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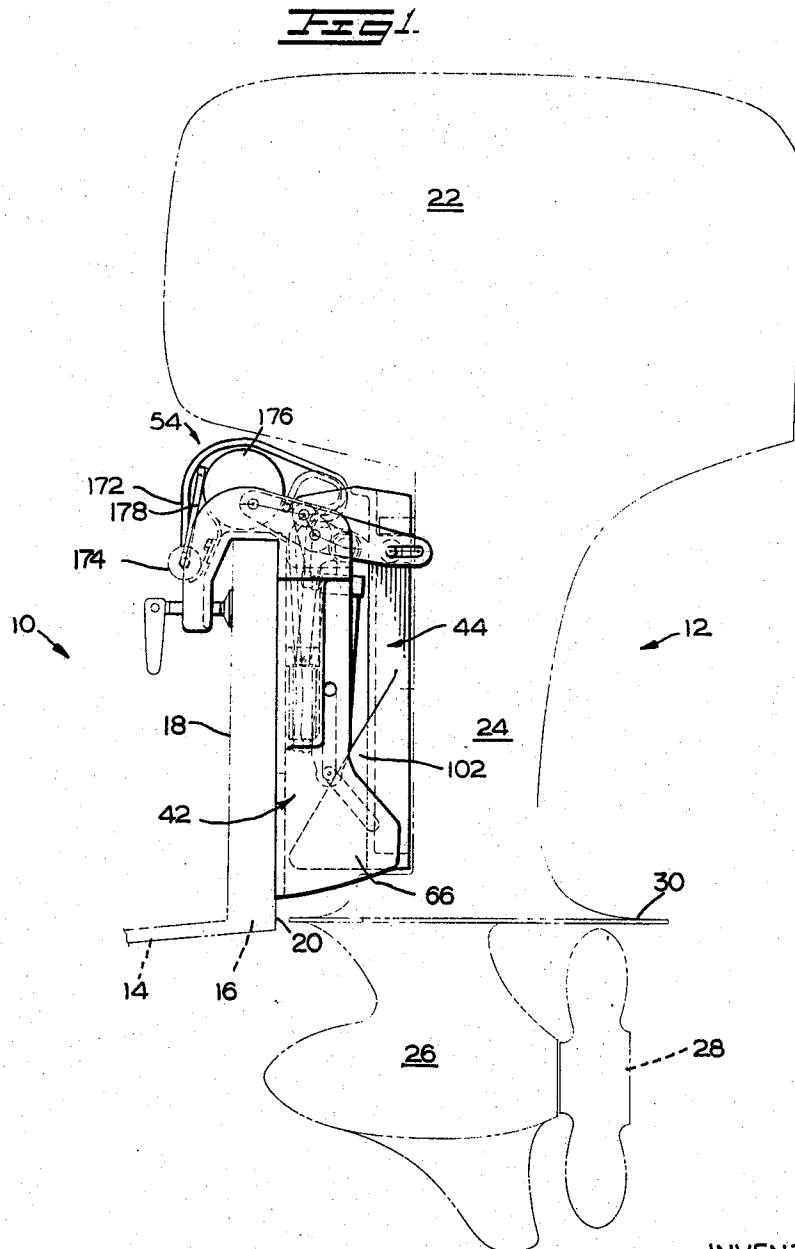
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3,486,724

