Feb. 6, 1962 H. A. BERLINER 3,019,760

PROPELLED SURFBOARD

Filed March 9, 1960

Fig. 1.

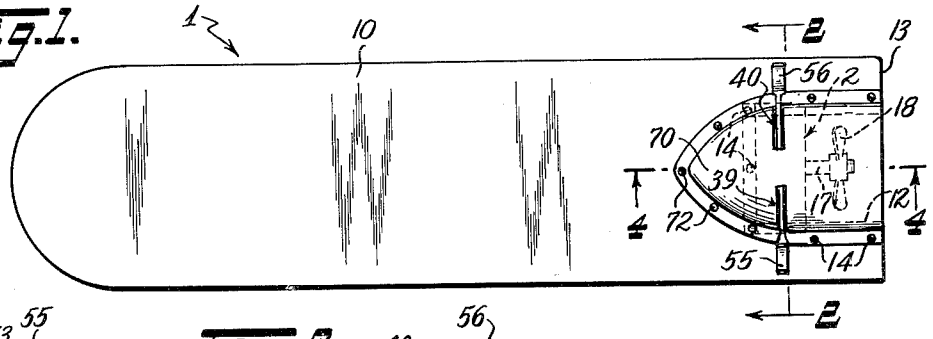


Fig. 2.

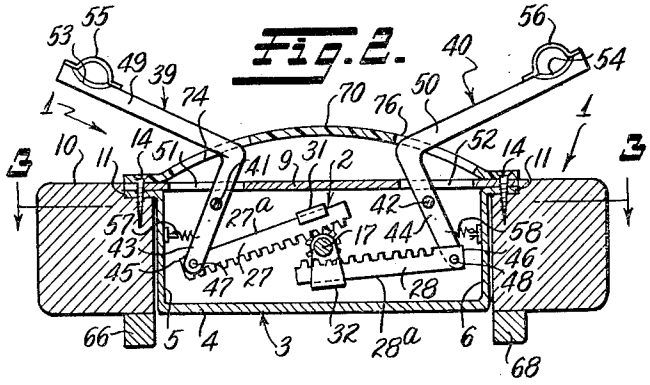
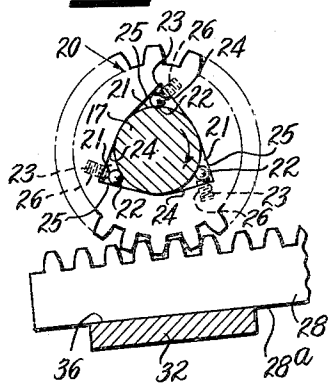


Fig. 5.



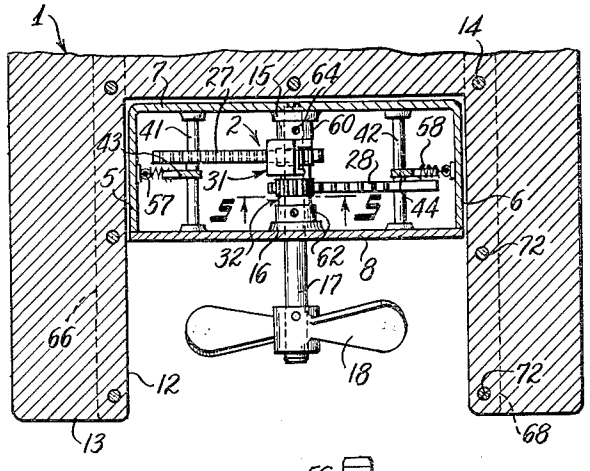


Fig. 3.

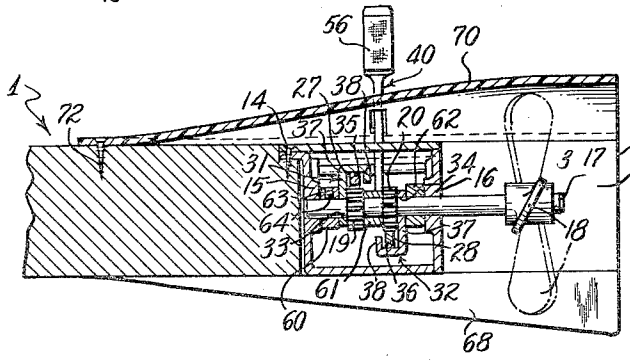


Fig. 4.

