United States Patent [19]

Gongwer

[11] **3,802,008**

[45] **Apr. 9, 1974**

[54] **SWIMMER PROPULSION DEVICE**

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[73] Assignee: **Innerspace Corporation,** Glendora, Calif.

[22] Filed: **May 10, 1971**

[21] Appl. No.: **141,787**

[52] **U.S. Cl.** ..... **9/301,** 9/303, 114/66.5 H, 272/71

[51] **Int. Cl.** **A63b 31/00**

[58] **Field of Search** ..... 9/301, 303, 304, 305; 115/25, 26.3, 30; 114/66.5 H; 272/71; 244/41, 130, 40 R; 416/224, 228, 235

[56] **References Cited**

UNITED STATES PATENTS

1,061,264	5/1913	Bys	9/304
3,122,759	3/1964	Gongwer	9/303
3,665,535	5/1972	Picken	9/304

FOREIGN PATENTS OR APPLICATIONS

26,274	11/1910	Great Britain	416/228

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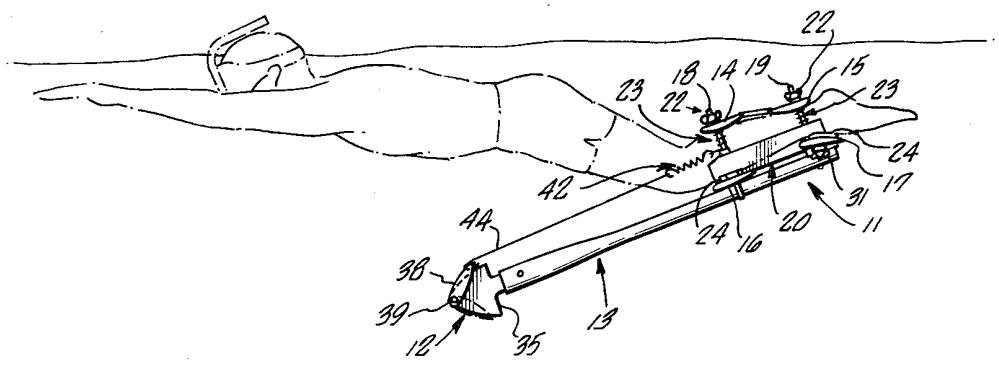
[57] **ABSTRACT**

A novel and improved swimmer propulsion device of the type having a resiliently positioned fin which is adapted to oscillate and thereby develop fluid flow.

