

Jan. 3, 1961

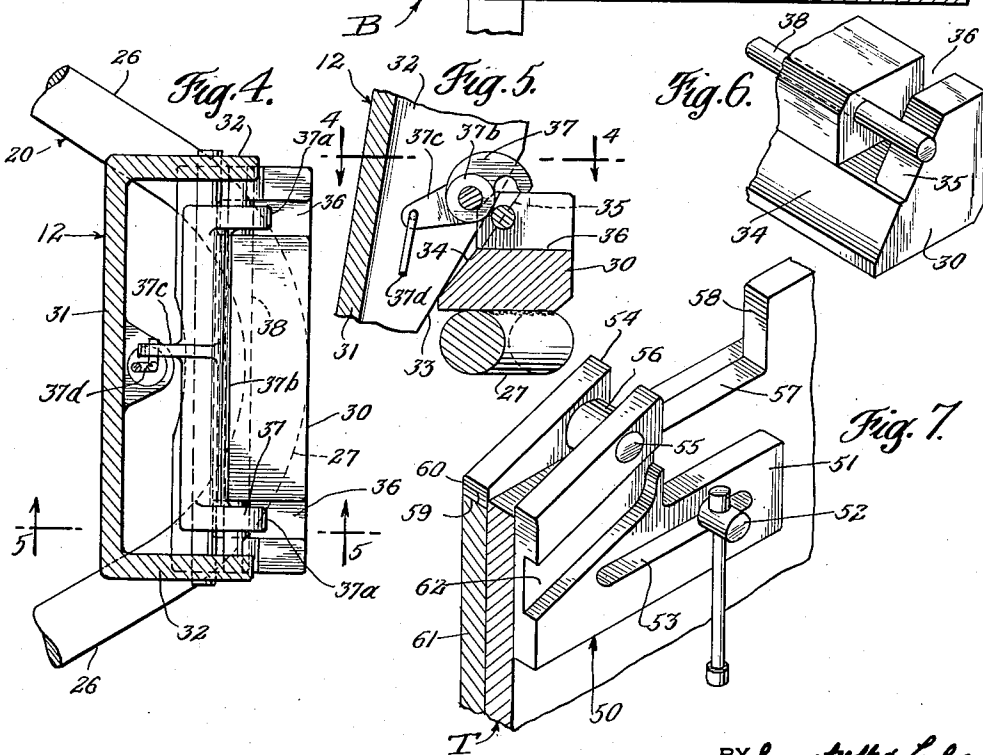
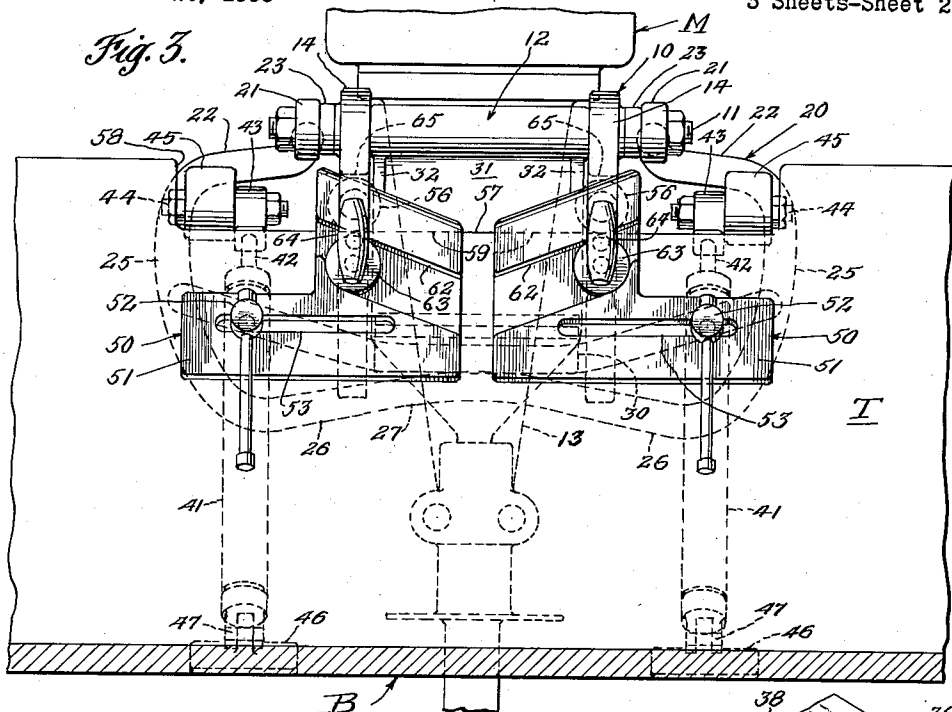
W. MacWILLIAM

