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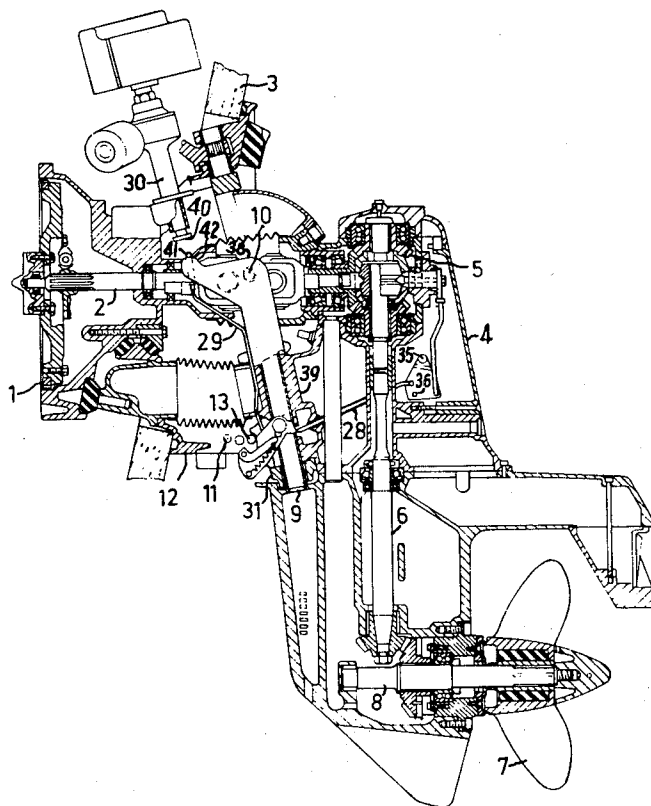
[54] **TILT LATCHING AND LOCKING MEANS FOR  
 TILTABLE STERN DRIVES FOR BOATS**  
 8 Claims, 4 Drawing Figs.

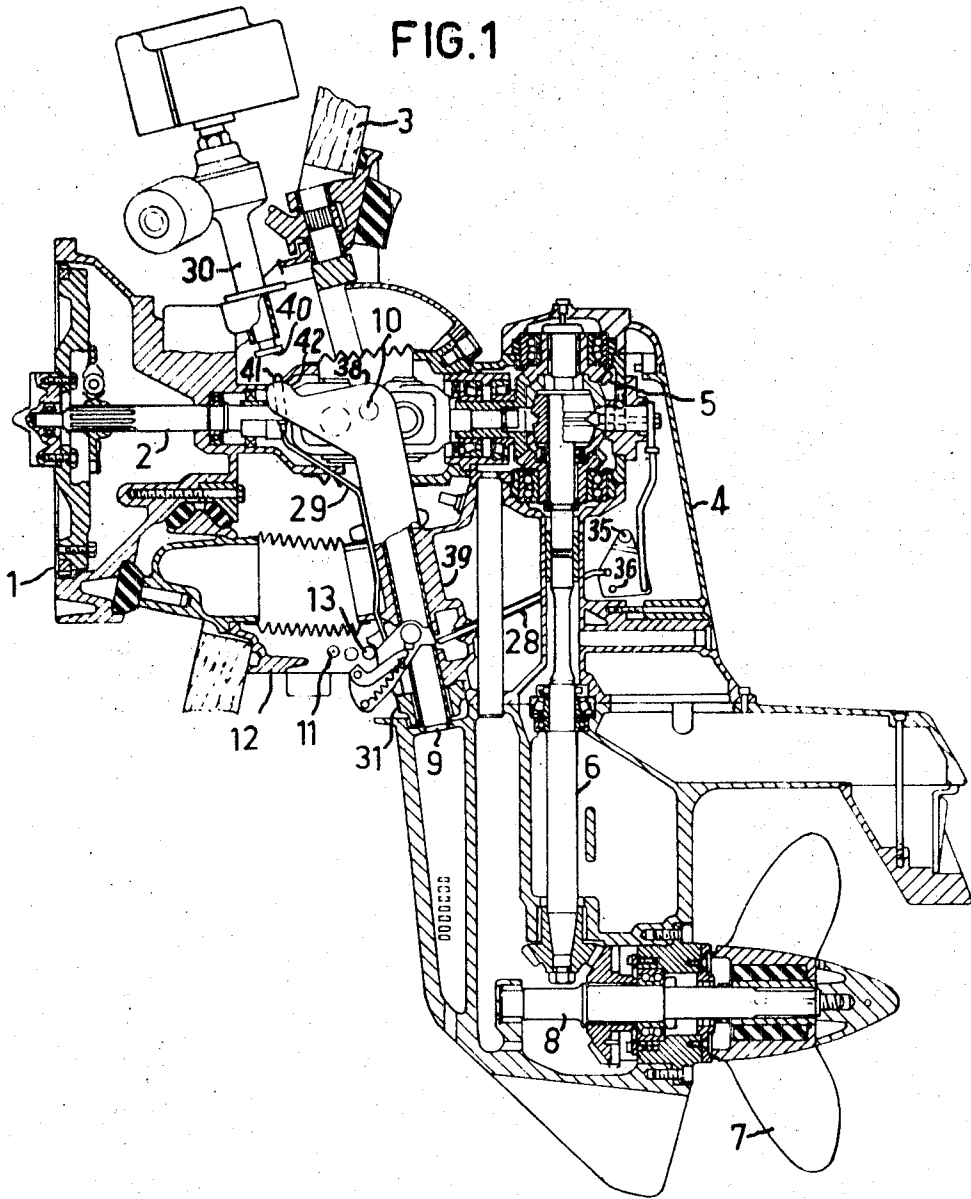
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 [51] Int. Cl. .... B63k 5/12  
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 (AT), 34

