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SKI LINE REEL APPARATUS

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FIG. 1

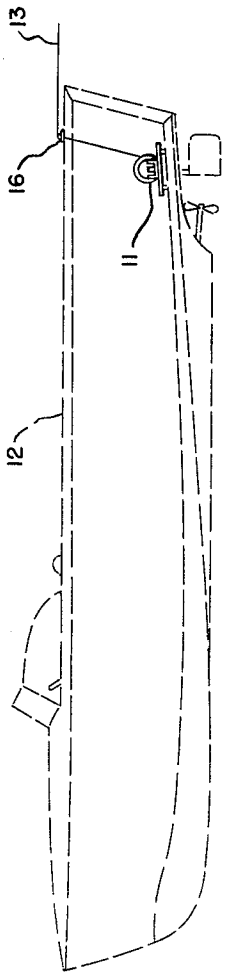
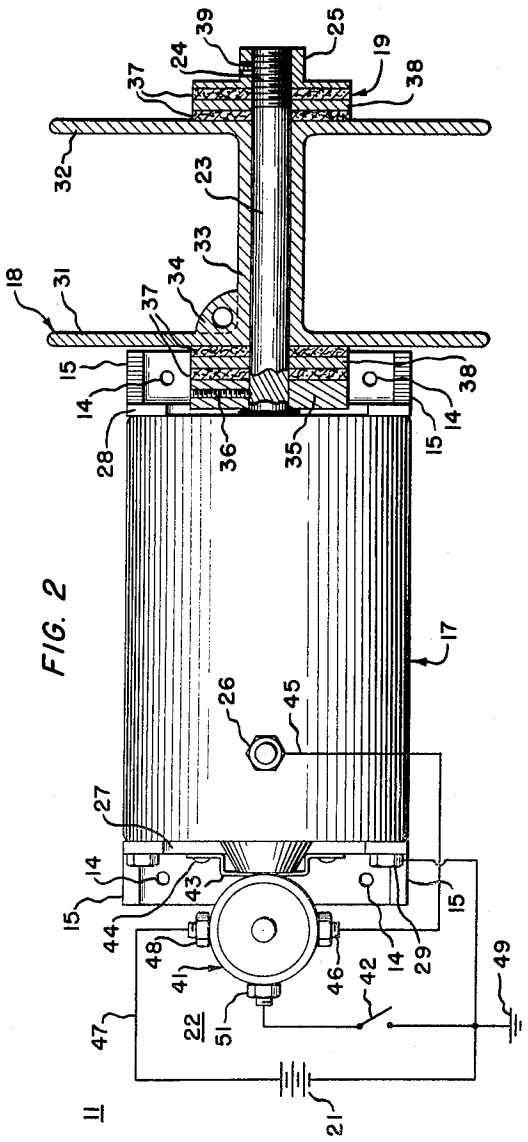


FIG. 2



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SKI LINE REEL APPARATUS

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1 Claim. (Cl. 254—187)

The present invention relates to ski line reel apparatus, and more particularly to a reel apparatus mounted in a boat and adapted to effect extension and retraction of a ski line used for towing water skiers.

The sport of water skiing has enjoyed great popularity in recent years, and it is a common sight to see water skiers being towed through the water at comparatively high speeds by power boats of both the inboard and the outboard types. The skier grasps handles carried by a ski line trailing from the stern of the boat, and as the speed of the boat increases, the planing effect of the skis upon the water overcomes the weight of the skier and enables the skier to skim across the top of the water.

At the conclusion of a ski run the skier releases the ski line and either swims or wades ashore, or, if he wishes to continue skiing, he waits for the boat to circle and return for another run. It will be apparent that the more quickly and expeditiously the boat returns to the skier, the greater the number of ski runs that can be made in any given time. Further, it is often important for the boat to return as quickly as possible, as for example when a skier has fallen off the skis into deep water.

Heretofore, after a skier lost his balance the return of the boat was necessarily delayed until the ski line was manually hauled in, it being neither prudent nor in most cases lawful to tow an unattended ski line behind the boat. But for the laborious and time-consuming task of manually bringing in the tow line it will be apparent that the return of the boat to the skier could generally be made much sooner. Frequently the ski line is also manually paid out to the skier after the boat has circled and returned, and unless this is done carefully there is the possibility of entangling or snarling the line and further delaying the next ski run.

