ABSTRACT OF THE DISCLOSURE

A continuous belt for propelling a substantially planar water-skimming board is mounted in a cutout portion in the stern of the board. The cutout portion and the belt are substantially as wide as the board in order to provide a leveling action on the stern of the board.

This invention relates generally to propulsion systems and more particularly to a novel and compact "outboard"-type of swimming equipment especially adapted to propel marine vehicles of the surfboard or similar type device.

The "outboard" type of propulsion device are common in the prior art for use in propelling small craft. There are, however, many recreational "skimming" vehicles for use in water or in the surf such, for example, as water skis, surfboards and the like. Generally, these devices require, for their propulsion, external power sources such as tow lines, wave action, etc. The prior art has also provided, in some instances, self-powered recreational devices of the above type such, for example, as those disclosed in United States Patents 3,158,882 to Kirby, issued Dec. 1, 1964; 3,136,288 to Hardy issued June 9, 1964; and 3,213,822 to Swochinski issued Oct. 26, 1965. The devices disclosed in these patents utilize conventional propeller-driven marine outboard engines for propulsion thereof. One of the primary disadvantages of the conventional outboard engine, especially when used in connection with surfboard-type vehicles, is that the vertical drive shaft and propeller housing extend beneath the board thereby preventing an obstacle to utilizing the board in shallow water and causing a downwardly projecting element which is a liability in the use of the apparatus. Another disadvantage of the conventional outboard-type propulsion unit is that the motor housing must be disposed substantially above the surface of the board thereby raising the center of gravity of the craft and causing instability thereof making the craft easily susceptible to capsizing.

It is an object of this invention to provide a novel propulsion device for surfboards which overcomes the disadvantages of the prior art by providing a novel propulsion device which is equally adapted for use in deep water, shallow water, beaches, sand bars, ski jumps and the like by furnishing a drive belt propulsion unit therefor.

It is another object of this invention to provide a novel propulsion device for surfboards and like craft which presents a low profile and does not alter the lateral stability of the craft by furnishing a device in which the engine thereof is mounted directly on the upper surface of the craft and in which the overall vertical configuration and dimensions of the device are minimal.

The prior art has also envisioned drive-belt propulsion units somewhat similar to the type to which this invention pertains. Such units are typified in the disclosures of United States Patent 1,720,452 to Messinger, issued July 9, 1922, and United States Patent 3,206,072 to Messinger, issued Dec. 22, 1942. The devices of this latter-mentioned group of patents are not suitable for use in craft of the type to which the applicant's invention is intended for incorporation since, in these devices, spaced, parallel belt chains are utilized to support the paddle-like propelling members thereof thereby providing a compact, non-continuous surface between the bottom paddles and the drive chains. This type of configuration would be unsuitable for use in craft such as that contemplated in this invention, since, when the board is supporting its contemplated load, the drive belt and stern of the craft is initially disposed beneath the surface of the water. A leveling action is, therefore, required to elevate the stern of the craft to provide proper planing thereof. If the drive mechanism were not leveled to raise the forward running upper run of the belt out of the water, the paddles on the upper run of the belt would counteract those of the lower run of the belt and would render the drive mechanism inefficient. In order to provide a leveling or surfacing action for a belt-type drive mechanism, it is required that a pressure differential exist between the upper and lower runs of the belt so that, upon starting of the belt, force would be exerted to elevate the device toward the surface of the water. This could not be provided by an open or discontinuous belt since a pressure differential could not exist thereon. The rigid paddles disclosed in this group of patents would also be unsuitable for use in shallow water or in proximity to sand bars, beaches, mud flats and the like since they would be subject to damage from contact with solid objects and would offer the same danger to swimmers. For these reasons, the devices disclosed in the latter-mentioned group of patents would be unsuitable for use with devices of the type contemplated in this invention.

It is, therefore, another object of this invention to provide a self-leveling propulsion system for water-borne vehicles which is especially adapted to propel small craft by furnishing an endless, transversely continuous paddle belt as the driving means therefor.

