July 21, 1953 R. N. KIRCHER ET AL 2,646,238

RESILIENT TILTING LOCK FOR OUTBOARD MOTORS

Filed June 8, 1950 4 Sheets-Sheet 1

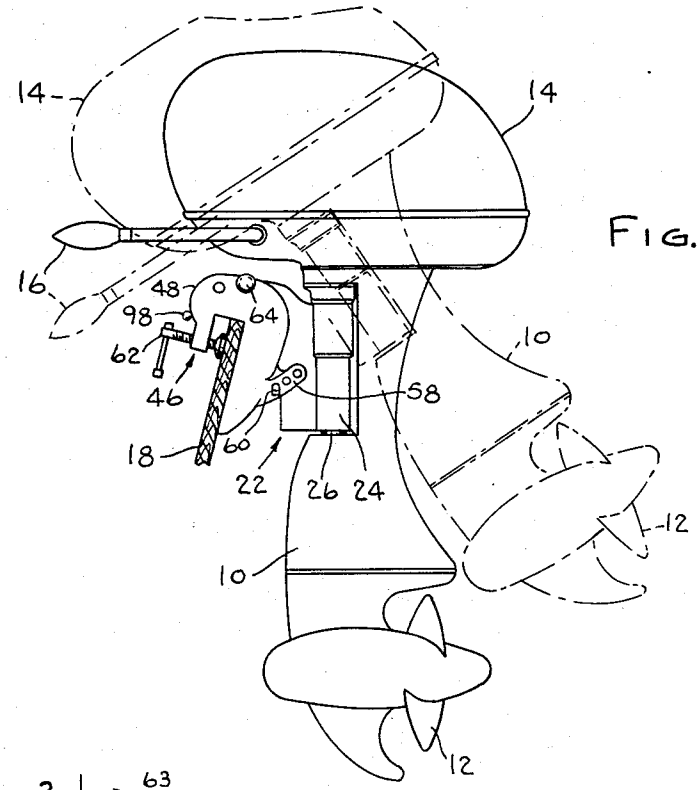


FIG. 1

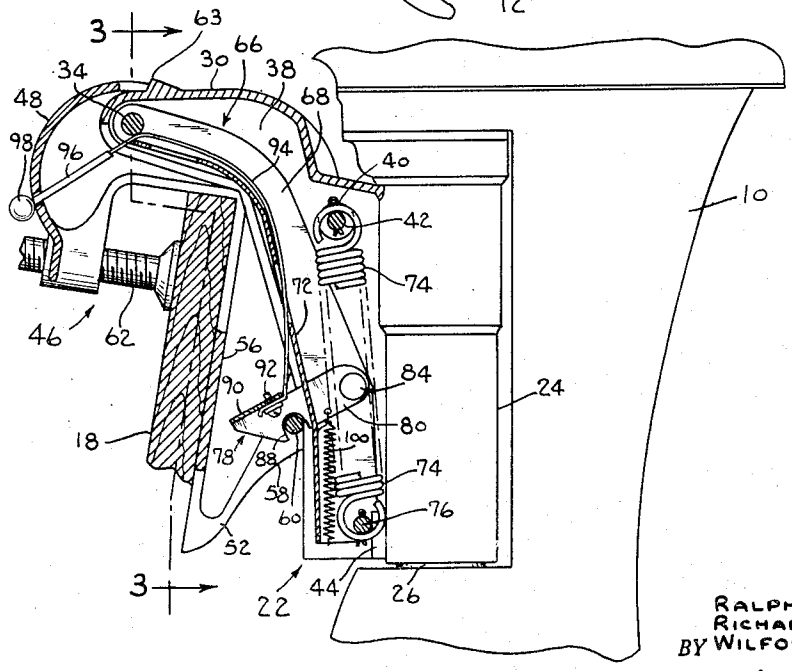


FIG. 2

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RESILIENT TILTING LOCK FOR OUTBOARD MOTORS

Filed June 8, 1950 4 Sheets-Sheet 2

