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(54) Propeller driven surfing device

Propellergetriebene Vorrichtung zum Wellenreiten

Dispositif de surf commandé par hélice

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EP 1 977 968 B1

Description

[0001] This invention relates to a surfing device, more particularly to a propeller driven surfing device driven by a motor for propelling through water.

[0002] Referring to Figs. 1 and 2, a conventional water propeller device 100 can be used in a diving activity (as shown in Fig. 1), and can be connected to a float board 101 for use in swimming (as shown in Fig. 2). However, the user has to hold the device 100 with both hands, which is inconvenient.

[0003] Referring to Figs. 3 and 4, a conventional propeller driven surfing device is shown to include a float board 11, a propeller unit 12 disposed on the surfboard 11, and a control handle 13 coupled to the propeller unit 12. The surfboard 11 has front and back edges 111, 112, and top and bottom surfaces 113,114 interconnecting the front and back edges 111,112. The propeller unit 12 is connected to the back edge 112 by a dovetailed joint 122 and is operable to generate a driving force to propel the surfboard 11 forward. The propeller unit 12 includes a body 121, a drive motor (not shown) which is disposed in the body 121 and which has an output shaft 124 extending rearwardly, and a propeller 125 which is coupled to the output shaft 124 and which is covered with a meshed guard. The control handle 13 includes a handlebar 131 connected to and extending from the propeller unit 12, and a handgrip 132 attached to an upper end of the handlebar 131 to be used for steadying the user and for actuating the drive motor.

[0004] Although this propeller driven surfing device allows a person with little surfboard riding skill to operate in relatively calm water, the following drawbacks arise:

1. Since the propeller unit 12 and the control handle 13 are disposed at the back edge 112 of the surfboard 11, the weight of the surfboard 11 is centered at the back edge 112 so that the surfboard 11 is inclined rearwardly. Thus, the surf riding routines is difficult to perform.

2. Due to the design of the propeller 125, water currents generated as a result of operation of the propeller 125 are divided with small jets so that the propelling force is not sufficient. Besides, the meshed guard covering the propeller 125 may thwart the flow of the water, thereby further weakening the propelling force of the water.

3. Since the control handle 13 is fixed to the propeller unit 12, when the user stands on the surfboard 11 and grips the handgrip 132, he/she cannot freely change his/her standing posture. Besides, as shown in Fig. 5, the user 20 cannot operate the control handle 13 when lying prostrate on the surfboard 11. Thus, the freedom and pleasure of surfing are discounted.

[0005] The object of the present invention is to provide a propeller driven surfing device which can achieve a great driving force for forward propulsion.

[0006] Another object of the present invention is to provide a propeller driven surfing device which allows the user to perform surfing with a greater flexibility and freedom.

[0007] According to this invention, the propeller driven surfing device includes an elongated body, a drive unit, a shell member, and an operating unit. The elongated body has front and rear ends opposite to each other along a longitudinal axis, and a tubular wall extending to interconnect the front and rear ends so as to define an accommodation chamber therein. The drive unit includes a drive motor, a power supply, and a control member disposed in the accommodation chamber. The control member is electrically coupled to the drive motor and the power supply. A propeller is driven by the drive motor, and is disposed outwardly of the elongated body and rearwardly of the rear end. The shell member includes a front surrounding segment which surrounds and which is spaced apart from the tubular wall to define a passageway therebetween, and a rear surrounding segment which extends rearwardly from the front surrounding segment and which terminates at a distal end that is disposed rearwardly of the propeller. The front surrounding segment and the distal end respectively define a water intake port and a water outlet port which are disposed upstream and downstream of the passageway, respectively, such that water flows from the intake port and out of the outlet port through the passageway. The operating unit is electrically coupled to the control member, and is disposed to be movable relative to the shell member so as to be operable to control operation of the control member.