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PROPELLED SURFBOARD

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This invention relates to surfboard construction and more particularly to improvements in foot-operated propelling means therefor.

In the past, foot-operated propelling devices for surfboards, floats, or the like have been actuated by the occupant moving his feet in a manner simulating walking or running. This type of movement of the feet is undesirable as it requires the occupant to bend and raise the knees while lying face down on the surfboard.

It is therefore an object of this invention to provide propelling mechanism for use in surfboard construction which may be operated by a natural swimming movement of the feet of the occupant.

Another object is to provide light-weight, inexpensive, foot-operated propelling mechanism for surfboard propulsion.

Another object is to provide a complete propelling mechanism which may be quickly and easily attached as a unit to a conventional surfboard.

These and other objects and advantages of the invention will become more apparent from the following specification taken in conjunction with the drawing, in which:

FIG. 1 is a top plan view of the surfboard;

FIG. 2 is an enlarged sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is a sectional view taken on line 3—3 of FIG. 2;

FIG. 4 is an enlarged sectional view taken on line 4—4 of FIG. 1, the drive shaft and gears being shown in elevation; and

FIG. 5 is an enlarged fragmentary sectional view taken on line 5—5 of FIG. 3.

Propelling mechanism which may be actuated by a flutter-kick swimming movement of the feet of the occupant of a surfboard is shown in the drawing. A surfboard or float, generally indicated at the numeral 1 in FIG. 1, has a generally flat upper surface 10 adapted to receive the body of an occupant lying in prone position and is provided at the rear end thereof with a foot-actuated propelling mechanism 2. A housing 3 which supports propelling mechanism 2 includes a bottom wall 4, side walls 5 and 6, end walls 7 and 8 and a top 9. Side walls 5 and 6 and end wall 7 include outwardly extending flange portions 11 upon which top 9 is seated.

An opening 12 formed in the rear end 13 of surfboard 1 is slightly wider than housing 3 and somewhat longer than propelling mechanism 2 including propeller 18. Propelling mechanism 2 is adapted to be attached to surfboard 1 as a unit by inserting the housing 3 into opening 12 so that flange portions 11 of side walls 5 and 6 and of end wall 7 will overlie the adjacent upper surface 10 and permit the housing to be secured in the opening by fasteners 14 passing through top 9 and flanges 11. The upper surface of surfboard 1 upon which flanges 11 rest may be recessed in order to permit the upper surface of top 9 to lie flush with surface 10. In the event that it is not convenient to recess one end wall of surfboard 1 in order to receive housing 3, end wall 7 of housing 3 may be directly secured on the rear face of end 13 of surfboard 1 by fasteners passing through openings provided therein, thus installing the housing 3 rearwardly of the surfboard.

Axially aligned bearings 15 and 16 are mounted on or may be formed with end walls 7 and 8, respectively, midway between side walls 5 and 6, and rotatably support a shaft 17 having propeller 18 fixedly secured to the outer end thereof. Spur gears 19 and 20 are journaled on propeller shaft 17 between bearings 15 and 16 and are adapted to rotate shaft 17 in one direction through one-way clutches.

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Any conventional type of one-way clutch mechanism may be employed between spur gears 19 and 20 and propeller shaft 17 and, by way of illustration, there is shown in FIG. 5 a simple, compact structure which serves this purpose. As spur gears 19 and 20 are identical in structure and the one-way clutch mechanisms employed between spur gears 19 and 20 and shaft 17 are identical, the structure and method of operation of only spur gear 20 and of the one-way clutch mechanism employed therewith will be described. Spur gear 20 is provided with a plurality of V-shaped recesses 21 along its inner periphery which receive rollers 22. Compression springs 23 are positioned between rollers 22 and corresponding walls 24 of recesses 21, and serve to urge rollers 22 into contact with propeller shaft 17 and with the opposed walls 25 of recesses 21. Springs 23 are very weak and exert on rollers 22 only sufficient pressure to maintain the rollers in contact with walls 25 and shaft 17. In order to prevent displacement of springs 23, one end of each spring may be seated in an opening 26 formed in the respective wall 24 of spur gear 20.

