

[54] WATER SKIS

[76] Inventor: Helge Krogseng, P.O. Box 583,
Achorage, Alaska 99510

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Primary Examiner—Trygve M. Blix
Assistant Examiner—Galen L. Barefoot
Attorney, Agent, or Firm—Berman, Bishoff & Platt

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[51] Int. Cl. B63h 16/08

[58] Field of Search 115/21, 22, 23, 24, 25,
115/26; 9/310 C, 310 D

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ABSTRACT

A pair of side-by-side user-propelled buoyant water skis having rear paddle wheels and a mechanism interconnecting the skis and drivingly coupled to the paddle wheels so as to rotate the paddle wheels responsive to relative longitudinal movements of the skis, whereby a user can propel the skis through the water by walking movements. The skis have respective pivoted rudders and the rudders are operated by control rods grasped by the user. The skis are held in substantially coplanar relationship by a rod extending slidably through vertically swivelled guide sleeves on the respective skis and are held in parallel relationship by sliding connections between the skis.

13 Claims, 9 Drawing Figures

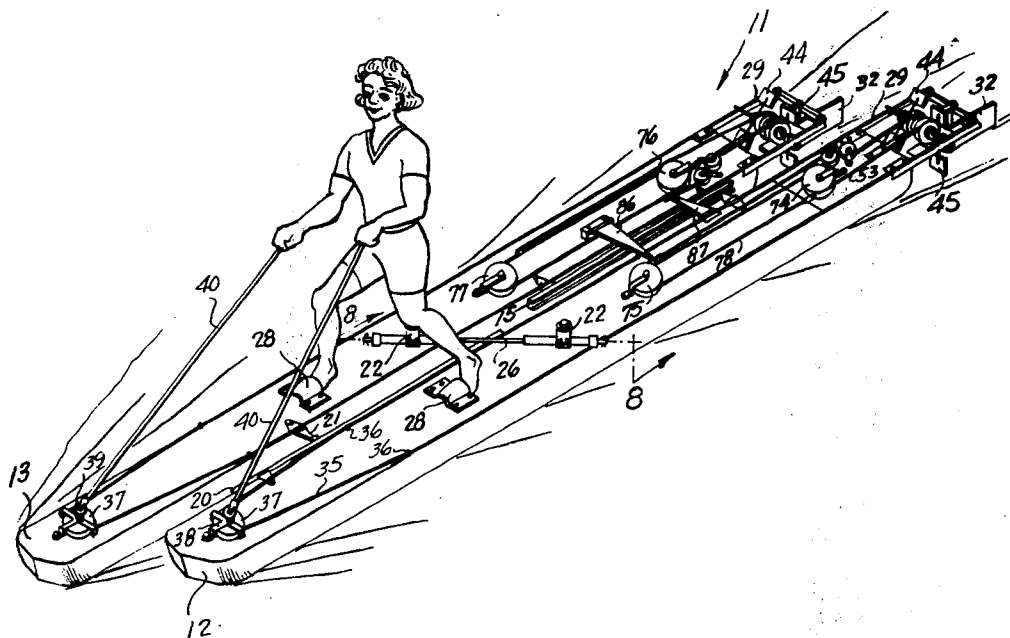


FIG. 1.

