April 13, 1965 E. C. ANDERSEN 3,178,127

WATER SKI REEL APPARATUS

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FIG. 1

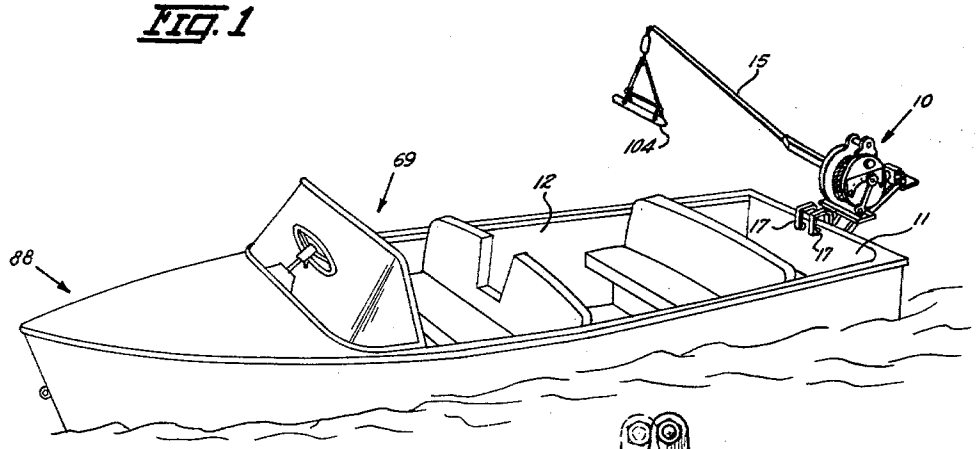


FIG. 2

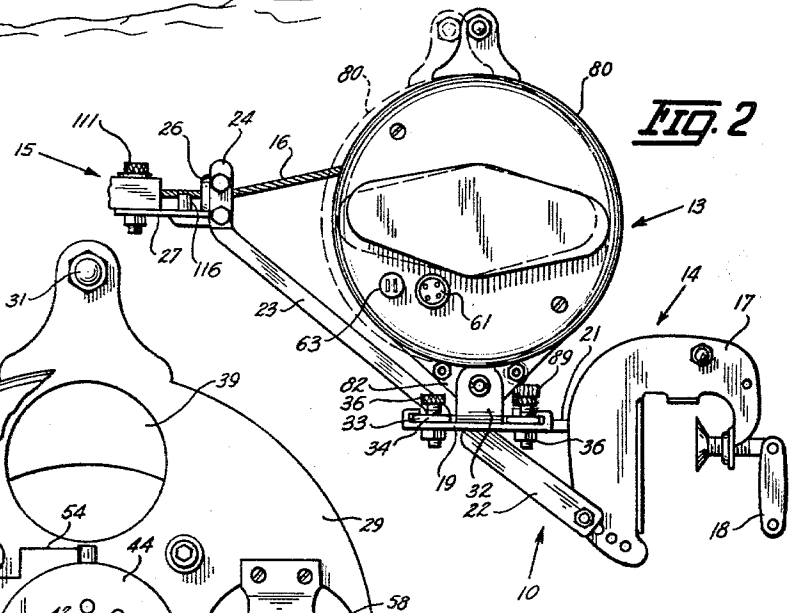
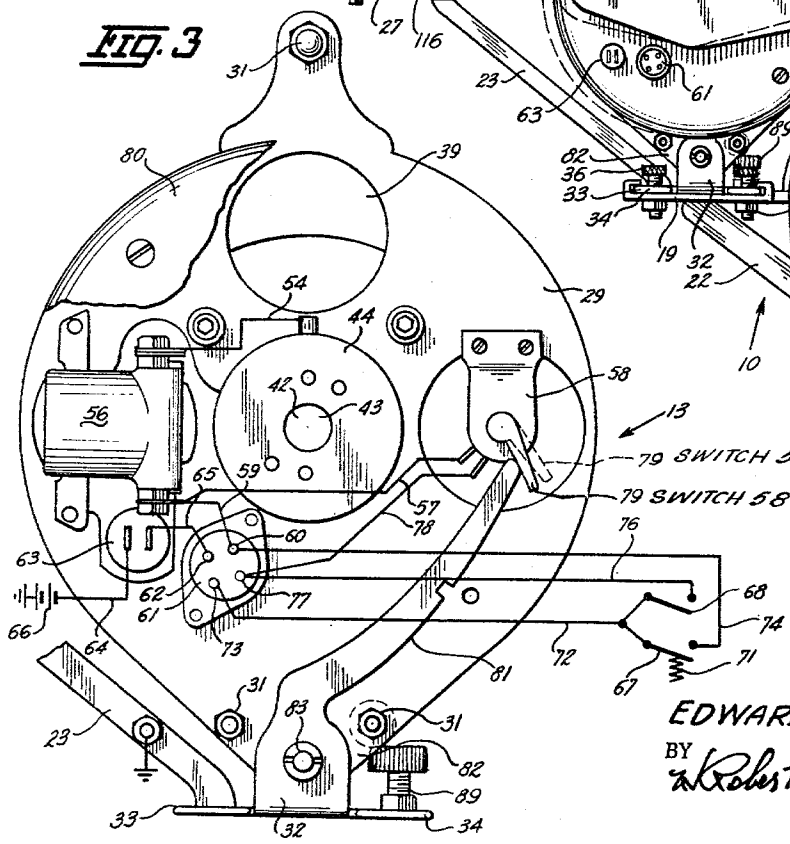