2,966,876

OUTBOARD MOTOR POSITION-ADJUSTING APPARATUS

Filed March 26, 1958

3 Sheets-Sheet 2



BY *Lynn & Lechner*
ATTORNEYS

1

2,966,876

OUTBOARD MOTOR POSITION-ADJUSTING APPARATUS

Wallace MacWilliam, 363 Crest Road, Ridgewood, N.J.

Filed Mar. 26, 1958, Ser. No. 724,014

12 Claims. (Cl. 115—41)

This invention relates to outboard type motors for boats and is concerned with means for adjusting the position of such motors on the stern board or transom of the boat.

Before stating the objects of the invention it will be helpful to refer briefly to some of the factors which should be taken into consideration in mounting a motor of this type. For instance, it is well known to those skilled in the art that the overall efficiency of the motor, the boat speed which can be attained and the degree of travel comfort which can be secured in boats equipped with outboard motors are determined to a very large extent by the angular position at which the boat hull travels relative to the surface of the water and generally speaking, optimum results in all these respects are best attained by so designing and adjusting the motor that the hull of the boat will ride in a plane which is approximately parallel to the surface of the water or only slightly inclined bow-up. It is also well recognized by those skilled in the art that greatest efficiency of motor and propeller operation are secured when the propeller's thrust is approximately parallel to the direction of boat travel.

The usual outboard motor comprises an internal combustion engine connected, through suitable drive mechanism, to an associated propeller and the motor and the drive mechanism are generally contained in a common housing unit. The housing is provided with mounting brackets for fastening it to the transom of the boat and the brackets generally include a horizontally disposed pivot pin or bolt upon which the housing can swing or swivel, the swiveling point being arranged so that the upper portion of the motor can be tilted or tipped inwardly toward the boat so that the lower portion of the motor is arcuately lifted out of the water whenever there is insufficient depth to permit the propeller to operate without obstruction.

In addition, in recognition of the importance of the factors mentioned above, most outboard motors of better quality are equipped with an adjustable stop or lock pin against which the forward portion of the motor housing is adapted to rest when the boat is in operation. Lock hooks or latches are also provided which are designed to engage the lock pin in order to hold the motor in driving position when the propeller is operated for reverse or neutral travel. A series of pairs of apertures for receiving the lock pin are also provided which apertures are arranged in an arc so that the angle of the motor relative to the stern or transom of the boat can be adjusted by moving the pin to a different pair of holes. In this way, the motor and its associated propeller can be positioned at any one of a series of angles for the purpose of securing optimum results in operation under various wave conditions and boat loadings. However, the adjustments which are possible with such prior art equipment are necessarily made when the boat is not being operated and require a considerable amount of guess work and are usually the result of trial and error.

2

For this reason, needed adjustments are often neglected with resulting impairment in the efficiency, speed and comfort of boat operation. For example, a typical situation requiring ready adjustment is encountered when the motor is started up. If, at start, the planing angle has been set for operation at optimum speed and efficiency, the propeller will frequently cavitate which results in excessive and destructive r.p.m. with little or no forward movement of the boat.

With the foregoing in mind, the principal object of my invention will be more fully understood and appreciated. It involves the provision of apparatus for supporting an outboard motor by means of which power actuated adjustment of the transom angle of the motor is made possible while the boat is in operation and further whereby such adjustment can be effected whenever necessary even to the point of substantially continuous manipulation if conditions of boat operation are such as to make continuous adjustments either necessary or desirable.