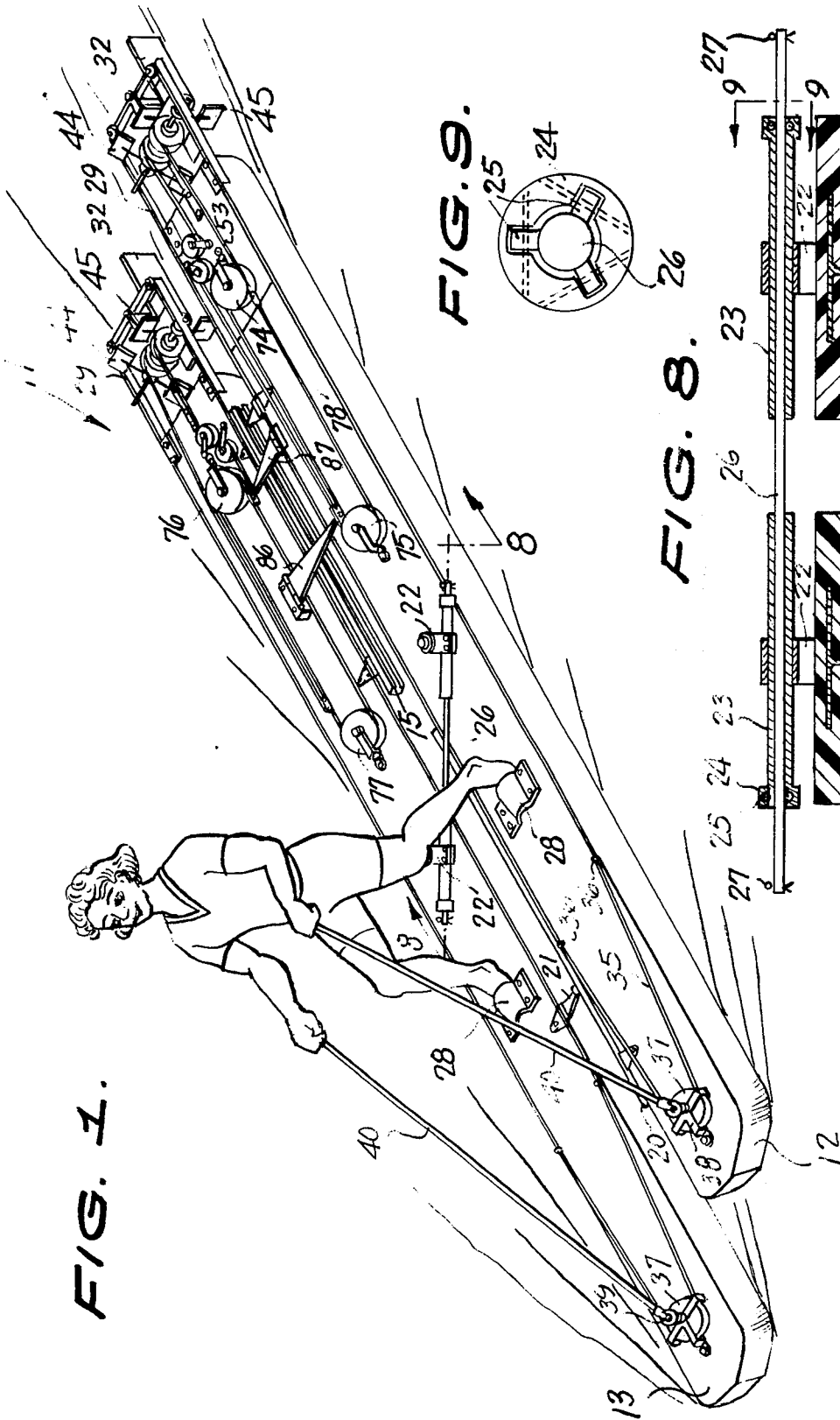


FIG. 9.

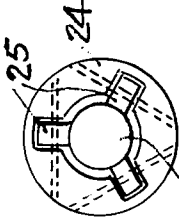


FIG. 8.

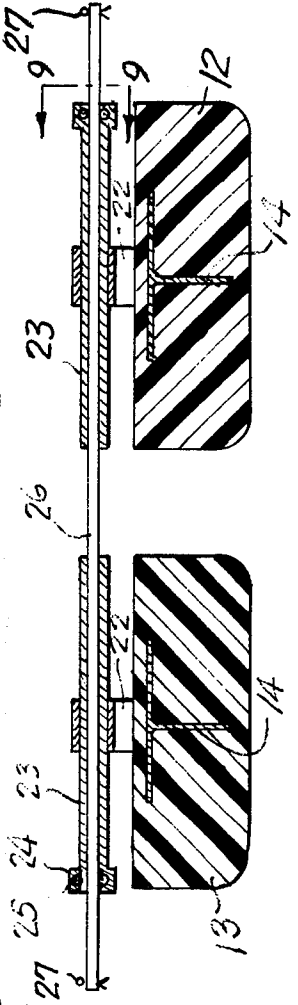


FIG. 2.

