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2,916,007

RESILIENT MOUNTING FOR AN OUTBOARD MOTOR

Filed June 3, 1955

3 Sheets-Sheet 1

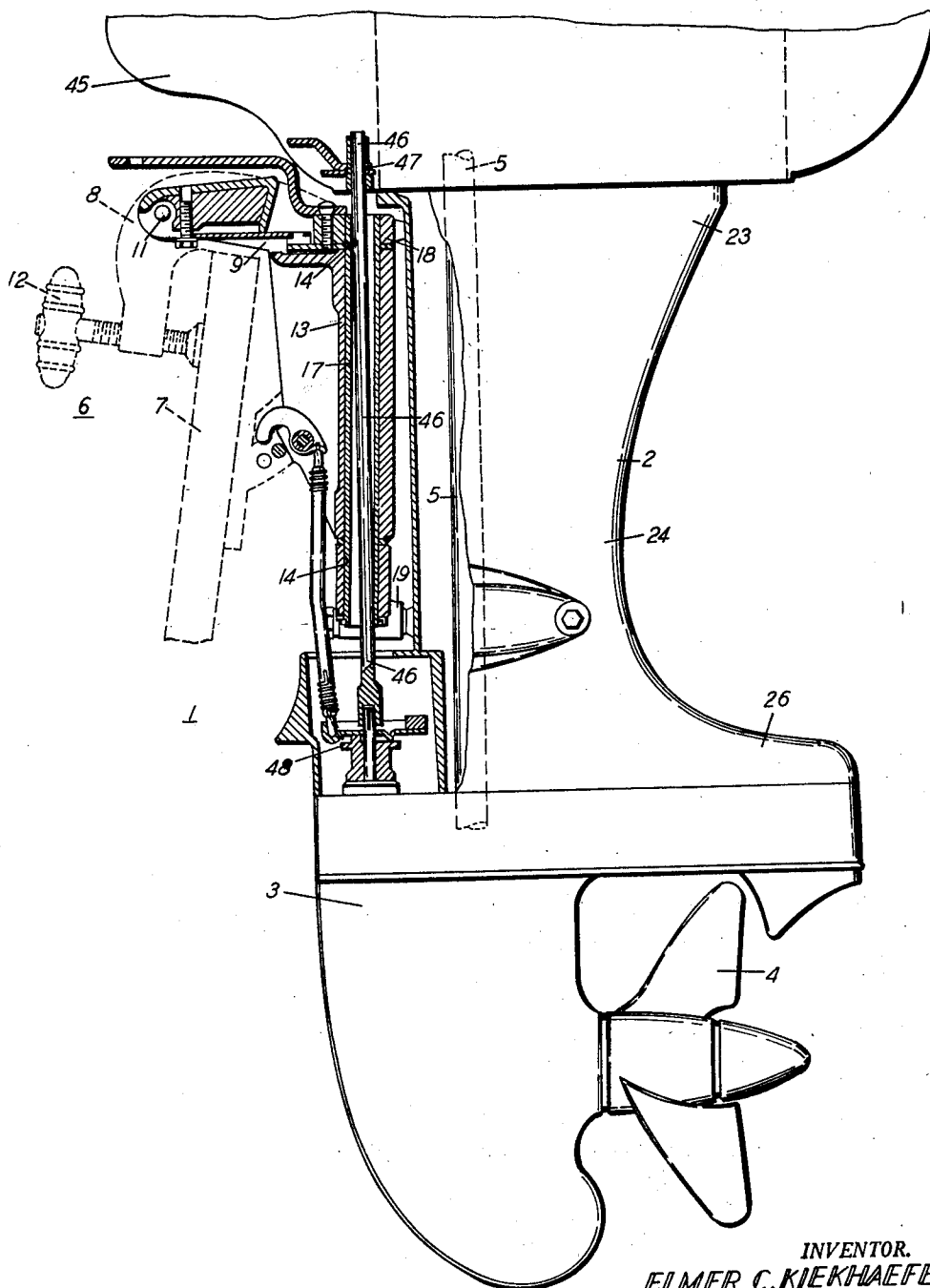


FIG. 1.