Thus, in order not to prolong the return of the tow craft for another ski run, the tow line has to be hauled in quickly, and yet in the prior art this was not always possible because the drag of the ski line and its handles was great enough that while the tow craft was in motion, manually pulling in the tow line was somewhat tedious.

Accordingly, the present invention provides a ski line reel apparatus which is effective to haul or reel in a line at a rapid but controlled rate, without danger to the skier and without damage to the towing craft. A power driven spool or reel obviates the wearying and time-consuming task of hauling and paying out the line by hand, and electrical switch means permit remote actuation of the reel as desired. Drag or clutch elements cooperating with the reel serve to adjust the rate of extension or retraction of the ski line in accordance with the existing circumstances. For example, should the tow craft be operating at high speeds, the clutch elements may be adjusted so as to exert an extraordinary pull on the ski line to thereby overcome the high drag of the line and handles, and, conversely, when the towing craft is proceeding slowly, the clutch elements may be adjusted so that the tow line is brought in gently without any whipping, flailing action of the line. Further, the drag or

clutch elements will slip if the tow line becomes knotted or entangled with the boat, of if the line is completely hauled in and the reel is still turning. In this manner, injury to personnel and damage to the tow craft are avoided.

The present apparatus is compact, and easily fitted to the existing structure of most present day power boats. It is a self-contained or integral apparatus, reliant only upon a source of power such as a battery. Thus it may easily be affixed to tow craft which are not provided with a power take-off from the engine, and, as will be apparent, it is well suited to a variety of types of boats, both inboard and outboard. The present apparatus is relatively inexpensive, simple to manufacture, and requires a minimum of maintenance.

It is therefore an object of the present invention to provide an improved ski line reel apparatus which is adapted for attachment to a tow craft for the extension and retraction of a ski tow line at a substantially controlled rate.

Another object of the invention is the provision of a unique ski line reel apparatus adapted for mounting to a power boat, and which is battery powered.

A further object of the invention is to provide a novel motor-reel apparatus for deploying and retracting a tow line for water skiers, and which is adapted to be remotely actuated.

Another object of the invention resides in the provision of an improved ski line reel apparatus adapted to be mounted in a power boat and effective to maintain a steady and controlled tension upon the ski line.

An additional object of the invention is to provide a unique ski line reel apparatus which is simple in construction, easy to install in a tow craft, and requires a minimum of maintenance.

Other objects and features of the present invention will be readily apparent to those skilled in the art from the following specification and appended drawings wherein is illustrated a preferred form of the invention, and in which:

Figure 1 is an elevational view of the ski line reel apparatus of the present invention mounted to a tow craft; and

Figure 2 is a plan view of the present reel apparatus, partially in cross section, and including a diagrammatical showing of the electrical circuit associated with such apparatus.

Referring to the drawings, and more particularly to Figure 1, there is illustrated a ski line reel apparatus **11** mounted to a boat or tow craft **12**, and operative to deploy and haul in a ski line **13** behind boat **12**. As will be apparent, as boat **12** proceeds through the water at a greater and greater speed, the skier grasping the usual handles (not shown) carried at the end of line **13** will plane across the surface of the water until he loses his balance or until boat **12** slows for some reason. Apparatus **11** is preferably mounted to the floor boards of boat **12** at the stern thereof to facilitate handling of line **13**, and appropriate openings **14**, Figure 2, are provided for this purpose in a pair of brackets **15** of apparatus **11**. It is to be understood, however, that the mounting of apparatus **11** may be in any suitable location as desired.

Usual bolts (not shown) serve to secure apparatus **11** to boat **12** at the stern thereof whereby line **13** may be deployed from apparatus **11** upwardly through a centrally bored fitting **16** which is suitably secured, as by wood screws or the like, to the stern section of boat **12**. As illustrated, line **13** is trained from apparatus **11**, up through fitting **16**, and aft to the water skier. The particular location of apparatus **11** within boat **12** is not critical to the present invention, nor is the particular form of fairing or fitting **16** used to fair lead the line **13** aft.