FIG. 3



INVENTOR.
EDWARD C. ANDERSEN
BY Robert Henderson
ATTORNEY.

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FIG. 4

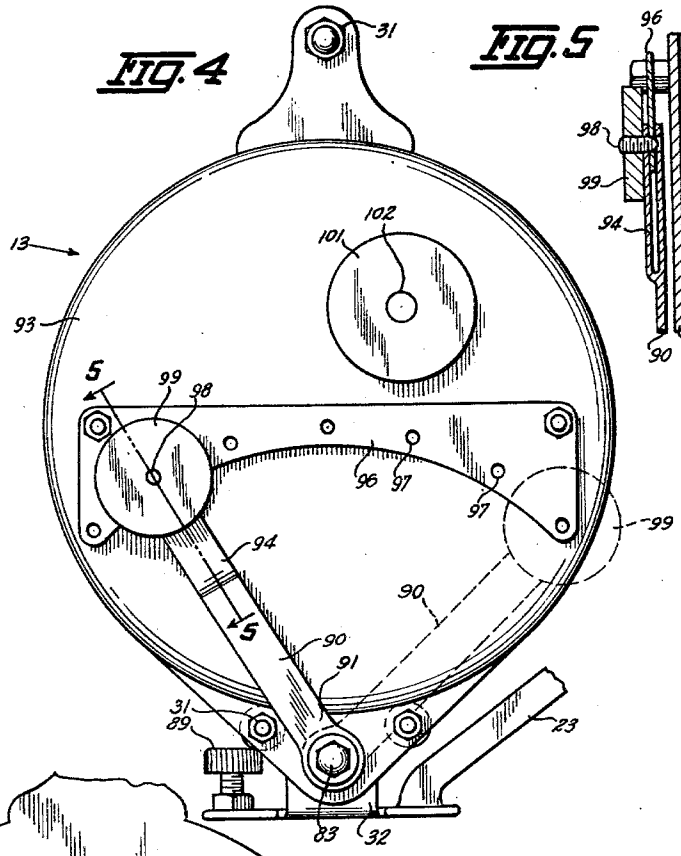


FIG. 5

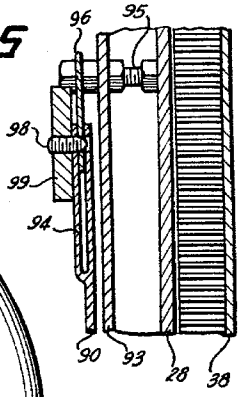
