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[56]

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[54] **SHALLOW WATER TRIM ADJUSTMENT FOR  
OUTBOARD PROPULSION UNITS**  
7 Claims, 4 Drawing Figs.

|                           |                   |
|---------------------------|-------------------|
| [52] U.S. Cl.....         | 115/17,<br>115/41 |
| [51] Int. Cl.....         | B63h 21/26        |
| [50] Field of Search..... | 115/41, 17,<br>34 |

**ABSTRACT:** There is disclosed for inclusion on an outboard propulsion unit having abutment means establishing a first operating trim position for the drive member at a given rake angle, a trim adjustment member selectively engageable with the abutment means to provide for a second operating trim position for the drive member at a rake angle greater than the given rake angle for use, by way of example, for shallow water operation.

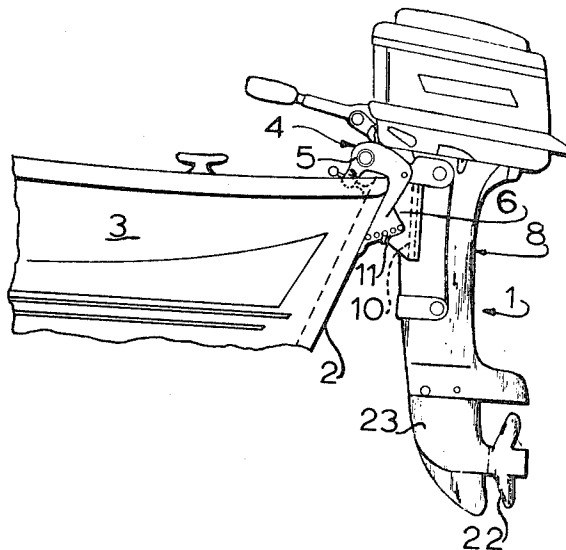


FIG 1

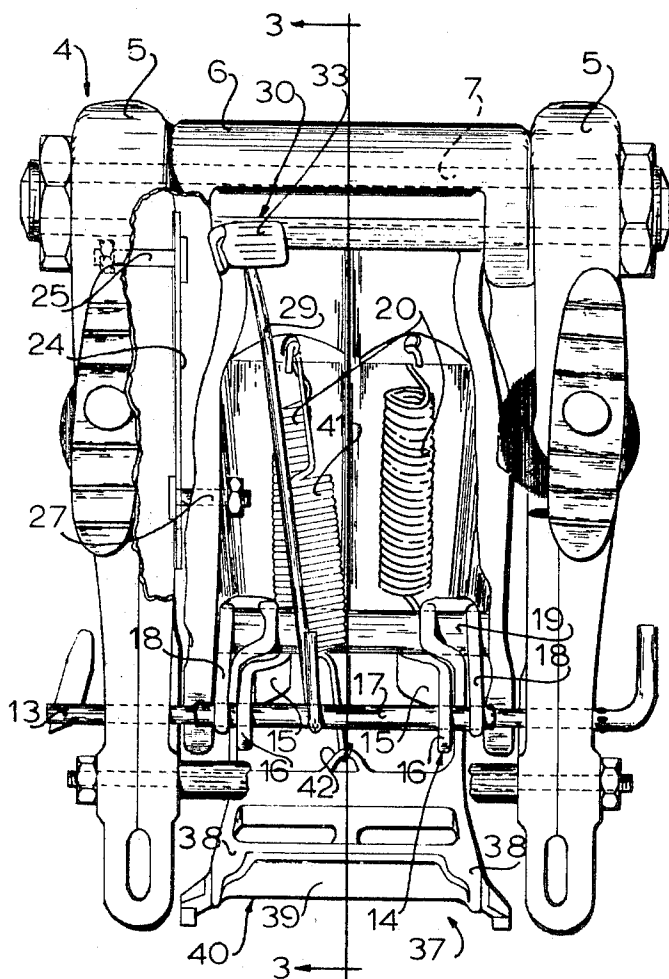
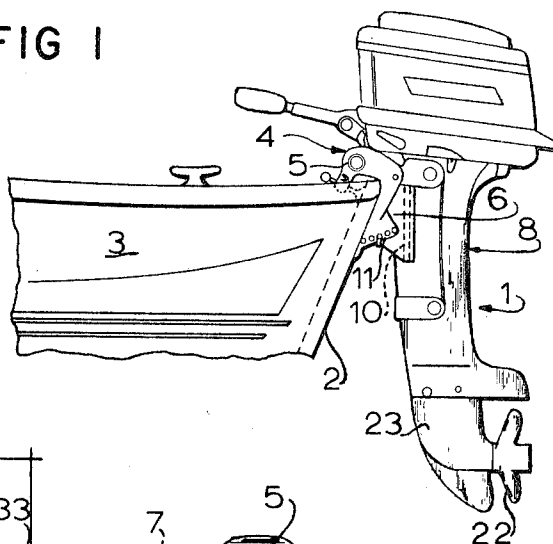