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3 Sheets-Sheet 2

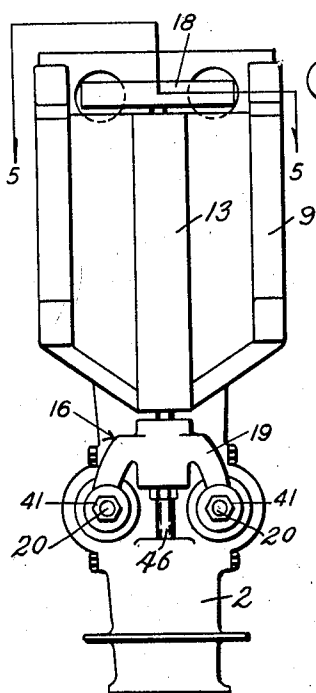


FIG 3

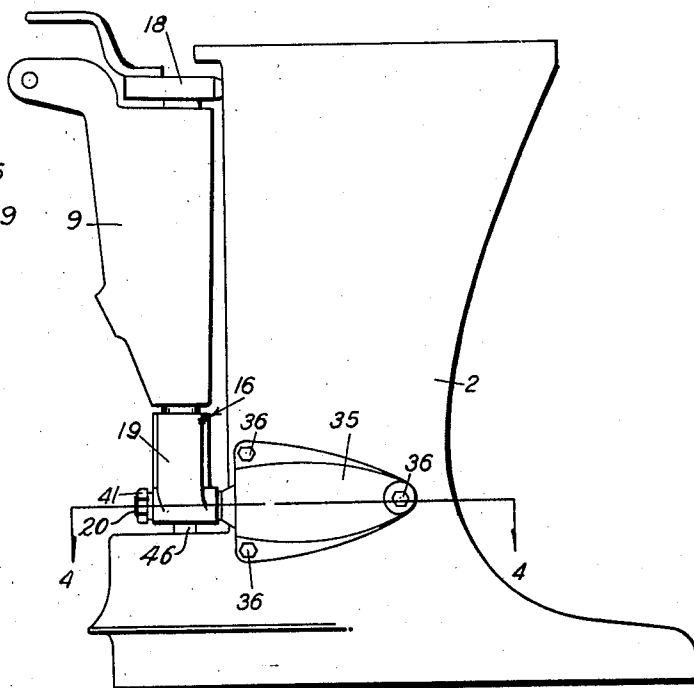


FIG 2

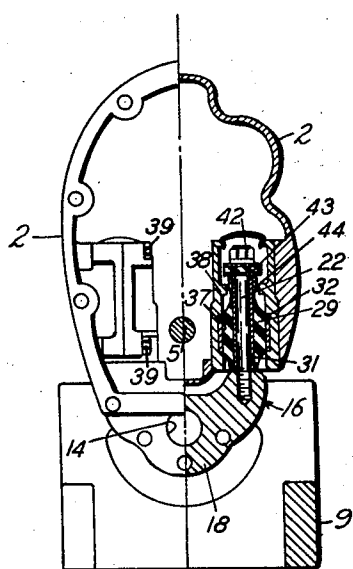


FIG 5

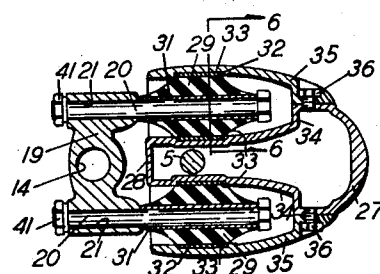


FIG 4

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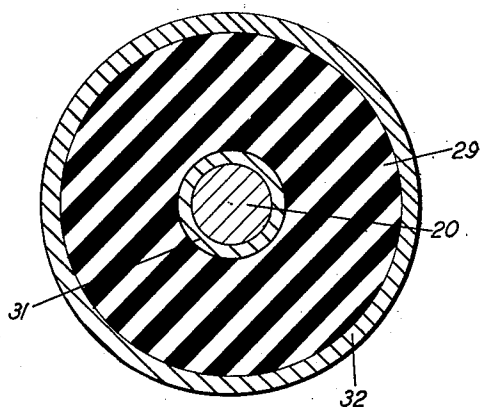


FIG. 6.