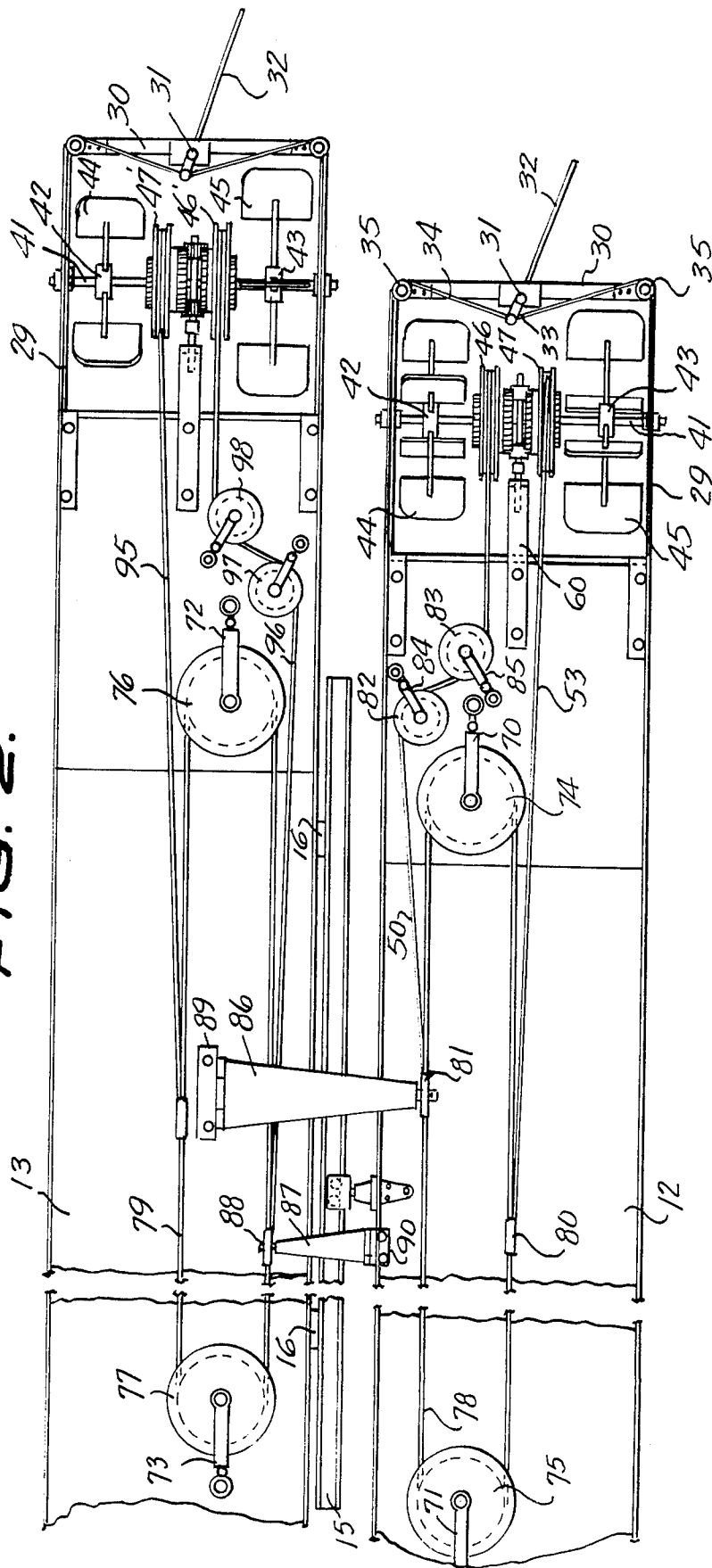


FIG. 3.

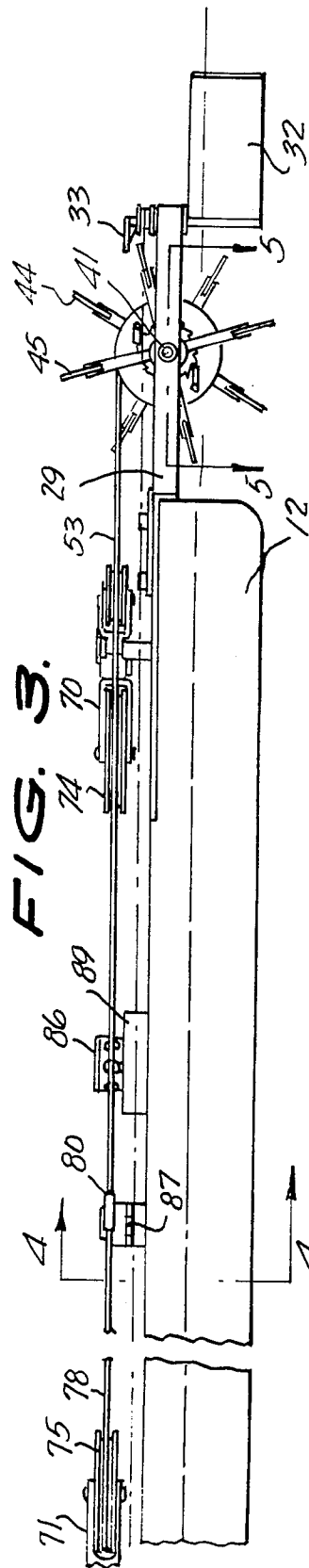


FIG. 4.

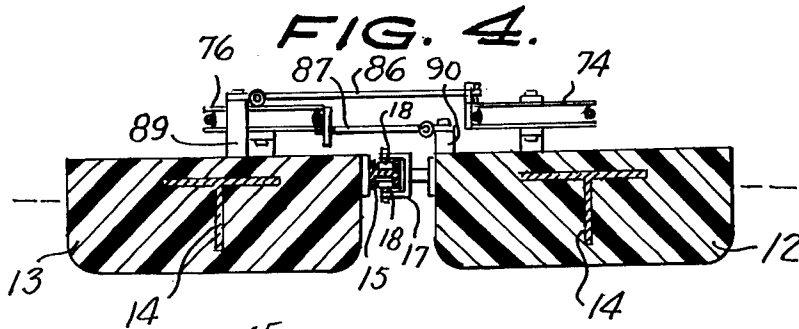


FIG. 5.

