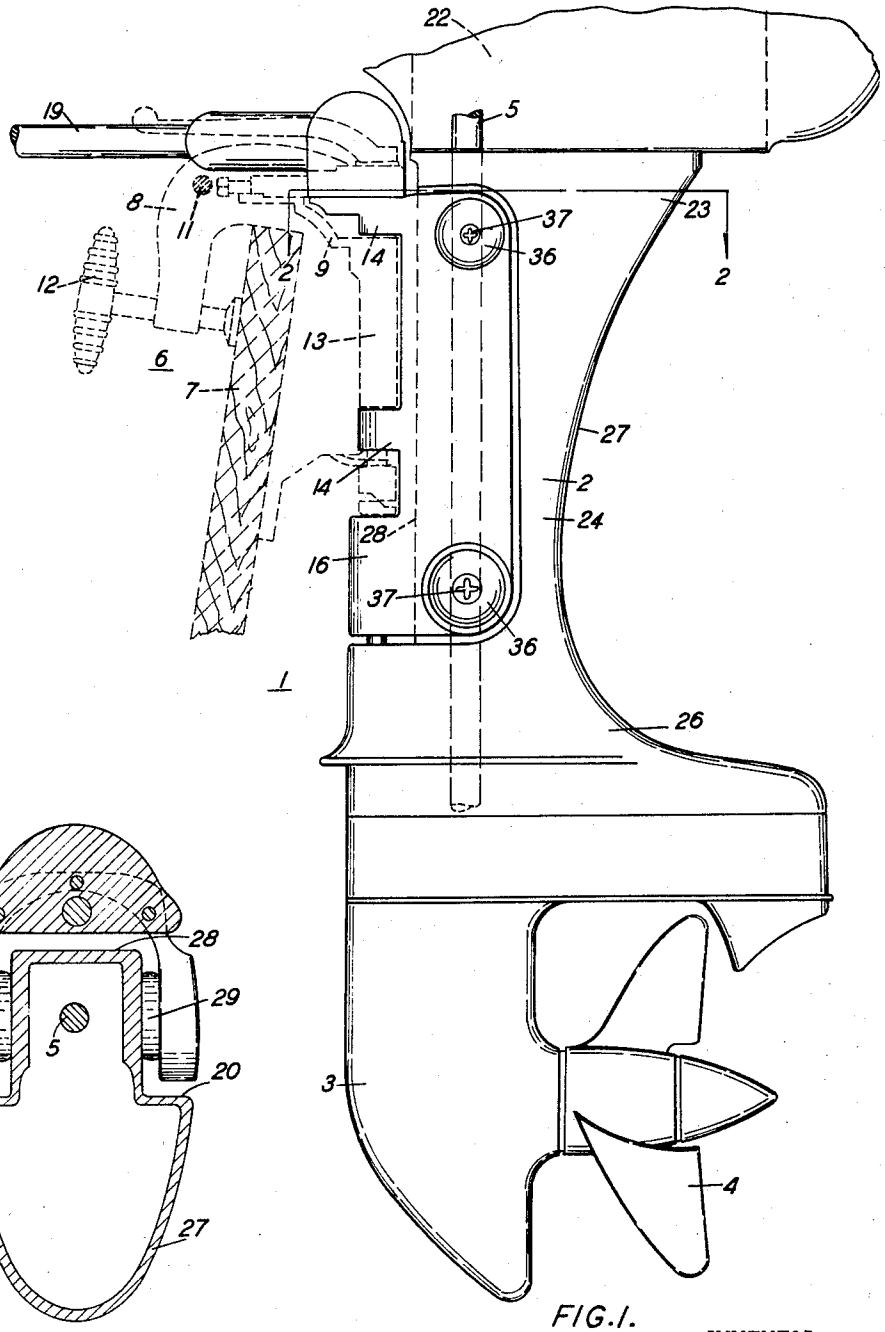


FIG. 1.

FIG. 2.