It will thus be seen that during rotation of spur gear 20 in a clockwise direction, rollers 22 will become wedged between walls 25 and shaft 17 and thus rotate shaft 17 in a clockwise direction while rotation of gear 20 in a counter-clockwise direction will tend to move rollers 22 to the deeper portions of recesses 21 where no wedging action takes place, thus permitting spur gear 20 to overrun shaft 17 in a counter-clockwise direction.

Gear racks 27 and 28 are adapted to rotate spur gears 19 and 20 and are provided with teeth 29 and 30, which are in mesh with teeth 19*a* and 20*a* of spur gears 19 and 20, respectively, so that reciprocation of gear racks 27 and 28 will cause rotation of spur gears 19 and 20. J-shaped hanger members 31 and 32 are identical in structure and maintain racks 27 and 28 in contact with spur gears 19 and 20 on the upper and lower sides, respectively, thereof. Shaft 17 pivotally supports hangers 31 and 32 by passing through openings 33 and 34 which are slightly larger in diameter than the shaft. The outer surfaces 27*a* and 28*a* of racks 27 and 28 bear against walls 35 and 36 of hangers 31 and 32 while hanger side walls 37 and 38 guide the racks therebetween. The rack 27, operating on the top of spur gear 19 from the left side thereof (as viewed in FIGS. 2 and 3), and the rack 28 operating on the bottom of the spur gear 20, may be reciprocated alternately to impart continuous clockwise rotation to the shaft 17. Hangers 31 and 32, being pivotally mounted on shaft 17, maintain the racks 27 and 28 in engagement with the respective spur gears despite the fact that their path of movement during operation of the propelling mechanism is not truly longitudinal.

Cylindrical spacing elements 60, 61, and 62 are mounted on shaft 17 to maintain spur gears 19 and 20 properly spaced with respect to each other and also with respect to end walls 7 and 8. Spacer 60 is positioned between bearing 15 and hanger 31, spacer 61 is positioned between spur gears 19 and 20, and spacer 62 is positioned between bearing 16 and hanger 32. Spacer 61 together with hangers 31 and 32 prevents rollers 22 from being displaced from recesses 21 in spur gears 19 and 20. Spacer 60 is formed with a threaded opening 63 which receives a threaded set screw 64. Shaft 17 is prevented from axial movement after the parts are assembled thereon by turning set screw 64 inwardly until shaft 17 is firmly engaged to fixedly secure spacer 60 on shaft 17.

A pair of bell-crank levers 39 and 40 are pivotally mounted in housing 3 on shafts 41 and 42 and reciprocate racks 27 and 28. As viewed in FIGS. 2 and 3,

shaft 41 is mounted between end walls 5 and 6 to the left of shaft 17, while shaft 42 is mounted between end walls 5 and 6 to the right of shaft 17. Bell-crank lever 39 is journaled intermediately the ends thereof on shaft 41 while bell-crank lever 40 is journaled on shaft 42 in a similar manner. The inner ends 43 and 44 of levers 39 and 40 are pivotally attached to the outer ends 45 and 46 of racks 27 and 28 as indicated at 47 and 48, respectively. The outer ends 49 and 50 of levers 39 and 40 pass through openings 51 and 52 in top 9 and diverge in generally upward and transversely outward directions. Depressions 53 and 54 are formed in the upper surface of levers 39 and 40 near the outer ends thereof to accommodate the foot of the occupant and straps 55 and 56 may be attached to the upper surface of levers 39 and 40 to span depressions 53 and 54.