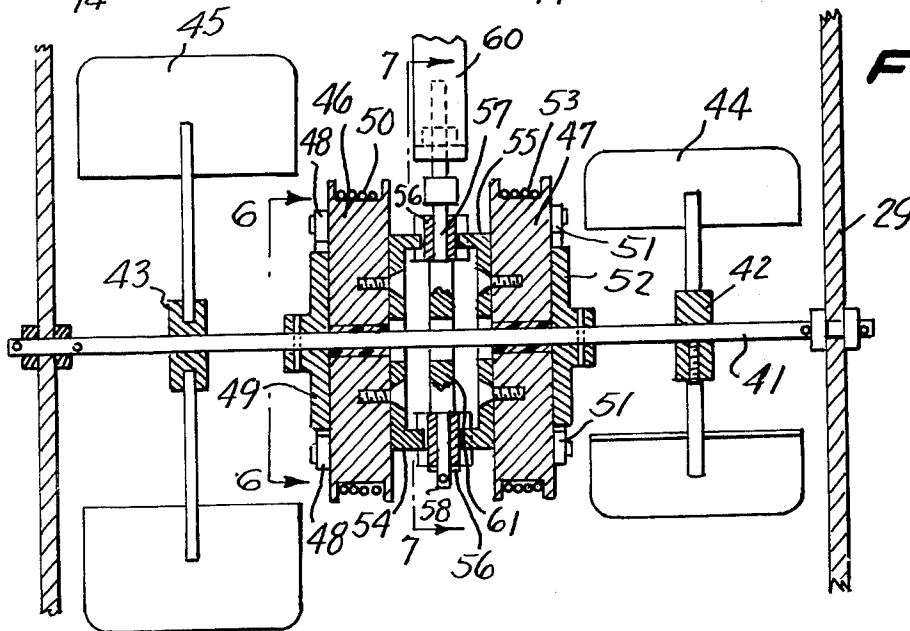


FIG. 6.

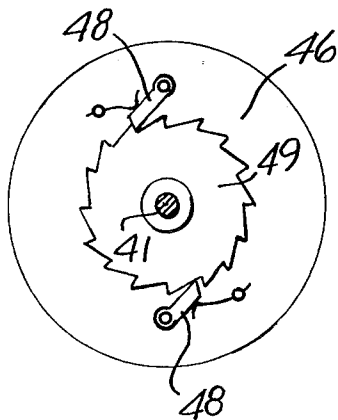
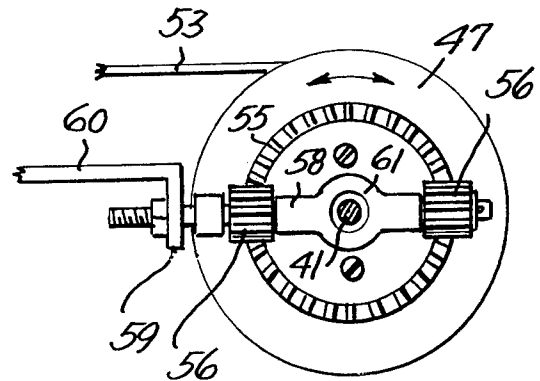


FIG. 7.



WATER SKIS

This invention relates to water skis, and more particularly to a water ski assembly of the type having propulsion means operated by the occupant of the ski assembly.

A main object of the invention is to provide a novel and improved self-propelled water ski assembly of the type including a pair of buoyant ski members and provided with propulsion means activated by walking movement of the rider, the assembly involving relatively simple components, being easy to operate and enabling the rider of the assembly to propel it through the water responsive to walking movements by the rider's legs.

A further object of the invention is to provide an improved self-propelled water ski assembly which is arranged to provide propulsion through the water as a result of substantially natural walking movements of the occupant, the assembly being inexpensive to manufacture, being reliable in operation, and providing a smooth and continuous propulsion action wherein longitudinal movements of the buoyant members of the assembly are translated into propulsion action.

A still further object of the invention is to provide an improved self-propelled water ski assembly which is relatively compact in size, which is light in weight, which provides smooth and reliable propulsion action, and which is provided with means to maintain the buoyant ski members thereof substantially in a coplanar relationship while allowing the buoyant members to be moved parallel to each other, such parallel movement being translated into propulsion action developed by rotary impellers provided on the rear end portions of the respective buoyant ski members.