A concomitant object is the provision of a mechanism of the character described by means of which any desired angular position of the boat hull relative to the surface of the water can be attained while the boat is in operation whereby to satisfy any temporary need or desire on the part of the operator.

It is also an object of my invention to provide power mechanism for adjusting the transom angle of the motor by a control which can be placed at a point remote from the motor and convenient to the hand of the operator or helmsman wherever he may be located.

Another object is to provide power means for raising and lowering an outboard motor so that the boat may be launched or beached under at least a certain measure of power from the propeller even in shallow depths with continuous adjustment of the propeller angle being provided for as the depth of the water varies.

Among the important features of my invention is the provision of apparatus for adjusting the transom angle of an outboard motor wherein the lock pin which co-operates with the locking hooks or latches is arranged to move with the motor and retain the functions of these parts, regardless of the transom angle to which the motor may have been moved by the power mechanism of my invention.

A further object of the invention is to provide a motor position-adjusting mechanism which can be readily applied to motors of existing type without necessitating any radical changes in design and without in any way impairing the advantageous features of construction heretofore characteristic of the outboard motor art. In other words, my improvements are of such a nature that they can be easily and readily applied to existing motors and boats by making only the simplest of substitutions when applying the parts of my improved apparatus and without the need for changing the basic structure of the motor or the boat.

The invention also involves the provision of mechanism for mounting an outboard motor on the transom so that it may be readily positioned vertically to locate the propeller at any desired operating depth in the water regardless of the transom angle at which it may be operating.

Still another object of the invention involves the provision of an ideally located rope attachment member to which a skier's tow line can be secured without the danger of having the line foul up or tipping or upsetting the boat as has sometimes occurred heretofore especially when the boat is making a tight turn.

How the foregoing objects and advantages together with such other objects as may appear hereinafter are attained is illustrated in preferred form in the accompanying drawings wherein:

3

Figure 1 is a side elevational view with the transom and hull of the boat shown in section, the view being taken approximately on the line 1—1 of Figure 2 and illustrating my invention as applied to a boat having an outboard motor of common form;

Figure 2 is a plan view of Figure 1 taken as indicated by the line 2—2 in Figure 1;

Figure 3 is a cross section taken on the line 3—3 of Figure 1;

Figure 4 is an enlarged fragmentary plan section approximately as indicated by the line 4—4 of Figure 5;

Figure 5 is a vertical section taken approximately as indicated by the line 5—5 of Figure 4;

Figure 6 is a fragmentary isometric view of a supporting member or block employed in connection with the invention;

Figure 7 is a fragmentary isometric view of one of the plates which cooperate with other parts in securing vertical adjustment of the motor;

Figure 8 is a side elevational view similar to that of Figure 1 but illustrating the motor in its position of maximum upward tilt; and

Figure 9 is a schematic view illustrating the power and control unit employed with my invention.

Referring more particularly to Figures 1, 2, 3 and 8, it will be seen that I have illustrated an outboard motor M of familiar and common construction mounted on the transom T of a boat B. The power device for adjusting the motor transom angle according to my invention is indicated generally by the reference character D, the details of which will appear more fully as the description proceeds.

The outboard motor, as stated, may be of any well known form and, in the present instance, includes the familiar clamp bracket 10 which is adapted to be clamped on the transom T of the boat. It has the usual horizontally disposed pivot pin 11 upon which the swivel bracket 12 of the motor is adapted to swing, the bracket 12, in the form illustrated, being associated with the lower housing 13 of the motor. It will be understood, of course, that the motor and the bracket are rigidly secured together and that upward swiveling or swinging of the motor takes place around the pin 11 as a pivot in a manner well understood in this art.

The clamp bracket 10 comprises the usual pair of side members 14 which are laterally spaced apart by rods 15 and 16 and it will be noted that the clamp bracket has the customary arcuate portion 17 containing a series of oppositely disposed apertures adapted to receive a tilt lock adjustment pin. However, the pin normally used in association with these apertures is not shown as being mounted in the apertures of this arcuate portion 17 because, with the present invention, it is replaced, by a lock pin carried by a part associated with the structure of my invention as will further appear.