It is still another object of this invention to furnish a drive device for water-borne vehicles which is safe and which is adapted to traverse sand bars, mud flats, beaches and other like obstacles without damage to the drive system thereof or without danger of injury to swimmers by furnishing a belt having resilient paddles extending therefrom.

These and other objects of the invention will become more apparent to those skilled in the art by reference to the following detailed description viewed in the light of the accompanying drawings wherein like elements thereof are indicated by like numerals throughout the figures thereof and wherein:

FIGURE 1 is a side elevational view, partly broken away of a propulsion device in accordance with the invention;

FIGURE 2 is a sectional view of the device of FIGURE 1 taken along the lines 2--2 thereof;

FIGURE 3 is an enlarged view of a portion of the device of FIGURE 1 showing an element thereof in detail;

FIGURE 4 is a side elevation view of a surfboard incorporating a propulsion device in accordance with the invention; and

FIGURE 5 is a plan view of the board of FIGURE 4.
one another, support a pair of rollers 30 and 31 proximate either end thereof. The rollers 30 and 31 are provided with axles 32 and 34 respectively which extend from either end thereof through bearings 36 and 38 proximate either end of the frames. The drive belt 16 is entwined around the rollers 30 and 31 to be driven thereby. In FIGURE 3, bearing 38, shown in enlarged detail, is mounted in a longitudinal slot 40 disposed proximate the rearward end of the frame member 26 and is biased a direction away from the forward end of the frame by a compression spring 42. The bearing 38 in the frame member 28 is mounted in an identical manner to that described above. The belt is formed with an extended diameter, when disposed about the rollers 30 and 31, of a smaller dimension than that between the extreme end surfaces of the rollers when the bearings 38 are at their rearmost extreme in the slots 40 so that a constant tension is imposed on the belt 16 by the bias of the springs 42.

Each of the rollers 30 and 31 are provided with transversely disposed corrugated surfaces 44 in their peripheral surface at least proximate either end thereof and transversely extending flanges 46 are mounted at either end of the rollers to confine the belt 16 therebetween. The axle 32 of the roller 30 extends in one direction beyond the frame 26 for connection to a sprocket 48 for purposes to be described below. The drive belt 16 is provided, on the inner surface thereof, with transversely extending corrugated surfaces 50 proximate either edge thereof, corresponding and intermeshing with the corrugated surfaces 44 of the rollers when the belt 16 is installed therein.

A drive shaft 52 projects from the engine housing 18 and is provided with a drive sprocket 54 mounted for rotation therewith. A drive chain 55 connects the drive sprocket 54 to the sprocket 48 to furnish drive for roller 30 consequently the belt 16 in the direction indicated by the arrows. An exhaust stack 56 extends from the upper portion of the housing 18 to provide exhaust of combustion gases from the engine to the atmosphere. The engine may be of any type suitable for the purposes but is preferably of the light horsepower class similar to those used in lawn mowers, chain saws, and like devices.

The throttle control cable 24 is of the type which incorporates a flexible push-pull rod 60 disposed within the cable sheath for reciprocating movement therein. Turning now to FIGURES 4 and 5 of the drawings, although the propulsion device is suitable for use with many types of watercraft, it is particularly adapted for use with the surfboard as shown. A hand grip 64 is connected to the forward portion of the board 62 by a flexible line 66 to provide means for a standing operator to balance himself on the board.