FIG 2

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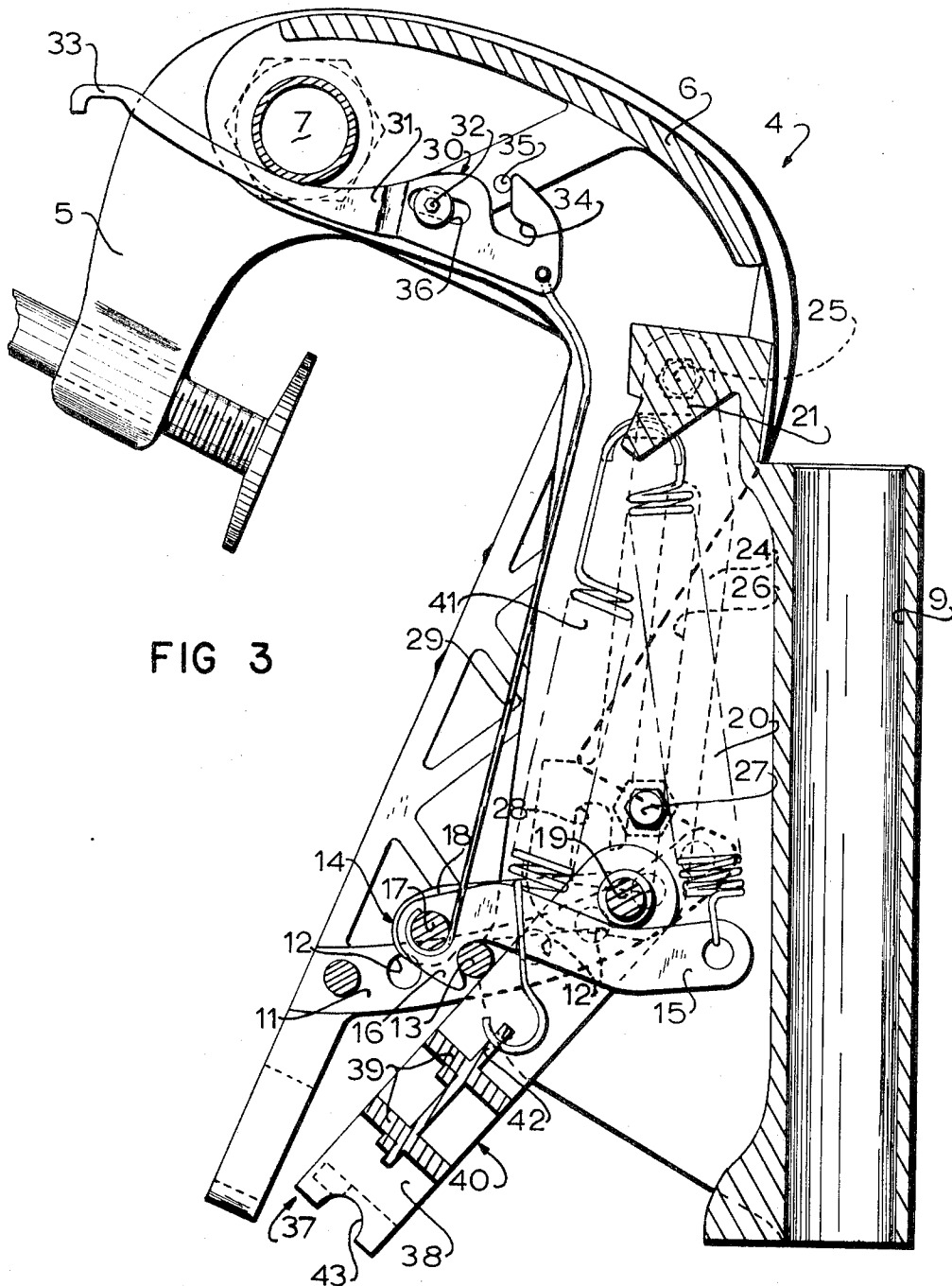