[56] **References Cited**  
**UNITED STATES PATENTS**

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**ABSTRACT:** A tilt lock for motor boat stern drives of the type comprising a downwardly extending leg having propeller means at its lower end portion and pivotally connected to the boat at its upper portion on an axis extending laterally of the boat keel for tilting upwardly and rearwardly. The tilt lock comprises pivoted arms preferably carried by the leg having notches therein for receiving a pin preferably carried by the boat in a selectable position. The notches are provided with cam surfaces which engage the pin during forward propulsion in a direction to force the arms away from the pin, whereby sudden tilting of the leg moves the arms away from the pin before biasing means are effective to swing the arms into position to nest the pin in the notches. A latch member is pivotally carried by the arms and biased in position to retard escape of the pin from the notches but yieldable to permit such escape when the leg is forced to tilt. A lock member is arranged for selective swinging into the path of yielding movement of the latch, and the lock member is operably connected to reverse gear shifting means to lock the latch member in retaining position during reverse operation of the propeller means.





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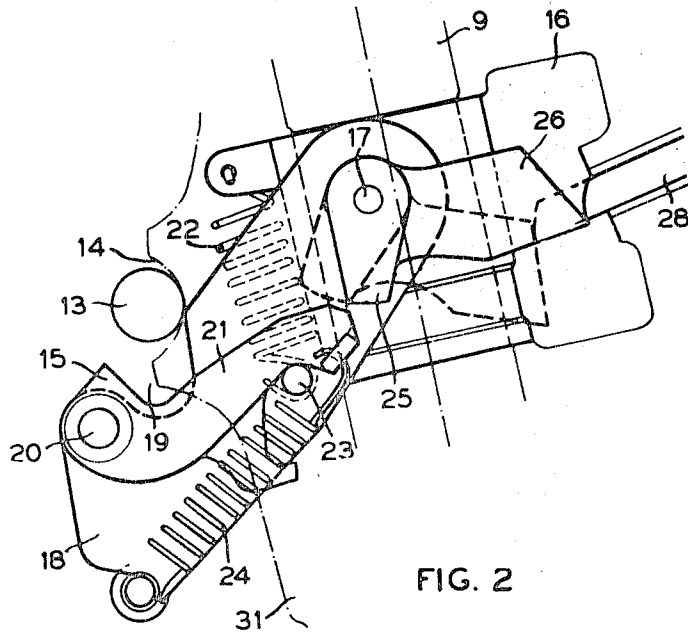


