United States Patent [19]

Larsen

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[54] **MARINE NOISE AND VIBRATION ISOLATION SYSTEM**

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[52] **U.S. Cl.** **115/17;** 248/4; 248/9; 248/20

[51] **Int. Cl.**..... **B63h 21/26;** B63h 21/30

[58] **Field of Search**..... 115/17, 18, 34, 41; 248/4, 248/15, 22, 9, 20

[56] **References Cited**

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1,861,048	5/1932	Conover	248/4 X
2,209,592	7/1940	Beck	248/4
2,738,751	3/1956	Hogberg	115/17
2,740,368	4/1956	Irgens et al.	115/18
3,586,272	6/1971	Pestell	248/22
3,599,594	8/1971	Taipale	115/17

FOREIGN PATENTS OR APPLICATIONS

560,537	4/1957	Italy	248/4

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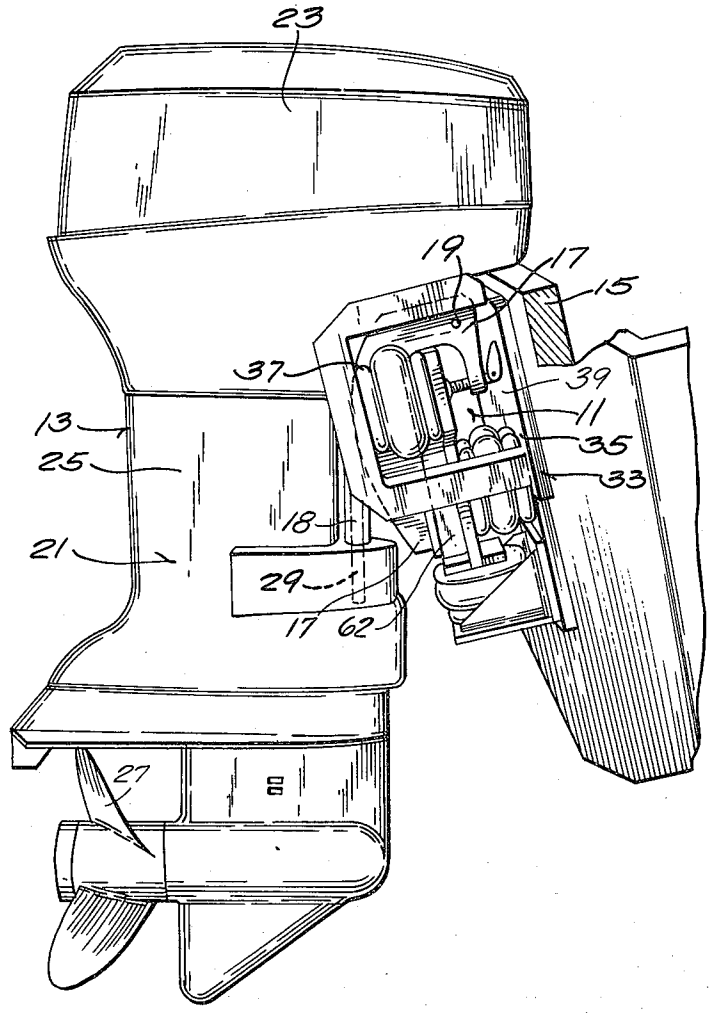
[57] **ABSTRACT**

Disclosed herein is an outboard motor mounting arrangement comprising a first bracket adapted to be secured to the transom of a boat and including a lower generally vertically extending and rearwardly facing surface and an upper generally vertically extending and forwardly facing surface located in rearwardly spaced relation to and above the rearwardly facing surface, together with a second bracket and including an upper generally vertical and rearwardly facing surface located in opposed and spaced relation to the forwardly facing surface of the first bracket and a lower generally vertical and forwardly facing surface in spaced and opposed relation to the rearwardly facing surface of the first bracket, and first and second noise and vibration isolating mounts respectively extending between the upper forwardly and rearwardly facing surfaces and the lower forwardly and rearwardly facing surfaces.