OUTBOARD MOTOR SUPPORT

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6 Sheets-Sheet 1



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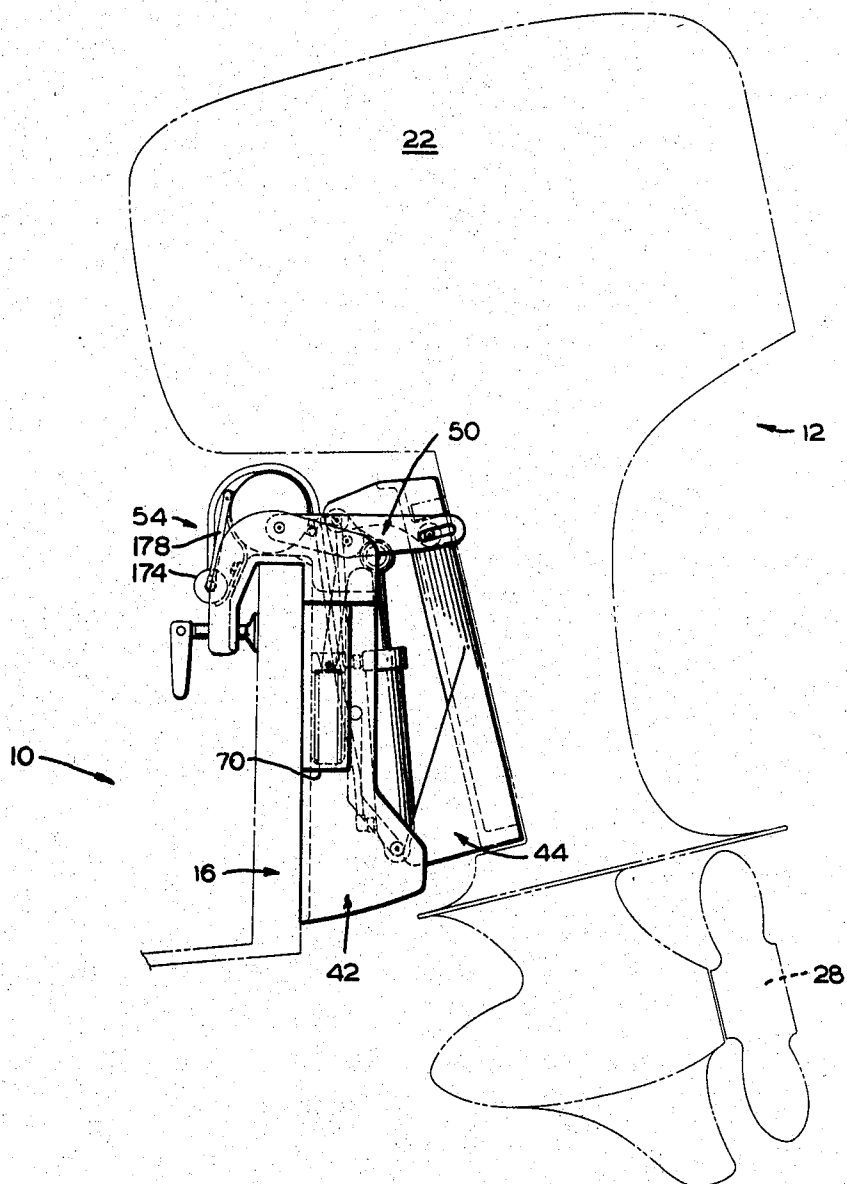
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Fig 2.