8 Claims, 11 Drawing Figures



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SHEET 1 OF 2

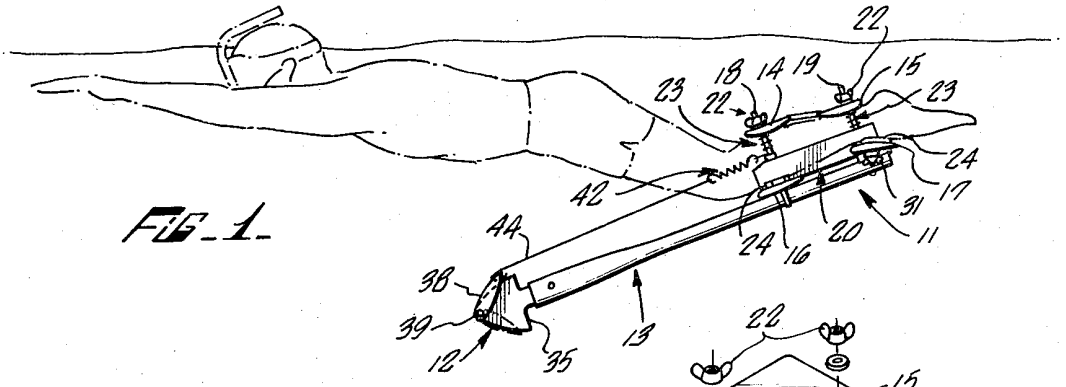

FIG. 1

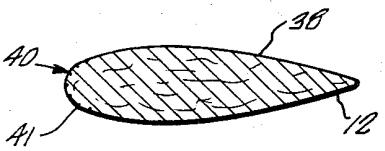

FIG. 5

FIG. 2

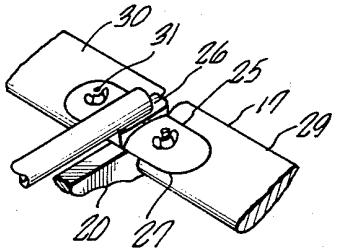

FIG. 3

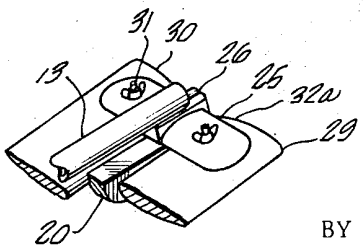

FIG. 4

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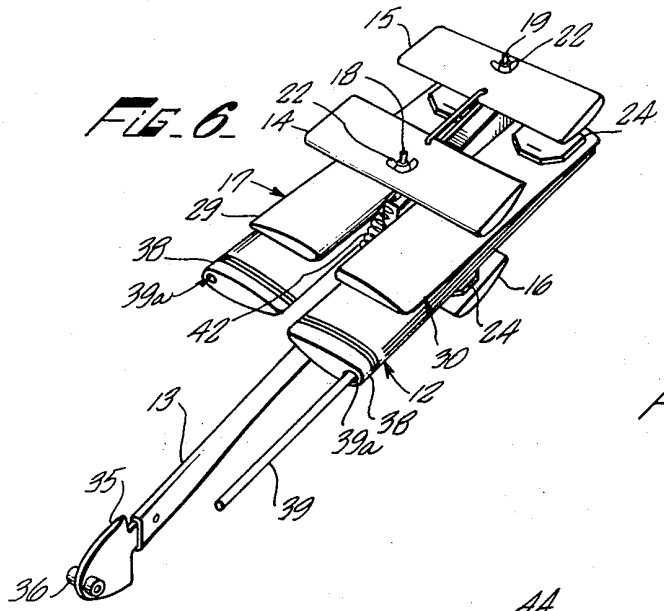