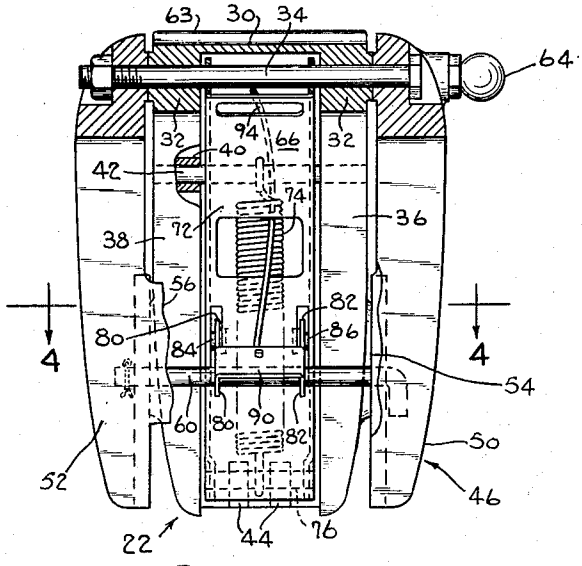


FIG. 3

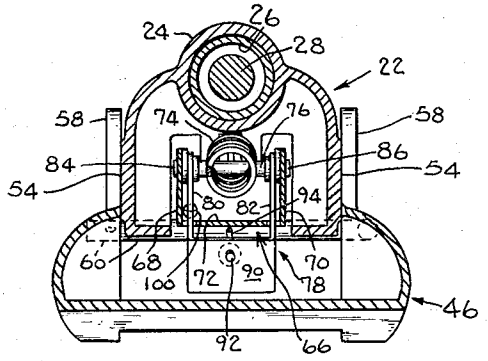


FIG. 4

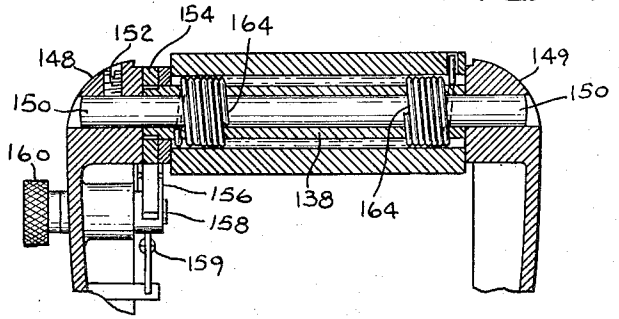


FIG. 10

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RESILIENT TILTING LOCK FOR OUTBOARD MOTORS

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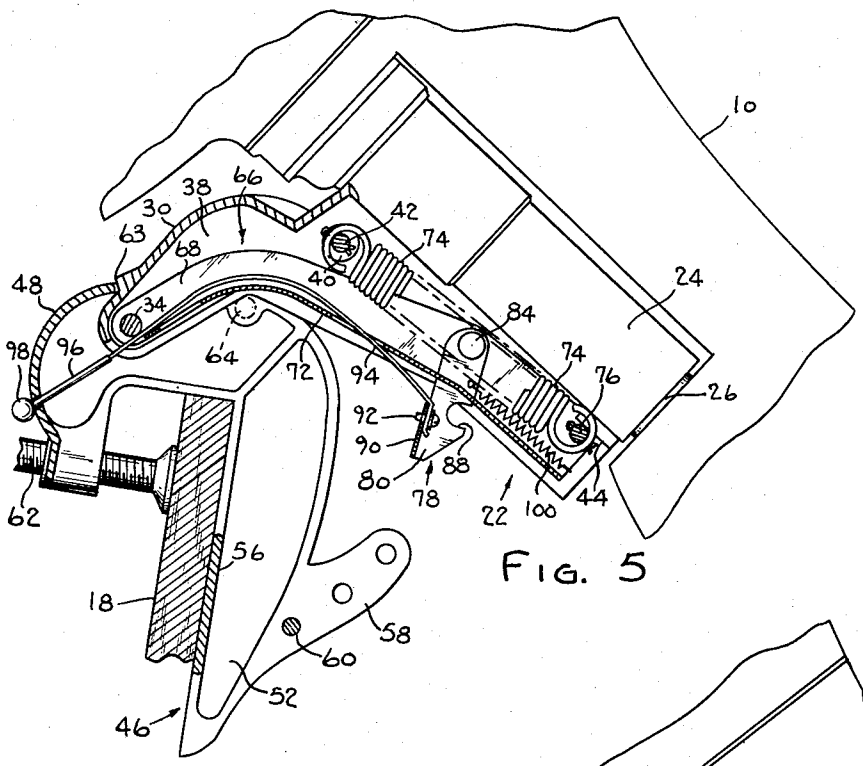