The power adjusting device D of my invention includes a frame 20 preferably of rod construction and suitably formed, as will further appear, to provide ample clearance for the outboard motor in any steering or tilted position. The frame 20 comprises spaced side arm portions substantially of U-shape with the legs of the U arranged one above the other as most clearly shown in Figures 1 and 8. The forward end of each upper leg 22 is provided with an apertured ear 21, said ears providing means by which the frame is pivotally mounted on the pivot pin 11 of the clamp bracket 10. In order to provide for this, it should be noted that the pivot pin normally supplied with a motor of this kind is replaced by a pin which is slightly longer so that its ends project laterally somewhat beyond the sides of the bracket. I prefer to provide spacer collars 23 between the ears 21 and the side members 14 of the bracket 10.

As seen in the plan view of Figure 2, the upper legs 22 of the side arm members extend rearwardly in parallel relation for a short distance from the pivot pin 11 and

4

then angle outwardly at 24 for a further distance and then bow downwardly and inwardly at 25 to merge with the lower legs 26 which latter extend angularly forward and are interconnected by the bowed portion 27. At the rear a substantially U-shaped or bowed cross brace 28 connects the side or arm portions of the frame, being preferably welded to the side arms at the bowed portions 25 where stiffening web plates 29 may be provided for greater strength.

A cross or abutment bar 30 (see Figures 1, 2, 3, 4, 5 and 6) is secured to the lower connecting bowed portion 27 of the frame 20 as by means of welding and this bar 30 serves as an abutment member against which the swivel bracket 12 of the motor is adapted to bear.

As will be seen the frame 20 constitutes, in effect, a cradle for supporting the motor during a tilting operation as will further appear. It should also be noted that the cross brace 28 is located sufficiently far to the rear of the engine and is so shaped and disposed with relation to the boat as to provide an ideal member to which skiers' tow lines may be attached. Being at the rear of the engine and centrally located it practically precludes all possibility of the lines becoming fouled in the engine or of causing the boat to tip over in a tight turn.

As best seen in Figures 4 and 5, the swivel bracket 12 of the motor, viewed in plan section, is generally of channel form with a central web 31 and side flanges 32. The side flanges are tapered at 33 and these side flanges abut against the supporting bar 30 of the cradle as clearly seen in Figure 5, it being noted that the adjacent face 34 of the bar 30 is similarly tapered. It will be noticed that notches 35 are provided in the bar to accommodate the tapered flanges.

The bar 30 is provided with spaced notches 36 in its upper face to accommodate the hooked ends 37a of the standard pivoted lock hooks 37 of the motor. A longitudinally extending pin 38 is provided in the bar 30 in a position to be engaged by the lock hooks 37a whereby to lock the motor to the bar 30 during neutral and reverse or backward motion of the boat. In other words, the pin 38 takes the place of the standard tilt lock pin and it will be understood that in my improved device this pin moves with the cradle when it is being swung by the power mechanism to be described hereinafter.

I also wish to point out that there are two spaced hook portions 37a, one at each end of a barrel portion 37b and that a centrally disposed arm 37c projects rearwardly from the barrel portion in position to be actuated by the controlling rod 37d. This rod 37d first extends downwardly and then turns upwardly at the point 37e because of the necessity to clear certain parts of the engine mechanism. The upper end of the controlling rod 37d is associated with the reverse mechanism of the engine in any manner well understood in this art so that when the engine is set for forward motion of the boat the rod 37d holds the hooks 37a clear of the pin 38 as shown in Figures 1 and 5, since the propeller of the motor then holds the engine against the bar 30. However, upon neutral or reverse motion of the motor, the rod 37d is moved by the shifting mechanism of the boat to raise the arm 37c and lower the hooks 37a so that the latter will engage and lock the motor to the pin 38. This principle of operation of the locking hooks is familiar to those skilled in the art but with my invention it should be noted that the pin 38 which takes the place of the usual tilt lock pin moves with the power actuated frame or cradle by means of which I provide for adjusting the transom angle of the motor.