FIG. 6

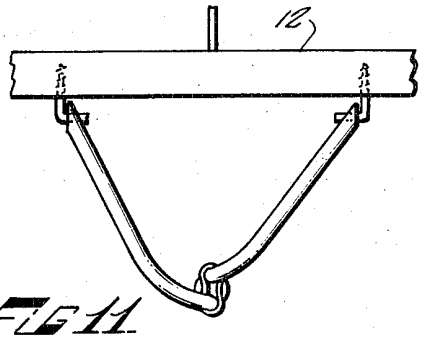

FIG 11

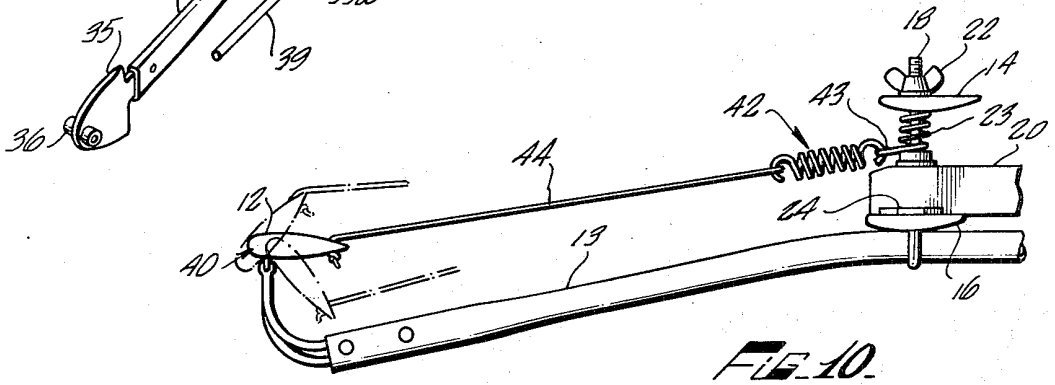

FIG. 10

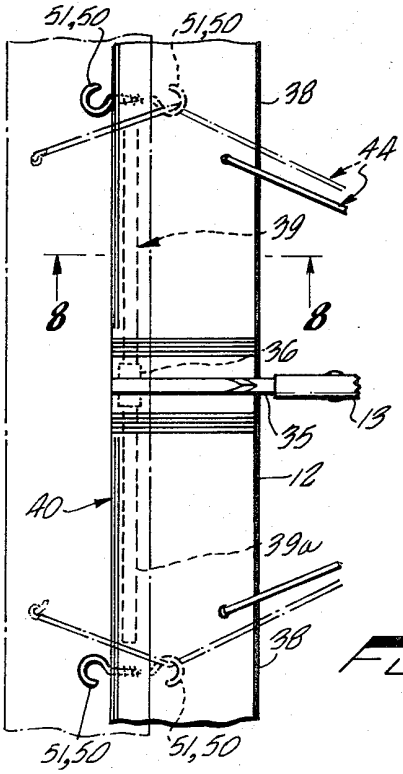

FIG. 7

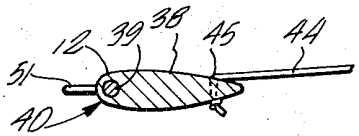

FIG. 8

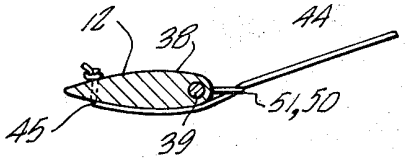

FIG. 9

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SWIMMER PROPULSION DEVICE

This invention relates to a new and improved form of the device shown in my U.S. Pat. Nos. 3,122,759, 3,204,262, and 3,204,699.

A swimmer propulsion device of the type shown in my above mentioned United States patents operate on a fishtail-like propulsion principle. Prior to these inventions, swimmers' aids of the type adapted to be affixed to the body of the swimmer were primarily restricted to the principle of enlarging the effective area of a swimmer's hands or feet. The most common swimmer's aid relying on this increased effective area was of the type adapted to be worn at or near the feet of the swimmer in order to take advantage of the Australian crawl flutter kick commonly used by most swimmers. However, it was found that the endurance of the individual muscles used in this particular swimming stroke severely limited the effectiveness of this type device. Still, other type fin systems prior to my above mentioned inventions were found to be even less satisfactory because they created unsatisfactory oscillations of the body of the swimmer, whereby the body "wagged" rather than the fin system.

In my inventions shown U.S. Pat. Nos. 3,122,759, 3,204,262, and 3,204,699, the propulsive fin means operably connected to a leg attachment is adapted to be positioned immediately adjacent to the torso of the swimmer whereby the transverse reactions of the fin means is directed through the approximate center of gravity of the body of the swimmer and perpendicular to the propulsive reactions. Therefore, the body of the swimmer during operation of the device maintains its attitude despite the transverse forces and the objectionable oscillation of the body is substantially eliminated.

Because of the remarkable results of my prior inventions, it is useful in a wide range of swimming activities, including ordinary pleasure swimming, skin diving, life saving, and is particularly useful for long range swimming. The usefulness of this type device has resulted in a frequent transportation of the device by its users to various locations of use. However, the particular nature of the device has in the past made it rather difficult to transport without completely disassembling the device. Therefore, it is an important object of this inventon to provide a device of this type which is collapsible in part to be substantially compact and readily transportable without being completely disassembled. In accordance with this object it is important that such objectives be achieved without affecting the overall performance of the device.

Moreover, while the device of my previous inventions represents a major advance in swimmer propulsion devices, improvements which effect easier operation of the device and improved results are still very important to the user who is required to supply the power. Therefore, it is another important object of this invention to provide a device of this type having a new form of fin which results in improved performance.

As stated before, this type of swimmer propulsion device has also been found to be particularly effective for use by both lifeguards and skin divers. Lifeguards, of course, are often required during the course of a rescue to tow a person in distress and therefore, it would be particularly desirable if they could hold onto the person they are towing with both hands while at the same time

advancing in a direction away from the person being towed. Skin divers and, of course, other divers often find it necessary while in the water to dive a substantial depth. Traditionally this is accomplished by the use of weights which counteract the natural buoyancy and the diver somersaults to a head down attitude to swim down. However, it would be preferable if the diver could dive feet first without the necessity of a reversal of attitude. Therefore, it is still another object of this invention to provide a swimmer propulsion device which can be adjusted during use to propel a swimmer in either a forward, or head first direction, or a reverse, or feet first direction.

A still further object of this invention is to provide a swimmer propulsion device of this type which is economical to manufacture. In this regard it has been found desirable in certain instances to provide a single integral fin element.

Another important object of this invention is to provide a swimmer propulsion device which can be adjusted by the swimmer during use to reverse the direction of the swimmer.

In accordance with these objects, the present invention is directed to a novel and improved swimmer propulsion device of the type having a resiliently positioned fin adapted to oscillate and thereby develop propelling fluid flow, a leg attachment and stabilizing wing adapted to be positioned at or about the feet of the swimmer, and a power transmitting shaft which extends from the leg attachment to the fin. The improvement includes collapsible portions for providing a readily transportable unit, reversing means to change the direction of the developed fluid flow, and a novel fin design for improving the overall performance of the device.