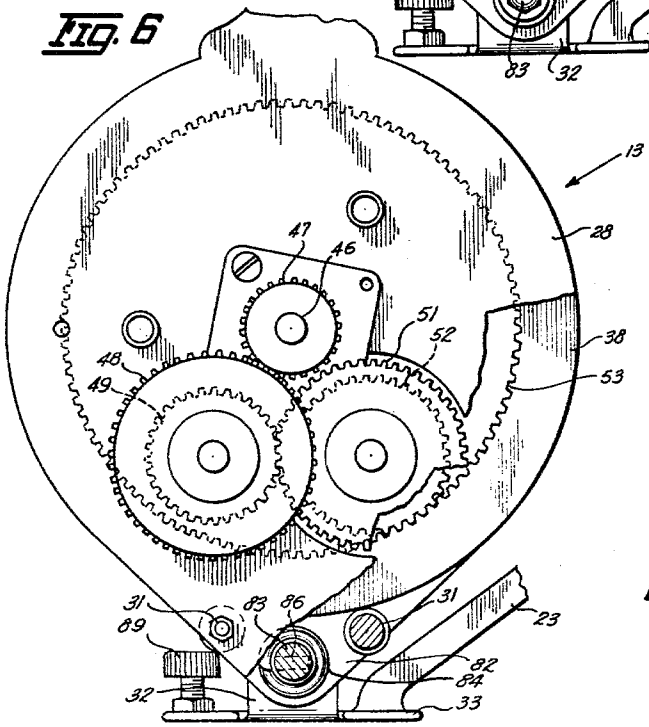


FIG. 6



INVENTOR.
EDWARD C. ANDERSEN
BY Robert W. Henderson
ATTORNEY.

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FIG. 7

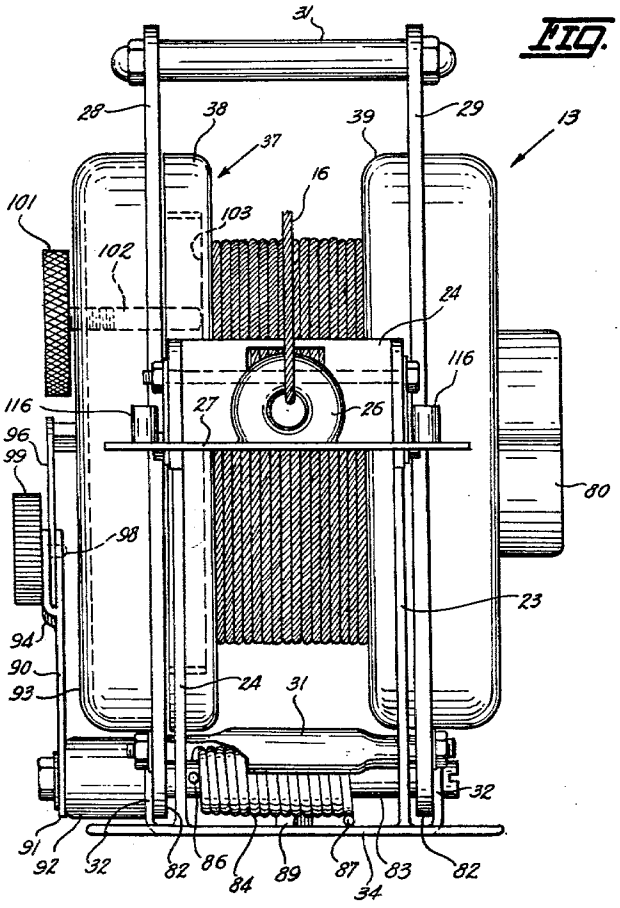
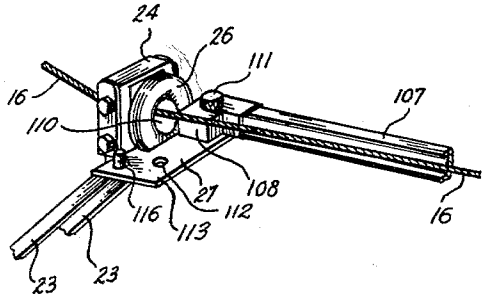