FIG 3

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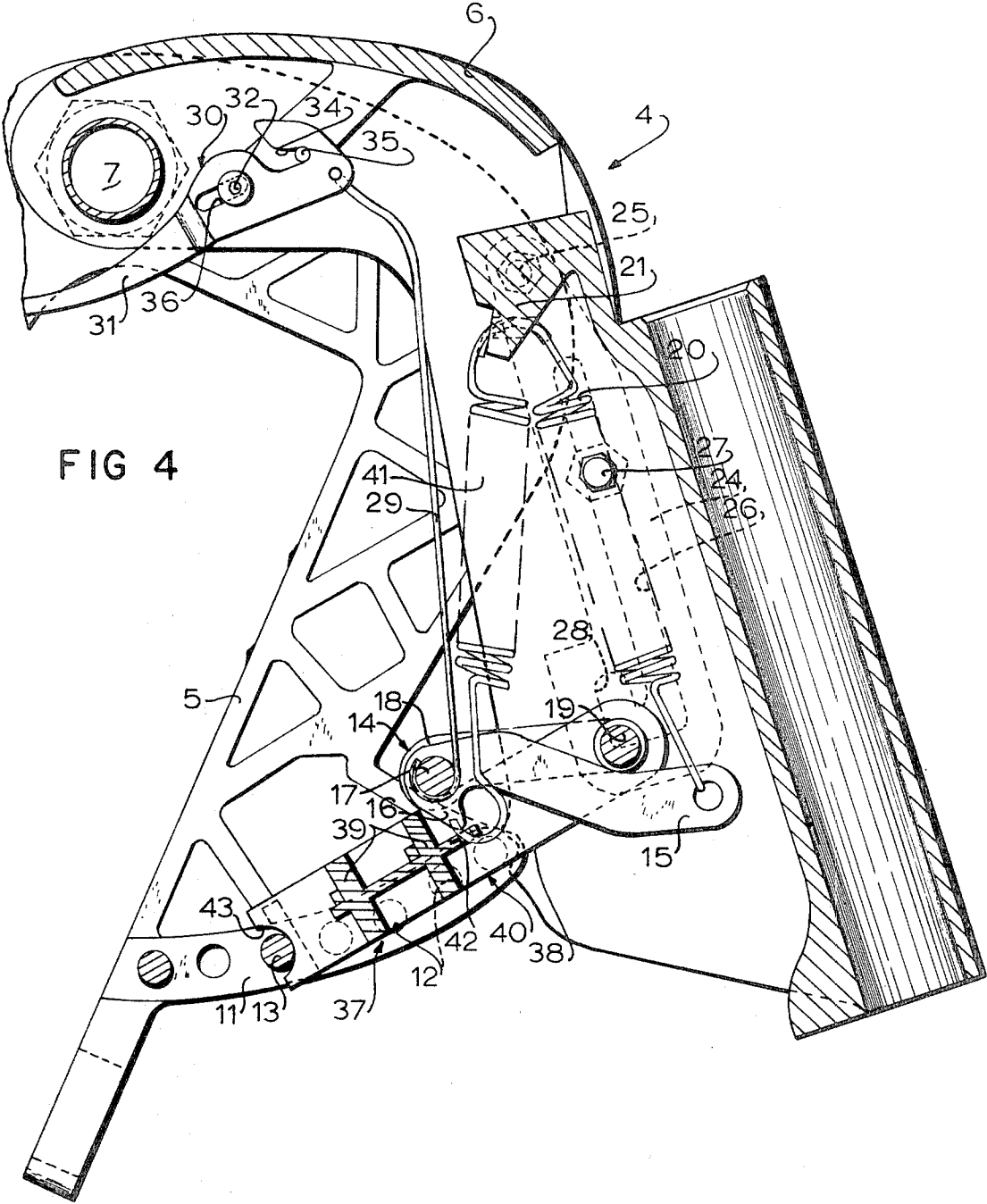