FIG. 5

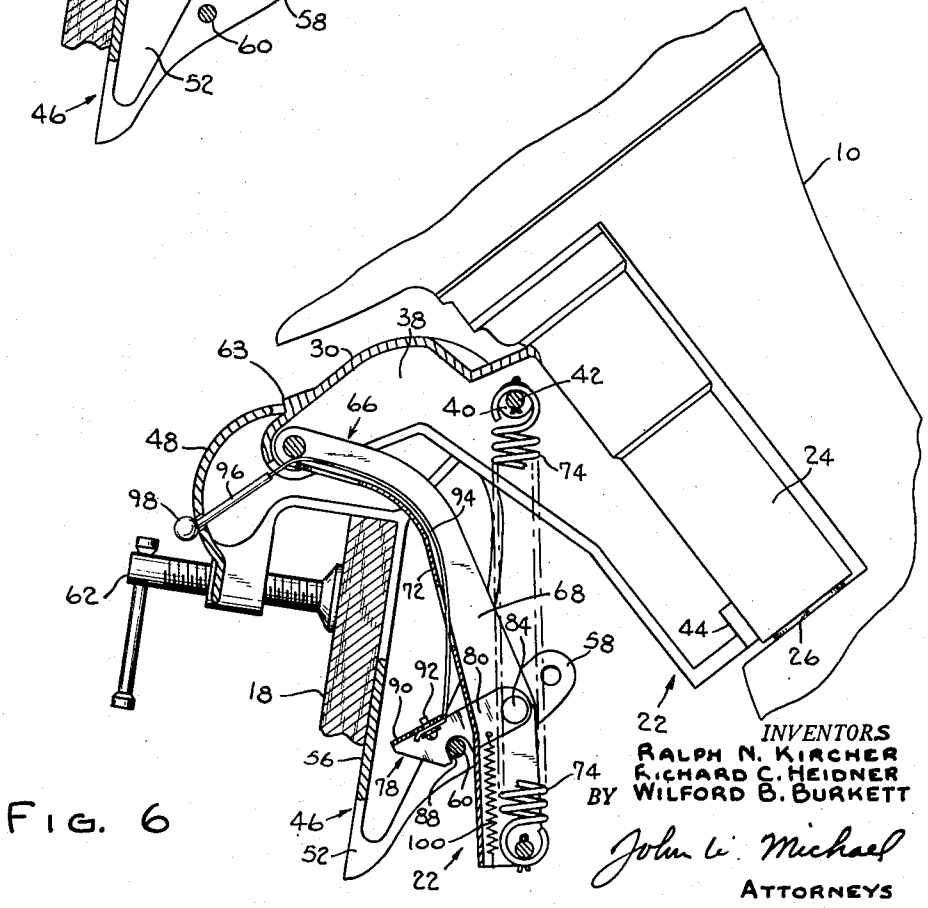


FIG. 6

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RESILIENT TILTING LOCK FOR OUTBOARD MOTORS

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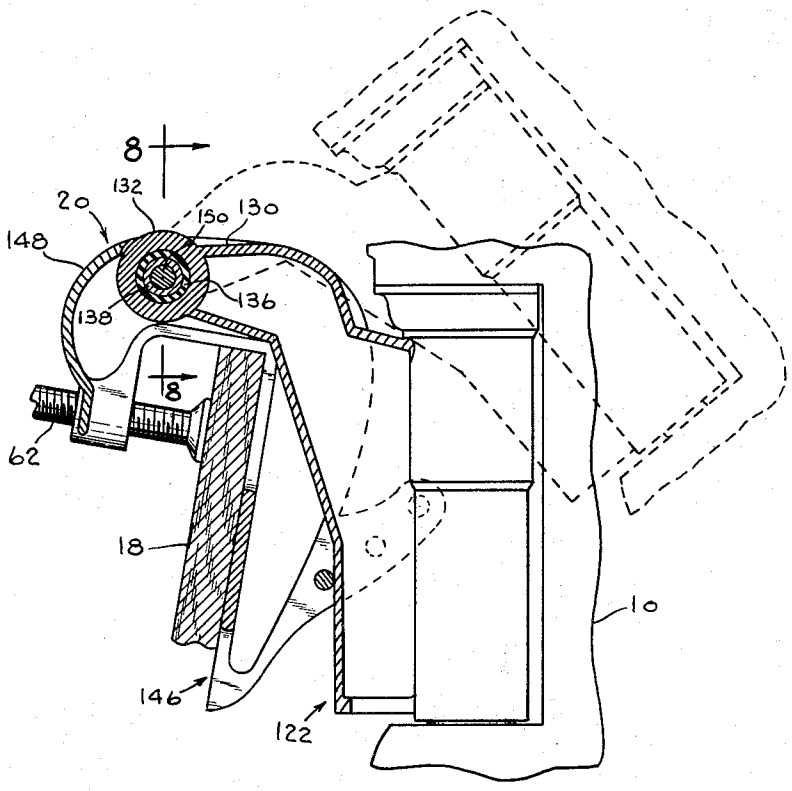