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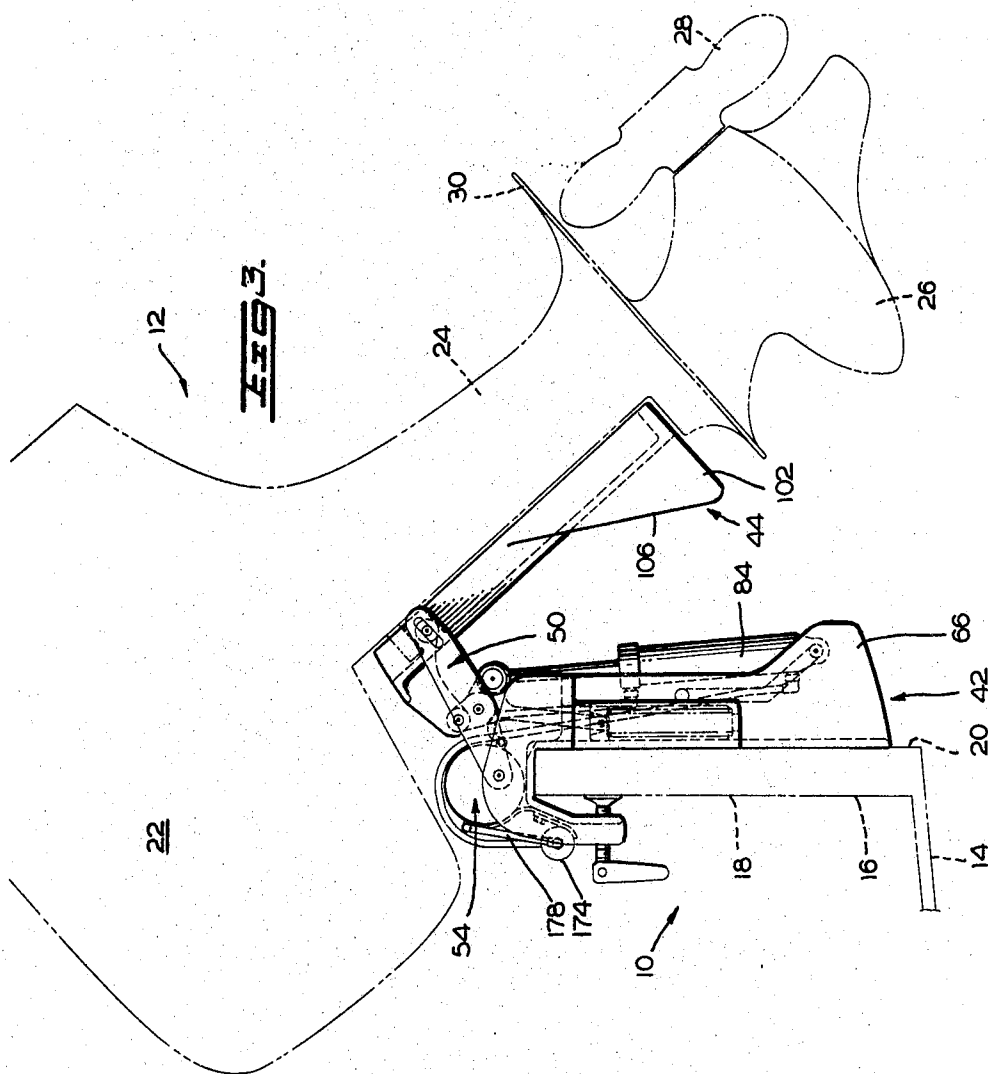
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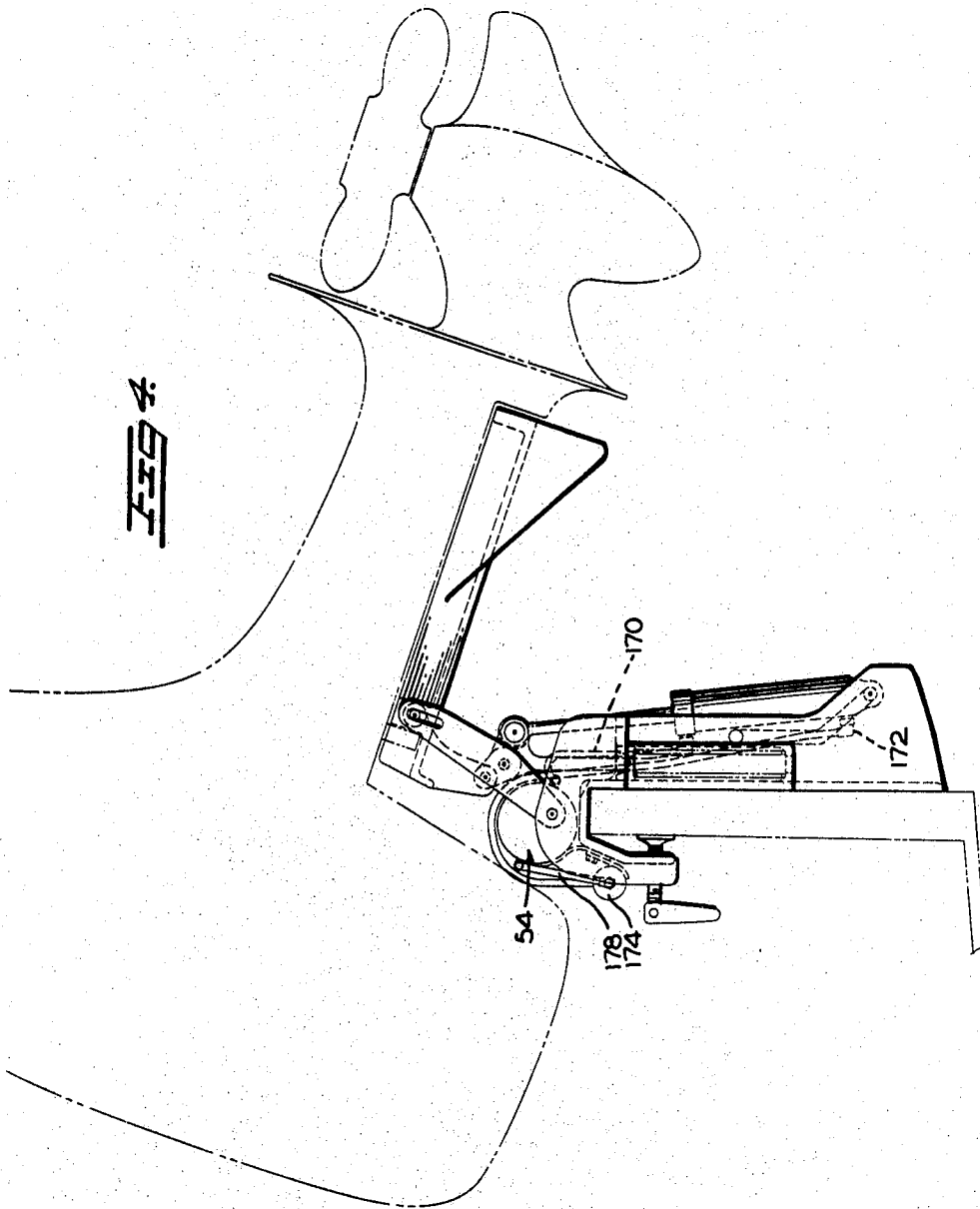