19 Claims, 7 Drawing Figures



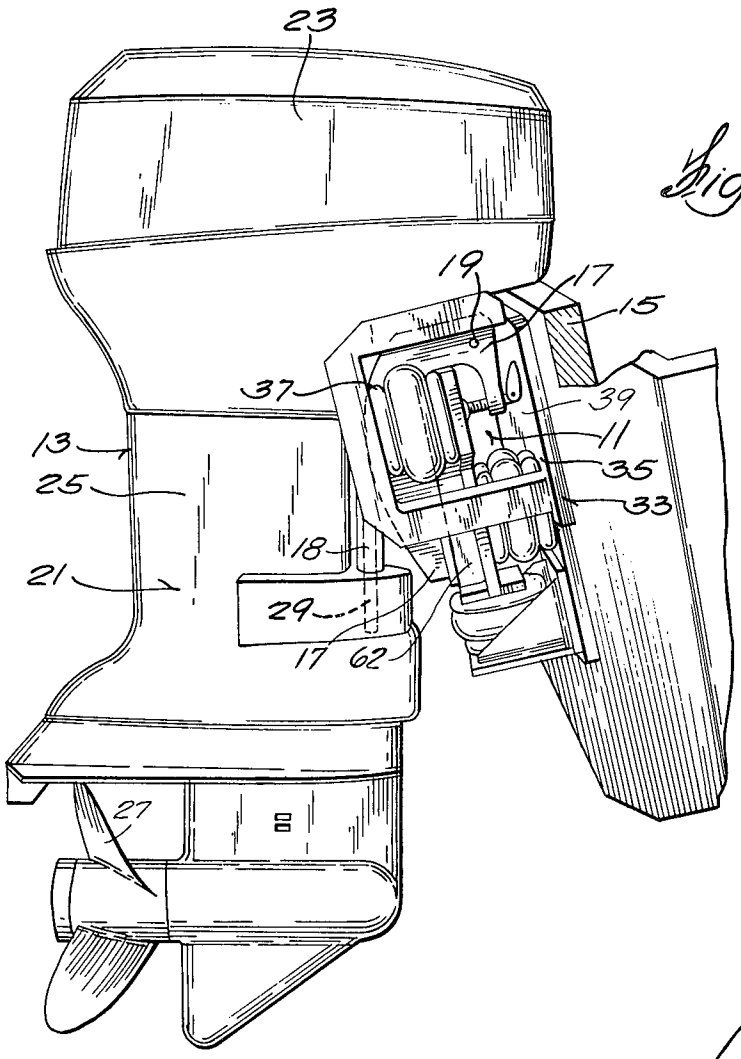


Fig. 1

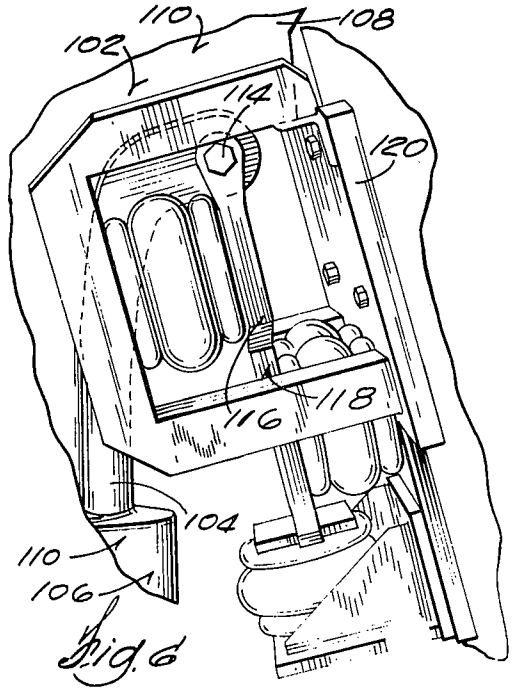