FIG. 2

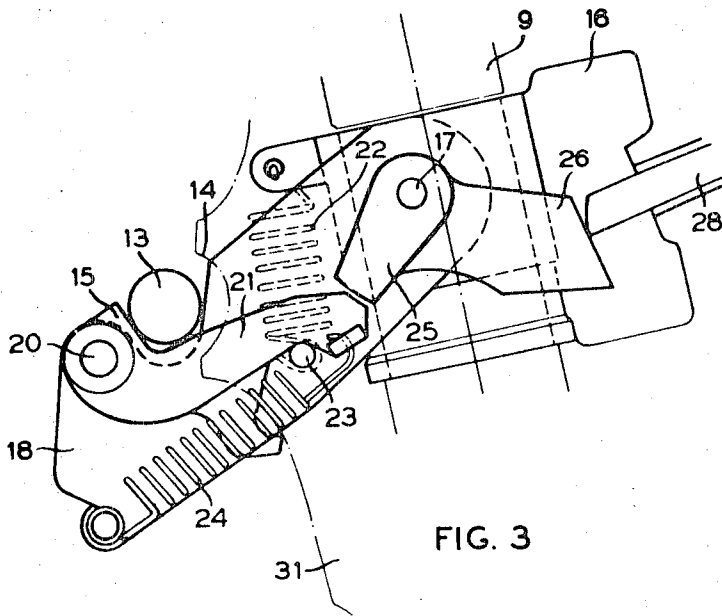


FIG. 3

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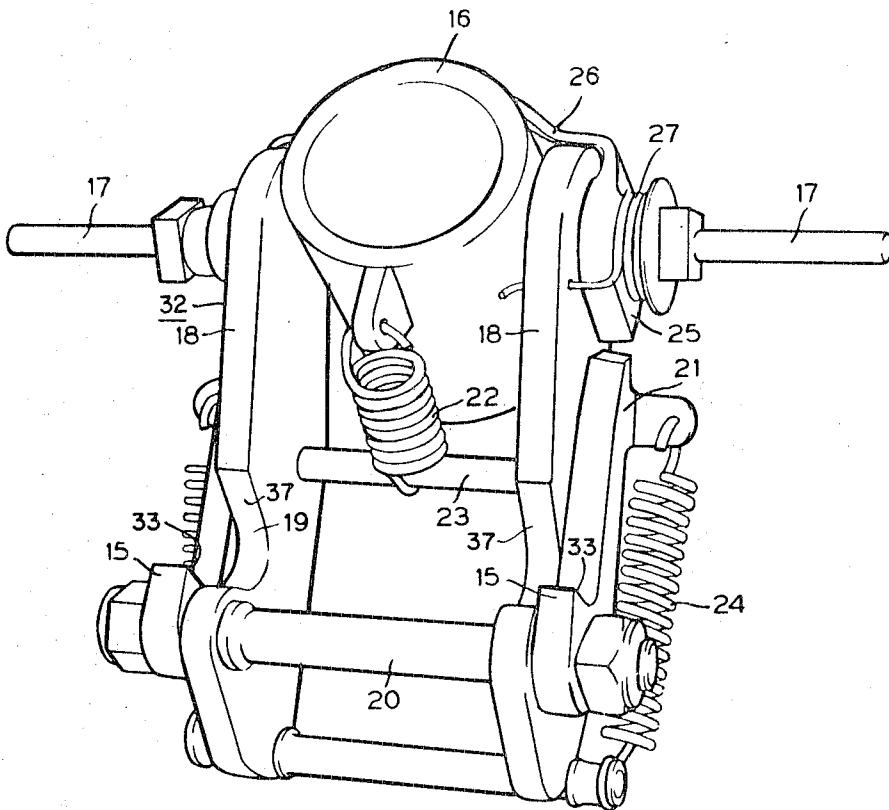


FIG. 4

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## TILT LATCHING AND LOCKING MEANS FOR TILTABLE STERN DRIVES FOR BOATS

The invention relates to a tilt control means for pivotally mounted stern drives so arranged that the drive can be tilted up unless arrested in the down position by the tilt control means. The latching and locking means is shown herein in connection with a boat having an inboard motor, the shaft of which is connected to the propeller drive. This drive can be tilted up in the vertical direction and turned in the horizontal direction. The invention is, however, readily adaptable for use with other drive arrangements which embody tilting outboard legs.