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RESILIENT MOUNTING FOR AN OUTBOARD MOTOR

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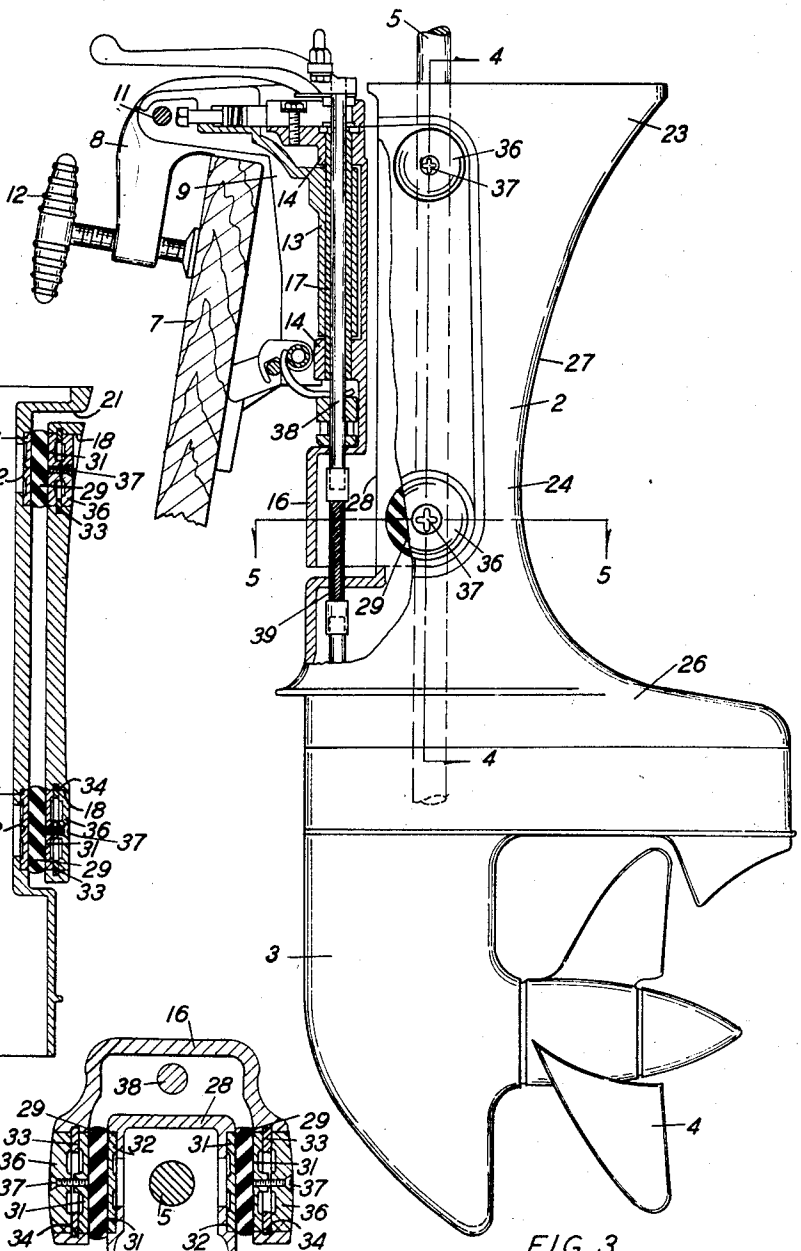


FIG. 3.

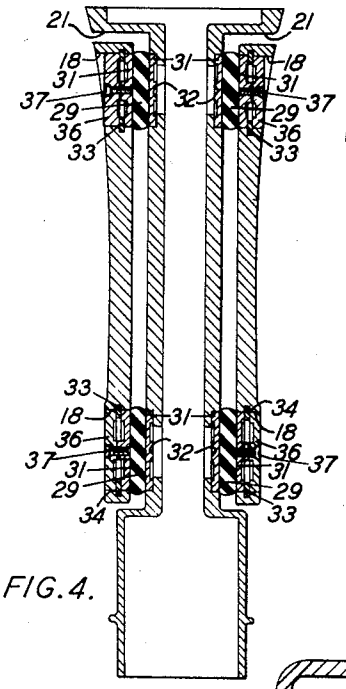


FIG. 4.

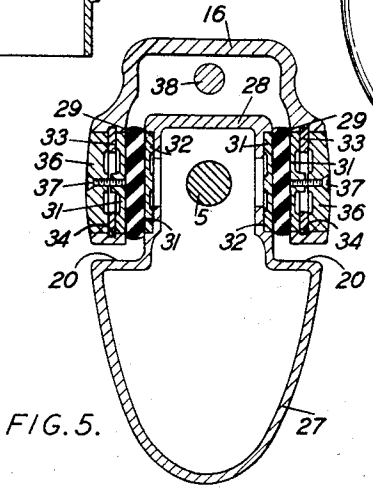


FIG. 5.

