RESILIENT OUTBOARD MOTOR MOUNTING

Filed July 11, 1955
This invention relates to outboard motors and particularly to the resilient support of the engine and underwater propeller assembly joined by the drive shaft as a rigid assembly comprising the power unit.

According to the invention, a cowl structure is exteriorly supported by a clamp bracket assembly for pivotal steering movement on a vertical axis. The power unit is resiliently mounted in a cowl structure with the drive shaft housing projecting from a downward opening in the cowl to dispose the propeller underwater. The weight of the power unit is concentrated in the engine and the weight of the unit is resiliently supported at a point considerably below the engine so that a series of extremely resilient stabilizers located between the engine and cowl and allowing oscillation of the unit about said point are adequate to maintain the power unit upright and secure the unit against the moment which is set up by the thrust of the propeller.

An object of the invention is to provide the improved resilient support of the power unit to isolate the vibration of the power unit from the boat and reduce noise.

Another object is to support the power unit by resilient means with a minimum of loading effected by the thrust of the propeller.

The drawings furnished herewith illustrate the best mode of carrying out the invention as presently contemplated and set forth hereinafter.

In the drawings:

Figure 1 is a side elevation of an outboard motor with parts thereof broken away and sectioned to show the support of the motor unit within the cowl;

Fig. 2 is a section taken on line 2—2 of Figure 1;

Fig. 3 is a section taken on line 3—3 of Figure 1; and

Fig. 4 is an enlarged sectional view of the forward resilient element located within the upper portion of the cowl to stabilize the motor unit as shown in Figure 1.

The outboard motor shown in the drawings includes the engine 1 shown diagrammatically and as disposed within the cowl structure 2 formed by the upper and lower cowl members 3 and 4, respectively.

The drive shaft 5 extending upwardly from the lower underwater gear case 6 to engine 1 is enclosed by the drive shaft housing 7 which supports the engine. Housing 7 connects engine 1 and gear case 6 to comprise the power unit 8, which is resiliently supported as a rigid assembly.

The propeller 9 is driven by engine 1 through shaft 5 and the gear transmission, not shown, of gear case 6 and is disposed rearwardly of the gear case and immediately beneath the flat anti-cavitation plate 10 extending horizontally between the lower end of housing 7 and the upper end of gear case 6. The upper end of shaft 5 is connected to the lower end 11 of the vertical crankshaft of engine 1.

Engine 1 is seated on the flat upper face of housing 7 to discharge the exhaust gas into the enlarged, open upper end of the housing. The exhaust passing through housing 7 which generally diminishes in cross-section is discharged through the nozzle 12 located beneath and at the rear of plate 10 and opening rearwardly into the propeller slip stream.

The bracket member 13 which is adapted to be secured to the transom of a boat, not shown, pivotally carries the vertically spaced lugs 14 projecting forwardly from the lower portion of cowl member 4 for relative movement of cowl structure 2 on a vertical axis. The lower portion of cowl member 4 is of dimensions generally correspondingly larger than housing 7 and encloses the housing with adequate clearance therebetween for the vibration of the power unit 8 within the cowl structure, as will be described.

The resilient cushion 15 is seated on the narrow shelf 16 extending at the front of and across the lower opening of cowl member 4 from which housing 7 projects downwardly.

The forward bracket 17 of housing 7 rests on cushion 15 and is located beneath engine 1 to support substantially the entire weight of the power unit 8 within cowl structure 2. The power unit 8 is maintained upright by the series of L-shaped resilient elements 18 having corresponding ends carried in the fixtures 19 secured to engine 1 and corresponding other ends fixed in the sockets 20 formed in the bosses 21 located around the inner, upper periphery of cowl member 4. The elements 18 and their mountings are similar to that described and claimed in the copending application of the present inventor, filed March 14, 1955, Serial No. 494,316.

Elements 18 are horizontally spaced relative to each other and about the upper periphery of cowl member 4 to position engine 1 centrally within the cowl and to yield to the vibration of the engine which causes the vibration of the entire power unit 8.

The vibration of the power unit 8 includes rotational oscillation on a vertical axis which is due to the torque reaction of the engine to each torque impulse applied by the engine to the vertical shaft 5 and the vibration of engine 1 which is due to the unbalanced forces set up by the moving parts of the engine and occurs principally in the horizontal direction which is normal to the axis of the engine crankshaft.