The line 13 could just as well have been deployed directly rearwardly through a fitting or opening provided in the stern end of the boat, if desired. The important considerations are to so locate apparatus 11 that it can be conveniently operated, that it be out of the way of equipment and passengers in the boat, and that it be adapted to handle line 13 without entanglement or excessive abrading thereof.

Only a portion of line 13 is illustrated, it being understood that the line normally extends rearwardly a considerable distance behind the boat whereby a skier may grasp suitable handles attached to the end of the line and water ski in the well known fashion. With line 13 deployed rearwardly to its limit, apparatus 11, as will be seen, functions as a fixed anchor for the inboard end of the line. Assuming the skier loses his balance and it is desired to haul in line 13 quickly in order to put about and pick up the skier for another run, apparatus 11 will be operated in a manner hereinafter to be described.

Apparatus 11 comprises, generally, a usual and conventional direct current driven motor 17, which may be, for example, of the type widely used in present day automobiles as starter motors, a reel 18 mounted to motor 17, a clutch or drag means 19 for adjusting the rotation of reel 18, a battery 21 for supplying direct current to apparatus 11, and switch means 22 for selectively closing the circuit between battery 21 and motor 17 to thereby drive reel 18.

Motor 17 is conventional in construction as stated, and for this reason will not be described in detail. Motor 17 when connected in electrical circuit with battery 21 provides motive power for reel 18, and serves to drive reel 18 through a motor shaft 23 upon which reel 18 is mounted. Shaft 23 is threaded at its outer end 24 to carry an integral washer-nut or flanged nut 25 which when threaded upon end 24 bears up against drag means 19 for purposes to be hereinafter described. In addition, motor 17 also carries a cable post or terminal 26, and housing end plates 27 and 28 held in position by a plurality of nuts, one of which, designated 29, serves as a grounding terminal or post for motor 17. The connection of battery 21 across posts 26 and 29 serves to energize motor 17, as will be apparent to this skilled in the art.

Upon energization of motor 17, shaft 23 will rotate and rotate reel 18 by reason of the interconnection therebetween. Reel 18 is formed of a pair of spaced circular plates 31 and 32 which are integrally joined by a tube or cylinder 33 through which shaft 23 is disposed in close fitting relationship. An ear or tab 34 with a suitable opening therethrough is integrally secured to plate 31 and cylinder 33 at a point of juncture therebetween, as illustrated, tab 34 serving to receive in the opening thereof the inner end of tow or ski line 13. As reel 18 is rotated, it will be apparent that line 13 will be wound about cylinder 33 between plates 31 and 32.

Reel 18 is rotatably mounted upon shaft 23 and is therefore adapted for free-running whereby any appreciable tension or pull upon line 13, as by a water skier or by the drag of the ski line and handles in the water, will tend to pay out the line and unwind it from reel 18. This characteristic is useful in gradually and controllably deploying line 13 rearwardly at the beginning of a ski run, and it will be apparent that this arrangement prevents the snarling and entanglement of line 13 which might occur were line 13 simply thrown overboard to the skier.

Drag means 19 provides the means whereby reel 18 is caused to rotate with motor shaft 23 when it is desired to reel in line 13 after the completion of a ski run. Means 19 comprises a knurled thrust collar 35 which is fitted over shaft 23 adjacent end plate 28 of motor 17, and which is held in position by a set screw 36; a plurality of fibrous or laminated disks or rings 37 fitted over shaft 23; and a plurality of metal disks or rings 38 also fitted over shaft 23. Rings 37 and 38 serve as friction clutch surfaces, and are located as follows: one ring 37 in abutment with collar 35, one ring 37 in abutment with plates 31, and a ring 38 between the pair of rings 37; one ring 37 in abutment with plate 32, one ring 37 in abutment with the washer of washer-nut 25, and a ring 38 between this latter pair of rings 37. With this arrangement it will be apparent that the knurled collar 35 may be grasped with one hand, and the washer-nut 25 tightened with the other hand so that the engaging surfaces of rings 37 and 38, collar 35, washer-nut 25, and spool 18 tend to effect rotation of spool 18 with shaft 23 in proportion to the amount by which nut 25 is tightened. Thus, the rate at which line 13 is reeled in by apparatus 11 may be simply and quickly adjusted to suit the requirements of the particular situation. For this purpose collar 35 is rigidly secured to shaft 23 by set screw 36, rings 37 and 38 are adapted to rotate upon shaft 23, and washer-nut 25 is provided with a soft metal or fiber set screw 39 for maintaining any adjusted position of nut 25.