Fig. 6

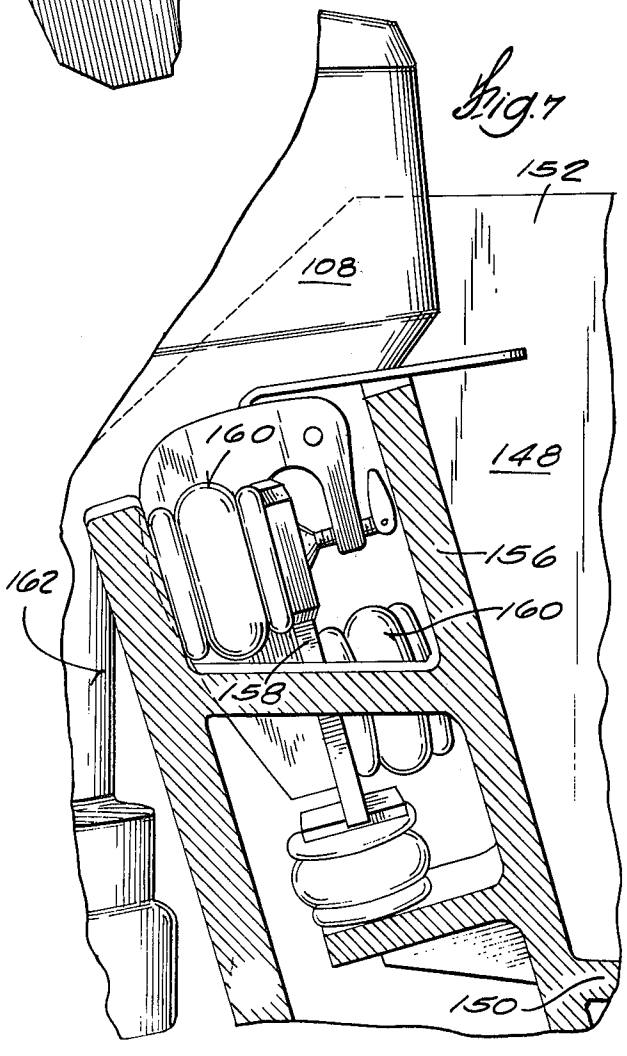


Fig. 7

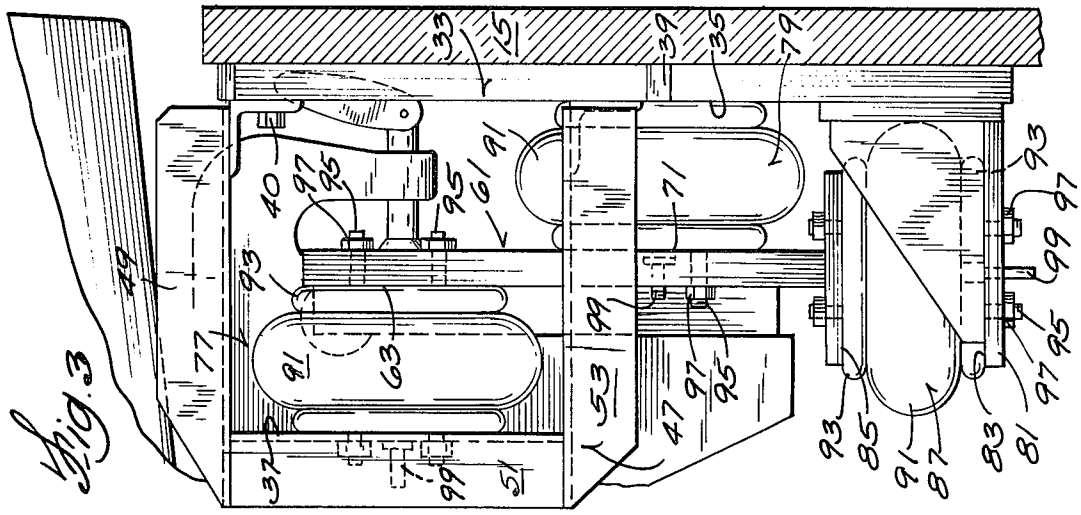


Fig. 3