The device 10 is mounted in a cut out portion 68 formed in the rear end of the board. The board itself is formed with parallel sides over a major portion of its length with an ogive-like nose tapering to a point at the bow and a gentle curvature decreasing the beam width proximate the stern. Although the board may take any suitable configuration and be formed of any desired material it is preferred, from a standpoint of simplicity, economy of construction and weight, that the board be fabricated of a fiber-glass shell 70 filled with a core of foam plastic 72 such as urethane, styrofoam, polyfoam, or the like. In elevational configuration, the board should be formed so that the buoyancy thereof is sufficient to maintain at least the upper surface of the engine housing 18 clear of the water when the board is fully loaded. In order to accomplish this, it is preferable that the elevational profile of a 16 foot long board be approximately 4 inches proximate the stern end thereof maintaining a constant thickness extended forward until, at a point approximately 4 feet from the bow end of the board, it tapers gently at an angle of approximately 5° to 10° from the normal center line as both the upper and lower surfaces of the board curve slightly upward to the thickness of two inches at the extreme bow of the board. The overall buoyancy of the board should be preferably sufficient to support a load of 250 pounds in addition to the dead weight of the vehicle in such a manner that the engine 18 is not submerged when the board is dead in the water.

The throttle control cable 24 is connected to the throttle linkage of the engine on one end and to a scissor-type power-control handle 74 on the other end. The linkage accelerates the engine as the pivotal portions of the handle 74 are squeezed towards a closed position. A spring 76, between the pivotal portions of the power-control handle 74, biases the throttle in an idling condition so that, if the operator is thrown from the board, the engine is retarded so that the board may be retrieved. Any standard mechanism of the same general type providing the well-known "dead man" type throttle may be used here. The propulsion device 10 is vertically positioned in the board 62 so that a portion of the paddles preferably extends beneath the lower surface of the board.

In operation, the operator stands on the board 12 proximate the forward portion of the drive mechanism 10 and, preferably while in a kneeling position, starts the engine by any suitable means such as, for example, a pull rope, inertia starter or the like. When the engine is started, the operator, gripping the handle 64, accelerates the engine by means of the belt 16. A drive power-control handle 74. By properly displacing his weight lengthwise on the board 12, the operator may adjust the attitude of the board so that, when the belt 16 is at proper speed, the board planes as desired. As was described above, the belt 16, due to the pressure differential between the bottom and the upper portion thereof, creates a self-leveling effect which, in conjunction with the operator's displacement of his weight longitudinally on the board, will provide the proper planing action for the board. The board is steered by the operator laterally displacing his weight to cause the board to bank and turn in a manner similar to the steering of conventional surfboards, water skis, and aquaplanes.

In a power-off condition, the board may be used as a conventional surfboard. In this configuration, the paddles 20 provide drag stabilization for the board obviating the need for a rigid keel and thereby eliminating one of the more dangerous elements in this type of sport.

What has been set forth above is intended as exemplary of a teaching in accordance with the invention to enable those skilled in the art in the practice thereof. It should, therefore, be understood that, within the scope of the appended claims, the invention may be practiced other than as specifically set forth. What is new and, therefore, desired to be protected by Letters Patent of the United States is:

1. A self-propelled water craft comprising in combination:
   a substantially planar water-skimming board;
   said board having a cutout portion in its stern; and
   a driving device mounted in said cutout portion said driving device comprising:
   a pair of parallel spaced rollers mounted for rotation in said cutout portion;
   an endless belt entwined about said rollers to be driven thereby; and
   a plurality of transverse elastomic members projecting from the outer surface of said belt, said belt being disposed to extend said paddles beneath the lower surface of said board during one run thereof to provide propulsion for said board; and
   means to controllably drive at least one said rollers.
2. A device in accordance with claim 1 wherein means are provided for resiliently biasing one of said rollers away from the other of said rollers.
3. A device in accordance with claim 1 wherein said rollers are provided with belt retaining flanges on either end thereof.
4. A device in accordance with claim 1 wherein said rollers are provided with corrugations on the periphery thereof at least proximate the ends thereof and wherein the inner surface of said belt is provided with corrugations corresponding to and intermeshing with the corrugations on said rollers.

5. A device in accordance with claim 1 wherein the means to drive said rollers comprises an internal combustion engine mounted proximate said rollers and drivingly connected thereto through a sprocket chain drive connecting a sprocket on the drive shaft of said engine to a sprocket mounted for rotation of one of said rollers.

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