FIG. 8



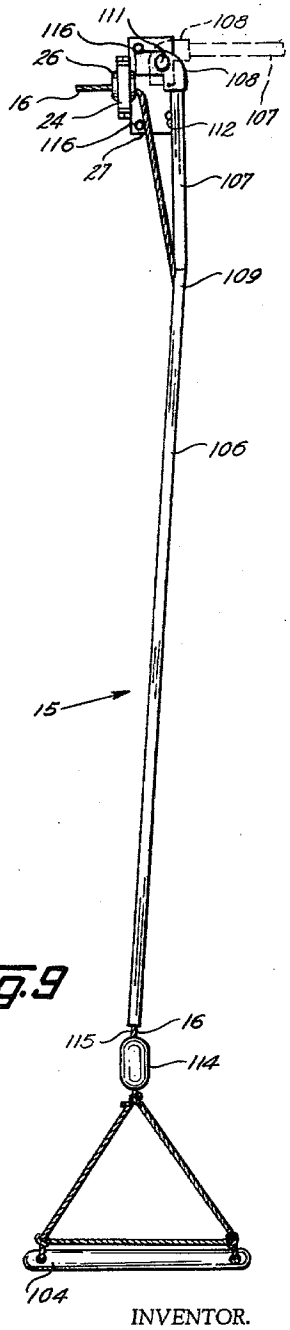


FIG. 9

INVENTOR.
EDWARD C. ANDERSEN
BY
Robert Henderson
ATTORNEY.

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3,178,127

WATER SKI REEL APPARATUS

Edward C. Andersen, R.R. 2, Grinnell, Iowa

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5 Claims. (Cl. 242—86.5)

This invention relates generally to water skiing apparatus and particularly to a motor operated reel for controlling the tautness and length of the tow line.

In the sport of water skiing, it has always been a problem to maintain a taut tow line during the time the skier is actually being towed, and additionally it has been a problem to quickly pull in the line when the skier has fallen, in order to return the tow line to him as rapidly as possible. A third problem has always been one of keeping the line away from the propeller of the towing boat while it is being pulled in.

It is, therefore, an object of this invention to provide a new and novel water ski reel apparatus for automatically maintaining a taut tow line, automatically reeling in the tow rope when it has been dropped, and for automatically moving the tow line and handle to one side of the boat and away from the motor upon being reeled in.

Another object of this invention is to provide a water ski reel apparatus which automatically reels in a tow line as long as there is slack in the line.

Another object of this invention is to provide a water ski reel apparatus which can maintain complete control over the length of the tow line at all times.

Yet another object of this invention is to provide a water ski reel apparatus which is automatically de-energized from reeling in the tow line when a skier is being pulled, and which is adjustable for different weights of skiers.

A further object of this invention is to provide a water ski reel apparatus adapted to both a manual and automatic control over the length of the tow line whereby the operator of the towing boat can maintain control over the position of the tow line handle after it has been dropped by the skier, without leaving his driving seat.

And another object of this invention is to provide a water ski reel apparatus wherein as the tow line and handle are automatically reeled in the line handle is automatically swung away from the propeller and to one side of the boat, where the handle may be readily grasped by the skier in the water, free and clear from the rear of the boat.

Yet another object of this invention is to provide a water ski reel apparatus which automatically energizes itself to reel in a tow line when the line goes slack, and which automatically de-energizes itself when the tow line has been completely reeled in.

A further object of this invention is to provide a new and novel water ski apparatus having the construction and arrangement of parts capable of attaining the above designated objective which is economical, effective, and serviceable.