Further objects and advantages of the invention will become apparent from the following description and claims and from the accompanying drawings wherein:

FIG. 1 is a perspective view showing a typical water ski assembly constructed in accordance with the present invention and illustrating the manner in which the occupant activates the rotary impeller means of the assembly by exerting walking movements.

FIG. 2 is an enlarged fragmentary top plan view showing the rear portion of the water ski assembly illustrated in FIG. 1.

FIG. 3 is a side elevational view of the structure shown in FIG. 2.

FIG. 4 is a transverse vertical cross-sectional view taken substantially on line 4—4 of FIG. 3.

FIG. 5 is an enlarged fragmentary horizontal cross-sectional view taken substantially on line 5—5 of FIG. 3.

FIG. 6 is a vertical cross-sectional detailed view taken substantially on line 6—6 of FIG. 5.

FIG. 7 is a vertical cross-sectional detailed view taken substantially on line 7—7 of FIG. 5.

FIG. 8 is an enlarged vertical cross-sectional view taken substantially on line 8—8 of FIG. 1, showing the stabilizing means for maintaining the elongated buoyant ski members of the assembly substantially in a coplanar relationship.

FIG. 9 is an enlarged elevational detailed view taken substantially on line 9—9 of FIG. 8.

Referring to the drawings, 11 generally designates an improved water ski assembly constructed in accordance with the present invention. The water ski assembly

comprises a pair of side-by-side elongated buoyant members 12 and 13, which may be made of any suitable buoyant material, such as styrofoam or other suitable expanded plastic material, or alternatively, may comprise elongated float members of the inflatable type. In the typical embodiment illustrated herein, the elongated buoyant members 12 and 13 are made of buoyant expanded plastic material, and are provided with longitudinally extending internal T-shaped rigid core elements 14 extending substantially for the full length of the buoyant members, and acting to strengthen and rigidify same. The core members 14 may be of any suitable light weight rigid material, such as molded plastic, aluminum, or the like.

The float members 12 and 13 are slidably interconnected to maintain them in parallel spaced relationship, and are further provided with means to maintain them in substantially coplanar relationship, as will be presently described. Thus, the float member 13 is provided on its inner longitudinal side with a guide rail 15, secured parallel to and spaced from the inner side of float member 13 by suitable spacer brackets 16, the guide rail 15 being located at the rear portion of float member 13 as shown in FIG. 1. As shown in FIG. 4, guide rail 15 is substantially H-shaped in cross-section. Secured to the rear portion of the inner longitudinal side of float member 12 is an inwardly extending, generally C-shaped guide yoke 17 which slidably receives the guide rail 15 and which is provided with inwardly projecting bearing elements 18, 18 which are received in the top and bottom grooves of the guide rail 15 and which act as retaining means cooperating with the guide rail to hold the rear portions of the float members 13 and 12 in spaced parallel relationship while permitting them to move freely longitudinally relative to each other. The members 18, 18 may comprise rollers or other suitable bearing elements. The forward portion of the inner longitudinal side of the front member 12 is likewise provided with a longitudinally extending guide rail 20, similar to guide rail 15 which is slidably engaged by a yoke member attached to float member 13 carried by a bracket 21 secured to the inner longitudinal side portion of float member 13 and cooperates with the guide rail 20 in the same manner as above described in connection with guide rail 15 and the C-shaped yoke member 17. By this arrangement, the float members 12 and 13 are maintained in spaced parallel relationship and are free to slide longitudinally relative to each other.

Pivotaly mounted to swivel on vertical axes at the intermediate portions of the float members 12 and 13 are respective bracket members 22, 22 in which are rigidly secured respective guide sleeves 23, 23, the guide sleeves having enlarged outer end portions 24 containing ball bearings 25 which engage with a rod member 26 extending through the sleeves 23, 23, said rod member being provided at its opposite ends with cotter pins 27, 27 or other suitable retaining means. The sleeves 23, 23 are free to pivot with their associated supporting brackets 22, but are maintained horizontal thereby, and the rod 26 cooperates with said sleeves to hold the float members 12 and 13 in substantially coplanar relationship. As shown in FIG. 1, the stabilizing assembly comprising the guide sleeves 23 and the stabilizing rod 26 is located substantially at the mid portions of the elongated float members 12, 13.

Forwardly of the stabilizing assembly thus described, the float members 12 and 13 are provided with suitable receptacle means, such as the foot-receiving tunnel members 28, 28, shaped to receive the rider's feet in the manner illustrated in FIG. 1. Any other suitably shaped foot-receiving socket means may be substituted for the tunnel members 28, 28 within the spirit of the present invention.