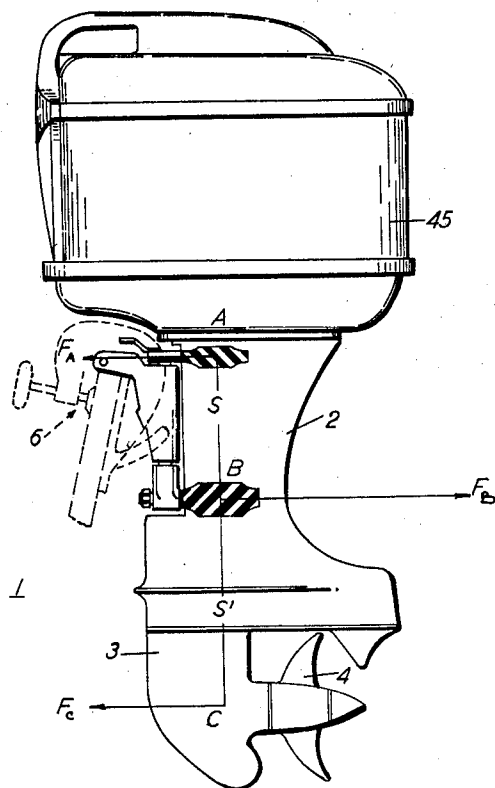


FIG. 7.

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1

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RESILIENT MOUNTING FOR AN OUTBOARD MOTOR

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Application June 3, 1955, Serial No. 512,940

6 Claims. (Cl. 115—18)

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 boat and without in any way interfering with the perfect control of the pivotal steering movement of such motor.

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 by the supporting resilient means.

Another object of the invention is the provision of novel resilient means for supporting the outboard motor unit wherein impact resulting from the outboard motor propeller striking an 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 shown partially in section of an outboard motor embodying the invention;

Fig. 2 is a side elevation view of a part of an outboard motor embodying the invention;

Fig. 3 is a front view of the structure shown in Fig. 2;

Fig. 4 is a section view taken along line 4—4 of Fig. 2;

Fig. 5 is a view shown partially in plan and partially in section taken along line 5—5 of Fig. 3;

Fig. 6 is an enlarged section view taken along line 6—6 of Fig. 4; and

Fig. 7 is a side elevation view of an outboard motor embodying the invention showing a force diagram of thrust forces acting thereon.

As shown in the drawings, a preferred embodiment of the invention is illustrated as applied to an outboard motor

2

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 vertical drive shaft 5 may be considered to be at or near to the center of gravity of the outboard motor unit, although in some cases the center of gravity may be rearwardly of the shaft.

The attachment means 6 or support member comprises a clamp bracket 8 having a generally L-shaped swivel bracket 9 pivotably connected 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 includes a vertically extending bushing 13 in register with openings 14 provided in the upper and lower bifurcated members 18, 19 which together with the connecting hollow pivot pin 17 comprise a yoke member 16 forming a part of the support member. The yoke member is pivotably connected to the swivel bracket for movement in a horizontal plane with the hollow pivot pin 17 passing through bushing 13. The pin 17 is connected to the members 18, 19 by means of a press fit to solidly join the upper and lower members 18, 19. A pair of laterally spaced bolts 20 as shown in Fig. 4 pass through fore and aft horizontally extending openings 21 in the lower member 19 while a pair of laterally spaced studs 22 as shown in Fig. 5 parallel the bolts 20 and engage tapped openings in the upper member 18 to complete the yoke member 16.