FIG. 7

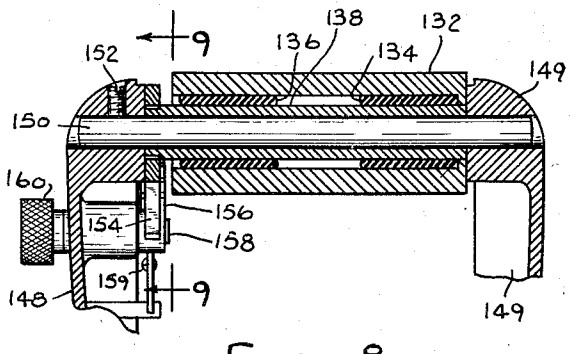


FIG. 8

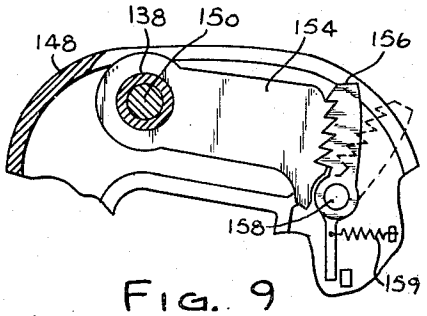


FIG. 9

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Patented July 21, 1953 2,646,238

UNITED STATES PATENT OFFICE

2,646,238

RESILIENT TILTING LOCK FOR OUTBOARD MOTORS

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Application June 8, 1950, Serial No. 166,808

11 Claims. (Cl. 248—4)

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This invention relates to improvements in outboard motors and particularly to a mounting for such motors which resiliently resists rearward upward tilting of the lower legs of such motors relative to the boat during reversing of propeller thrust and freely permits such tilting when not in operation.

Outboard motors now have boat mountings which permit the lower leg of the motor to be manually tilted rearwardly to raise the propeller out of the water or to allow the underwater leg to swing rearwardly if it strikes an obstruction while in operation. Outboard motors so mounted, if turned about a vertical axis to reverse the direction of the propeller thrust, or if their propellers are reversed by reversing mechanism, must have a special lock to prevent rearward tilting. When so locked, if the engine develops too much power the stern of the boat will tend to submerge, creating a dangerous, hazardous condition.

It is an object of this invention, therefore, to provide a mounting for outboard motors which will prevent the stern of a boat from tending to submerge when the thrust of the propeller is reversed for the purpose of stopping or backing up the boat.

Another object of this invention is to provide a mounting for an outboard motor which automatically tilts the angle of reverse thrust so that it is directed downwardly to lift the stern of the boat when the power exceeds that necessary to safely back up the boat.

A still further object of this invention is to provide a mounting for an outboard motor which will automatically prevent the generation of excessive sternward speed of the boat.

A still further object is to provide a mounting for an outboard motor which will prevent the underwater leg thereof from tilting rearwardly and upwardly as the speed of the motor is varied during the forward propulsion of the boat.

A still further object of the invention is to provide a mounting for an outboard motor which will automatically produce an audible safety warning when the engine, while the propeller is in reverse thrust motion, generates power in excess of that for safely operating a boat sternward.

These objects are obtained by providing in a mounting, which permits the lower end of the outward motor to tilt rearwardly and upwardly, a resilient member which resists such tilting and only permits it to take place whenever the force of the reverse thrust of the propeller exceeds

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a predetermined amount designed for safe sternward movement. There are many mechanical variations by which the force of the resilient member may be applied to the motor. The essential characteristic of this invention is that the resilient member permit upward and rearward tilting to commence when the force reverse thrust of the propeller approaches a predetermined safe amount. When this safe amount is approximately reached, and should more and more power be applied, the propeller end of the motor will gradually tilt rearwardly and upwardly thus causing the angle of propeller thrust to lift the stern of the boat and thus prevent submerging. If the power is further increased with attendant increase in propeller thrust, the rearward angle will eventually be such that the exhaust nozzle will break above the surface of the water causing a loud exhaust noise which serves to warn the operator. If no heed is paid to this warning and the power and associated thrust are further increased, the propeller will raise to the surface of the water creating excessive splashing which serves as an additional audible and physical warning and at the same time reduces the rearward component of thrust. It is desirable that the resilient member offer initial resistance against rearward and upward tilting even during forward thrust. Such force will prevent the outboard motor from rearwardly tilting due to speed changes occurring during the forward operation of the boat. When the motor is not in operation, it can be easily tilted rearwardly upwardly by providing a latching device between the resilient member and the motor or between such member and the boat. When such latch is unfastened the motor may be swung rearwardly and upwardly with respect to the boat without distorting the resilient member. When the latch is fastened the resilient member is again brought into operation to resist such tilting. The latch is preferably designed to automatically lock as the motor is moved into normal untilted position.