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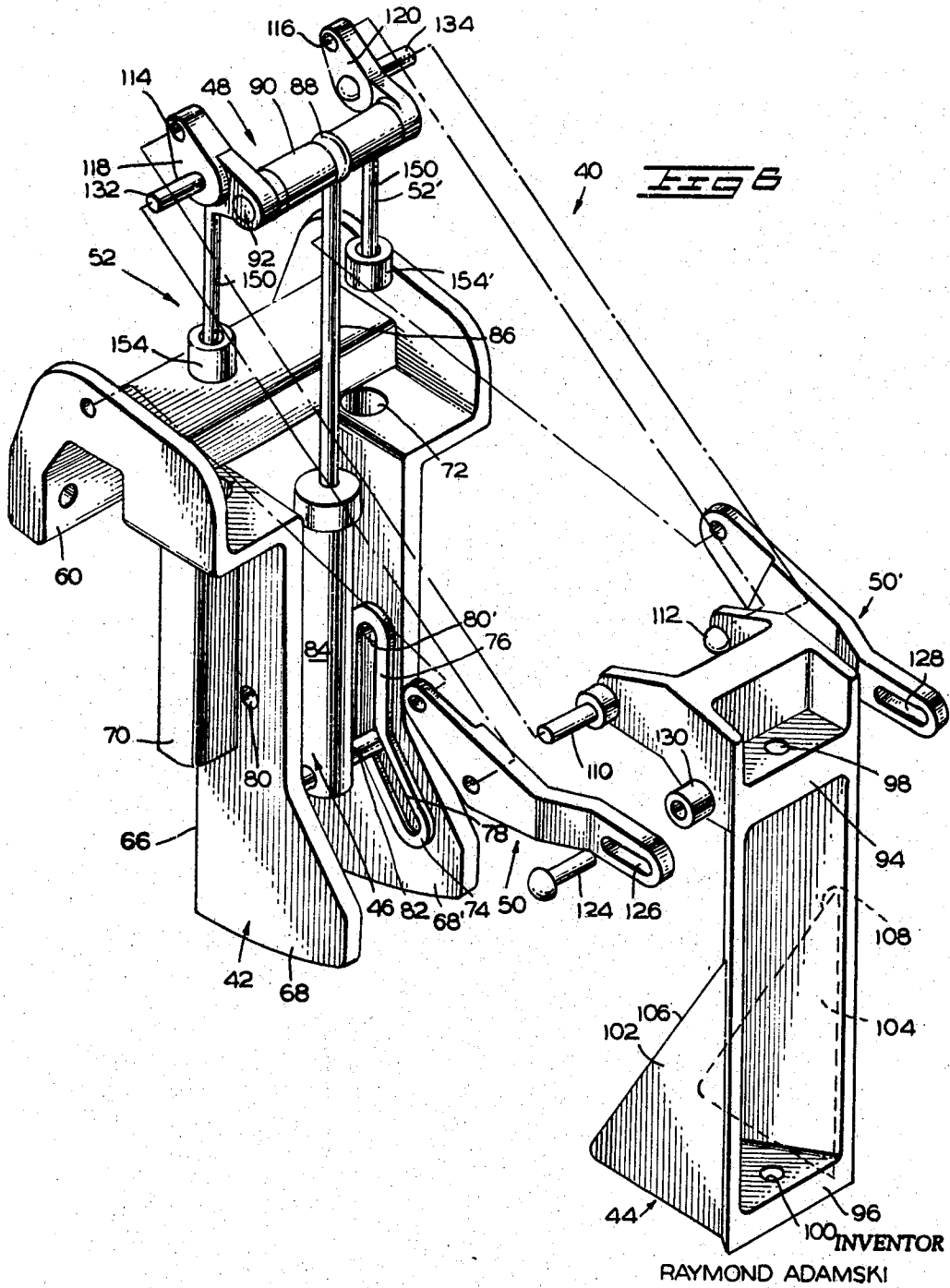
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OUTBOARD MOTOR SUPPORT