These objects and other features and advantages of my invention will become more apparent upon reference to the following description and the accompanying drawings, wherein:

FIG. 1 is a perspective view of a motor boat to which the water ski reel apparatus of this invention is shown attached;

FIG. 2 is an enlarged fragmentary side elevational view of the reel apparatus, showing alternate positions of the reel unit relative to the mounting unit;

FIG. 3 is a further enlarged fragmentary side elevational view with a cover plate for that side removed to show the electrical components, the wiring for the entire apparatus shown completed by a schematic diagram;

FIG. 4 is a fragmentary view comparable in size of the other side of the reel apparatus;

FIG. 5 is a fragmentary sectional view showing the brake unit as viewed on line 5—5 in FIG. 4;

FIG. 6 is a fragmentary view of the side of FIG. 4 with the cover plate for that side removed, and showing the gear train for the reel apparatus, certain parts broken away for clarity of illustration;

FIG. 7 is an elevational view of the rear of the water ski reel apparatus, certain parts broken away for clarity of illustration;

FIG. 8 is an enlarged, fragmentary, perspective view of a portion of the swing arm unit; and

FIG. 9 is a reduced fragmentary plan view of the swing arm unit in combination with the tow line and handle, and showing the 90 degree change in position at the end of the reeling in operation.

Referring now to the drawings, the reel apparatus of my invention, indicated generally at 10 in FIG. 1 is shown secured to the transom 11 of a motor boat 12. The boat 12 can be an inboard or it may have one or two outboard motors (not shown) also attached to transom 11.

The reel apparatus 10 comprises a reel unit 13 (FIG. 2), a mounting unit 14 for securing the reel unit 13 to the boat 11, and a swing arm unit 15 for movably holding the ski tow line 16. The mounting unit 14 includes a pair of conventional C-clamp devices 17 with clamping bolts 18 for attachment to the transom. A C-shaped pedestal 19 is pivotally mounted by a plate 21 (only a portion showing) to the device 17, and is adjustably secured thereto as by a pair of parallel bars 22.

Extended rearwardly and upwardly from the pedestal, are a pair of arms 23 (FIGS. 2 and 8) the upper ends of which are secured to a square, open bracket 24. A nylon, or the like, guide 26 is secured to the bracket 24 and through which the tow line 16 extends. Extended outwardly from the lower edge of the bracket 24 is a horizontally disposed shelf 27 for use with the swing arm unit 15.

Adapted to be inserted in and locked to the C-shaped pedestal 19, the reel unit (FIG. 2) includes a pair of substantially circular vertically disposed side plates 28 and 29 (FIGS. 3 and 7). The plates are spaced apart by a trio of spacing units 31, one at the top and the other two horizontally spaced (see FIG. 3) at the bottom of the plates 28 and 29. The side plates 28 and 29 are pivotally connected adjacent their bottom to the upturned ears 32 of a mounting bracket 33, the flat plate 34 of which is inserted into the pedestal 19 and secured thereto by nuts and bolts 36. The lower ends of the arms 23 are integral with the mounting bracket 33.

Mounted between the side plates 28 and 29 is a reel 37 (FIG. 7) the sides of which comprise disks 38 and 39 integral with a drum (not shown) about which the tow line 16 is wound. The reel 37 is rotatably mounted on a shaft 42 (FIG. 3) suitably journaled in bearings, and with one end 43 of the shaft 42 inserted into and driven by an electric motor 44 mounted on a side plate 29. The other end 46 (FIG. 6) of the reel drive shaft 42 is inserted into and attached for rotating a drive gear 47.

The gear reduction train for the reel 37, in addition to the drive gear 47 includes a driven gear 48 and a smaller inner gear 49 therewith, a larger gear 51, and a smaller sun gear 52 behind the gear 51 and extended into the adjacent disk 38 (FIG. 6). The teeth of the sun gear 52 mesh with the teeth 53 of a ring gear integral with the disk 38. Thus, rotation of the drive shaft 42 by the motor 44 (FIG. 3) is transmitted through the gear train for rotating the reel 37 via the ring gear teeth 53.

The electric motor 44 (FIG. 3) is connected by a lead 54 to a spring return solenoid 56 the other side of which is connected by a lead 57 to a two-position switch 58.