Rigidly secured to the rear ends of the respective elongated float members 12 and 13 and projecting rearwardly and substantially horizontally therefrom are respective rectangular rigid frames 29, 29 having transverse rear end bar portions 30. Vertically swivelled centrally in the transverse rear bar portion 30 are respective vertical rudder shafts 31 to the lower portions of which are connected the respective float rudders 32, 32. The top ends of the rotor shafts 31 are provided with forwardly projecting control arms 33. Respective control cables 34 are connected to the forward ends of the control arms 33, the cables being engaged around corner pulleys 35, 35 provided at the rear corners of the frames 29 and extending through apertured guide members 36 provided on the float members and ultimately engaging around and being suitably secured to control pulleys 37 rotatably mounted on the forward end portions of the float members 12 and 13. The pulleys 37 are provided with vertical shafts which are suitably journaled in brackets 38 secured on the forward end portions of the float members and the pulley shafts are provided with enlarged top end portions 39 to which are rigidly secured respective upwardly and rearwardly inclined control rods 40 adapted to be grasped at their top ends by the occupant of the ski assembly in the manner illustrated in FIG. 1, enabling the occupant to individually steer the respective elongated float members 12 and 13.

Journalled transversely in the rear end frames 29, 29 are respective impeller shafts 41, 41, on which are rigidly secured spaced pairs of vaned rotor assemblies 42, 43, the respective rotor assemblies 42 and 43 having outwardly extending vanes 44 and 45 which are preferably angularly staggered relative to each other, as shown in FIG. 3.

Rotatably mounted symmetrically on the shaft 41 are respective pairs of peripherally grooved cable reels 46 and 47 which are freely rotatable relative to their shafts 41 but which are differentially interconnected by a differential assembly so that rotation of one cable reel produces reverse rotation of the other cable reel in a manner presently to be described. The cable reels 46 and 47 are arranged to be at times drivingly coupled to the associated supporting shaft 41 by oppositely acting pawl and ratchet means. Thus, in the structure shown in FIG. 5, the cable reel 46 is provided with pivoted springbiased ratchet dogs 48, 48 which are biased into engagement with the teeth of a ratchet wheel 49 secured to shaft 41, the ratchet wheel 49 being free to rotate in a counterclockwise direction, as viewed in FIG. 6, relative to the dogs 48, 48, but being in driving engagement with said dogs when the ratchet wheel 49 is urged clockwise relative to the associated cable reel 46, and similarly, when the cable reel 46 is urged counterclockwise relative to the ratchet wheel 49. Thus, when the cable reel 46 is rotated in a counterclockwise direction, as viewed in FIG. 6, the dogs 48 will cause the ratchet wheel 49 to similarly rotate counterclockwise and drive the shaft 41 in the same direction, thereby

causing the vanes 44 and 45 carried on said shaft to be similarly rotated with the shaft. As will be presently explained, this action occurs when the cable 50 carried by the reel 46, is unwound from the cable reel by tension exerted thereon.

The opposite cable reel 47 is similarly provided with dogs 51, 51 which engage the periphery of a ratchet wheel 52 secured on shaft 41 and which are arranged to drive the shaft 41 in the same manner when the cable 53 carried on reel 47 is unwound from the reel by tension exerted thereon, as will be presently described.

The differential assembly coupling cable reel 46 to cable reel 47 comprises respective crown gears 54 and 55 coaxially secured to the inside faces of the cable reels 46 and 47 and meshing with pinion gears 56, 56 journaled on shaft portions 57 provided on a longitudinally extending supporting member 58 which is in turn secured to the depending flange 59 of a bracket arm 60 rigidly secured to the rear end portion of the associated float member. Each member 58 has a centrally apertured portion 61 through which the associated impeller shaft 41 extends, as shown in FIG. 7. Thus, the supporting member 58 is substantially rigid with the associated float member whereas the pinion gears 56, 56 are in mesh with the opposing crown gears 54 and 55, whereby rotation of one cable reel causes the opposite cable reel to rotate in an opposite direction. Thus, when cable reel 46 rotates in a counterclockwise direction, as viewed in FIG. 6, in the manner above described, wherein its cable 50 is unwound from the reel, the opposite cable reel 47 is rotated in a clockwise direction causing its cable 53 to be wound up thereon. This opposite rotation of cable reel 47 is permitted by the configuration of its associated ratchet wheel 52 and dogs 51. It will be understood that the reverse action occurs, namely, when cable 53 is being unwound from cable reel 47 because of tension exerted thereon, the dogs 51 act on the ratchet wheel 52 to again drive the impeller shaft 41 in a counterclockwise direction, as viewed in FIG. 6, causing cable reel 46 to rotate in a reverse direction to wind up its cable 50 thereon, this action being permitted by the configuration of the ratchet dogs 48 with respect to the associated ratchet wheel 49.