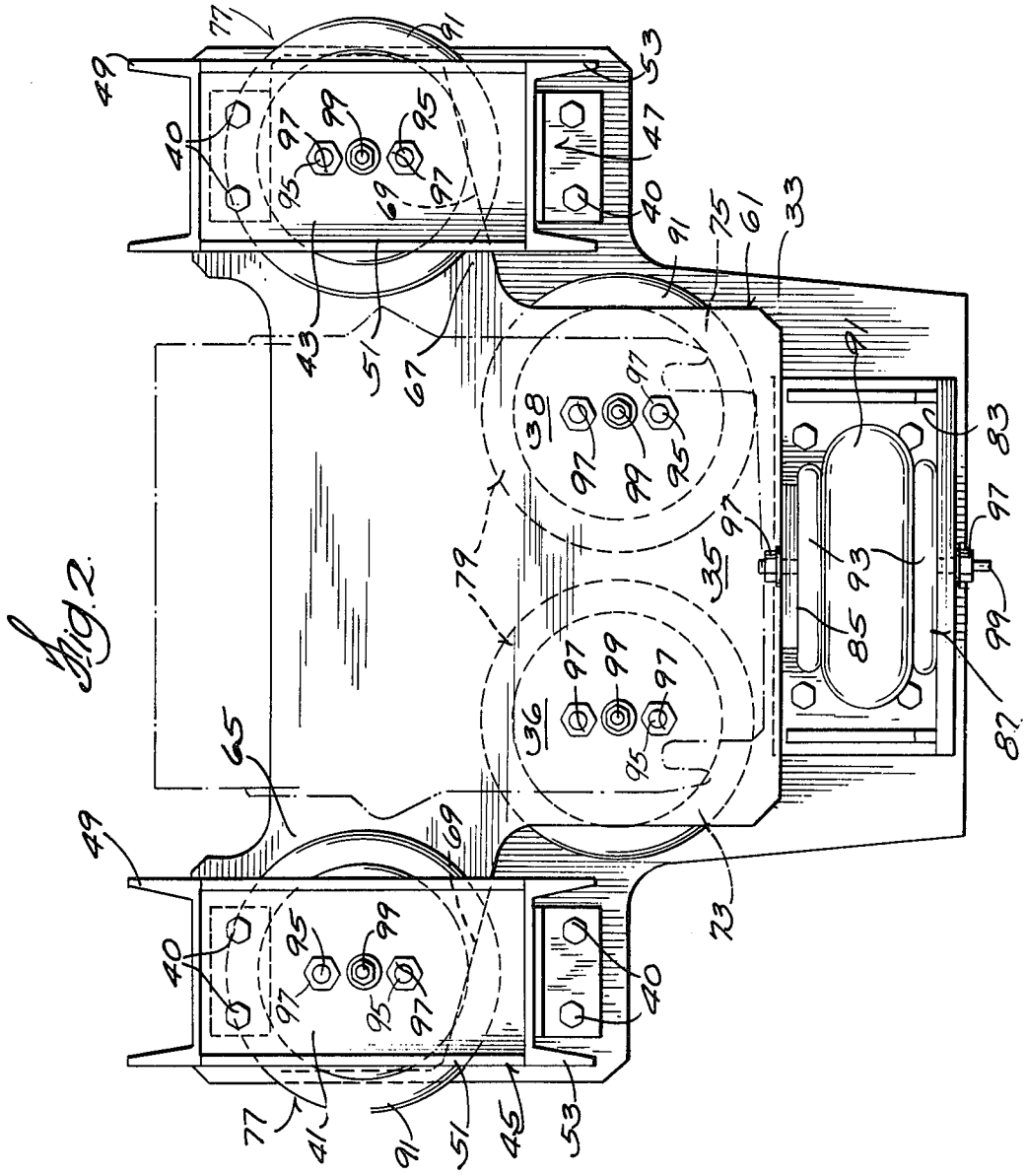


Fig. 2

Fig.5

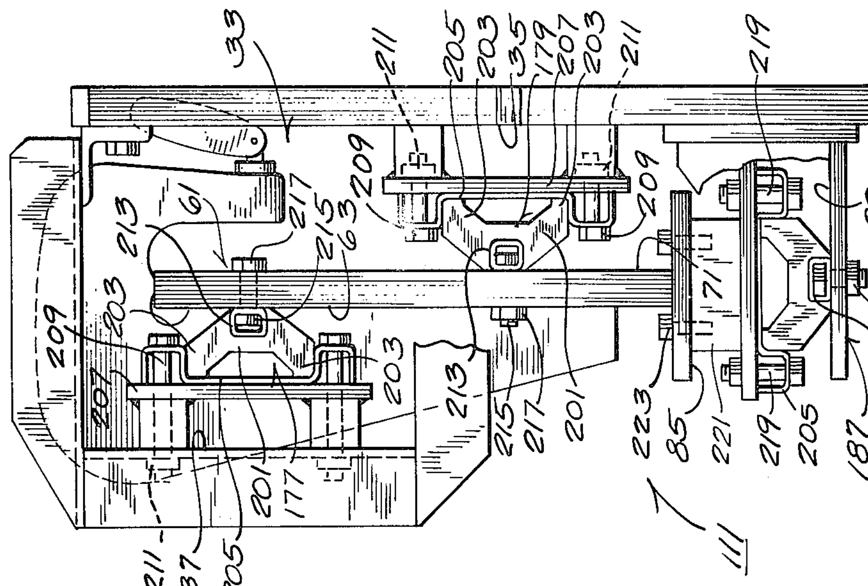
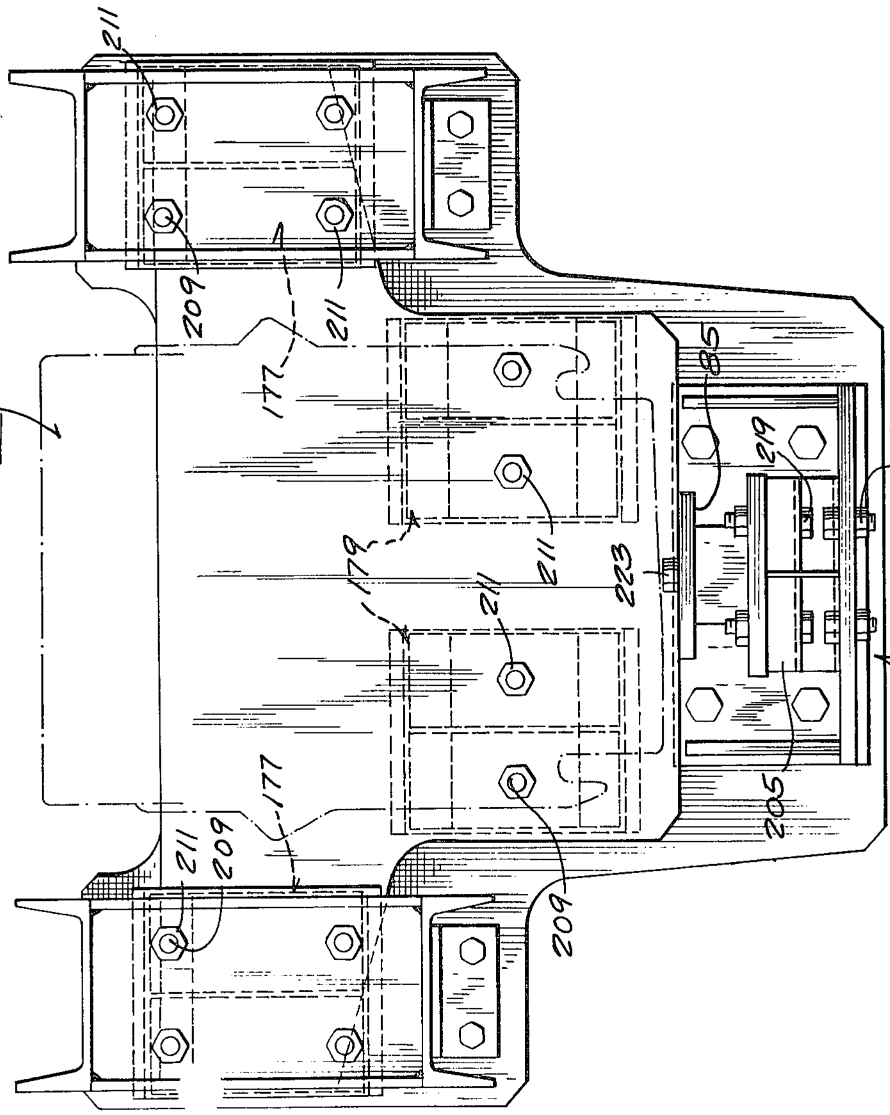