As will be obvious from the foregoing description, the motor M is always free to swing upwardly around its pivot pin 11 so as to avoid damage to the lower portion of the engine, especially to the propeller, in the event that a submerged obstruction is encountered. Under such circumstances, the frame or cradle of my invention, of course, will remain stationary in its position of adjust-

ment there being sufficient clearance at the rear between the bowed portion 28 and the motor proper to permit such swinging motion of the motor when an obstruction is encountered.

In the showing of Figure 1 the parts of my improved power device are shown in the positions they will assume when the motor is adjusted for normal running conditions while in Figure 8 they are shown in the positions they occupy when the motor is adjusted to its position of maximum tilt. In this latter position, the usual stop links 40 limit the upward movement of the motor.

Power for operating my motor adjusting cradle is provided by means of a pair of hydraulic cylinders 41—one at each side of the frame 20. The piston rod 42 of each cylinder is connected by means of an ear 43 and a pin 44 to an apertured lug 45 on the upper leg 22 of a side arm. The cylinders are pivotally connected at their lower ends to the stern of the boat, preferably near the bottom of the transom as by means of brackets 46 and pins 47.

When fluid pressure is applied to the bottom faces of the pistons the cradle frame and consequently the motor will be tilted upwardly about the pivot pin 11 and in the full up stroke of the pistons the cradle and the motor will be tilted to the positions shown in Figure 8. Reverse operation or swiveling of the motor is accomplished by exhausting the pressure on the lower faces of the piston and applying pressure on the upper faces of the piston whereupon the frame and motor will be tilted downwardly around the pin 11 toward the transom T of the boat. Normal or average running position is illustrated in Figure 1 in which what is known as the tilt or transom angle is substantially 12° which, of course, takes into consideration that the transom itself is generally sloped slightly toward the rear as shown in Figures 1 and 8. It will be noted that sufficient clearance is provided to permit the motor to be tilted still further toward the transom to establish an even smaller transom angle as is necessary in high waves although a transom angle of 12° is the commonly accepted average for normal operation.

Referring now particularly to Figures 1, 3 and 7 it will be seen that I have provided a safety lock and adjustment of the motor up and down on the transom of the boat whereby the depth of the propeller in the water may be altered as desired at whatever transom angle is in effect.

To this end, a pair of adjusting devices 50 are interposed between the clamp bracket 10 and the transom T of the boat. Each of these adjusting devices 50 comprises an inner plate 51 adjustably secured against the inner face of the transom by means of a clamp screw 52 operating in a longitudinally extending slot 53 in the plate and an outer plate 54 secured in spaced relation to the inner plate by means of a rivet 55 and a spacer collar 56. The spacer collar 56 rests on the upper surface 57 of the transom notch 58 and the bottom face 59 of the outer plate 54 preferably rests on the upper face 60 of the outer transom stiffener member 61.

The inner plate 51 is provided with an inclined groove 62 in its inner face for receiving the clamp disk 63 of the clamp screw 64 of the clamp bracket 10. It will be noted that the groove 62 of the right hand plate, as viewed in Figure 3, inclines upwardly from the central portion of the transom toward the right side of the boat and that the groove 62 of the left hand plate inclines upwardly from the central portion of the transom toward the left side of the boat, i.e., they are oppositely inclined.

In Figure 3, the motor is shown adjusted to its highest vertical position in which case both adjusting devices 50 have been moved inwardly toward each other and clamped in such position, in which position the clamp disks 63 are seated in the top portions of the inclined grooves 62. It should be noted in this connection that the top edges of the inner and outer plates 51 and 54 are inclined parallel to the incline of the groove 62 and that the surfaces 65 of the side members 14 of the bracket 10 bear

on the top edges of the plates so that the plates take the weight of the motor.

If it is desired to adjust the motor downwardly, the clamp screws 64 and 52 are loosened and the adjusting plates are moved outwardly thus causing the bracket surfaces 65 and the clamp disks 63 to ride down the inclines above described and when the motor has been lowered to the desired point, the clamp screws 64 and 52 are tightened.