The novel features, which are considered characteristic of the invention, are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a side view of an outboard motor

having a mounting embodying the present invention and showing in broken lines the position of the motor when partially tilted during reverse thrust of the propeller;

Fig. 2 is a fragmentary view partly in section and partly in elevation of such mounting with the outboard motor in upright position;

Fig. 3 is a fragmentary sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a fragmentary sectional view taken on line 4—4 of Fig. 3;

Fig. 5 is a fragmentary view of the mounting when the automatic lock is released and the motor is locked in its farthest upward tilted position;

Fig. 6 is a fragmentary view of the mounting when the automatic lock is locked and the motor is partially tilted against the resilience of the anti-tilt spring;

Fig. 7 is a fragmentary view partly in section and partly in plan of a modification of the invention;

Fig. 8 is a fragmentary enlarged sectional view taken on line 8—8 of Fig. 7;

Fig. 9 is a fragmentary sectional view taken on line 9—9 of Fig. 8; and

Fig. 10 is a fragmentary sectional view similar to the view of Fig. 8 and illustrating a still further modification of the invention.

Referring to the drawings by reference numerals, the outboard motor, shown schematically in Fig. 1, is of standard design. It has a leg 10 at the lower end on which is mounted the propeller 12. At the top of such leg within a cover 14 there is an engine (not shown) for supplying power to the propeller. A tiller 16 is used to turn the motor and steer the boat and its handle controls the operation of the engine. The motor also has a reversing mechanism by which the direction of thrust of the propeller 12 may be changed from forward to reverse. There is no interlock between the reversing mechanism and the engine control. It is therefore possible for the operator to cause the engine to develop its full power while the propeller is producing reverse thrust.

The outboard motor is mounted to the transom 18 or other part of a boat by a mounting which includes a swivel bracket 22 and a stern bracket 46 connected thereto by a pivotal connection 34. The swivel bracket 22 holds the motor so that it may be turned about an upright axis for steering. The stern bracket 46 has means by which it is clamped to the transom. The pivoting of the swivel bracket relative to the stern bracket permits the motor to be tilted rearwardly and upwardly as illustrated in Fig. 1. As is customary in this type of mounting, a thrust receiving member 60 placeable in a variety of positions receives the forward thrust from the swivel bracket and thus transmits power to the boat while maintaining the outboard motor at the desired angle with respect to the transom of the boat. For best forward operation the motor is in a substantially vertical position and the forward thrust of the propeller is at an angle slightly down from the horizontal.

In the modification of the invention of Figs. 1 to 6, an anti-tilting mechanism (including a coiled axially loaded tension spring 74) is positioned between the swivel bracket 22 and the stern bracket 46 and resiliently maintains those members in the position shown in Fig. 2 and resists the rearward tilting of the swivel bracket except when sufficient force is applied to overcome the force of the spring.

Proceeding now to the detailed description of the swivel bracket 22, it has a cylindrical bearing 24 in which is rotatably received a hollow king pin 26 by which the motor is carried so as to rotate about an upright axis to accomplish steering of the boat. A drive shaft 28 from the engine (see Fig. 4) extends through the hollow king pin. The swivel bracket has a top 30 connecting spaced sides 36 and 38 in which are located bearings 32 (see Fig. 3) which rotatably receive the horizontal pivot 34 providing the pivotal connection between the swivel bracket and stern bracket. The sides 36 and 38 project forwardly from the cylindrical bearing 24 and define a recess therebetween which receives the anti-tilt mechanism. Trunnions 40, one on each of the inner surfaces of the sides 36 and 38 (only one shown, see Fig. 3), receive and hold an anchor pin 42 by which the upper end of the anti-tilt spring is secured to the swivel bracket. It is also advantageous to provide the swivel bracket with abutments 44 located near the bottom of the bearing 24 in the recess between the sides. These abutments engage the lower end of the anti-tilt spring bracket 66 to arrest it in its fully retracted position within such recess.