The other side of the solenoid 56 is also connected by a lead 59 to a terminal 60 of a four-way receptacle 61. Power is supplied to another terminal 62 of the receptacle 61 via a lead 65 and a two-way receptacle 63 by a lead 64 from the battery 66 for the boat 11.

For controlling the operation of the motor 44 either manually or automatically, a pair of switches 67 and 68 are provided which can be remotely installed in the driver's compartment 69 (FIG. 1) of the boat 12. The manual switch 67 includes a spring 71 whereby the switch is normally open, and is connected by a lead 72 to a four-way receptacle terminal 73 and by another lead 74 on the other side of the switch to the solenoid terminal 60. When the receptacle 63 is plugged in and power is supplied to the terminal 62, a closing of the manual switch 67 results in actuation of the solenoid 56 and the transmission of current to the motor 44. Operation therefore of the motor 44 causes rotation of the reel 37, by means of the gear train, and a reeling in of the tow line 16.

To effect an automatic control and operation of the motor 44 and the reel 37, the automatic switch (FIG. 3) is also connected through lead 72 to the four-way receptacle terminal 73, and through another lead 76 to another terminal 77 and thence via a lead 78 to the two-position switch 58. The switch 58 is provided with a switch arm 79 (FIG. 3) which is biased toward a normally "on" position indicated by full lines in FIG. 3. A cover 80 is secured over the electrical components, and is provided with openings for the receptacles 61 and 63 (FIG. 2).

To cause movement of the switch arm 79 to an "off" position as indicated by dotted lines in FIG. 3, a stationary switch actuating arm 81 is provided which is integral with one of the bracket ears 32. The reel unit 13, indicated hereinbefore as pivotally mounted, has the lower portions 82 (FIG. 6) of the side plates 28 and 29 pivotally mounted on a pivot shaft 83 inserted therethrough, whereby the reel unit 13 pivots about a horizontal axis toward and away from the boat 11. A coil spring 84 (FIGS. 6 and 7) is mounted about the pivot shaft 83 and has one end 86 (FIG. 6) inserted into the pivot shaft 83 and has the other end 87 (FIG. 7) forced against the surface of the plate 34.

By this arrangement, the reel unit 13 (FIG. 4) is pivotally biased on the plate 34 and away from the arms 23 toward the front 88 (FIG. 1) of the boat 12. A stop member 89 (FIG. 3) is inserted into the plate 34 for engaging an adjacent spacing unit 31 to normally position the reel unit 13. Thus, in the normal forwardly biased position, the switch arm 79 (FIG. 3) is positioned so that the switch 58 is closed. Upon closure of the automatic switch 68 by the operator, current from the battery 66 through leads 64, 65, and 72 is directed through leads 76, 78 and 57 is actuate the solenoid 56, and thence through lead 54 to operate the motor 44. The tow line 16 is thereby reeled in and onto the reel 37.

When, however, a drag or pull of sufficient force, such as that of a water skier, is put on the tow line 16 to pivot the reel unit 13 rearwardly and against the bias of the spring 84, as indicated by the dotted line position of the reel unit 13 in FIG. 2, the rearward pivoting movement of the reel unit 13 forces the switch arm 79 back to the dotted line position of FIG. 3. In this position, the switch 58 is open and the tow line 16 remains stationary so that the skier is at a constant distance from the boat.

The amount of drag or pull necessary to pivot the reel unit 13 can be varied, as that of a small or slight child might not be sufficient to pivot the unit 13 if the spring 84 is set for an adult. Thus, a handle 90 (FIGS. 4 and 7) is connected at its lower end 91 to the pivot shaft 83, whereupon pivotal movement of the handle 90 effects a rotation of the shaft 83 and a tightening or loosening of the coil spring 84. A sleeve 92 (FIG. 7) is provided to space the handle 90 outwardly of a cover 93, secured

by bolts 95 (FIG. 5) to the side plate 28 for enclosing the gear train.