FIG 4

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## SHALLOW WATER TRIM ADJUSTMENT FOR OUTBOARD PROPULSION UNITS

This invention relates to means providing for shallow water trim adjustment on outboard propulsion units for watercraft.

The drive member of an outboard propulsion unit is customarily tiltable relative to the transom of a watercraft in a generally vertical plane on a horizontal axis. The operating trim or rake angle of the drive member is generally established by abutment means disposed between the transom and drive member and engaged by the tiltable portion of the propulsion unit. The abutment means are generally adjustable and are initially set to provide the desired operating trim or rake angle for the drive member. While the desired operating trim or rake angle of the drive member as initially set by the abutment means may be suited for operation in relatively deep and open waters, such is not ordinarily suited for operation in shallow waters, or for beaching the watercraft, or in object- and/or obstacle-infested waters under which conditions a greater rake angle for the drive unit may be more desirable. It is generally an object of this invention to provide means for changing the operating trim of the drive member to define a greater rake angle when desired, even while underway and without adjustment of the abutment means.

According to the invention, an outboard propulsion unit comprises generally a support member carried by the transom of the watercraft, an intermediate support member pivoted on the first support member about a first axis, and a drive member pivoted on the intermediate support member about a second axis generally normal to the first axis. One of the axes connecting the propulsion unit members is disposed generally vertical to provide for steering movement of the drive member in a generally horizontal plane and the other of the axes is transverse horizontal to provide for tilt movement of the drive member in a generally vertical plane. Abutment means are provided on one of the propulsion unit members hinged or connected at the tilt axis and which is engageable by the other of the members connected at the tilt axis to establish the operating trim of the drive member. Releasable latch means are carried on the abutment means engaging member to latchably engage with the abutment means and thereby releasably secure the propulsion unit members hinged or connected at the tilt axis together. Means are provided on the propulsion unit for manually disengaging the latch means from the abutment means. The propulsion unit further includes a shallow water trim adjustment member which is carried by the abutment means engaging member and is movable between an out-of-the-way stowed position and a position of engagement with the abutment means. The shallow water trim adjustment member is movable to the position of engagement with the abutment means to establish the operating trim of the drive member at a greater rake angle when the latch means are manually disengaged from the abutment means.

The accompanying drawing illustrates the best mode presently contemplated by the inventor for carrying out the invention.

In the drawings:

FIG. 1 is a side of an outboard motor embodying the invention;

FIG. 2 is an enlarged front elevational view of a portion of the outboard motor with parts broken away and sectioned and shows the bracket assembly with the releasable latch hooks engaged over the abutment means;

FIG. 3 is an enlarged sectional view taken generally on line 3-3 of FIG. 2; and

FIG. 4 is an enlarged sectional view and shows the shallow water trim adjustment member engaged with the abutment means to place the power unit of the outboard motor in an operating trim position defining a greater rake angle.