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RESILIENT MOUNTING FOR AN OUTBOARD MOTOR

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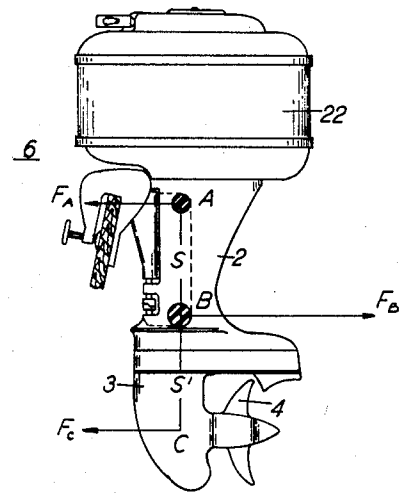


FIG. 6.

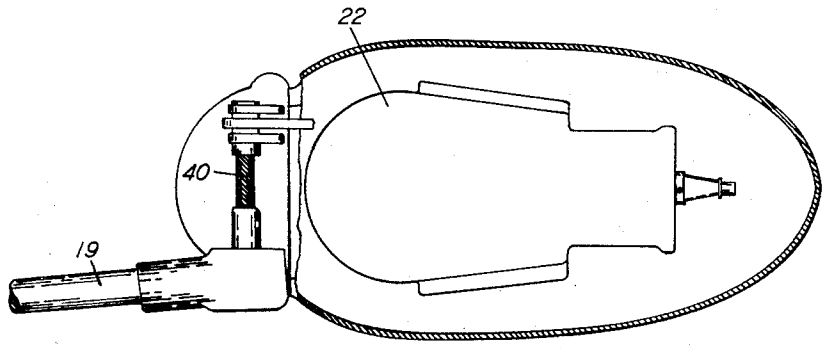


FIG. 7.

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United States Patent Office

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RESILIENT MOUNTING FOR AN OUTBOARD MOTOR

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Application June 3, 1955, Serial No. 513,106

3 Claims. (Cl. 115—17)

This invention relates generally to an outboard motor and more specifically to a resilient mounting therefor which lessens the transmission of vibration shock from the power head and propeller to the motor support and boat.

Heretofore, shock mountings have been developed for cushioning the torque vibration of the power head and propeller unit from the transom bracket and boat. Such mountings, however, do not prevent other types of vibration from being transmitted to the transom bracket and boat. Applicant's invention provides a novel and improved means for resiliently suspending the outboard motor unit comprising the power head, drive shaft and lower unit to vibrationally isolate the outboard motor unit from the supporting bracket and boat.

It is therefore an object of the present invention to suspend or float an outboard motor unit for freedom from torque vibration without transmitting any of such vibrations to the supporting bracket or other support member and thereby to the boat and without in any way interfering with the perfect control of such motor in the course of its pivotal movement for steering.

Another object of the invention is to provide novel means for resiliently suspending the outboard motor unit within a supporting member.

Another object of the invention is the provision of novel resilient means of simple construction requiring fewer parts and less machining than prior known means for vibrationally isolating the outboard motor unit from the boat and supporting member.

Another object of the invention is to provide a resiliently suspended outboard motor unit in which the dynamic forces developed thereby are resisted primarily in shear by the supporting resilient means.

Another object of the invention is the provision of novel resilient means for suspending the outboard motor unit within a supporting member wherein impact resulting from the outboard motor propeller striking and obstruction is absorbed by said resilient means.

Objects and advantages other than those set forth above will be apparent from the following description when read in connection with the accompanying drawing, in which:

Fig. 1 is a side elevation view of a part of an outboard motor embodying the invention;

Fig. 2 is a view in section taken along line 2—2 of Fig. 1;

Fig. 3 is a side elevation view partially in section of the outboard motor structure shown in Fig. 1;

Fig. 4 is a view in section taken along line 4—4 of Fig. 3;

Fig. 5 is an enlarged view in section taken along line 5—5 of Fig. 3;

Fig. 6 is a side elevation view of an outboard motor embodying the invention showing a force diagram of thrust forces acting thereon; and

Fig. 7 is a plan view of Fig. 1 showing the flexible connection between the tiller arm and the power head.

As shown in the drawings, a preferred embodiment of the invention is illustrated as applied to an outboard motor 1 comprising a hollow drive shaft housing 2 for enclosing a drive shaft 5, a gear housing 3 or lower unit connected to the drive shaft housing 2 and carrying a propeller 4 at the lower end thereof, and attachment means 6 for attaching the outboard motor 1 pendently to the transom 7 of a boat, not shown.