The drive shaft housing 2 as shown in Fig. 1 comprises a hollow cast member having an upper flared region 23, an intermediate convergent region 24, and a lower portion 26 which extends outwardly, both forwardly and rearwardly. The drive shaft housing 2 is provided with a streamlined rear portion 27 as shown in Fig. 4 to reduce the resistance of the housing 2 while moving through water, and the front portion 28 of the housing 2 opposite from yoke member 16 is substantially planar.

The drive shaft housing 2 is attached and spaced from the yoke member 16 by means of resilient members comprising annular rubber members 29 as shown in Figs. 4, 5 and 6. The resilient members 29 are each provided with inner and outer annular metal cylinders 31, 32 bonded thereto as shown in Fig. 6. The inner metal cylinder 31 is mounted on a corresponding finger projecting from yoke member 16, here illustrated as a bolt 20 or stud 22 and the outer metal cylinder 32, in the case of the lower member 19, is seated within an annular groove 33 provided in recess 34 of the housing 2. A metal cap 35 of semi-circular cross section is secured to the housing 2 by means of screws 36 and together with recess 34 forms a cavity within which the resilient member 29 is disposed. In the case of the upper member 18, the outer metal cylinder 32 of the resilient member 29 is seated within an annular groove 37 formed by a split hollow cylindrical member 38 which is secured to the drive shaft housing 2 by means of bolts 39 passing therethrough and engaging threaded openings, not shown, in the housing 2. The inner metal cylinders 31 of the rubber members 29 are secured to the lower member 19 between the heads of the respective bolts 20 and the member 19 by means of nuts 41. In the upper member 18 the inner metal portions 31 are secured between the member 18 and respective nuts 42 threaded on the studs 22. Interposed between the nuts 42 and the resilient members 29 of the upper member 18 are resilient cushion rings 43 adapted to engage a

3

shoulder 44 of the cylindrical member 38 to provide a safety stop means and to prevent breaking off of the stud 22 and nut 42 when the axial or torsional movement of housing 2 relative to the upper member 18 and studs 22 exceeds a predetermined amount. The cylindrical resilient members 29 are preferably provided with a chamfered or slanted edge as shown.

A power head 45 as shown in Fig. 1, the drive shaft housing 2 upon which the power head 45 is mounted, and the lower unit or gear housing 3 form an outboard motor unit that is completely supported by the yoke member 16 of the attachment means 6 by means of the resilient members 29. Therefore, the weight of this outboard motor unit, the forces developed by the action of the power head 45 and the thrust developed by the propeller 4 are resisted by the vertically spaced resilient members 29.

In order to permit substantially complete freedom of movement of the outboard motor unit relative to the yoke member 16, a flexible shift control rod 46 as shown in Fig. 1 is provided passing through the pivot pin 17 to connect the shift control 47 carried by the power head 45 to the portion of the shift control 48 carried by the gear housing 3.

The proper positioning and dimensioning of the resilient members 29 may be readily calculated by resorting to a force-moment diagram as shown in Fig. 7. Assuming that the maximum propeller thrust F_C acting through the point C is 100 pounds and the lower resilient member 29 is positioned at B so that the distance S between the upper resilient member 29 positioned at A and the lower member at B is equal to the distance S' between the lower member 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 45, the resilient members 29 positioned at B must be chosen of proper strength characteristics and dimensions to withstand a thrust force of 200 pounds whereas the resilient members 29 positioned at A need only be strong enough to resist a force of 100 pounds.

Where the center of gravity of the outboard motor unit is to the rear of the resilient members 29, the weight of the motor will generally add to the forces referred to above. It is, therefore, desirable to dispose the resilient members on opposite sides of the center of gravity with at least some part of the members in the transverse plane containing the center of gravity. In the illustrations, it will be noted that the members 29 are disposed laterally of the drive shaft 5, which in this instance is very close to the vertical transverse plane of the center of gravity.