Referring to the drawings, an outboard propulsion unit such as the outboard motor 1 is supported from the transom 2 of a watercraft 3 by a bracket assembly 4. The bracket assembly 4 includes a transom bracket 5 secured to the transom 2 and a swivel bracket 6 pivotally carried by the transom bracket on a horizontal transverse tubular member 7 to provide for tilt

movement of the drive or power unit 8 in a generally vertical plane. The swivel bracket 6 includes a generally vertically extending bearing 9 for pivotally receiving the swivel pin 10 of the power unit 8 to provide for steering movement of the power unit in a generally horizontal plane.

The transom bracket 5 of the outboard motor 1 includes a pair of transversely spaced, rearwardly extending trim adjustment projections 11 each of which are provided with a plurality of correspondingly spaced holes 12 disposed on a given radius from the transverse tubular member 7. Corresponding holes 12 of the respective projections 11 are transversely aligned for selective insertion of the trim adjustment pin 13 which extends between the projections 11 and serves as an abutment for engagement by the swivel bracket 6 to establish the operating trim at a given rake angle for the power unit 8.

In the normal operating position of the power unit 8 as established by engagement of the swivel bracket 6 with the trim adjustment pin 13, the latter is engaged by a releasable latch assembly 14 carried by the swivel bracket. The latch assembly 14 includes a pair of transversely spaced levers 15 each of which terminates forwardly with a camming latch hook 16 adapted to engage over the trim adjustment pin 13. The levers 15 are connected forwardly by a transversely extending pin 17 to integrate their operation. A pair of transversely spaced arms 18 are pivotally mounted on the transversely extending pin member 19 supported by the swivel bracket 6 and respectively pivotally carry the corresponding ends of pin 17 whereby movement of pin 17 is confined to an arcuate path about the pin member 19.

The levers 15 extend beneath and to the rear of pin member 19 and the rearward ends thereof are supported by corresponding tension springs 20 which extend generally upwardly for connection to the projection 21 on the swivel bracket 6.

In service the latch hooks 16 on levers 15 normally engage over the trim adjustment pin 13. The force of the tension springs 20 cause the levers 15 to bear upwardly against the underside of pin member 19 which acts as a fulcrum so that the hook ends of levers 15 exert a given downwardly directed biasing force on the trim adjustment pin 13 to releasably secure the swivel bracket 6 along with power unit 8 relative to the bracket 5. The biasing force imposed on levers 15 by the springs 20 to maintain the latch hooks 16 engaged over the trim adjustment pin 13 is more than adequate to hold as against the thrust of propeller 22 when the power unit 8 is operated in reverse and to normally prevent trail-out of the power unit when operating under forward propeller thrust conditions. The latch assembly 14 is releasable, however, when the lower portion 23 of power unit 8 strikes an object or obstacle capable of causing tilting of the power unit, in which case the latch hooks 16 cam over the trim adjustment pin 13 as the levers 15 pivot to extend the tension springs 20. Thus, the releasable latch assembly 14 permits the power unit 8 to swing free on the transverse tilt axis defined by tubular member 7 following an impact to clear the object or obstacle which caused the tilting.

Upward tilt movement or tilting of the power unit 8 upon the tilt axis is limited by the linkage member 24 pivotally supported from the transom bracket 5 at 25. The linkage member 24 is provided with a longitudinally extending slot 26 which slidably receives a projecting pin 27 carried by the swivel bracket 6. As the power unit 8 is tilted upwardly the linkage member 24 is caused to pivot relative to the transom bracket 5 as the swivel bracket pin 27 moves rearwardly within the slot 26 with the uppermost travel of the power unit being reached when the pin 27 engages the extremity of the slot 26 farthest removed from pivot 25. The linkage member 24 further includes a relatively short slot 28 which generally parallels the slot 26 and communicates therewith by means of a slot passage at the farthest extremity from pivot 25 whereby, upon manual tilting of power unit 8 and manual manipulation of the linkage member relative to the pin 27 at the extreme tilt

position to place the pin 27 in slot 28, the linkage member is caused to serve as a support for the power unit to support the latter in a raised or tilted inoperative position as might be desired during periods of trailering or nonuse of the motor 1 or for possible repair.