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OUTBOARD MOTOR SUPPORT
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9 Claims

ABSTRACT OF THE DISCLOSURE

Power actuated mounting means for an outboard motor including a linear actuator having connection at its opposite ends to separate linkage means whereby during the high force requirement portions of the duty cycle of the system force output is materially increased.

For the propulsion of marine craft, by outboard type of motors which are suspended from the marine craft transom, it has been the practice to have a power producing package, generally of the internal combustion cylinder and piston type, mounted over a generally vertical drive shaft and housing. The housing extends downward and connects to a lower housing in which is resident a transmission mechanism to direct the force from the power producing package to an essentially horizontal shaft, such shaft emitting, rear end wise, from the lower housing and having mounted thereon a propeller generally of the screw pitch and blade type. A common feature of the lower housing is a horizontal extension known as the cavitation plate which functions to stabilize the craft from the forward thrust of the propeller. The stabilizing effect of the cavitation plate along with the control of the direction of thrust from the propeller is dependent to a large extent on the position of the propeller relative to the hull bottom surface of the craft and therefore also relative to its mounting bracket.

It was also common in the prior art to pivotally mount the entire power producing outboard motor on a transom bracket via a single horizontally disposed transverse axis connection. In general, transom brackets are of the inverted U type with one of the legs of the bracket contacting the outboard side of the transom of the marine craft while the inboard extension of the bracket extends downward along the forward or inner face of the transom. Such brackets also commonly employ means for clamping and fastening the generally inverted U shaped bracket on the transom.

A motor hanger is generally pivotally mounted onto the transom bracket on a horizontally disposed transverse axis positioned in the uppermost extension of the transom bracket in such a manner that the motor may be adjusted for the desired horizontal aspect of the power package propeller along with the cavitation plate with respect to the hull bottom contours of the craft. Further, it was common practice to provide a predetermined and limited number of fixed positional stops between the transom bracket and the motor hanger. The fixed positional stops, while limited in number, permitted manual adjustment of the cavitation plate and the propeller with respect to the hull bottom contour of the boat. The limited number of adjustments, and the fact that such manual adjustments could be performed only in the absence of propeller thrust prevented full utilization of the theoretical performance of the craft.

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In order to improve the performance of an outboard motor powered craft at varying speeds, it is necessary to provide substantially unlimited adjustment of the direction of thrust of the propeller and the cavitation plate of the power plant in respect to the varying attitudes of the hull bottom of the craft. This is particularly true on small marine craft such as are commonly powered by outboard type motors where loading fore and aft has a marked influence on the performance of the craft at varying speeds from starting and lower speeds at which the hull of the craft cuts through the water to the higher speeds at which the hull rides on the surface of the water, commonly known as "planing." To be practically functional, the adjustment of the direction of propeller thrust and of the attitude of the cavitation plate must be accomplished by powered means.

It is also desirable to be able to vary the angular relationship between the propeller shaft of the outboard motor and the plane of the hull of the craft to permit operation of the craft in shallow water or in weed infested water.

It is also desirable to include means whereby if the downwardly extending portion of the outboard motor strikes a submerged object, the motor will freely tilt to reduce damage to itself, to its connections to the craft, and to the craft. Further, means should be provided in the system which will arrest rapid and possibly destructive dropping of the motor from a tilted position to the normal operating positions.

It is desirable that the motor support should provide means to powerably tilt the outboard motor to a transport or service position wherein the normally vertical downwardly extending housing is more nearly horizontal and that such means be capable of maintaining the motor in that position indefinitely for transport or for service afloat.

It is further desirable to create the components of the motor support and their relationship to each other in a manner such that all the desired functions are attained with minimized force and power requirements.

Also desirable is an outboard motor support means wherein the physical design and arrangement of the various components favorably accentuate the aesthetic design of the entire product.

The disadvantages of prior art outboard mountings are eliminated and all of the advantages hereinbefore discussed are provided by mounting means for an outboard motor comprising a first bracket adapted to be secured to a boat transom, a second bracket or motor hanger adapted to be secured to an outboard motor, a linear actuator, a primary link, means pivotally connecting one movable end of the linear actuator to the primary link, means pivotally and generally longitudinally mounting the other movable end of the linear actuator to the first bracket, means pivotally mounting the second bracket to the primary linkage on an axis spaced from the axis of the pivotal mounting between the primary link and the said one end of the linear actuator, and a lost motion link means pivotally connecting the upper ends of the first and second brackets.