### GENERAL ORGANIZATION AND OPERATION OF THE ILLUSTRATED EMBODIMENT

During normal forward propulsion the reaction force of the propeller forces the out drive leg towards the boat against a trimming element in the form of pin provided on a transom bracket fixed to the boat so that the stern drive leg remains in the correct trimming position without the need of locks or other blocking means. When running the drive in reverse; the leg tends to pull itself up out of the water so that a locking means is required for preventing such a tiltup movement towards a tilted position. Even when running ahead it sometimes happens that the drive may tilt up such as when the speed is quickly reduced. It is for these reasons that there usually are means for locking the leg in the normal drive position, which, with the arrangement shown herein, is substantially a vertical position of operation. Such a lock must yield, however, as a safety measure to avoid damage in case of running aground or collision with a floating or subaquatic body permitting the drive to tilt up. The force against the leg required to release the lock has to be relatively large, such as several hundred pounds, to prevent unintentional and undesirable tilting. This invention relates to a latching arrangement which avoids damage to latches or locks which, in prior art arrangements have been subject to damage from too rapid release, and the present arrangement is not subject to the random and unreliable latch or lock release operation characteristic of prior art arrangements when beaching on a shallow beach having a low angle of inclination.

It has been proposed to avoid such disadvantages by keeping the lock released when going ahead, by means of a manual release device which, however, may have the effect that the drive is tilted up when quickly reversing the drive, for example to avoid a collision with a floating body, so that the whole maneuver may be abortive. Such manually operated devices further require the operator to remember and reset the lock release and, of course, require that extra manual control means be provided for operation by the operator.

The present invention relates to a tilt latch and lock which is automatically maintained in a released position during forward propulsion but which occupies a locking position when the drive has been shifted into reverse gear. The mechanism comprises one or more vertically yielding arms, connected to the stern drive leg and provided with spring-loaded hooks for engaging a transverse rod or pin or similar hook-engaging means attached to the boat. According to the invention, the tilt latching and locking arrangement is characterized in that the levers have a notch or recess for receiving such rod or pin, the slope of the edges of the recess being such that when forced by the force of reaction of the propeller the arms are turned down to a position in which hooking edges of the notch are at a level lower than that of the pin and are thus entirely disengaged.

The drawings illustrate the preferred embodiment of the latching and locking means as applied to a typical inboard-outboard drive unit for a boat.

In the drawings:

FIG. 1 is a sectional side view of an inboard-outboard drive unit embodying the invention, the unit being mounted on a boat and driven by an engine which are represented in fragmentary section;

FIG. 2 is a detail side elevation on an enlarged scale of tilt latching and locking means according to the preferred embodiment of the invention with the elements in positions assumed during normal forward propulsion of the boat, including the tilt pin and fragmentary portions of the outboard leg;

FIG. 3 is a view similar to FIG. 2 but showing the elements in positions assumed when the drive has been shifted into reverse gear; and

FIG. 4 is a detail perspective view showing the latching and locking means of FIGS. 2 and 3 but omitting the tilt pin and leg portions shown therein.

Referring particularly to FIG. 1 of the drawings, the out-drive unit comprises a power shaft 2 of an inboard motor, indicated at 1, connected to a stern drive leg 4, the leg being pivotally connected to the boat transom 3. The leg includes a reverse gear 5, a vertical drive shaft 6 and a propeller shaft 8 driving the propeller 7. The drive 4 can be turned around a generally upright king pin 9 and can be tilted around a horizontal pivot 10. The drive can be trimmed by a number of holes 11 provided in flanges 12 and by a trim pin in the form of bolt 13 to be inserted therein. Reverse gear and mounting arrangements of the type illustrated herein are more specifically described in U.S. Pat. No. 3,269,497, issued Aug. 30, 1966 entitled "Clutch Mechanism" and U.S. Pat. No. 3,339,517 issued Sept. 5, 1967, to K. A. Bergstedt, entitled "Steering Mechanism for Inboard-Outboard Unit," each of which is assigned to the assignee hereof. As best seen in FIGS. 2 and 3, the bolt or pin 13 engages an abutment face 14 of the drive leg 4 during forward propulsion. It further serves as a catch to be caught by latch hooks 15. The latch hooks 15, when the drive unit is not being driven and is not in reverse gear, are arranged to be forced against spring bias into a pin releasing position upon application of a heavy force to the leg tending to tilt the leg, but when the drive is shifted into reverse gear, a locking top member is moved into position to prevent movement of the latch hook into pin releasing position.