In order to adjust the tilt or transom angle of the motor, a control unit C (Figure 9) is provided. This control unit is adapted to be located at any point convenient to the operator or helmsman, say for example, in the bow of the boat. The power means, therefore, is remote controlled. Figure 9 is a schematic illustration of the control unit and examination of this figure will show that it includes a hydraulic pump 70 driven by a motor 71, a control switch 72 and a pair of normally closed solenoid operated valves 73 and 74 together with suitable electric connections between the control switch and the solenoid operated valves.

A fluid pressure line 75 leads from the pump 70 to the valve 73 and another pressure line 76 leads from the pump to the valve 74. Fluid lines 77 and 78 lead from the valve 73 to the bottom of the cylinders 41 and fluid lines 79 and 80 lead from the valve 74 to the top of the cylinders 41. Assume, by way of example, that the motor is in the position of adjustment shown in Figure 1 and it is found, due to load conditions, that the boat plows with the bow too low and with the stern too high. In order to correct this condition and cause the boat to run on an even keel the angle of tilt of the motor, i.e., the transom angle must be increased. To accomplish this, the control switch 72 is operated to actuate the pump, the valves 73 and 74 in a direction to admit fluid pressure to the lower ends of the cylinder 41 thereby swinging the cradle and the motor away from the transom. This operation may be continued until the boat assumes the desired relation to the surface of the water—generally what is known as an even keel—whereupon the control switch is operated to stop the pump and close the fluid valves and thereby lock the motor bracket with the motor in their newly adjusted position.

On the other hand, should it be found that the boat squats with the bow too high the control switch is operated to reverse the pump and actuate the valves 73 and 74 in a direction which admits fluid pressure to the tops of the cylinders 41 while exhausting it from the lower portions of the cylinders, thus tilting the cradle and the motor toward the transom and when the boat reaches an even keel position, the control switch is operated to hold the motor in the newly adjusted position.

I should like to point out at this time that my improved power device for adjusting the transom angle of the motor can be operated while the boat is being driven and that adjustments can be made whenever necessary and even substantially continuously if that becomes desirable for any particular set of running conditions. Furthermore, the apparatus I have developed makes it possible to effect the desired adjustments from a point remote from the motor which is a very great advantage especially in dangerous water because it never requires the helmsman to leave his post to make an adjustment.

My invention is also extremely useful in situations where it is desired to launch the boat in shallow water. To do this the control switch 72 is operated to actuate the hydraulic system in a direction to admit fluid pressure to the bottom of the cylinders until the cradle and the motor are tilted up to a position in which the propeller is clear of the bottom whereupon the boat can take off into deeper water after which the control switch may be moved in the direction which gradually admits fluid to the top of the cylinders in order to bring the motor down to the proper transom angle for the running conditions encountered.

From all of the foregoing, it will be apparent that my invention makes possible both tansom angle adjustment and vertical position adjustment in combination and that either type of adjustment can be made separately without necessarily involving the other. This is made possible by virtue of the interrelationship between the transom angle adjusting apparatus and the vertical position adjusting mechanism. For instance, the pivotal connections 44 and 47 at the ends of the cylinder and piston power means 41—42 and the fact that the position of the piston 42 can be adjusted slightly in the cylinder 41 makes it possible to change the vertical position of the motor in the manner illustrated without affecting the transom angle.

It will be seen that my improved motor adjusting apparatus is simple, sturdy and easily applied to a boat and that no material change in the structure of the average motor is required in order to install the equipment. It is also relatively inexpensive to manufacture and maintain. Furthermore, the cradle or framework for adjusting the transom angle of the motor provides an ideally located rear member upon which to attach skiers' tow lines inasmuch as the bar 28 is centrally disposed and rigidly connected to the stern of the boat and is always available regardless of the transom angle at which the motor may be operating. Its location also prevents fouling of the lines or tipping of the boat in tight turns.

I claim:

1. Apparatus for adjusting the position of an outboard motor on the transom of a boat, comprising in combination with the stern clamp bracket, a transverse, stern-bracket pivot pin, a motor swivel bracket swingably mounting the motor on said pin, a frame providing a cradle for supporting the motor, said frame also being swingably mounted on said bracket pivot pin, and power means for swinging the cradle on said pin whereby to alter the transom angle of the motor.