The attachment means 6 constituting the support member for the outboard motor unit, comprises a clamp bracket 8 having a generally L-shaped swivel bracket 9 pivotably connected at one end thereto by means of a bolt 11 for pivotal movement in a vertical plane. The clamp bracket 8 is shown as a substantially U-shaped clamp adapted to engage over the upper edge of the transom 7 and carrying a clamping screw 12 at the lower end thereof for engaging the inside of the transom 7 to clamp the transom 7 between the end of the screw 12 and a portion of the clamp bracket 8. The swivel bracket 9 is provided with a vertically extending bushing 13 in register with aligned annular bosses 14 provided in a yoke member 16 and is pivotably connected thereto for pivotal movement in a horizontal plane by means of a hollow pivot pin 17 passing through the annular bosses 14 and bushing 13 and secured to the bosses 14 by means of a press fit. The yoke member 16 is shown in Figs. 1 and 2 as a vertically extending member having a generally U-shaped cross section throughout, and constitutes a part of the attachment means 6. The yoke member 16 is provided with vertically spaced transverse openings 18 as shown in Fig. 4 in each side of the U-shaped member 16 with the corresponding openings of each side being transversely aligned for a purpose to be explained hereinafter.

The hollow drive shaft housing 2 is shown in Fig. 1 with a portion thereof dotted and comprises a single casting having an upper flared region 23, an intermediate convergent region 24, and a lower portion 26 which extends outwardly, both forwardly and rearwardly. The upper and intermediate regions 23, 24 of the drive shaft housing 2 have a cross section substantially shaped in the form of an arrow-head as shown in Figs. 2 and 5 with the rear portion 27 thereof being streamlined to reduce the water resistance of the housing 2 while moving through the water. The front portion 28 of the housing 2 facing the attachment means 6 forms a substantially U-shaped member complementary to the U-shaped inner surface of the yoke member 16.

The front portion 28 of the drive shaft housing 2 is disposed within the U-shaped yoke member 16 and attached thereto and spaced therefrom by means of resilient members shown as discs 29. The resilient discs 29 are shown as circular rubber members although any resilient material having properties and characteristics similar to the rubber may be used. The rubber members 29 are preferably firmly secured between a pair of flat circular plates 31 by bonding or any other suitable means. The sides of the U-shaped front portion 28 of the drive shaft housing 2 are provided with transversely aligned circular recesses 32 as shown in Fig. 4 into which one of the plates 31 of the resilient disc 29 is disposed.

In assembly, the drive shaft housing **2** is connected to the yoke member **16** by disposing the front portion **28** of the drive shaft housing **2** within the yoke member **16** with the circular recesses **32** of the front portion **28** in register or alignment with the corresponding opening **18** of the yoke member **16** as shown in Fig. 4. The resilient discs **29** are then inserted through the openings **18** in the yoke member **16** with the circular plates **31** of the resilient discs **29** mating with the circular recesses **32** of the housing **2**. A clamping means, such as a U-clamp, is used to compress the resilient discs **29**. The resilient discs **29** are locked in place by means of snap rings **33** shown in Figs. 4 and 5 fitting into corresponding annular grooves **34** provided in the yoke member **16**. The streamlined contour of the housing **2** and yoke member **16** is retained by means of caps **36** which are adapted to seat within the openings **18** and present an outer surface generally flush with the outer surface of the yoke member. The caps are secured in place by means of a screw **37** adapted to engage threaded openings in the outer of the circular plates **31**. The outboard motor is preferably designed so that the axial centers of the circular recesses **32** of the drive shaft housing **2** and the openings **18** in the yoke member **16** are positioned to lie in a vertical plane containing the center of gravity of the outboard motor **1** when the outboard motor is in position for normal operation. The center of gravity of the outboard motor unit generally coincides with or is very close to the axis of drive shaft **5** and therefore need not be shown separately in the drawing.