The lower end of a link 29 engages under the transverse pin 17 connecting the spaced levers 15. The link 29 forms a part of the release assembly 30 manually disengaging the releasable latch assembly 14 from the trim adjustment pin 13 thereby providing means for rendering springs 20 ineffective. Following an impact with an object or obstacle capable of causing the power unit 8 to tilt and so release the latch assembly 14 from the trim adjustment pin 13, the link 29 further serves to support the forward end of the disconnected latch assembly in position for effecting an automatic reengagement of the latch assembly over the trim adjustment pin when the motor swings back down to the drive position.

The release assembly 30 for manually disengaging the releasable latch assembly 14 from the trim adjustment pin 13 includes a lever 31 fulcrumed intermediate its length on the pin 32 provided on the swivel bracket 6 generally to the rear and beneath the tubular member 7. The lever 31 projects forwardly beneath the tubular member 7 to present a handle 33 for manual manipulation while the link 29 is pivotally connected on the opposite end of the lever. The handle 33 of lever 31 is movable between a position abutting against the underside of tubular member 7 as a stop wherein the link 29 is in its lower position permitting engagement of the latch assembly 14 with the trim adjustment pin 13, or providing for a reengagement therebetween following an impact, and a position spaced from the tubular member wherein the link 29 disengages and raises the releasable latch assembly 14 clear of the trim adjustment pin 13.

Opposite from the handle 33, the lever 31 is further provided with a generally L-shaped recess 34 which is adapted to receive a projecting pin 35 on the swivel bracket 6. The pin 35 remains disengaged from recess 34 when the handle 33 of lever 31 is in abutting relation with the tubular member 7. When the handle 33 of lever 31 is manipulated downwardly to a position spaced from tubular member 7, the opposite end of the lever moves upwardly to raise the link 29 to thereby disengage the releasable latch assembly 14 from the trim adjustment pin 13 and the recess 34 receives the pin 35. If the handle 33 of lever 31 is simultaneously depressed and pulled forwardly as provided for by the longitudinally extending slot 36 in the lever receiving the fulcrum pin 32, the holding pin 35 will engage within the lower leg of recess 34 so that upon release of the handle the lever will remain in the position placing link 29 in a raised position to retain the releasable latch assembly 14 out of engagement with the trim adjustment pin 13. When it is desired to reengage the latch assembly 14 with the trim adjustment pin 13, the handle 33 of lever 31 is pushed rearwardly so that pin 35 can clear the lower leg of recess 34 whereupon the tension springs 20 will bias the latch assembly 14 to the position for reengagement with the trim adjustment pin 13 and through link 29 will return the lever to its position with the handle 33 abutting the tubular member 7.

When operating a watercraft in shallow water or during beaching operations, or when operating a watercraft in waters known to be object- and/or obstacle-infested, prudence normally dictates that one proceed with caution and relatively slowly. If under such circumstances the lower portion 23 of power unit 8 strikes bottom, an object or an obstacle with the releasable latch assembly 14 engaged over the trim adjustment pin 13, the resulting impact at slow speed may not provide an adequate force to effect a disengagement of the latch assembly to permit tilting of the power unit 8 to provide for relief or clearance, in which case damage to the propeller 22 and/or other portions of the outboard motor 1 may occur. Thus, when operating in shallow or object- and/or obstacle-infested waters, prudence would also dictate that the releasable latch assembly 14 be disengaged from the trim adjustment pin 13 so that the power unit 8 can more readily tilt upwardly upon impact to clear that which was impacted.