Fig.4



MARINE NOISE AND VIBRATION ISOLATION SYSTEM

BACKGROUND OF THE INVENTION

The invention relates generally to noise and vibration isolation systems or arrangements for outboard motors. More particularly, the invention relates to outboard motor mounting arrangements and to outboard motors and to boats. Still more particularly, the invention relates to noise and vibration isolating systems and arrangements for preventing or at least reducing noise and vibration transmission from an outboard motor propulsion unit to a supporting boat hull.

Prior examples of arrangements for isolating the noise and vibration associated with a marine propulsion unit from a supporting boat are found in the following U.S. Pat. Nos.:

Long	2,630,991 issued March 10, 1953
Irgens	2,740,368 issued April 3, 1956
Rose	2,890,674 issued June 16, 1959
Kiekhaefer	2,911,963 issued November 10, 1959
Kiekhaefer	2,916,007 issued December 8, 1959
Watkins	3,002,489 issued April 7, 1964
Mohr	3,127,866 issued April 7, 1964
Watkins	3,452,704 issued July 1, 1969
Taipale	3,599,594 issued August 17, 1971
Wick	3,613,631 issued October 19, 1971

SUMMARY OF THE INVENTION

The invention provides a noise and vibration isolating mounting system for an outboard motor comprising a first member or bracket adapted to be secured to the transom of a boat and including a lower surface and an upper surface located in rearwardly spaced relation to and above the lower surface, together with a second bracket or member adapted to support an outboard motor, located between the upper and lower surfaces of the first bracket and including an upper surface located in spaced relation to the upper surface of the first bracket and a lower surface in spaced relation to the lower surface of the first bracket, and first and second noise isolating means or isolators respectively extending between the upper surfaces and the lower surfaces.

In further accordance with the invention the lower surface of the first bracket extends generally vertically and is rearwardly facing in opposed relation to the lower surface of the second bracket which extends generally vertically and is forwardly facing. The upper surface of the first bracket extends generally vertically and is forwardly facing in opposed relation to the upper surface of the second bracket which extends generally vertically and is rearwardly facing.

In still further accordance with the invention, the noise and vibration isolating mounting arrangement can also include an upwardly facing surface on the first bracket together with a downwardly facing surface on the second bracket in opposed and spaced relation to the upwardly facing surface on the first bracket, together with a third noise isolating means or isolator between the opposed upwardly and downwardly facing surfaces.

The isolators can, in accordance with the invention, be either air bags, or soft rubber mounts, or other suitable noise and vibration isolating means.

Also provided is an outboard motor which incorporates a noise and vibration isolating arrangement embodying the invention and which is adapted to be mounted on the transom of a boat.

Still further, there is provided a boat which incorporates a noise and vibration isolating arrangement or system embodying the invention and which is adapted to receive or support a conventional outboard motor.

One of the principal features of the invention is the provision of an outboard motor noise and vibration isolating arrangement providing superior efficiency in preventing, or at least reducing, noise and vibration transmission from a marine propulsion unit to a supporting boat hull.

Another of the principal features of the invention is a marine propulsion device which is adapted to be mounted on the transom of a boat and which incorporates a noise and vibration isolation system between a tilt bracket and transom attachment bracket.

Another of the principal features of the invention is the provision of a boat hull including a noise and vibration isolation arrangement which is adapted to support an outboard motor.

Other features and advantages of the invention will become known by reference to the following drawings, general description and appended claims.

DRAWINGS

FIG. **1** is a side elevational view, of an arrangement for mounting an outboard motor to the stern of a boat hull.