The stern bracket 46 has a front wall 48 which interconnects two parallel legs 50 and 52 spaced so as to be in overlapping relationship with the sides 36 and 38. At the top of these legs near the juncture with the front wall are openings for mounting the horizontal pivot 34. As is shown in Fig. 3, the adjacent edges of the sides 36 and 38 and legs 50 and 52 are provided with raised bearing surfaces 54 which provide a sliding guide between the swivel bracket and the stern bracket during tilting motion therebetween. A cross brace 56 preferably extends between the lower portions of the legs 50 and 52 to strengthen them and provide a bearing area for the transom 18. A pair of rearwardly projecting horns 58 with spaced openings therein receive the adjustable thrust pin 60 in the selected proper position depending upon the slope of the transom 18 with respect to the vertical. The front wall 48 has threaded openings with hand screw clamps 62 of customary design therein to engage the transom. With the stern bracket 46 mounted as shown, the swivel bracket 22 may be tilted rearwardly and upwardly from the substantially vertical position shown in Figs. 1 and 2 to its upper limit shown in Fig. 5. Such upper limit is determined by the abutment between a raised bead 63 on the swivel bracket and the rear edge of the front wall 48 on the stern bracket. In order to hold the swivel bracket in the extreme raised position shown in Fig. 5, a snap lock pin 64 is mounted in the leg 50 and is spring-biased so that it will project under the side 36 (as diagrammatically indicated in the broken lines of Fig. 5) when the swivel bracket is in the extreme raised position. To lower the swivel bracket 22 from such position it is only necessary to pull the knob of the lock 64 outwardly and withdraw its inner end from beneath the edge of such side. The forward thrust position of the swivel bracket is determined by the engagement between the forward edges of the sides 36 and 38 and the adjustable thrust pin 60. This pin is placed in such of the openings in the horns 58 as will cause the drive shaft of the motor to be in substantially vertical position

when the stern bracket is clamped to the transom 18.

The anti-tilt mechanism which is incorporated within the swivel bracket and stern bracket consists of a spring bracket 66 having spaced sides 68 and 70 shaped as shown in Figs. 2 to 6, inclusive, joined by a body 72 at the forward edges of such sides. The bracket 66 is pivoted at the top of such sides to the horizontal pivot 34 or to pivotal interconnection between the stern bracket and swivel bracket and fits within the recess of swivel bracket 22 in its at rest position. The bracket 66 is long enough so that its lower end extends substantially to the bottom of the swivel bracket to permit a coiled axially loaded tension spring 74 to extend longitudinally of the motor between an anchor pin 76 on the spring bracket and the anchor pin 42 on the swivel bracket. In this embodiment, the spring is capable of extending five inches and must extend one and five-eighths inches under a load of approximately one hundred twenty pounds. The spring is assembled under initial tension and thus always initially tends to hold the spring bracket tightly within the recess in the swivel bracket, as shown in Figs. 2 and 5. The advantage of this is that the motor is held in its normal upright position under tension and hence will not tip rearwardly as the result of varying changes in speed as it is driving the boat. Both the anchor pins 42 and 76 are held against longitudinal displacement by cotter pins placed therein and abutting against adjacent sides of the member in which the pins are mounted. Such anchor pins may also be provided with a circumferential groove in which the eye on each end of the spring 74 fits to keep that spring properly centered.

When the lower end of the spring bracket 66 is attached to the stern bracket it cannot rotate with the swivel bracket. Hence as the swivel bracket tilts rearwardly and upwardly with respect to the stern bracket the spring 74 will be elongated and resiliently resist such tilting. Such lower end is only temporarily secured and may be released from the stern bracket so that the motor may be freely tilted upwardly rearwardly to its raised position in Fig. 5 without elongating the spring 74. The automatic lock for this purpose includes a latch 78 having rearwardly extending spaced legs 80 and 82 which pass through slots in the body 72 and are pivoted respectively by rivets 84 and 86 to the sides 68 and 70. The lower edge of the legs have U notches 88 adapted to engage with the thrust pin 60 when the swivel bracket is moved into its normal position as shown in Figs. 1 and 2. The legs 80 and 82 are joined by a connecting plate 90 which has a threaded hole therein to hold a screw and washer clamp 92. This clamp engages the end of a flexible wire 94 which passes upwardly through an opening in the wall 48 and along its inner surface to the top thereof. The wire 94 projects from the wall 48 at the horizontal pivot 34 and has its upper end secured to a guide sleeve 96 projecting through an opening in the front wall 48. The outer end of such sleeve has a hand-gripping knob 98 secured thereto. The latch 78 is continually urged downwardly to latching position by a coil spring 100 extending between the leg 80 and the lower end of the side 68. A sloping front edge on the front of legs 80 and 82 cause the latch 78 to cam upwardly as it strikes the pin 60 and move into locked position (see Figs. 2 and 6) as the swivel bracket is swung into engagement with the stern bracket. To release the anti-tilt mechanism the knob 98 is grasped and pulled (preferably when the motor is in the upright non-tilted position) temporarily raising the latch 78 out of engagement with the thrust pin 60 permitting the motor to be freely tilted. After the latch is swung rearwardly of the thrust pin 60, it is no longer necessary to hold the knob 98 in extended position.