The outer ends 49 and 50 of levers 39 and 40 are normally maintained in a raised position by tension springs 57 and 58. As shown in FIGS. 2 and 3, one end of spring 57 is attached to side wall 5 while the other end is attached adjacent the inner end 43 of lever 39 midway between pivot 47 and the point where lever 39 is mounted on shaft 41. Spring 58 is attached to side wall 6 at one end while the other end is attached to lever 40 midway between pivot 48 and the point where lever 40 is mounted on shaft 42. Stops (not shown) may be employed to limit the extent of movement of levers 39 and 40 in either or both directions.

In order to prevent propeller 18 from coming into contact with any person or with the earth, runners or skids 66 and 68 are provided on the bottom of surfboard 1 extending lengthwise thereof at each side of opening 12. The runners, as shown in FIG. 4, decrease in height from the rear end 13 of the surfboard 1, where they extend further below the lower surface of surfboard 1 than does propeller 18, to a point forward of opening 12 where they blend into the lower surface of the surfboard.

An arched hood 70, having a bullet shaped appearance, as viewed in FIG. 1, is attached to the upper surface of surfboard 1, at the rear end thereof, by means of fasteners 72 and covers propelling mechanism 2 and opening 12. Slit openings 74 and 76 are provided to permit levers 39 and 40 to extend freely through hood 70. The hood 70 is arched upwardly from the upper surface of the surfboard to a maximum height at a point over the propeller 18 where a slight clearance is provided.

In operation, the occupant lies face down on surfboard 1 with his feet placed in depressions 53 and 54 on levers 39 and 40 beneath straps 55 and 56. The feet are moved alternately up and down in a substantially vertical direction simulating a flutter-kick swimming movement. As levers 39 and 40 are alternately depressed by the feet of the occupant, they will cause racks 27 and 28 to move inwardly, spur gears 19 and 20 to be rotated in a clockwise direction, rollers 22 to wedge between walls 25 of spur gears 19 and 20 and shaft 17, thus driving shaft 17 continuously in a clockwise direction. When levers 39 and 40 are alternately raised by the action of springs 57 and 58, and as the feet of the occupant are lifted, they will cause racks 27 and 28 to reciprocate outwardly, spur gears 19 and 20 to be rotated in a counter-clockwise direction, rollers 22 to be released from wedging action between shaft 17 and walls 25 of spur gears 19 and 20 and thus permit the spur gears to freely overrun shaft 17 and return to starting position.

It will be understood that while only one embodiment of the invention has been illustrated in the drawings and described hereinabove, many changes can be made in the construction, arrangement, design and material disclosed without departing from the spirit of the invention or the scope of the annexed claims.

I claim:

1. A propelling device adapted to be attached to one end of a surfboard, comprising: a housing; a propeller shaft rotatably mounted in said housing; gear means rotatably mounted on said shaft; one-way clutch means between said shaft and said gear means to operably connect said shaft to said gear means for rotation in one direction with respect thereto rack means extending inwardly from opposite sides of said shaft and engaging said gear means; and an actuating member connected to said rack means and movable from outside of said housing to effect reciprocation of said rack means and rotation of said propeller shaft.

2. A surfboard construction, comprising: an elongated surfboard body member; a propelling mechanism attached to one end of said body member; and levers mounted on said surfboard and pivoted on longitudinally disposed axes for substantially vertical movement with respect to said surfboard, said levers being operably connected to said propelling mechanism, and extending above the upper surface of said body, whereby movement of said levers in a substantially vertical direction actuates said propelling mechanism.

3. The construction of claim 2, wherein said levers extend upwardly and transversely from points on said upper surface of said body.

4. In surfboard apparatus, an elongated support member having a substantially flat upper surface, a propelling mechanism secured to said support at one end thereof, and levers pivotally mounted adjacent their inner ends on said apparatus for movement in a transverse vertical plane, said levers operably connected to said propelling mechanism and extending above said surface of said support, said levers diverging and extending generally horizontally and substantially laterally of said support whereby pivotal movement of said levers causes operation of said propelling mechanism.