FIG. **2** is an enlarged rear elevational view of the mounting arrangement employed in FIG. **1.**

FIG. **3** is a side elevational view, partially in section, of the mounting arrangement employed in FIG. **1.**

FIG. **4** is a view similar to FIG. **2** illustrating another embodiment of the invention.

FIG. **5** is a partially broken away view similar to FIG. **3,** further illustrating the embodiment shown in FIG. **4.**

FIG. **6** is a fragmentary view of a marine propulsion device integrally embodying a noise and vibration isolating system in accordance with the invention.

FIG. **7** is a fragmentary view of a boat hull integrally embodying a noise and vibration isolating system in accordance with the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Before explaining the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein is for the purposes of description and should not be regarded as limiting.

GENERAL DESCRIPTION

Shown in FIG. **1** is a noise and vibration isolating system or arrangement **11** for mounting an outboard motor **13** to a boat transom **15.** The outboard motor **13** is of conventional structure including a clamp or transom bracket **17,** a swivel bracket **18** connected to the clamp bracket **17** by a tilt pin **19** and a propulsion unit **21** which includes a power head **23** and a lower unit **25** supporting a propeller **27** and which is connected to the swivel bracket **18** through a king pin **29** journaled by

the swivel bracket **18.** The outboard motor can be either with or without conventional isolation mounts between the king pin **29** and the propulsion unit **21** as shown for instance in the previously identified U.S. Irgens, Kiekhaefer, Taipale and Wick patents.

In accordance with the invention, the outboard motor mounting arrangement **11** includes, as shown best in FIGS. **2** and **3,** a first member or mounting or transom bracket which is adapted to be fixedly connected to the transom **15,** as by bolting or the like. The mounting bracket **33** includes a lower, generally vertical and rearwardly facing surface **35** and an upper generally vertically and forwardly facing surface **37** which is located in rearwardly spaced relation to and above the lower rearwardly facing surface **35.** More specifically, in the construction illustrated in FIGS. **1** through **3,** the mounting bracket **33** includes a mounting plate **39** which includes the lower rearwardly facing surface **35** which comprises two laterally adjacent surface portions **36** and **38.** The upper forwardly facing surface **37** includes (See FIGS. **2** and **3**) laterally spaced portions **41** and **43** which are supported from the mounting plate **39** by respective laterally spaced bridging structures **45** and **47** which can take various forms. In the illustrated construction, each bridging structure is in the form of three channel shaped sections **49, 51** and **53** which are welded together to form U-shaped bracket portions which are respectively connected by bolts **40** to the plate **39.**

Interposed between the lower rearwardly facing surface **35** and the upper forwardly facing surface **37** of the mounting bracket **33** is a generally vertically extending second member or intermediate plate or bracket **61** which is generally in the form of a plate extending between the forwardly and rearwardly spaced surfaces **35** and **37** of the mounting bracket **33,** and which forms a support to which the clamp bracket **17** is connected. If desired, a spacer **62** can be located between the intermediate bracket **61** and the clamp bracket **17.**

The intermediate bracket **61** includes an upper rearwardly facing surface **63** located in opposed spaced relation to the upper, forwardly facing surface **37** of the mounting bracket **33.** In the illustrated construction, the rearwardly facing surface **63** includes two laterally spaced portions **65** and **67** formed by laterally extending wings **69.** The intermediate bracket **61** also includes a lower forwardly facing surface **71** in rearwardly spaced and opposing relation to the lower rearwardly facing surface **35** of the mounting bracket **33.** In the illustrated construction, lower surface **71** includes two laterally adjacent portions **73** and **75.**

In further accordance with the invention, noise and vibration isolating means are provided for supporting the intermediate bracket from the mounting bracket. In the construction shown in FIGS. **1** through **5,** such means comprises one or more upper isolators **77** extending between the upper forwardly facing surface **37** of the mounting bracket **33** and the upper rearwardly facing surface **63** of the intermediate bracket **61,** together with one or more isolators **79** extending between the lower, rearwardly facing surface **35** of the mounting bracket **33** and the lower, forwardly facing surface **71** of the intermediate bracket **61.**

While the upper and lower isolators **77** and **79** can provide sufficient vertical support for the intermediate bracket **61,** it is preferred to provide the mounting bracket **33** with a lower rearwardly extending shelf **81** having an upwardly facing surface **83** and to provide the intermediate bracket **61** with a downwardly facing surface **85** in spaced and opposed relation to the upward facing surface **83** of the mounting bracket **33** and to locate between such opposed surfaces **83** and **85** one or more isolators **87** which are particularly adapted to support vertical loading on the intermediate bracket **61.**