Although only one embodiment has been illustrated and described, it will be apparent to those skilled in the art that various 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, the combination of a power unit comprising a power head and a drive shaft housing supporting said head, a support member for said power unit mountable on the transom of a boat and including means adapted to be pivotally movable about a substantially vertical axis when the power unit is in normal operating position, said support member means being provided with fore and aft extending and laterally spaced

4

fingers to form a substantially U-shaped portion, the housing of said unit being disposed generally rearwardly of said support member means and fore and aft extending housing recesses therein aligned with and concentric to said fingers, a plurality of resilient means each comprising an annular rubber element bonded between inner and outer cylinders and interposed between said support member means and said housing with the inner cylinder of one of said resilient means being mounted on each of said fingers and the outer cylinders thereof engaging the wall of the corresponding recesses provided in the housing, said resilient means comprising the sole connection between said unit and said support member means to provide for relative movement of said unit with respect to said support member means to vibrationally isolate said unit from said support member means.

2. The combination of claim 1 wherein stop means associated with said fingers are provided for limiting the deflection of said resilient means.

3. In an outboard motor, the combination of: a support member mountable on the transom of a boat, a yoke member carried by said support member and being pivotally relative to the support member about a substantially vertical axis when the power unit is in normal operating position, a pair of horizontally extending, laterally spaced and aligned fingers projecting rearwardly from the respective upper and lower ends of said yoke member, a power unit comprising a power head and a drive shaft housing supporting said head, the housing of said unit being disposed generally rearwardly of said yoke member and having fore and aft extending semi-circular recesses therein aligned with each of the lower fingers of the yoke member, a semi-circular cap member mounted on said housing in register with each of said recesses to form first cylindrical cavities in said housing for receiving the corresponding lower fingers of said yoke member, fore and aft extending annular members carried by said housing and forming second cylindrical cavities for receiving the respective upper fingers of the yoke member, and a plurality of annular rubber elements each encased in an inner and outer metallic sleeve interposed between the yoke member and said housing with the inner sleeve of one of said resilient means being mounted on each of the yoke member fingers and the outer sleeves thereof engaging the wall of the corresponding cavities in said housing, said elements comprising the sole connection between the power unit and yoke member to vibrationally isolate said unit from said yoke member.

4. The combination set forth in claim 3 wherein the upper fingers of said yoke member are provided with resilient stop means adapted to engage a shoulder provided in the respective cavities for said fingers to limit the deflection of the corresponding rubber elements.

5. In an outboard motor, a power unit including a drive shaft housing, means for supporting the power unit on a boat and including a support member pivotally movable about a substantially vertical axis when the power unit is in normal operating position and disposed forwardly of the unit, upper and lower laterally spaced and aligned finger means extending rearwardly from said support member, said drive shaft housing being disposed generally rearwardly of said support member and having fore and aft extending recesses therein aligned with and concentric to each of the support member finger means, and an elongated annular resilient element disposed between each of the respective finger means and the wall of the corresponding recess in said housing, said elements comprising the sole connection between the power unit and support member to vibrationally isolate the unit from the support member.

6. In an outboard motor, a power unit comprising a power head and a housing member supporting said head, means for supporting the power unit on a boat and including a support member pivotally movable about a substantially vertical axis when the power unit is in

5

normal operating position and disposed forwardly of said power unit, laterally spaced and aligned finger means extending in a fore and aft direction between the housing member and support member and connected to one of said members, said finger means being received in fore and aft extending cylindrical recesses provided in the other of said members, and an elongated annular resilient element disposed between each of the respective finger means and the wall of the corresponding recess, said elements comprising the sole connection between the power unit and the support member to vibrationally isolate the unit from the support member.

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10

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