This invention will be more particularly described in reference to the accompanying drawings wherein:

FIGURE 1 is an elevational view of an improved mounting means for an outboard motor with a portion

of the craft supporting the mounting means and the outboard motor assembly shown in phantom lines;

FIGURE 2 is a view similar to that illustrated in FIGURE 1 with the motor tilted on its mounting means approximately 15 degrees;

FIGURE 3 is a view similar to FIGURES 1 and 2, which shows the motor pivoted 45 degrees;

FIGURE 4 is a view similar to FIGURES 1-3 with the motor pivoted to its greatest extent;

FIGURE 5 is an enlarged fragmentary partial sectional view of the motor support means illustrated in FIGURES 1-4; and

FIGURE 6 is an enlarged fragmentary partially exploded perspective view illustrating the primary structures of the improved mounting of the invention.

Referring to the drawings, 10 generally designates a marine craft and 12 generally designates a conventional gasoline powered outboard motor. In the drawings, in FIGURE 1 through 5, the marine craft is shown as including a hull bottom 14 and a transom 16 having an inner face 18 and an outer face 20.

The outboard motor 12 includes a power package 22, usually of the internal combustion engine type, a generally vertical housing 24, a transmission portion 26, and a rearwardly projecting propeller 28. Between the propeller and the lower end of the housing 24 is positioned a cavitation plate 30.

The mounting means 40 of the invention generally comprises the following primary structures:

- a first or transom bracket 42;
- a second or motor secured bracket 44;
- a linear actuator 46;
- primary link means 48;
- lost motion link means 50 and 50';
- primary link guide means 52 and 52'; and
- linear actuator power pack 54.

The first or transom bracket 42 is generally inverted U shaped in vertical section. Leg 60 of the bracket is adapted to be positioned adjacent the inner wall 18 of the transom 16 and is provided with a pair of screw clamp means 62 for releasably securing the bracket 42 to the transom. The other leg 64 of the bracket 42 has a forward face 66 which is adapted to engage the rearward surface 20 of the transom 16. Leg 64 also includes a pair of parallel rearward extending spaced wing portions 68 and 68', and a pair of parallel spaced cylinder forming structures 70 and 72.

The lower opposed faces of the wing-like structures 68 and 68' are provided with track forming elements 74. The track forming elements have a generally vertical portion 76 and a downwardly and rearwardly sloping portion 78. Adjacent the upper end of the vertical portion of the tracks formed by track forming element 74 are bores 80 and 80' through which may be inserted a wedge pin 82, which wedge pin has a length and diameter so sized to be slidably retained in the tracks formed by track forming elements 74. Also, as more clearly shown in FIGURE 6 of the drawings, the wedge pin 82 pivotally mounts the lower end of the cylinder portion 84 of the linear actuator 46.

The linear actuator includes a piston, not shown, and a piston rod 86. The upper end 88 of the piston rod 86 is pivotally connected to a cross arm 90, via pin 92, of the primary linkage 48.

The second or motor bracket 44 includes a pair of cross webs 94 and 96, each of which is bored as at 98 and 100, to receive suitable pins or bolts for securing the forward surface of the housing 24 of the outboard motor to the bracket.

The motor bracket 44 includes a pair of forwardly extending parallel spaced wing portions 102 and 104. The wing portions 102 and 104 have sloping cam surfaces 106 and 108, respectively, which cam surfaces are adapted to be engaged by wedge pin 82 during the travel

of the wedge pin in the rearwardly curved portions 78 of the tracks formed by track forming element 74, as to be more fully described hereinafter.

The bracket 44 is pivotally mounted to the primary link 48 via pins 110 and 112 which are received in bores 114 and 116 carried at the outboard ends of arms 118 and 120 of the linkage 48.

The motor bracket 44 is pivotally mounted to the transom bracket 42 via the pair of lost motion links 50 and 50'. The most forward ends of links 50 and 50' are mounted to the bracket 42 via pins 22 while the rearward ends of the links 50 and 50' are connected to the upper end of bracket 44 via pins 124 which pass through elongated lost motion slots 126 and 128 in links 50 and 50', and thence into pin retaining ferrules 130 secured to opposite sides of the bracket 44. Further, links 50 and 50' are connected to the primary link 48 via pins 132 and 134, which pins are intermediate pin 92 and holes 114-116.