In the construction shown in FIGS. **2** and **3,** two upper isolators **77** and employed between the opposed portions **41–43** and **65–67** of the upper rearwardly and forwardly facing surfaces **37** and **63** and two lower isolators **79** are employed between the adjacent portions **36–38** and **73–75** of the lower forwardly and rearwardly facing surfaces **35** and **71.**

While various isolator constructions can be employed, in the construction shown in FIGS. **2** and **3,** each of the upper and lower isolators **77** and **79** and the vertical load supporting isolator **87** comprises a commercially available air bag comprising an inflatable disc-like rubber envelope **91** having opposed side faces to which are bonded mounting plates **93.** Extending from the mounting plates **93** are threaded stubs **95** received in suitable holes in the adjacent brackets **36** and **61** and fixed thereto by nuts **97.** Other means for attaching the air bags between the mounting bracket **33** and the intermediate bracket **61** can be employed. Each air bag is provided with a valve **99** facilitating inflation thereof and variation of the air pressure therein, whereby the operating characteristics of the mounting arrangements can be varied as may be desired. Although the various air bags could be associated with a common valve header, whereby uniform pressure could be provided in all of the bags, it is preferred to employ a separate valve **99** for each air bag to enhance adaptability of the mounting system to various load factors.

Illustrated in FIGS. **4** and **5** is another embodiment of an isolating system **111** in accordance with the invention. The isolating system **111** is substantially identical to the isolating system **11** except that the isolating system includes isolators **177, 179** and **187** and mountings therefor which are of somewhat different form than the isolators **77, 79** and **87** shown in FIGS. **2** and **3.** The parts of the isolation system **111** (shown in FIGS. **4** and **5**) which are substantially identical to the corresponding parts of the FIGS. **2** and **3** construction, have been given the same reference numerals as used in FIGS. **2** and **3.**

Each of the isolators **177, 179** and **187** incorporated in the construction shown in FIGS. **4** and **5** is commercially available and is made of soft rubber in the form of a channel having a web **201** and spaced extending flanges **203.** Bonded to the outer extremities of the flanges **203** of each of the soft rubber isolators **177, 179** and **187** is a mounting plate **205.** The mounting plates **205** of the isolators **177** and **179** are located on pedestals **207** and are connected to the bracket **33** by one or more bolts **209** extending through apertures in the pedestals **207** and in the adjacent surface of the mounting bracket **33** and secured thereto by nuts **211.** The pedestals **207** merely serve to bridge the space between the opposed surfaces **35–71** and **37–63.**

Bonded to the web of each of the soft rubber isolators **177, 179** and **187** is a channel shaped mounting sleeve **213.** The sleeves **213** bonded to the isolators **177** and

179 capture the heads of one or more bolts 215 which pass through suitable apertures in the adjacent surface of the intermediate bracket 61 and are secured by respective nuts 217.

The mounting plate 205 of the vertical load supporting isolator 187 is bolted at 219 to a pedestal 221 which, in turn, is bolted at 223 to the downwardly facing surface 85 of the intermediate bracket 61.

The mounting sleeve 213 bonded to the web of the isolator 187 is connected by one or more bolts at 227 to the upwardly facing surface 83 of the mounting bracket 33.

Shown in FIG. 6 is a marine propulsion device in the form of an outboard motor 102 including a swivel bracket 104 and connected propulsion unit 106 including a power head 108 and a lower unit 110 which supports a propeller (not shown). The swivel bracket 104 is connected through a tilt pin 114 to a vertically extending bracket 116 which provides support for the tilt pin 114 and which in other respects corresponds to the before mentioned intermediate bracket 61. As in the embodiments shown in FIGS. 1 through 5, the tilt pin supporting bracket 116 is connected through a noise and vibration isolating system 118 to a mounting bracket 120 which is removably fixable in any suitable manner to a boat transom. The isolating system 118 is substantially identical to the isolating system shown in FIG. 1 through 3.

Shown fragmentarily in FIG. 7 a boat hull 148 including a bottom 150 and opposed sides 152. Structurally integrated into the boat hull 148, adjacent the rearward end thereof, is a structural member 156 which corresponds to the before mentioned mounting bracket 33 and which supports a rearwardly spaced member or bracket 158 which corresponds to the before mentioned intermediate bracket 61. As in the outboard motor 102 shown in FIG. 6, the rearwardly spaced bracket 158 is supported from the structural member 156 by an isolating system 160 such as disclosed in FIGS. 1 and 5.

Suitable means extend from the structural member 156 to the bottom 150 and sides 152 of the boat hull 148 to prevent entry of water into the boat hull. The structural member 156 can form the boat transom or, if desired, can be located forwardly of a false transom (not shown). In any event, the construction shown in FIG. 7 is intended to integrate the disclosed isolating system in a boat hull and to provide for removable attachment to the rear bracket 158 of a marine propulsion device such as an outboard motor 162.

As already indicated, when employing the isolating systems disclosed herein, the conventional isolation mounts employed in an outboard motor between the drive shaft housing and the king pin carried by the swivel bracket can be omitted if desired.