According to the present invention the vertical support of the power unit well below the engine and the considerable lateral or horizontal movement allowed the engine in the cowl permits most vibration to dissipate itself without transmission to the boat, and the securement of the power unit by cushion 15 may be adequately provided without restraining the vibration.

Cushion 15 may be bonded between shelf 16 and the bracket 17 which may further include the projection 22 extending downwardly into the cushion. Cushion 15 should be reasonably firm to support the power unit but with some resilience to absorb the small pulsations in the thrust of the propeller which is due to the unevenness of the power output referred to above in connection with the torque reaction of the engine.

Since the weight of the power unit is carried by cushion 15, vibration of power unit 8 is essentially limited to movement around the flexible connection provided by cushion 15 between housing 7 and cowl member 4.

With the connection referred to located as far below engine 1 as practicable, the movement of the engine occurring theoretically in a flat arc is then substantially horizontal and coincident with its natural vibration.

Elements 18 are of a free length to allow considerable movement of engine 1 in the cowl structure 2 and offer initially low resistance to horizontal movement of the engine 1 so that the reciprocal forces causing the vibration are allowed to periodically restore the power unit to its original position and a minimum of vibra-
tion is necessarily absorbed by the compression of the elements 18 and transmitted through cowl structure 2 and bracket 13 to the boat.

According further to the invention the flexible connection referred to is located as low as practicable so that the thrust of the propeller in either the forward or reverse direction does not appreciably load the corresponding elements 18 and adversely affect the isolation of the vibration of the power unit. The thrust referred to sets up a moment or tendency toward rotational movement of the power unit on a transverse axis so that opposite horizontal loads are applied to cushion 15 and the forward or rearward-most elements 18. With the cushion 15 located as near as practicable to propeller 9 and as remote as practicable from elements 18, a relatively minor proportion of the thrust load is applied to the elements 18 and the major thrust load applied to cushion 15 does not in any material way increase the resistance of the cushion to the vibration of the power unit 8 about the flexible connection formed by the cushion. The large amplitude of vibration of the power unit occurring particularly at low engine speeds is readily absorbed by the resilience of elements 18, and is accommodated by the clearance between the power unit and the interior of cowl structure 2.

Various modes of carrying out the invention are contemplated as within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

Claim:

1. In an outboard motor, a bracket to be attached to a boat, a cowl structure having a lower opening and supported by said bracket for the pivotal movement of the cowl structure on a vertical axis, a power assembly comprising an engine and underwater propeller unit and an intermediate hollow housing rigidly connecting said engine and propeller unit, the weight of said engine being the greater part of the weight of the power assembly, the lower portion of said cowl structure and said housing having a flexible connection supporting the power assembly with the engine disposed in the upper portion of the cowl structure and with the housing extending downwardly therefrom and through the opening thereof, and horizontally spaced resilient elements disposed between said engine and cowl structure and positioning the engine therein, said supporting connection being below and relatively remote from the engine whereby normal horizontal vibration of the engine substantially coincides with the movement of the power assembly about said flexible connection permitted by said resilient elements, and said flexible connection being relatively adjacent to the underwater propeller unit whereby the thrust of the propeller unit is in greater part directed against and carried by the flexible connection and said resilient elements are subject to nominal loading and relatively unaffected by the thrust of the propeller unit.

2. In an outboard motor, a bracket to be attached to a boat, a cowl structure having a lower opening and supported by said bracket for the pivotal movement of the cowl structure on a vertical axis, a power assembly comprising an engine and underwater propeller unit and an intermediate hollow housing rigidly connecting said engine and propeller unit, the weight of said engine being the greater part of the weight of the power assembly, the lower portion of said cowl structure and said housing having a flexible connection supporting the power assembly with the engine disposed in the upper portion of the cowl structure and with the housing extending downwardly therefrom and through the opening thereof, and horizontally spaced resilient elements comprising L-shaped elements seated in corresponding abutments carried by the engine and cowl structure and positioning the engine within the cowl structure said supporting connection being below and relatively remote from the engine whereby normal horizontal vibration of the engine substantially coincides with the movement of the power assembly about said flexible connection permitted by said resilient elements, and said flexible connection being relatively adjacent to the underwater propeller unit whereby the thrust of the propeller unit is in greater part directed against and carried by the flexible connection and said resilient elements are subject to nominal loading and relatively unaffected by the thrust of the propeller unit.

References Cited in the file of this patent

UNITED STATES PATENTS

2,044,920 Smith June 23, 1936
2,256,831 Karey Sept. 23, 1941
2,740,368 Irgens et al. Apr. 3, 1956