2. Apparatus according to claim 1 wherein the stern bracket pivot pin extends beyond the stern bracket at each side thereof and wherein the cradle frame has an arm on each side pivoted on said pin extensions.

3. Apparatus according to claim 2 wherein each side arm of the frame is of substantial U-shape with the legs of the U disposed one above the other and with the ends of the upper legs pivoted on the stern bracket pin, the lower legs being connected together by a supporting member adapted to contact the forward side of the motor.

4. Apparatus according to claim 3 wherein each side arm of the frame is of substantial U-shape with the legs of the U disposed one above the other and with the ends of the upper legs pivoted on the stern bracket pin, the lower legs being connected together by a supporting member adapted to contact the forward side of the motor and the bases of the U-shaped members being joined together by a brace member providing for tow line attachment at a point sufficiently far to the rear to permit tilting of the motor independent of the frame.

5. Apparatus according to claim 1 wherein said cradle frame carries a motor tilt lock pin and, further, wherein a motor lock hook is pivoted on the swivel bracket in position to cooperate with said lock pin during reverse operation of the motor.

6. Apparatus according to claim 1 wherein the power means includes fluid actuated piston and cylinder members one of which members is pivoted to the frame and the other to the stern of the boat near the bottom of the transom.

7. Apparatus according to claim 6 wherein valve mechanism for controlling the flow of the fluid and an electric operating circuit for the valve mechanism are provided for effecting adjustment of the stern angle while the boat is being driven by the motor.

8. Apparatus according to claim 1 wherein the frame includes an arm at each side of the motor adapted to be pivotally attached to the clamp bracket, and a U-shaped brace member joining said arms at the rear, the U of said brace member providing for tow line attachment and being of sufficient dimension in the rearward direction to permit tilting of the motor independent of the frame.

9. Apparatus according to claim 1 wherein a pair of transversely slidable supporting plates are mounted on the transom, said plates having oppositely inclined upper surfaces upon which the clamp bracket rests, a correspondingly inclined slot in the face of each plate, a bracket clamp disc slidable in each slot, and means for locking the plates in any desired position of transverse adjustment, the motor being raised and lowered by sliding the plates toward and away from each other.

10. In outboard motor mechanism having the usual stern bracket adapted to be clamped to the transom of a boat and with the motor pivoted on the bracket for angular adjustment of the transom angle; the combination of a frame providing a cradle for the motor, said frame having an arm at each side of the motor, a cross bar connecting said arms and adapted to contact the front of the motor, and said frame being pivoted on the stern bracket for up and down swinging movement, together with fluid actuated piston and cylinder members for moving said frame to alter the transom angle of the motor one of which members is pivoted to the frame and the other to the stern of the boat near the bottom of the transom.

11. Apparatus according to claim 10 wherein each side arm of the cradle frame is of substantial U-shape with the legs of the U disposed one above the other and, further, wherein the connection between the piston and cylinder member and the frame is made on the upper leg of the U.

12. In outboard motor mechanism having the usual stern bracket adapted to be clamped to the transom of a boat and with the motor pivoted on the bracket to provide for adjustment of the transom angle; the combination of a frame pivoted on the stern bracket for up and down swinging movement, said frame having an arm at each side of the motor and means adapted to support the motor on said arms, together with fluid actuated piston and cylinder members for moving said frame to alter the transom angle of the motor, one of which members is pivoted to the frame and the other to the stern of the boat near the bottom of the transom.

References Cited in the file of this patent

UNITED STATES PATENTS

2,613,896	Witt	Oct. 14, 1952
2,638,863	Keibler et al.	May 19, 1953
2,674,219	Kiekhäfer	Apr. 6, 1954
2,775,219	Curtis	Dec. 25, 1956
2,815,731	Curtis	Dec. 10, 1957
2,822,999	Tromanhauser	Feb. 11, 1958
2,830,863	Fehr	Apr. 15, 1958
2,893,342	Langford	July 7, 1959