Rings 37 are made of a clutch facing material such as laminated phenolic of the "Micarta" type, and the remainder of the components of reel 18 and drag means 19 are preferably made of a corrosion resistant material such as bronze or specially treated aluminum.

The energization of motor 17 which causes shaft 23 to rotate is effected through switch means 22 which preferably includes a usual and conventional, normally open solenoid actuated switch 41 and a normally open push button or toggle switch 42 which may be conveniently located in the drivers compartments up forward in boat 12. Solenoid switch 41 is conveniently secured to end plate 27 of motor 17 by a bracket 43 and a plurality of any suitable fasteners, such as indicated at 44.

Solenoid switch 41 is connected between cable post 26 of motor 17 and battery 21 by a lead 45 connected to a terminal 46 of switch 41; and by a lead 47 connected to a terminal 48 of solenoid 41. This circuit, which is normally open, is closed by energization of the solenoid of switch 41, as will be obvious to those skilled in the art, whereby motor 17 is energized.

Energization of the solenoid of switch 41 is accomplished by switch 42 which is normally open and connected between ground 49 and a terminal 51 of switch 41. Terminal 51 is normally electrically connected to terminal 48 through the solenoid so that when switch 42 is closed a circuit is completed between battery 21 and ground, through terminal 48, the solenoid, terminal 51, and switch 42. In this manner the driver of boat 12 may remotely control apparatus 11 by manipulation of switch 42. It is noted that ground post 29, switch 42, and one side of battery 21 are each connected to a suitable ground 49, which may be the engine block of boat 12.

In operation, the skier grasps the handles at the end of line 13, and this pull unreels line 13 from reel 18 as the boat 12 moves away from the skier. When the line is completely payed out, the ski run is begun. After the ski run is completed and the boat turns to return to the skier for another run, switch 42 is actuated, and this energizes solenoid switch 41 to complete the circuit between battery 21 and motor 17.

The energization of motor 17 effects rotation of shaft 23, and assuming the above-described adjustment of nut 25 has already been made, the drag means 19 tends to rotate reel 18 at some proportion of the rotation of motor 23. The water drag upon line 13 and the handles at the end thereof tends to keep tension upon line 13, and line 13 is reeled in at the adjusted rate until switch 42 is opened. In this manner, it will be apparent that an apparatus has been provided which is effective to haul or reel in a water ski line at a rapid but controlled rate, without danger to the water skier or other persons,

and without danger to the structure of the towing craft.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto, as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claim.

We claim:

In a tow craft for towing a water skier by a line led through fair lead means on the tow craft, which line has a handle at its free end, an apparatus carried by the tow craft for reeling in the line, said apparatus comprising: an electric motor having an output shaft; a reel for the line, said reel including a pair of flange portions spaced apart by a spool portion rotatable and axially slidable upon said output shaft; a thrust collar secured to and rotatable with said output shaft intermediate said motor and the exterior face of one of said flange portions; a nut threaded upon said shaft outwardly of the exterior face of the other of said flange portions; a plurality of adjacent, alternately arranged metal and fibrous clutch discs rotatably mounted upon said shaft, certain of said discs being located intermediate said thrust collar and the exterior face of said one of said

flange portions, and certain of said discs being located intermediate said nut and the exterior face of said other of said flange portions, said nut being rotatable to urge together said clutch discs and said reel in frictional engagement against said thrust collar; means for securing said nut to said shaft in any rotated position of said nut; and means for energizing said electric motor, the force of said frictional engagement being adjusted by rotation of said nut so as to be less than the force developed when the handle of the line engages the fair lead means of the tow craft when the line is reeled in.

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