As seen in FIGS. 2, 3 and 4, the tilt latching and locking assembly, shown at 32 in FIG. 4, is carried by its sleeve 16 rotatably engaged on the generally upright king pin 9. The sleeve is provided with outwardly extending transverse trunnions or studs 17 forming pivots for parallel arms 18 so that the arms extend on either side of the sleeve 16 forwardly toward the transom of the boat. A recess or notch 19 for receiving the bolt 13 is cut in the upper side of each of the arms 18. In front of the recesses 19, a cross shaft 20 extends between and through the arms 18, and that end of the shaft 20 which projects beyond the arms 18 forms a pivot for the latches or hooks 15. Each hook or latch member 15 comprises a rear leg 21 opposed to the pin-engageable lip 33 of the hook. The arms 18 are urged upwardly by a cylindrical coil spring 22 inserted between the sleeve 16 and a transverse rod 23 extending between, through and slightly beyond the arms 18. The end portions of rod 23 which extend outwardly of arms 18 form stops for the hook legs 21. Spring 22 biases arms 18 to swing upwardly on trunnions 17. A respective strong tension spring 24 is active between the front part of each of the arms 18 and the rear part of each leg 21 to urge or bias the hooks 15 in the position shown in the drawings, with legs 21 engaged with stops 23. Against the action of the spring 24 the hooks 15 and legs 21 can be turned counterclockwise (as seen in FIGS. 2 and 3) on the cross shaft 20 and will be immediately returned, when released, to their original position by action of springs 24. An angular movement of the latch or hook members 15 may be prevented by locking stop members 25 being rotated on the studs 17 from the solid line position shown in FIG. 3 into the position shown in broken lines at 25' so that the ends of the legs 21 are stopped against upward movement by the interposition of the stop members into the upward paths of the legs. The stop members 25 are fixed to a stirrup 26 which extends around the sleeve 16 from one side to the other. The stirrup is biased in the position shown in full lines in FIG. 2 by means of a coil spring 27 or other flexible element engaged between one of arms 18 and the stirrup and stop

member 25, 27. The stop members with their interconnecting stirrup may be turned to the locking position shown in FIG. 3 by a push rod 28 connected to the actuator 35 of the reverse gear so that when the rod is pushed the stirrup 26 is turned down and is retained in this down position. The actuator rotates on pin 36 in a clockwise direction for forward drive and counterclockwise for reverse gear connection as viewed in FIG. 1.

The operation of the latching and locking means is as follows. When the drive 4 is in upright untilted position and the boat is not running, the spring 22 keeps the arms 18 in their upper position so that the latch hooks 15 engage the pin or bolt 13 and the drive 4 is restrained in its upright position. When the propeller 7 begins rotating in the forward drive direction, the drive 4 is forced toward the boat by the pressure produced by the propeller, i.e. by the force of reaction of the propeller, the rear camming edges 37 of the recesses 19 of the arms 18 being forced against the bolt 13. The slope of these camming edges is such that the arms 18 overcome the action of spring 22 until the lips 33 of latch members 15 are at a level lower than that of the lower side of the bolt 13 which, then, is engaging the abutment face 14 of the drive leg 4. It is to be noted that the abutment face 14 is shown in broken lines in FIGS. 2 and 3 for clarity. The abutment face constitutes a part of the supporting yoke 38 which mounts king pin 9 on which the leg 4 swings in steering. The yoke and king pin swing upwardly on pivot 10 for tilting of the leg 4. Housing 31 constitutes the lower portion of the yoke and abutment face 14 comprises the forward part of this casing. The leg 4 comprises an integral bearing portion 39 engaged on king pin 9 mounting the leg for steering movement on the tiltable yoke 38. If when running the boat the leg 4 strikes an obstacle such as a drift log or if it touches bottom, the leg 4 is rapidly tilted up, this movement being too rapid to allow the arms 18 to be moved upward by the spring 22 so that the bolt 13 is clear of the lips 33 as they pass by. When, however, the motor is slowed to idling speed, and the gears placed in neutral, the pressure is reduced at a slower rate so that the arms 18 swing up, whereby the bolt 13 enters notches 19 during the initial tilting movement of the drive and, thus, prevents tilting. Consequently, the drive may be immediately shifted into reverse gear and operated in reverse without resulting in tilting of the drive. The stirrup 26 is curved and of the shape of a portion of a cone. Thus push rod 28, which swings about the axis of king pin 9 with the leg 4 as the leg is steered back and forth merely traverses the surface of the stirrup. If the unit is in reverse, the push rod 28 may move toward and away from the viewer as seen in FIG. 3 without thereby permitting or causing any change in position of the stirrup as its integral lock members 25.