5. Surfboard apparatus, comprising: an elongated buoyant member having a substantially flat upper surface; pedals mounted above said surface on opposite sides of said member at the rear thereof for reciprocating movement in generally transverse vertical planes; rotary propelling means mounted adjacent the rear of said member; and means connecting said pedals with said propelling means for translating said generally vertical movement of said pedals into rotary movement of said propelling means.

6. Surfboard apparatus, comprising: an elongated buoyant member having a substantially flat upper surface; a closed housing attached to the rear end of said member; a propeller shaft rotatably mounted in said housing, one end of said shaft extending out of said housing in a rearward direction; a propeller mounted on the outer end of said shaft, means in said housing operably connected to said shaft for rotating the same, said means including a first gear rotatably mounted on said shaft, a first one-way clutch positioned between said first gear and said shaft for rotating said shaft in one direction, a second gear rotatably mounted on said shaft, and a second one-way clutch between said second gear and said shaft for rotating said shaft in the same direction as said first gear; a first lever pivotally mounted intermediate the ends thereof in said housing; a first gear rack connecting the inner end of said first lever and said first gear for rotating said first gear; a second lever pivotally mounted intermediate the ends thereof in said housing; and a second gear rack connecting the inner end of said second lever and said second gear for rotating said second gear, said first and second levers being mounted on opposite sides of said shaft with the outer end of said first lever extending above said housing in a direction away from said second lever and the outer end of said second lever extending above said housing in a direction away from said first lever, said levers lying in a plane normal to said shaft and substantially between said gears, whereby pivotal movement of either of said levers in a downward direction will rotate said propeller while return movement of said levers can be effected in disengaged relation thereto.

7. A propelling mechanism adapted to be attached to the rear of a surfboard, comprising: a closed housing; a

propeller shaft rotatably mounted in said housing, one end of said shaft extending out of said housing in a rearward direction; a propeller mounted on the outer end of said shaft; means in said housing operably connected to said shaft for rotating the same, said means including a first gear rotatably mounted on said shaft, a first one-way clutch positioned between said first gear and said shaft for rotating said shaft in one direction, a second gear rotatably mounted on said shaft, and a second one-way clutch between said second gear and said shaft for rotating said shaft in the same direction as said first gear; a first lever pivotally mounted intermediate the ends thereof in said housing; a first gear rack connecting the inner end of said first lever and said first gear for rotating said first gear; a second lever pivotally mounted intermediate the ends thereof in said housing; and a second gear rack connecting the inner end of said second lever and said second gear for rotating said second gear, said first and second levers being mounted on opposite sides of said shaft with the outer end of said first lever extending above said housing in a direction away from said second lever and the outer end of said second lever extending above said housing in a direction away from said first lever, said levers lying in a plane normal to said shaft and substantially between said gears, whereby pivotal movement of either said levers in a downward direction will rotate said propeller while return movement of said levers can be effected in disengaged relation thereto.

8. A propelling mechanism adapted to be attached to the rear of a surfboard, comprising: a propeller shaft; support means for rotatably supporting said shaft; a propeller fixed on one end of said shaft; a pair of gears mounted on said shaft; actuating levers pivotally mounted on said support means on either side of said shaft for swinging movement in a plane transverse to said shaft; a rack connected to the inner end of each of said levers and extending inwardly therefrom, one of said racks engaging the bottom of one of said gears and the other of said racks engaging the top of the other of said gears; means for holding said racks in engagement with the respective gears, said racks being movable inwardly to rotate said gears in response to swinging movement of said actuating levers; and spring means urging said racks into their outermost positions, whereby said racks may be alternately moved inwardly by operation of said levers and returned by the influence of said springs.

9. Surfboard apparatus, comprising: an elongated buoyant member having a substantially flat upper surface; pedals mounted above said surface on opposite sides of said member at the rear thereof for reciprocating movement in generally vertical paths; rotary propelling means fixedly mounted on a shaft adjacent the rear of said member; gear means rotatably mounted on said shaft and one-way clutch means operably connecting said gear means and said shaft; and rack means in operative engagement with said gear means, said rack means being operably connected to said pedals.

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