Other and further objects of this invention will become readily apparent from the following detailed description and the accompanying drawings. In the drawings:

FIG. **1** is a side elevation of the present invention in use by a swimmer in a kick position.

FIG. **2** is an exploded perspective view illustrating the various components of the invention.

FIG. **3** is a fragmental view illustrating components of the collapsing rear stabilizing wing.

FIG. **4** is a fragmental perspective view similar to FIG. **3** showing the stabilizing wing in a collapsed position.

FIG. **5** is a side elevation illustrating the improved fin design.

FIG. **6** is a perspective view of the invention in its collapsed form for transportation.

FIG. **7** is a top plan view of the fin illustrating the reversing means of the invention.

FIG. **8** is a fragmental side sectional view of the fin illustrating its normal position.

FIG. **9** is a fragmental side sectional view of the fin similar to FIG. **8** illustrating the reversed position of the fin.

FIG. **10** is a partial side view of the invention illustrating a modified form of the invention.

FIG. **11** is a front view of the form of the invention shown in FIG. **10.**

Referring now in detail to the drawings, the swimming device **10** is a relatively light assembly generally comprised of wood and metal components, although in certain instances plastic components may be prefera-

ble. The device includes essentially three principal elements, the leg attachment element **11**, which includes a stabilizing wing, the forward oscillating fin or vane element **12**, and the power transmitting means or shaft element **13**.

The leg attachment element, which is adapted to be secured to the lower legs of a swimmer, includes a pair of back leg boards **14** and **15**, a front leg board **16**, and a front leg or tail board **17** which also serves as the stabilizing wing. The leg boards extend across the shaft element **13** and outwardly from each side thereof. However, because of its stabilizing function, the leg board **17** is substantially longer than the other leg boards and in its operative position extends a greater distance from each side of the shaft. Preferably, the leg boards are wing shaped in cross-section with the forward edge of the leg board or stabilizing wing **17** positioned at a slight upward incline with respect to the axis of the shaft **13**.

Bolts **18** and **19** are fixedly attached to the shaft **13** and extend upwardly therefrom. The front leg boards **16** and **17** are mounted on the shaft **13** with the bolts **18** and **19**, respectively, passing upwardly therethrough. Positioned between the front and back leg boards and in parallel alignment with the axis of the shaft **13** is a spacer board **20** having a plurality of passageways **21** through which the bolts pass.

The back leg boards **14** and **15** are secured to the free ends of the bolts **18** and **19**, respectively, by wing nuts **22**. Mounted concentrically on each bolt is an adjustment spring member **23** which separates the spacer board and back leg board. The spring members **23** along with the wing nuts **22** allow for adjustment of the distance between the front and back leg boards and along with the leg pads **24** which are affixed to the front leg boards **16** and **17**, provide for a secure but comfortable attachment to the swimmer's legs. It is important to note that the space between the ends of the front and back leg boards on each side of the shaft is relatively unrestricted which thereby permits easy mounting of the device to the swimmer and in addition permits the swimmer to easily dismount by merely spreading his legs.

As pointed out before, the tail board or stabilizing wing **17** is substantially longer than the other leg boards and therefore would generally interfere with transportation of the device. Preferably, then, the present invention includes a mounting bracket, generally designated **25**, which is best seen in FIGS. **2** through **4**. The mounting bracket **25** includes a center or body portion **26** which is contoured on one side **26** to fit onto the round shaft **13** and further includes leaves **27** which extend outwardly from each side of the body portion **26**. The body portion **26** includes an aperture (not shown) through which the bolt **19** extends and the leaves each include a central opening **28**. It should be noted that each leaf **27** is inclined with respect to the access of the shaft **13**. The incline of the leaves **27** maintains the stabilizing wing in the proper inclined position during operation of the unit as described above. The stabilizing wing or tail board **17** in its improved form comprises two mirror image components **29** and **30** symmetric with the center axis of the shaft element **13**. Each wing component is pivotally mounted to a leaf **27** by a bolt and wing nut connection **31**, with the bolt extending through an aperture **32** in the wing component and through the central opening **28** in the leaf. It should also be noted that the front inside corner **32***a* of each wing component is rounded slightly to permit pivotal movement of the wing components **29** and **30** without interference with the spacer board **20**. Thus, when it is desirable to transport the device as a unit, the stabilizing wing **17** is collapsed or folded as shown in FIGS. **4** and **6** with each wing component extending forward and generally parallel to but slightly inclined with respect to the axis of the shaft **13**. This incline provides a convenient space between the folded wing components and the front leg board **16** for receiving the dismounted fin **12** as seen in FIG. **6**.