As previously stated, the anti-tilt spring 74 is designed to extend one and five-eighths inches under a load of one hundred twenty pounds. The engine with which such spring is used is rated at approximately 16 H. P. With this combination the spring will start to elongate and permit rearward and upward tilting of the motor under the influence of reverse thrust of the propeller when the engine produces approximately one-third to one-half of its rated capacity. Such strength of spring is not critical. Its strength varies with the rated horse-power of the engine. With smaller motors the spring does not necessarily have to be weaker. The critical factor is to have the spring elongate and permit rearward tilting whenever the engine during reverse thrust of the propeller develops enough power to cause the stern of the boat to be sucked downwardly if such tilting did not occur. Whenever tilting occurs because the engine is developing a dangerous amount of reverse thrust, several effects take place. The thrust will be in the upward direction and the stern of the boat will not be sucked down but will be raised instead. If the force of the reverse thrust increases the propeller will work its way out of the water. This causes a terrific thrashing and splashing drawing the operator's attention thereto. In addition to that the exhaust opening will be out of the water with consequent increase in noise. These occurrences warn the operator of the excessive engine output and the engine can be throttled down until the upward rearward tilt of the motor comes back to normally upright position.

While the spring is in an upright position within the recess it need not be so placed to operate satisfactorily. It is so positioned to save space and create a neat appearance. Furthermore any resilient member which develops substantially the same force as the spring may be used in lieu thereof. In the modification shown in Figs. 7 to 9, inclusive, the resilient anti-tilt member consists of cylindrical rubber members 134 and 136 which are put under torque distortion by the rearward upward tilting of the outboard motor. In the modification shown in Fig. 10 the resilient member is a coiled torsionally loaded tension spring. In these modifications the swivel bracket 122 rotatably mounts the lower leg 10 in the same fashion as in the case of the first modification and is of substantially the same construction as that of such modification except that its top 130 has at its forward end an elongated hollow cylindrical outer bearing 132. The hollow cylindrical rubber members 134 and 136 are mounted within the bearing 132 and have their outer surfaces fixedly secured thereto. An inner bearing sleeve 138 passes through the outer bearing 132 and its outer surface is secured to the rubber members 134 and 136. When the outer bearing 132 is rotated with respect to the inner bearing sleeve 138, the rubber members 134 and 136 will be placed under torque distortion and will resist such turning action.

The swivel bracket 122 is pivotally mounted

to a stern bracket 146 which is substantially like the stern bracket 46 of the first modification. It has openings in its legs 148 and 149 which mount the ends of an axle 150 passing through the inner sleeve bearing 138. Such axle is held against axial displacement by a set screw 152. Thus the inner bearing 138 corresponds to the spring bracket 66. If its rotation with respect to the stern bracket is prevented the rubber members will be tortionally distorted and stressed upon the rearward upward tilting of the motor. To accomplish such non-rotation or locking of the inner bearing, a ratchet arm 154 is fixedly secured to the projecting end of the inner bearing sleeve 138. Such ratchet arm has teeth which engage with a ratchet lock 156 adjustably mounted on the stern bracket by a pin 158 and biased by spring 159 toward engagement with the ratchet arm 154 as is illustrated in Fig. 9. A knurled handle 160 on the outer end of the pin 158 provides means for manually moving the ratchet lock 156 temporarily out of engagement with the arm 154. With the swivel bracket 122 in the position in Fig. 7, the ratchet arm 154 may be moved clockwise, as viewed in Fig. 9, to prestress the rubber members 134 and 136 and as so prestressed and positioned may be locked by swinging the latch 156 into locking engagement therewith. In this modification the resistance to rearward upward tilting of the motor has the same characteristic advantages as that heretofore described in the first modification. When it is desired to swing the motor freely to its fully raised position, the latch 156 is swung to disengaged position, shown in dotted lines in Fig. 9, and the inner bearing sleeve will freely rotate with the outer bearing and without stressing or putting torque distortion on the rubber members.

The only difference between the modification shown in Figs. 8 and 9 and that shown in Fig. 10 is the substitution for the rubber members 134 and 136 of a coiled torsionally loaded spring 164. This spring has one end secured in an opening in the outer bearing 132 and another end secured in an opening in the inner bearing sleeve 138. This spring may be prestressed in identically the same manner as the rubber members 132 and 134 by the identical operation of the ratchet arm 154 and its cooperable latch 156.