Each of the arms 118 and 120 of linkage 48 are provided with rigid depending arms 150 and 150' of guide means 52 and 52'. The lower end of each of the arms 150 and 150' (as more clearly illustrated in FIGURE 5 of the drawing) is pivotally mounted via pivot pin 152 to pistons 154 and 154' which are slidably received in the pair of parallel spaced cylinder forming structures 70 and 72 formed in the transom bracket 42. Further, within each of the cylinder spaces 156 of the cylinder forming structures 70 and 72 is positioned a helical spring 158. The lower end of each of the helical springs 158 engages the bottom wall 160 of the cylinders 156 while the upper end of each of the helical springs bears against the inner end of its respective piston 154.

When the outboard motor is in the normal drive position, as in FIGURE 1, the helical springs 158 are compressed and the pistons 154 are positioned inwardly of the upper ends of the cylinders 156, as illustrated in FIGURE 5 of the drawings.

The assembly also includes power means 54 for supplying pressure fluid such as hydraulic fluid to the linear actuator 46. Referring, for example, to FIGURES 1 and 4 of the drawings, pressure fluid is directed to and from the upper and lower ends of the linear actuator cylinder 84 via conduits 170 and 172, respectively, which conduits are connected to flow control valve means 174, which in turn is connected to a hydraulic reservoir and electric motor means generally designated 176. The valve and the output from the pump are connected via conduits 178 in conventional fashion. In the illustrated form of the invention the unit 176 is of the sealed electric motor and pump type. Where desired, the electric motor hydraulic pump unit may be replaced by or used in conjunction with hand operated hydraulic pump means. Alternately, the hydraulic type linear actuator illustrated may be a linear actuator of the screw type or a gear rack and pinion type, such alternate actuators being operated either by an electric motor or by manual means as for example via a flexible torque cable.

OPERATION

With the assembly positioned on a transom of a water craft in the position illustrated, for example, in FIGURES 1 and 5, and it is desired to pivot upwardly the outboard motor assembly 12 the hydraulic pump is actuated and the valve mechanism 174 is set to direct pressure fluid, via conduit 172, to the lower end of the linear actuator 46 whereby pressure fluid exhaust from the cylinder 84 via conduit 170 to the hydraulic reservoir. The pressure fluid directed to the lower end of the hydraulic cylinder 84 acts against the piston of the unit and the piston rod 86 is urged upwardly while an equal and opposite reaction forces the lower end of the linear actuator 84 downwardly in a path corresponding to the lower portion of the trackway 78. This movement of the lower end of cylinder 84 forces the wedge pin 82 into camming

engagement with the inclined cam surfaces 106 and 108 of the wing portions 102 and 104 of the motor support bracket 44, as more clearly illustrated in FIGURE 5.

The camming action forces the lower end of the motor bracket 44 rearwardly until the wedge pin 82 reaches the bottom of the track. When the pin reaches the bottom of the track the motor has moved to a position substantially as shown in FIGURE 2 of the drawing. Simultaneously with the foregoing motion an equal and opposite force is directed upwardly through piston rod 86 to the primary linkage 48, which causes this linkage to move upwardly whereby lost motion links 50 and 50' pivot about their pivotal connection 122 to the transom mounted bracket 42 and, of course, about the pivot pins 132 and 134.

It will also be appreciated that a portion of the upward rocking movement of the links 50 and 50' is brought about by force derived from the pair of helical springs 158 which, when the motor is in the position illustrated in FIGURE 1, are compressed and continuously exert an upward force upon the links through the primary linkage 48.

Continued upward travel of the piston rod 86 continues the rocking motion of the motor bracket 44 and its connected motor until the uppermost limit of travel is reached, as illustrated in FIGURE 4. The lower end of the cylinder 84 remains in its lowermost position. It is further to be observed, that since the motor bracket 44 is attached to linkage 48 and to the links 50 and 50' with the links being primarily pivotal about pins 122 carried by the transom bracket 42 during the pivotal movement of the motor from its FIGURE 1 position to its FIGURE 4 position, sliding motion takes place between pins 124 carried in ferrules 130 secured to the motor bracket 44 and the slots 126 and 128 in the linkage or lever arms 50 and 50'.

It will be observed in FIGURE 1 that the pins 124 are at the forward ends of their respective slots 126 and 128, while when the motor and its connected mount has reached its most tilted position, as illustrated in FIGURE 4, the pins 124 are at the most rearward end of the slots 126 and 128.