Mounted on the rear portions of the float member 12 and 13 are respective pairs of swivelled pulley brackets shown respectively at 70, 71 and 72, 73 in which are journaled respective idler pulleys 74, 75 and 76, 77. Engaged on the pulleys 74, 75 of float member 12 is an endless cable 78, and similarly engaged on the pulleys 76, 77 of float member 13 is another endless cable 79. The cable 53 associated with the reel 47 is connected to one side of the endless cable 78, as shown at 80, and the cable 50 associated with the cable reel 46 is connected to the other side of endless cable 78, as shown at 81. Cable 50 is engaged around respective idler pulleys 82 and 83 carried on suitably located swivelled pulley brackets 84 and 85 mounted on float member 12 in a manner so as to provide clearance for the rear endless cable pulley 74, as shown in FIG. 2. A transversely extending connecting arm 86 is hingedly connected to the opposite float member 13 and is connected at 81 to endless cable member 78 and float member 12, as shown in FIG. 2. Another transversely extending connecting arm 87 is hingedly connected to a float member 12 and is connected to the endless cable 79 of float member 13 at 88, as is further shown in FIG. 2. Suitable spacer means is provided for the connecting arm 86 so

that it is at an elevation substantially higher than the connecting arm 87, permitting the arms 86 and 87 to move past each other without interference. Thus, as shown in FIG. 3, the transversely extending arm 86 is mounted on a suitable spacer block 89 provided on float member 13 so that the connecting arm 86 is at a substantially higher level than the spacer arm 87, and the connecting arm 86 is substantially greater in length than the connecting arm 87 and is located so that it completely spans the path of travel of the connecting arm 87. Thus, the relatively low block 90 to which arm 87 is connected is located close to the inside longitudinal side of float member 12, whereas the relatively high block 89 to which connecting arm 86 is attached is located at a point between the endless cable pulleys 76, 77 of float member 13, as shown in FIG. 2, to provide necessary operating clearance.

The length of the endless cables 78 and 79 is substantially greater than twice the normal walking stride of a person using the water ski assembly, so that in operation the attachment points 88 and 81 can move freely longitudinally in accordance with the user's stride.

In using the water ski assembly, the user inserts his feet in the foot receptacle tunnel members 28, 28 in the manner shown in FIG. 1 and then moves his legs substantially in a manner simulating walking. First, assume that the float member 13 is thus moved leftward with the rider's right leg relative to the float member 12. This action causes the endless cable 78 to be moved in a counterclockwise direction, as viewed in FIG. 2, thereby developing tension in the cable 50, such tension being transmitted to the reel 46 which causes shaft 41 to be rotated counterclockwise, as viewed in FIG. 6, by the action of the dogs 48, 48 on the ratchet wheel 49. As above explained, this causes cable reel 47 to rotate in the opposite direction, winding the cable 53 thereon. The rotation of the shaft 41 in a counterclockwise direction, as viewed in FIG. 3, causes the vanes 45, 44 to similarly rotate and provide a propulsion stroke on the float member 12. When the opposite float member 12 is pushed forwardly with the action of the user's left foot, namely, when the float member 12 is pushed leftwardly relative to the float member 13, as viewed in FIG. 2, the endless cable 79 is caused to move in a clockwise direction, as viewed in FIG. 2, developing tension in the connecting cable 96, shown in FIG. 2, causing it to unwind from its associated reel 46' which acts through its ratchet mechanism to drive the shaft 41 associated with the float member 13 also in a counterclockwise direction, as viewed in FIG. 3, developing a propulsion stroke on the float member 13 in the same manner as above described and simultaneously causing the opposite connecting cable 95 of float member 13 to be wound up on its associated reel 47' because of the action of its differential mechanism in the manner above described. Thus, continued walking movement of the user's legs will drive the vanes 44, 45 of the respective float members 12 and 13 continuously in the same direction, providing continuous propulsion action on the float members and causing the assembly to progress forwardly through the water. As the float members 12 and 13 are propelled through the water, they can be steered by means of the rudder control rods 40, 40 grasped by the rider in the manner previously described.

It will be understood that propulsion is provided by the successive relative longitudinal movements of the

float members 12 and 13 with respect to each other, which are caused by the walking action of the occupant. Reverse movement of the water ski assembly 11 can be accomplished by suitably modifying the ratchet wheel and dog assembly.

As will be seen from FIG. 2, the connection cable element 96 is provided with offsetting idler pulleys 97 and 98 arranged similar to the pulleys 82, 83 of float member 12, to provide clearance around the rear endless cable pulley 76 and to properly guide the connection cable 96 to its associated cable reel.