Although only several embodiments of the invention are shown and described herein, it will be understood that this application is intended to cover such other changes or modifications as come within the spirit of the invention or scope of the following claims.

We claim:

1. A mounting for an outboard motor comprising, a swivel bracket in which said outboard motor is pivotally mounted for the steering of a boat on which said motor is mounted, a stern bracket having means adapted for engagement with a boat, a pivotal connection between said swivel bracket and said stern bracket whereby with said stern bracket secured to a boat said swivel bracket and motor may be tilted rearwardly and upwardly, an anti-tilt mechanism including a member pivoted on said pivotal connection, disengageable means for locking said member against rotation with respect to said stern bracket, and resilient means acting between said member and said swivel bracket to resist rearward upward tilting of said stern bracket and said motor.

2. A mounting as claimed in claim 1 in which said resilient means consists of a coiled axially loaded tension spring which is elongated upon rearward and upward tilting of said swivel bracket and motor to resist such tilting.

3. A mounting as claimed in claim 1 in which said resilient means consists of rubber-like bodies having opposed surfaces secured respectively to said member and said swivel bracket, said bodies being tortionally distorted upon rearward and upward tilting of said swivel bracket and motor to resist such tilting.

4. A mounting as claimed in claim 1 in which said resilient means consists of a coiled tortionally loaded spring having one end secured to said member and the other end secured to said swivel bracket, said spring being tortionally sprung upon rearward and upward tilting of said motor to resist such tilting.

5. A mounting for an outboard motor comprising, a swivel bracket in which said outboard motor is pivotally mounted for the steering of a boat on which said motor is mounted, a stern bracket having means adapted for engagement with a boat, a pivotal connection between said swivel bracket and said stern bracket whereby with said stern bracket secured to a boat said swivel bracket and motor may be tilted rearwardly and upwardly, said swivel bracket being provided with a recess, an anti-tilt spring bracket fittable within said recess and pivoted to said pivotal connection, latching means carried by said spring bracket and automatically engageable with said stern bracket to lock said spring bracket against rearward and upward tilting with respect to said stern bracket, and a spring in said recess and having one end connected with said spring bracket at a place removed from said pivotal connection, the other end of said spring being secured to said swivel bracket whereby said spring normally tends to maintain said spring bracket within said recess.

6. A mounting as claimed in claim 5 in which there is a flexible means connected with said latch means and extending to a place outside of said stern bracket forwardly of said pivotal connection whereby it may be readily grasped to effect unlatching of said latch means.

7. A mounting as claimed in claim 5 in which said spring extends longitudinally of said motor with said other end positioned above said one end.

8. A mounting for an outboard motor comprising, a swivel bracket in which said outboard motor is pivotally mounted for the steering of a boat on which said motor is mounted, a stern bracket having means adapted for engagement with a boat, a pivotal connection between said swivel bracket and said stern bracket whereby with said stern bracket secured to a boat said swivel bracket and motor may be tilted rearwardly and upwardly, an elongated hollow cylindrical outer bearing on said swivel bracket arranged coaxially of said pivotal connection, an inner bearing sleeve rotatably mounted on said pivotal connection and positioned within said outer bearing, latching means carried by said inner bearing sleeve and coacting with said stern bracket to arrest rotational movement of said inner bearing relative to said stern bracket, and resilient means positioned between said outer bearing and said inner bearing and reacting therebetween to resiliently resist said rearward and upward tilting when said latching means is in latching position.

9. A mounting as claimed in claim 8 in which

said resilient means comprises a rubber-like body having opposed surfaces secured respectively to said inner and outer bearings.

10. A mounting as claimed in claim 8 in which said resilient means comprises a coiled tortionally loaded spring having one end secured to said inner bearing and the other end secured to said outer bearing.

11. In an outboard motor, mounting means adapted to engage a boat to secure said motor to the boat, a pivotal interconnection between said motor and said means whereby said motor may be tilted rearwardly and upwardly, resilient means acting between said motor and said mounting means, said resilient means being increasingly stressed by continued rearward tilting of said motor to resiliently resist the rearward upward tilting of said motor, and a latch for disconnecting said resilient means so that continued rearward tilting of said motor will not increasingly stress said resilient means whereby said motor is free to tilt rearwardly and upwardly, said latch automatically interconnecting said resilient means and said motor as said motor is tilted downwardly and forwardly to its normal position.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,383,440	Baxter	Aug. 28, 1945
2,445,369	Shields	July 20, 1948