When driving the boat against a slightly sloping shore or a flat, almost horizontal rock-face, the pressure of the propeller force against the bolt 13 may decrease so slowly that the hooks 15 engage the bolt 13 and restrain the drive so as to tend to prevent same from tilting. However, under these circumstances, the tilting force becomes sufficient to overcome the power of the springs 24 and the latch members 15 to rotate on shaft 20 in a counterclockwise direction resulting in the release of the arms from bolt 13 with the lips 33 tripping under the bolt. The shape of the latch members 15 and of the arms are such that the arms are automatically cammed down under the bolt when the leg 4 returns from a tilted position into its normal upright position, spring 21 yielding under the cam pressure.

The drive may be tilted for repair and service, normally by a powered tilt mechanism 30 or by an external hoisting device. This requires the tilt lock to be released, for example, by a push rod 29 for pushing down the arms 18 and being controlled by the power tilt mechanism 30 or the like before tilting of the drive is started. Thus button 40 of power tilt mechanism 30 is lowered first into contact with rod 29, pushing the rod and, accordingly arms 18 downwardly before contacting knob 42 of yoke 38 to effecting tilting on axis 10 by forcing the knob downwardly.

The two notches 19 of the arms 18 located on either side of the steering shaft 9, and also the hooks 15 have to positively engage the bolt 13 at the same time. This is ensured in that the sleeve 16 is rotatable within a limited angle, and for this purpose the studs 17 are inserted in enlarged bores in the casing 31 housing the tilt lock and have therein a play of about one to a few millimeters so that any tolerances of production or wear of engaging faces are compensated and the distribution of strain of the bolt 13 and the respective arms 18 and latches 15 becomes substantially uniform and equal.

I claim:

1. In combination with an outboard drive leg mounted on a boat on a tilt pivot, a first member fixedly attached to the boat offset from said pivot, said leg having a member offset from said pivot and disposed opposite said first member when said leg is in operative drive position and swingable away therefrom with tilting movement of said leg, a latch arm element swingably mounted to one of said members extending toward the other said member and a cooperative latch-engageable element attached to said other member, said arm element comprising a lip latchingly engageable against a side of said engageable element facing away from said one member and said lip being swingable away from said engageable element with swinging of said arm element in a predetermined direction, means biasing said arm element against swinging in said predetermined direction, one of said elements comprising a cam surface for contacting the other element when said leg is forced by propeller reaction in the direction to move said members toward each other, said cam surface being oriented to swing said arm in said predetermined direction in response to said movement whereby said lip is moved out of position to oppose rapid tilting of said leg.

2. The combination according to claim 1 wherein said lip is a part of a latching member swingably carried by said arm element, and biasing means between said latching member and said arm element urging said latching member into a position in which said lip is operatively disposed.

3. The combination according to claim 1 wherein said latch arm element is mounted to the member connected to said leg and said latch-engageable element is a trim pin, said other member comprising means for mounting said trim pin in selected position with respect to said boat.

4. The combination according to claim 3 wherein said leg is provided with means including an abutment face engageable with said trim pin when said drive is providing forward propulsion.

5. The combination according to claim 2 wherein said arm element is provided with a locking member selectably moveable into and out of the path of said latching members and operative when in said path to prevent movement of said latching members from its operative latching position thereby to lock said leg against tilting movement.

6. The combination according to claim 5 wherein said unit is provided with forward and reverse gearing and moveable means for shifting the gearing, said locking member being linked to said means and moveable thereby into and out of said path with movement of said means to operate said gearing into and out of reverse gear.

7. In a boat drive unit having an outboard leg carrying a propeller at its lower end and adapted to be pivotally mounted at its upper end to a boat for tilting on a horizontal transverse axis, means for mounting a laterally extending trim pin to the boat below said axis, an arm extending forwardly from said leg and pivotally connected thereto for swinging up and down, said arm having a notch for receiving said pin, a lip member pivotally mounted to said arm and having a lip adjacent the forward edge of the notch for engaging said pin and restraining said leg against tilting movement when in a first position and for releasing said pin when in a second position, means biasing said arm in a direction to receive said pin in said notch, means engaged between said arm and lip member biasing said lip member into its said first position, and a locking member moveable when said lip member is in its said first position

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selectively into and out of the path of movement of said lip member from its said first to its said second position.

8. The combination according to claim 7 wherein said notch of said arm is bounded along its rearward edge by a cam sur-

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face engageable with said pin and operative to swing said arm in a direction to cause said pin to leave said notch in response to forward propulsion by said unit.

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