The substantially straight shaft **13** extends forwardly of the leg attachment element **11** to a streamline wedge shaped projecting end member **35** which includes a bossed hole (not shown) therethrough. This hole extends perpendicular to the axis of the shaft **13** and includes a surrounding collar **36** at each end thereof. The fin, or vane, **12**, which in the embodiment shown in FIGS. **1** through **7** comprises a pair of identical blade members **38**, is pivotally mounted to the forward end of the shaft **13**. A pivot rod **39** pivotally mounted in the hole of the projecting end member **35**. The blade members each include a bore **39***a* which receives the extension of the rod **39**. The bore **39***a* in each blade extends parallel to the forward or leading edge **40** of the blade and is adjacent thereto. Referring now to FIG. **5**, this forward edge **40** is provided with a roughed portion preferably in the form of a plurality of parallel scribe marks or scratches **41** which extend substantially the length of each blade member. In the embodiment shown there are seven scribe marks or scratches **41**, with one centrally positioned along the forward edge of the blade and three on each side of the center scribe mark. These scribe marks or scratches **41** are typically equally spaced and approximately one-fourth inch apart. These scratches provide an interruption in the otherwise smooth surface and trip the boundary layer from laminar to turbulent flow and thereby prevent separation of the flow or "stall." It has been found that this fin design with this roughed forward edge portion provides for a markedly improved performance, particularly at low effort swimming.

A coil spring **42** is used to center the fin **12**. As stated previously, the fin **12** is positioned near the center of gravity of the swimmer's body to reduce to a minimum the waggle or other movement of the swimmer's body in response to a component of force incident to oscillatory motion of the fins. The direction of this component is transverse or lateral to the direction of motion of the swimmer through the water. Although a spring is shown as a centering device in this embodiment, other resilient components may be used. The spring is secured at one end by an S-hook **43** to the bolt **18** above the spacer board **20**. The other end of the spring **42** is secured to the approximate midpoint of a cord **44** which in turn is attached at each end to one of the blade members. The blade members each include a hole **45** which extends from the top of the blade to the bottom of the blade as shown in FIG. **8**. This hole **45** is spaced from the shaft **13** and receives an end of the cord **44**. The position of the cord and blade connections is such that the tension of the cord prevents outward movement of the blades away from the shaft. At the same time the inner ends of the blades are not pushed against the projecting end of the shaft **13** because the pivot rod bottoms in the holes in the blades

and is of the proper length to prevent this rubbing. It is important to note that the ends of the cord enter the holes **45** at the top of the blades and are secure to the bottom of the blade.

The reversing means which permits a swimmer to move in a generally reverse or feet first direction is shown in FIGS. **7** through **9.** The reversing means, generally designated **50,** includes a hook or other holding means **51** at the forward edge **40** positioned generally opposite the cord hole **45** but slightly outward therefrom. When reversing the blades, the blade is flipped over as shown in FIG. **9** with the cord extending across the normally top side of the blade through the holding means **51** to the spring **42.**

The embodiment of the invention shown in FIGS. **10** and **11** is identical to the device previously described except for the fin element **12** and the forward portion of the shaft element **13.** Therefore, those identical components will be designated by the same numeral as used previously.

In this embodiment the shaft element **13** extends forward at a slight downward incline and includes at its forward end a bifurcated fork member **55** which is secured to the shaft by rivets or other means. The upwardly extending and diverging ends **56** and **57** of the fork member **55** are positioned in approximately the same plane as the leg attachment element **11** and each include a bossed pivot hole (not shown) which extend transverse to the axis of the shaft **13.** The fin element **12** in this embodiment is an integral single blade **58** which includes a pair of downwardly extending and forwardly positioned hook members **59** which are adapted to pivotally secure the blade **58** to the ends of the fork member **55.** The continuous forward edge **60** of the fin **12** also provides for improved performance.