While a specific embodiment of an improved self-propelled water ski assembly has been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore, it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

What is claimed is:

1. A water ski assembly comprising:

- a. a pair of elongated buoyant members;
- b. foot receptacle means on each of said buoyant members for receiving the feet of an operator of the assembly;
- c. means slidably interconnecting said members for relative longitudinal movement and constraining said members to substantial parallelism;
- d. a transverse shaft journaled on the rear portion of each of said buoyant members;
- e. a plural-vaned impeller rigidly mounted on each of said shafts; and
- f. means for driving said impellers in response to normal walking movements by said operator, comprising:
 - i. a pair of longitudinally spaced support pulleys rotatably mounted on each of said buoyant members;
 - ii. an endless cable engaged on each of said pair of support pulleys;
 - iii. means connecting each buoyant member to the endless cable on the other buoyant member, whereby the cables move responsive to relative longitudinal movement of the buoyant members; and
 - iv. means drivingly coupling each endless cable to its respective shaft.

2. The water ski assembly of claim 1, and wherein said coupling means comprises a pair of cable reels rotatably mounted on each shaft, connecting cables secured to opposite sides of the endless cable of the associated buoyant member and wound on the respective cable reels, differential gear means interconnecting the pairs of cable reels, and oppositelyacting drive ratchet means between the cable reels and the associated shafts, whereby to wind up one connecting cable on its reel while the other unwinds from its reel as the associated shaft rotates.

3. The water ski assembly of claim 2, and wherein said differential gear means comprises opposing crown gears on the cable reels, pinion gear means between and meshing with the opposing crown gears, and fixed means rotatably supporting said pinion gear means.

4. The water ski assembly of claim 3, and wherein each shaft is provided with a pair of plural-vaned impellers located on opposite sides of the associated differential gear means, the vanes of the pairs of impellers being staggered relative to each other.

5. A water ski assembly comprising:

- a. a pair of elongated buoyant members;
- b. foot receptacle means on each of said buoyant members for receiving the feet of an operator of the assembly;
- c. means slidably interconnecting said members for relative longitudinal movement and constraining said members to substantial parallelism;
- d. impeller means on each of said buoyant members;
- e. means on each of said buoyant members linked to said impeller means on the other of said buoyant members for driving said impeller means in response to normal walking movements by said operator; and
- f. means constraining the buoyant members to movement in the same plane
- g. said constraining means further comprises respective horizontal guide sleeves swivelly mounted on the buoyant member for horizontal rotation, and a rod member slidably engaged through said guide sleeves.

6. The water ski assembly of claim 5, and wherein said impeller means comprises respective transversely journaled plural-vaned impellers mounted on the rear portions of the buoyant members.

7. The water ski assembly of claim 5, and respective rudders vertically pivoted to the rear end portions of the buoyant members, rudder pulleys journaled on the forward end portions of the buoyant members, control cables operatively connected to the rudders and engaged around the rudder pulleys, and respective upwardly and rearwardly extending control rods secured to the rudder pulleys.

8. A water ski assembly comprising:

- a. a first buoyant member and a second buoyant member;
- b. a plural vaned impeller secured to a shaft mounted at the rear portion of said second buoyant member for driving the same;
- c. support pulley means rotatably mounted on said second buoyant member and an endless cable engaged on said support pulley means for rotating said impeller; and
- d. means connecting said first buoyant member to

said endless cable, whereby said cable causes said impeller to rotate in response to relative longitudinal movement of said first buoyant member with respect to said second buoyant member.

9. The water ski assembly set forth in claim 8 further including driving means on said first buoyant member and means coupling said second buoyant member to said first buoyant member driving means, so that a predetermined movement of said second buoyant member drives said first buoyant member.

10. The water ski assembly of claim 8, and means slidably interconnecting said members and constraining said members to substantial parallelism.

11. The water ski assembly of claim 8, and means constraining the buoyant members to a substantially coplanar relationship.

12. A water ski assembly comprising:

- a. a first buoyant member and a second buoyant member;
- b. means on said second buoyant member for driving the same, including an endless cable;
- c. means coupling said endless cable to said driving means including:
 - i. a pair of cable reels rotatably mounted on said second buoyant member;
 - ii. connecting cables secured to opposite sides of said endless cable and wound on respective cable reels;
 - iii. differential gear means interconnecting said pair of cable reels; and
 - iv. oppositely acting drive ratchet means to wind up one connecting cable on its reel while the other unwinds from its reel; and
- d. means connecting said first buoyant member to said endless cable, so that a predetermined movement of said first buoyant member activates said driving means on said second buoyant member.

13. The water ski assembly of claim 12, and wherein said second buoyant member is provided with a pair of pluralvaned impellers located on opposite sides of the associated differential gear means, the vanes of the pairs of impellers being staggered relative to each other.

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