A power head **22**, the drive shaft housing **2** upon which the power head **22** is mounted, and the gear housing **3** form an outboard motor unit that is completely suspended within the yoke member **16** of the attachment means **6** by means of the resilient discs **29**. Therefore, the weight of this outboard motor unit, the forces developed by the action of the power head **22** and the thrust developed by the propeller **4** are resisted by the resilient discs **29** primarily in shear. The upper portion **23** of the housing **2** has horizontally extending shoulder portions **21** adapted to engage an end of the yoke **16** to provide a stop for limiting the vertical deflection of the resilient discs **29**. The rear and front portions **27, 28** of the housing **2** merge to form vertically extending shoulder portions **20** as shown in Figs. 2 and 5 to provide a stop for limiting the horizontal deflection of the resilient discs **29**. In order to permit substantially complete freedom of movement of the outboard motor unit within the yoke member **16**, a shift control rod **38** passing through the pivot pin **17** is provided with a suitable flexible connecting member **39** as shown in Fig. 3 extending between the portion of the control rod **38** carried by the yoke member **16** and the portion of the control rod **38** carried by the gear housing **3**. Since the outboard motor is provided with a tiller arm **19** mounted on the yoke member **16** for steering and speed control as is well known in the art, a flexible connection means **40** similar to the flexible connecting member **39** is provided as shown in Fig. 7 to permit movement of the outboard motor unit relative to the yoke member **16** and tiller arm **19**.

The proper positioning and dimensioning of the resilient discs **29** may be readily calculated by resorting to a force-moment diagram as shown in Fig. 6. Assuming that the maximum propeller thrust F_C acting through the point C is 100 pounds and the lower resilient disc **29** is positioned at B so that the distance S between the upper resilient disc **29** positioned at A and the lower disc at B is equal to the distance S′ between the lower disc at B and the point C, the forces F_A and F_B may be computed as follows:

Taking force moments about the point B:

$$F_A S = F_C S'$$

or

$$F_A = 100 \text{ pounds}$$

Summation of forces in a horizontal plane:

$$F_B = F_A + F_C$$

or

$$F_B = 200 \text{ pounds}$$

Therefore, for the foregoing assumed fact situation and neglecting the weight of the outboard unit and the torsional forces developed by the power head, the resilient discs **29** positioned at B must be chosen of proper strength characteristics and dimensions to withstand a thrust force of 200 pounds whereas the resilient discs **29** positioned at A need only be strong enough to resist a force of 100 pounds.

Although only one embodiment has been illustrated and described, it will be apparent to those skilled in the art that various other changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

It is claimed and desired to secure by Letters Patent:

1. In an outboard motor, a power assembly comprising an engine and an underwater propeller unit and an intermediate housing rigidly connecting the engine and propeller unit and said housing having transversely spaced wall portions, a support member for pendantly attaching the outboard motor to a boat and comprising a yoke member having transversely spaced wall portions corresponding to the wall portions of said housing, said yoke member being adapted to receive the intermediate housing of the power assembly therebetween in spaced relation and with the corresponding wall portions in opposed relation, said wall portions on the support member being provided with transversely aligned openings and said opposing wall portions having corresponding seats facing said openings, a resilient supporting means insertable through each of said openings and having one end thereof interlocked with the corresponding seat on the wall portion of the intermediate housing in alignment with and opposite from said opening, and means to secure the other end of each resilient element relative to the support member and within the opening, said resilient elements constituting the sole connection between the power assembly and support member for carrying the entire weight of the power assembly and the propeller thrust.

2. In an outboard motor, a power assembly comprising an engine and an underwater propeller unit and an intermediate housing rigidly connecting the engine and propeller unit and said housing having transversely spaced wall portions, a support member for pendantly attaching the outboard motor to a boat and comprising a yoke member having transversely spaced wall portions corresponding to the wall portions of said housing, said yoke member being adapted to receive the intermediate housing of the power assembly therebetween in spaced relation and with the corresponding wall portions in opposed relation, said wall portions on the support member being provided with transversely aligned openings and the wall portions on the intermediate housing being provided with recesses in transverse alignment with said openings, resilient elements extending horizontally between the opposed wall portions of the housing and yoke member and constituting the sole connection therebetween whereby the entire weight of the power assembly and the propeller thrust are carried by the resilient elements in shear, each of said elements being insertable through the respective openings in the yoke member to place one end thereof in the opposed recess of the intermediate housing, and means provided within said opening to secure the other end of each resilient element relative to the yoke member.

3. In an outboard motor, a power assembly comprising an engine and an underwater propeller unit and an intermediate housing rigidly connecting the engine and propeller unit and said housing having transversely spaced

wall elements, a support assembly for pendantly attaching the outboard motor to a boat and comprising a yoke having transversely spaced members corresponding to the side walls of said housing, said yoke being adapted to receive the intermediate housing of the power assembly therebetween with the walls of the housing in opposed relation and spaced inwardly from the corresponding members of the yoke, said yoke members being provided with transverse openings, resilient means insertable through each of said openings in the yoke, means interlocking the inner end of said resilient means and the corresponding wall of said housing, and means to secure the outer end of each resilient element relative to the support assembly.

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