When beaching the motor-driven watercraft 3 or when approaching shallows, an adjustment of the operating trim of the power unit 8 to describe a greater rake angle is generally also desirable so that the watercraft and its motor 1 can operate in waters of lesser depth, or upon striking the bottom, the power unit 8 will experience the lesser impact of a glancing blow as afforded by the greater forward rake trim attitude. The lesser impact of a glancing blow as afforded by a greater forward rake trim attitude of power unit 8 is also desirable when operating in waters known to be object- and/or obstacle-infested.

Each time one beaches a watercraft, operates in shallows, the in object- and/or obstacle-infested waters, it of course would not be practical to adjust the operating trim of power unit 8 by relocating the trim adjustment pin 13 to provide a greater forward rake trim attitude. This disclosure contemplates means 37 for rapidly adjusting the operating trim of power unit 8 to describe a greater forward rake trim attitude of given magnitude.

The bracket assembly 4 of outboard motor 1 includes the means 37 comprising a pair of transversely extending pin member 19 carried by swivel bracket 6. The arms 38 project forwardly beneath the transverse pin 17 and are connected by one or more ribs 39 to form a shallow water trim adjustment member 40. Trim adjustment member 40 is constantly biased upwardly by the relatively weak tension spring 41 extending between the rib projection 42 on member 40 and the projection 21 on the swivel bracket 6.

When the hooks 16 of the releasable latch assembly 14 are engaged over the trim adjustment pin 13, the trim adjustment member 40 is forced into and stowed in an out-of-the-way position, being biased upwardly against the pin 13 by the spring 41 as generally shown in FIG. 3. Should the lower portion 23 of power unit 8 strike an object or obstacle such as to effect release of the hooks 16 and upward tilting of the power unit, the trim adjustment member 40 will pivot upwardly the short distance to engage the underside of transverse pin 17 under the influence of spring 41. Upon return of the power unit 8 to the drive position following an impact, the member 40 is struck and returned to its lower position by the trim adjustment pin 13 as the latter is reengaged by the hooks 16. Thus, springs 20, pin 13 and levers 15 provide means for rendering spring 41 ineffective.

When it is desired to change the operating trim of the power unit 8 to describe a greater rake angle, as when beaching for example and without changing the adjustment of pin 13 relative to the bracket projections 11, the hooks 16 are manually unlatched from the trim adjustment pin 13 by lifting the releasable latch assembly 14 through corresponding manipulation of lever 31 of the release assembly 30. With the hooks 16 disengaged from pin 13, upward tilting of the power unit 8, effected manually or by a power unit trail-out maneuver as when the forward propeller thrust is sharply reduced or a short burst of reverse thrust is applied, permits the trim adjustment member 40 to pivot upwardly and to be biased into engagement under the raised transverse pin 17 of the latch assembly 14. With the trim adjustment member 40 biased against the raised pin 17, the depression 43 at the forward end of member 40 is disposed at generally the same radius from the transverse tubular member 7 as the trim adjustment pin 13. Thus, when the power unit 8 returns to the drive position, the depression 43 of member 40 engages with the trim adjustment pin 13 and the operating trim attitude of the power unit is now established by member 40. Since member 40 projects considerably ahead of the swivel bracket 6, the trim angle of power unit 8 with member 40 engaged against pin 13 will describe a greater forward rake trim attitude as compared to the trim attitude with the swivel bracket engaged against pin 13. The greater forward rake trim attitude of power unit 8, as provided by engagement between trim adjustment member 40 and the trim adjustment pin 13, requires substantially less water depth for power unit operation and so is well suited for beaching or shallow water operation. The trim attitude of power unit 8 as established by

the trim adjustment member 40 may also be desired in object-and/or obstacle-infested waters so that the power unit will experience the lesser impact of a more glancing blow in the event something is struck by the unit.