In operation, the swimmer mounts the device, preferably in shallow water, by straddling the device and inserting his lower legs between the leg boards. The swimmer then assumes the prone position as illustrated in FIG. **1** and begins the swimming stroke which is as follows: the knees are dropped in relation to the torso forcing the fin **12** downwardly in the water to the position seen in FIG. **1.** The forward edge of the pivoted fin leads the rear edge during movement thereof, since the downward force exerted by the swimmer is transferred directly to the forward edge of the fin and the water lift force which acts aft of the pivot axis retards downward movement of the rear edge. This movement of the fin **12** starts the feathering or oscillating stroke. When the swimmer's legs are thereafter straightened causing the fin **12** to move upwardly, the fin will be pivoted about the rod to a position as shown in phantom lines in FIG. **1,** the water lift force resisting upward movement of the rear edge of the fin. The spring **42** constantly urges the fin to the center position and aids in causing the fishtail or oscillating motion to reoccur and propel the body of the swimmer through the water. The lift force on the blades acts at about the quarter chord point aft from the leading edge. The chord is the distance from the leading edge to the trailing edge of the blade. The pivot axis is ahead of this point at about the one-eighth chord point. Thus the blade tends to "weathercock" or align itself with the direction of the relative water flow. The spring tends to resist this complete alignment process thus developing an angle of attack between the vane and the relative flow direction thus providing the lift on the blade. The blade position, direction of relative water flow, and direction of the lift force reverse each half cycle of operation resulting in a "sculling" or swimming action which provides a net forward thrust. The arms of the swimmer may be held directly in front of the head with the hands extended to aid in directing the swimmer. The hands may be manipulated to act as vanes or cause yaw or roll. The swimmer thereafter repeats the knee action stroke to cause the fishtail motion thereby propelling the body through the water.

Having fully described my invention, it is to be understood that I do not wish to be limited to the details herein set forth, but my invention is of the full scope of the appended claims.

I claim:

1. A device for providing for propulsion to utilize a swimmer's power of the type having engaging means adapted for engagement with the lower leg portions of a swimmer, power transfer means attached to and operative with said engaging means, fin means pivotally attached to said power transfer means and positioned substantially opposite the center of gravity of the swimmer's body, and resilient means connecting said fin means to said power transfer means, wherein the improvement comprises:

at least one blade member forming said fin means and being positioned transverse of an axis at said power transfer means;

said blade member having a forward lead edge and a back trailing edge; and

means to reverse the relative positions of said lead edge and said trailing edge with respect to said engaging means.

2. A device for providing for propulsion to utilize a swimmer's power of the type having engaging means adapted for engagement with the lower leg portions of a swimmer, power transfer means attached to and operative with said engaging means, fin means pivotally attached to said power transfer means and positioned substantially opposite the center of gravity of the swimmer's body, and resilient means connecting said fin means to said power transfer means, wherein the improvement comprises:

at least one blade member forming said fin means and being positioned transverse of the axis of said power transfer means;

said blade member having a forward lead edge; and

said lead edge having a roughened portion to prevent separation of flow thereacross.

3. The device of claim **2,** wherein a plurality of scribe marks extending longitudinally along said forward lead edge form said roughened portion.

4. A device for providing for propulsion to utilize a swimmer's power of the type having engaging means adapted for engagement with the lower leg portions of a swimmer, stabilizing means adapted to maintain the swimmer's body in a level attitude, power transfer means attached to and operative with said engaging means, fin means pivotally attached to said power transfer means and positioned substantially opposite the center of gravity of the swimmer's body, and resilient means connecting said fin means to said power transfer means, wherein the improvement comprises:

a pair of mirror image component members forming said stabilizing means and being positioned sym-

metric about said power transfer means and extending transversely thereof during operation;

connecting means connecting said component members to said power transfer means; and

said component members being collapsible about said connecting means whereby said component members can be moved to a substantially parallel position with respect to said power transfer means and thereby provide a substantially compact transportable unit.

5. The device of claim **4,** wherein said fin means includes a roughened forward edge portion to prevent separation of the flow thereacross.

6. The device of claim **4,** wherein reversing means are provided to hold said fin means in a reversed position and thereby effect a change in the direction of propulsion.

7. The device of claim **4,** wherein said connecting means includes a mounting bracket and said component members are pivotally secured thereto.

8. The device of claim **7,** wherein said mounting bracket includes a pair of leaf members extending outwardly from each side thereof, said component members being pivotally connected to said leaf members and maintained at a forward incline with respect to an axis of said power transfer means.

* * * * *