To lock the handle 90 in a predetermined position so as to set the spring 84, the upper end of the handle 90 is formed like a yoke 94 (FIGS. 5 and 7) and straddles a plate 96 as illustrated in FIG. 4. The plate 96, secured to and spaced from the cover 93, has a plurality of arcuately spaced openings 97 formed therein and adapted to receive a shaft 98 threadably mounted on the yoke 94 and movable by manipulation of a hand knob 99 integral therewith. Thus, by threading the shaft 98 back and forth, the handle 90 can be locked in and unlocked from a plurality of positions.

A hand operated brake knob 101 (FIGS. 4 and 7) includes a shaft 102 threaded through the adjacent cover 93 and side plate 28 for engagement with the inner surface 103 of the reel disk 38. Thus, depending upon the degree of engagement of the end of the shaft 102 with the disk surface 103, a certain amount of braking drag is placed on the rotation of the reel 37. By this provision, a finger tip brake adjustment on the reel 37 is obtained.

It may readily be seen, in view of the structure now described, that so long as the water skier remains upright and has a grasp on the tow line handle 104 (FIG. 1) his drag on the tow line 16 maintains the reel unit 13 (FIG. 2) in the rearwardly pivoted dotted line position with the two-way switch arm 79 also in the dotted line position. Thus, the electric circuit including the switch 58 is open and the motor is inoperative. Even if the driver were to close the automatic switch 68, the circuit would still be open. However, with the switch 68 closed, should the skier fall and/or let loose of the handle 104, or should the line 16 become loose or nontaut for any reason, the resultant relief of the drag on the tow line 16 results in the reel unit 13 pivoting forward to the full line positions of FIGS. 2 and 3. In so doing, the actuating arm 81 substantially releases the switch arm 79 and the switch 58 closes the circuit. The motor 44 is thus operated to reel in the line 16. Actual tests proved the capability of the apparatus 10 reeling in seventy-five feet of tow line in eight seconds, behind a boat traveling forty miles per hour.

As the tow line 16 is being reeled in and as the handle 104 approaches the boat, the arrangement of the swing arm unit 15 (FIGS. 1 and 9) coacts with the reel unit 13 to swing the handle 104 to one side of the boat 11 and away from the propeller(s) (not shown) thereunder. The swing arm unit 15 includes an elongated boom or arm 106 which is tubular so that the tow line 16 passes therethrough and is slidable parallel the longitudinal axis of said arm 106. One end portion 107 (FIG. 8) of the arm 106 adjacent the boat 11 is C-shaped with one side open so that in a certain position of the arm 106 the tow line 16 can move free and clear of the arm portion 107. The inner end of the arm portion 107 has integral therewith an L-shaped connector 108 (FIGS. 7 and 8), over which the tow line 16 is adapted to lie as the latter passes between the guide 26 and the adjacent arm open end 109, and which is pivotally mounted on the shelf 27 by a pivot pin 111.

The pin 111 is inserted through either one of a pair of holes 112 (FIG. 8, only one showing) formed in opposed outer corners 113 of the shelf 27. As both holes 112 are spaced horizontally and laterally from the opening 110 and the sides thereof of the guide 26 through which the tow line 16 passes, it may readily be seen that when the stopper 114 (FIG. 9) reaches the end 115 of the arm 106, continued reeling in of the motor 44 causes the arm 106 to pivot and swing from the dotted line, "straight out" position of FIG. 9, to the full line "side" position thereof. This action occurs, of course, due to the capability of the swing arm 106 to pivot in a clockwise direction, as viewed in FIG. 8, about the pivot pin 111. To limit the amount of swing, a pair of studs 116

(FIG. 8) are mounted on the shelf, and each is engageable by the connector **108**.

Should it be desirable that the arm **106** swing in the opposite direction, the pivot pin **111** merely is removed, the arm turned over, and it is remounted on the shelf **27** with the pin **111** inserted through the other hole **112**. Thus, as the pin **111** which is the pivot point for the arm **106** would be to the right of the guide **26** opening, as one viewed in plan from the boat **11**, the arm would swing to the left until the connector **108** engaged the adjacent stud **116**. Upon an opening of the circuit to shut off the motor **44**, the swing arm **106** would then remain at its side position until the skier had grasped the handle **104** and the boat **11** had started to pull away from the skier to play out the tow line **16**. Whereupon, the arm **106** would gradually swing back to a position extended straight back and rearwardly of the boat **11**.