Reversal of the direction of flow of pressure fluid, such that the pressure fluid is directed to the upper end of the hydraulic cylinder and the lower end of the hydraulic cylinder is vented to the hydraulic reservoir, the first portion of the movement takes place substantially solely in the downward movement of the piston rod 86. It is not until the sloping faces 106 and 108 of wing members 102 and 104 come into contact with wedge 82 that the hydraulic cylinder 84 starts to move upwardly in the sloping trackway 78 such that the motor moves from the position illustrated in FIGURE 2 of the drawing to that illustrated in FIGURE 1. It will also be observed that during the reversed movement of the apparatus the helical springs 158 are recompressed to the form illustrated in FIGURE 5 of the drawings, and in being compressed carry a portion of the weight of the motor and its attached bracket.

It will be particularly noted that since there is no positive connection between the cam surfaces 106 and 108 of mounting bracket 44 and the wedge pin 82, if the lower portion of the power package 12 strikes a submerged object the bracket 44 and its connected motor will pivot upwardly. In so doing, the wedge pin 82 will move into the upper vertical portion 76 of the track forming members carried by the wing portions 68 and 68', thus materially reducing damage to the motor and its mounting.

This motion of the motor and its bracket 44 is resisted by the weight of the motor and the weight of its bracket. Thus, while the motor may be pivoted upwardly upon striking a relatively immobile object, merely reversing the direction of operation of the motor propeller will not cause the motor to follow this course.

The multiple linkage of this invention provides both upward and rotational movements of the motor and its attached hanger as separate yet directly related movements. Therefore, propeller attitude is not restricted to a given position with respect to a radius from a single pivotal axis. Additionally, the motor may be more favorably oriented in the transport or service position to clear the transom bracket and objects mounted thereon and to clear any of the craft structure immediately forward of the transom. This second feature especially is attained without unduly increasing the distance from the transom bracket pivotal point to the vertical portion of the motor hanger.

It should be noted that a primary merit of the invention is the utilization of force from both ends of the linear actuator during that portion of the duty cycle when the force requirement is greatest. This feature permits minimization of peak actuating force with accompanying reduction in physical size of all force carrying and force transmitting members of the system.

From the foregoing description of a preferred embodiment of the present invention, it will be appreciated by those skilled in the art that the present invention fully accomplishes the aims and objects hereinbefore set forth. It will also be apparent that various modifications may be made in the form of the structures forming this invention.

I claim:

1. Mounting means for an outboard motor comprising a first bracket adapted to be secured to a boat transom, a second bracket adapted to be secured to an outboard motor, a linear actuator, a primary link, means pivotally connecting one movable end of the linear actuator to the primary link, means pivotally and slidably mounting the other movable end of the linear actuator to the first bracket, means pivotally mounting the second bracket to the primary link on an axis spaced from the axis of the pivotal mounting between the primary link and the said end of the linear actuator, and lost motion link means pivotally connecting the upper ends of the first and second bracket.

2. The mounting means defined in claim 1 wherein the linear actuator comprises a piston and cylinder unit which is mounted such that each end of the linear actuator urges the second bracket into pivotal relationship to the first bracket during at least a portion of the duty cycle of the linear actuator.

3. The invention defined in claim 2 wherein the means pivotally and slidably mounting the said other movable end of the linear actuator to the first bracket comprises a wedge pin, the extended ends of which engage a cam track in the first bracket.

4. The invention defined in claim 3 wherein the second bracket is provided with cam surfaces adapted to be engaged by the wedge pin during a limited portion of the pivotal movement of the second bracket relative to the first bracket.

5. The invention defined in claim 1 including motion damping means and forced storage means slidably connecting the primary link to the first bracket.

6. The invention defined in claim 5 wherein said motion damping means comprises a pair of piston and cylinder units and cushioning means maintained within each of the cylinders thereof.

7. The invention defined in claim 1 wherein the linkage means mounting the second bracket is such that the motion of the second bracket and its attached motor is other than true rotational motion about any single fixed pivot axis in the first bracket.

8. The invention defined in claim 1 including means to control the attitude of the primary link with respect to the lost motion link and with respect to the second bracket.

9. The invention defined in claim 3 including an extension of said cam track in the first bracket to permit upward movement of the wedge pin when an external

force is applied to the motor or to the bracket secured thereto.

References Cited

UNITED STATES PATENTS

2,441,000	5/1948	Armstrong	248—4
2,893,342	7/1959	Langford	115—41
2,997,014	8/1961	Puckett	248—4 X
3,107,073	10/1963	Monroe	248—4

3,145,003	8/1964	Hart	248—4
3,406,652	10/1968	Mett et al.	115—41

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