The use of isolators other than the air bags and rubber mounts which have been particularly described and illustrated, is also within the scope of the invention. Various of the features of the invention are set forth in the following claims.

I claim:

1. An outboard motor mounting arrangement comprising a mounting bracket adapted to be secured to the transom of a boat and including a lower surface and an upper surface located in rearwardly spaced relation from and above said lower surface, an intermediate bracket located between said upper and lower surfaces of said mounting bracket and including an upper surface located in spaced facing relation to said upper surface of said mounting bracket and a lower surface in spaced facing relation to said lower surface of said mounting bracket, first and second discrete and laterally spaced noise and vibration isolating means extending between said spaced upper surfaces, and a third discrete noise and vibration isolating means extending between said spaced lower surfaces.

2. A mounting arrangement in accordance with claim 1 wherein said mounting bracket includes an upwardly facing surface, wherein said intermediate bracket includes a downwardly facing surface in opposed and spaced relation to said upwardly facing surface of said mounting bracket, and a fourth noise and vibration isolating means between said opposed upwardly and downwardly facing surfaces.

3. A mounting arrangement in accordance with claim 1 and further including a marine propulsion lower unit, and means connecting said lower unit to said intermediate bracket for vertical and horizontal swinging movement relative to said intermediate bracket.

4. A mounting arrangement in accordance with claim 1 wherein said third noise and vibration isolating means comprises two discrete mounts.

5. A mounting arrangement in accordance with claim 1 wherein each of said noise and vibration isolating means comprises an air bag.

6. A mounting arrangement in accordance with claim 5 wherein said air bags each include a rubber structure including a hollow interior and means for variably pressurizing said hollow interior of said rubber structure.

7. A mounting arrangement in accordance with claim 1 wherein each of said noise and vibration isolating means comprises a rubber mount.

8. A boat hull including bottom and sides extending from said bottom, a member connected to said boat hull adjacent to the rear thereof and including a lower surface and an upper surface located in rearwardly spaced relation from and above said lower surface, a bracket located between said upper and lower surfaces of said member and including an upper surface located in spaced facing relation to said upper surface of said member and a lower surface in spaced facing relation to said lower surface of said member, and first and second discrete, laterally spaced noise and vibration isolating means extending between said spaced upper surfaces, a third discrete noise and vibration isolating means extending between said spaced lower surfaces, and water-tight means extending between said member and said bottom and sides of said boat hull to prevent entry of water into said boat hull.

9. A boat hull in accordance with claim 8 wherein said member includes an upwardly facing surface, wherein said bracket includes a downwardly facing surface in opposed and spaced relation to said upwardly facing surface of said member, and a fourth noise and vibration isolating means between said opposed upwardly and downwardly facing surfaces.

10. A boat hull in accordance with claim 8 wherein said third noise and vibration isolating means comprises two discrete mounts.

11. A boat hull in accordance with claim 8 wherein each of said noise and vibration isolating means comprises an air bag.

12. A boat hull in accordance with claim 11 wherein said air bags each include a rubber structure including

a hollow interior and means for variably pressurizing said hollow interior of said rubber structure.

13. A boat hull in accordance with claim **8** wherein each of said noise and vibration isolating means comprises a rubber mount.

14. An outboard motor comprising a mounting bracket removably and rigidly secured to the transom of a boat and including a lower surface and an upper surface located in rearwardly spaced relation from and above said lower surface, an intermediate bracket located between said upper and lower surfaces of said mounting bracket and including an upper surface located in spaced relation to said upper surface of said mounting bracket and a lower surface located in spaced relation to said lower surface of said mounting bracket, a first noise and vibration isolating means extending between said spaced upper surfaces, a second noise and vibration isolating means extending between said spaced lower surfaces, a tilt pin journalled by said intermediate bracket, a swivel bracket supported by said tilt pin for vertical swinging movement relative to said intermediate bracket, a propulsion unit, and a king pin connecting said swivel bracket to said propulsion unit to permit horizontal steering movement therebetween.

15. An outboard motor in accordance with claim **14** wherein said mounting bracket includes an upwardly facing surface, wherein said intermediate bracket includes a downwardly facing surface in opposed and spaced relation to said upwardly facing surface of said mounting bracket, and a third noise and vibration isolating means between said opposed upwardly and downwardly facing surfaces.

16. An outboard motor in accordance with claim **14** wherein each of said noise and vibration isolating means comprises two discrete mounts.

17. An outboard motor in accordance with claim **14** wherein each of said noise and vibration isolating means comprises an air bag.

18. An outboard motor in accordance with claim **17** wherein said air bags each include a rubber structure including a hollow interior and means for variably pressurizing said hollow interior of said rubber structure.

19. An outboard motor in accordance with claim **14** wherein each of said noise and vibration isolating means comprises a rubber mount.

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