In summation, a water ski reel apparatus has been described which enables the driver of a motor boat to alone control the length of a tow line from the boat, wherein the tow line can be reeled in partially or its entire length either by a manual operation of an electric switch, or by an automatic operation of an electric switch due to the occurrence of slack in the tow line, and wherein further as the tow line is reeled in the handle is automatically swung to one side of the towing boat and away from the propellor.

Some changes may be made in the construction and arrangement of my water ski reel apparatus without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim:

1. A reel apparatus comprising in combination:
mounting means;
reel means movably mounted on said mounting means;
a tow line connected at one end to said reel means and adapted to be pulled taut relative to said reel means, said reel means movable to a first position;
means connected to said reel means for moving said reel means to a second position upon a slacking of said tow line; and
means automatically responsive to said movement of said reel means to said second position to actuate said reel means to reel in said tow line.

2. A reel apparatus comprising in combination:
mounting means;
upright means including interconnected, spaced apart plate members pivotally connected at lower portions thereof to said mounting means;
a reel rotatably mounted on said upright means and between said plate members;
a tow line connected at one end to said reel and wrapped thereabout, with the other end extended away from said reel in one direction, said other end adapted to be pulled away from said reel, whereby the pull on said tow line is such to pivot said upright means in said one direction to a rearward position;
means connected between said mounting means and said upright means for biasing said upright means in a direction opposite said one direction to a forward position when said tow line is free; and
power means including an electric motor energized when said upright means is in said forward position to wind said tow line thereon, and de-energized when said upright means is in said rearward position.

3. A reel apparatus comprising in combination:
mounting means;
a pair of interconnected upright plate members pivotally mounted on said mounting means in spaced relation;

a reel rotatably mounted between said plate members;
a tow line attached at one end to said reel and adapted to be wound thereon, the other end of said tow line extended away from said reel in one direction;
means connected to said plate members for normally biasing said plate members to a first position, said plate members movable to a second position by a pull upon said tow line in said one direction and against the bias of said connected means;
power means including an electric motor for rotating said reel to wind said tow line thereon; and
a normally closed switch wherein said motor is energized, operatively engageable by said mounting means to interrupt energization of said motor when said plate members are in said second position.

4. A reel apparatus comprising in combination:
mounting means;
a pair of interconnected, upright plate members pivotally mounted in spaced relation on said mounting means;
spring means connected between said mounting means and said plate members for biasing said plate members in one direction to a forward position;
a reel rotatably mounted on said plate members;
a tow line connected at one end to said reel;
electric motor means for rotating said reel to wind the tow line thereon and with the free end of said tow line extended in a direction opposite said one direction whereby said tow line can be pulled so as to overcome said spring means and to move said plate members in a direction opposite said one direction and to a rearward position;
an electric switch mounted on one of said plate members and having an arm, said switch normally closed to energize said motor means when said plate members are in said forward position; and
actuating means mounted on said mounting means and engageable with said switch arm upon movement of said plate members to said rearward position, whereby said switch operates to deenergize said motor means.

5. A reel apparatus comprising in combination:
mounting means;
a pair of interconnected, upright plate members movably mounted on said mounting means;
means connected to for biasing said plate members in one direction to a first position;
a reel rotatably mounted to and extended between said plate members for rotaaion about a normally horizontal axis;
a tow line connected at one end to said reel and adapted to be pulled away from said reel in a direction opposite said one direction whereby said plate members are moved to a second position;
electric motor means for rotating said reel to wind said tow line in said one direction and about said reel; and
switch means responsive to movement of said plate members from said first position to said second position to de-energize said electric motor means.

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MERVIN STEIN, *Primary Examiner.*

JOSEPH P. STRIZAK, *Examiner.*