In the event power unit 8 strikes an object or obstacle when operating at the trim attitude provided by engagement of member 40 with the trim adjustment pin 13 and the power unit tilts upwardly, the power unit will return to the same trim attitude since member 40 will retain its position in engagement with the underside of the raised transverse pin 17. When it is desired to reengage the releasable latch assembly 14 with the trim adjustment pin 13, lever 31 is correspondingly manually manipulated to release the latch assembly. Thereupon upward tilting of the power unit 8, effected manually or by a power unit trail-out maneuver as when the forward propeller thrust is sharply reduced or a short burst of reverse thrust is applied, allows the depression 43 to disengage from the trim adjustment pin 13. The overpowering biasing force of springs 20 relative to the spring 41 will then force transverse pin 17 down into engagement with the trim adjustment member 40 which results in deflecting the member 40 down in position to be struck by the trim adjustment pin 13 and then forced into the out-of-the-way position as the power unit 8 is lowered. The power unit 8 is lowered to the drive position by manual tilting, or if conditions permit, by a sudden burst of forward propeller thrust.

I claim:

1. In an outboard propulsion unit for watercraft having a first bracket supported by the watercraft and a second bracket supporting a drive unit, said second bracket being pivotally supported from said first bracket upon a horizontal tilt axis to provide for tilt movement of the drive unit in a generally vertical plane, a device for trimming the drive unit at a greater than normal tilt angle for shallow water operation comprising:

- a. abutment means carried by one of said brackets;
- b. a trim adjustment member carried by the other of said brackets;
- c. first spring means for biasing said trim adjustment member into a position for engagement with said abutment means when said drive unit is tilted to an angle slightly greater than the shallow water operating angle;
- d. second spring means for biasing said trim adjustment member into a stowed out-of-the-way position, said second spring means being adapted to overcome said first spring means; and
- e. means for rendering said second spring means ineffective.

2. The device of claim 1 wherein said abutment means are carried by the first bracket and the trim adjustment member is carried by the second bracket.

3. In an outboard propulsion unit for watercraft having a first bracket supported by the watercraft, a second bracket supporting a drive unit, said second bracket being pivotally supported from said first bracket upon a horizontal tilt axis to provide for tilt movement of the drive unit a generally vertical plane, abutment means on one of said brackets and

engageable by the other of said brackets to establish the normal operating trim of the drive member at a given tilt angle, latch means on the other bracket to latch with the abutment means and secure the brackets together, spring means for biasing said latch means into a position for latching with said abutment means, and means for overcoming said first spring means thereby rendering said latch means ineffective, a device for trimming the drive unit at a greater tilt angle than said given tilt angle comprising:

- a. a trim adjustment member on said other bracket, said member being held in a stowed out-of-the-way position when said latch means is in said position for latching; and
- b. spring means for biasing said member into a position for engagement with the abutment means when said first spring means is overcome.

4. The device of claim 5 wherein said abutment means are carried by the first bracket and the trim adjustment member is carried by the second bracket.

5. The device of claim 5 wherein movement of the latch means is confined to an arcuate path about a given axis and the trim adjustment member is pivotally supported on said given axis.

6. In an outboard propulsion unit for watercraft, a first support member carried by the transom of the watercraft, an intermediate support member pivotally mounted on the first support member about a first axis, and a drive member pivotally mounted on the intermediate support member about a second axis generally normal to the first axis, one of said axes being generally vertical to provide for steering movement of the drive member in a generally horizontal plane and the other of said axes being transverse horizontal to provide for tilt movement of the drive member in a generally vertical plane:

- a. abutment means of one of said members connected at the tilt axis and engageable by the other of said members connected at the tilt axis to establish a first operating trim position for the drive member at a given rake angle;
- b. a trim adjustment member carried by the abutment means engaging member and being movable between an out-of-the-way stowed position and a position of engagement with said abutment means, said trim adjustment member in the position of engagement with said abutment means providing for a second operating trim position for the drive member at a rake angle greater than said given rake angle; and
- c. means for moving said trim adjustment member into the position for engagement with said abutment means when said drive unit is tilted to some position beyond said second operating trim position.

7. The invention as set forth in claim 6 wherein the means for moving said trim adjustment member into the position for engagement with said abutments means comprises spring means for biasing said trim adjustment member correspondingly, and means for rendering the spring means ineffective.