[0008] Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiments of the invention, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a conventional water propeller in a state of use;

Fig. 2 is a side view of the conventional water propeller of Fig. 1 in another state of use;

Fig. 3 is an exploded perspective view of a conventional propeller driven surfing device;

Fig. 4 is a side view of the conventional propeller driven surfing device of Fig. 3 in a state of use;

Fig. 5 is a side view of the conventional propeller driven surfing device of Fig. 3 in another state of use;

Fig. 6 is a perspective view of the first preferred embodiment of a propeller driven surfing device according to this invention;

Fig. 7 is a top view of the first preferred embodiment of Fig. 6;

Fig. 8 is a sectional view of the first preferred embodiment of Fig. 6;

Fig. 9 is a perspective view of the second preferred embodiment of a propeller driven surfing device according to this invention;

Fig. 10 is a sectional view of the third preferred embodiment of a propeller driven surfing device according to this invention;

Fig. 11 is a rear view of the third preferred embodiment of Fig. 10;

Fig. 12 is a side view of the third preferred embodiment of Fig. 10 in a state of use;

Fig. 13 is a side view of the fourth preferred embodiment of a propeller driven surfing device according to this invention; and

Fig. 14 is a side view of the fourth preferred embodiment of Fig. 13 in another state of use.

[0009] Before the present invention is described in greater detail, it should be noted that same reference numerals have been used to denote like elements throughout the specification.

[0010] Referring to Figs . 6 to 8, the first preferred embodiment of a propeller driven surfing device according to the present invention is shown to comprise an elongated body 20, a drive unit 30, a shell member 40, and an operating unit 50.

[0011] The elongated body 20 is torpedo-shaped, and has front and rear ends 2 01,202 opposite to each other along a longitudinal axis, and a tubular wall 203 extending in a longitudinal direction parallel to the longitudinal axis to interconnect the front and rear ends 201,202 so as to define an accommodation chamber 2 04 therein.

[0012] The drive unit 30 includes a control member 31, such as a control module which is disposed in the accommodation chamber 204, a power supply 32, such as a battery, which is disposed in the accommodation chamber 204 and which is electrically coupled to the control member 31, a drive motor 33 which is disposed in the accommodation chamber 5 2 04 and which is electrically coupled to the control member 31, and a propeller 34 which is driven by the drive motor 33 and which is disposed outwardly of the elongated body 20 and rearwardly of the rear end 202.

[0013] The shell member 4 0 includes a front surrounding segment 10 401 which surrounds and which is spaced apart from the tubular wall 203 to define a passageway 43 therebetween, and a rear surrounding segment 402 which extends rearwardly from the front surrounding segment 401 in the longitudinal direction and which terminates at a distal end 403 that is disposed rearwardly of the propeller 34 and that is spaced apart from the propeller 34 in the longitudinal direction. The rear surrounding segment 402 is configured to converge towards the longitudinal axis from the front surrounding segment 401 to the distal end 403. The front 20 surrounding segment 401 defines a water intake port 42 having a pair of intake port portions 421 which are disposed opposite to each other in a diametrical direction relative to the longitudinal axis and which are disposed upstream of the passageway 43 such that water entering the passageway 43 through the two intake port portions 421 during operation of the propeller 34 forms two water currents in the passageway 43. The distal end 403 defines a water outlet port 41 which is disposed downstream of the passageway 43. Thus, the two water currents in the passageway 43 will meet before reaching the propeller 34 and will flow out of the outlet port 41 as one column of water. Moreover, 5 the front surrounding segment 401 has a pair of positioning sockets 44 which are disposed diametrically opposite to each other.

[0014] The operating unit 50 includes a pair of handgrips 51, each of which has a plug 511 that is configured to be 10 detachably fitted into a respective one of the positioning sockets 44 in a mortise-and-tenon engagement using, for instance, a dovetail structure, and a control button 52 which is mounted on one of the handgrips 51 and which is electrically coupled to the control member 31 by means of a signal cable 53. Hence, the operating unit 50 is movable and operable by the user to control operation of the control member 31 so as to shift the drive of the drive motor 33, such as the rotational speed thereof.

[0015] Accordingly, when the propeller 34 is driven and rotated, 20 water flows from the intake port portions 421 into the passageway 43 to form two water currents along the tubular wall 203 of the elongated body 20. The two water currents subsequently meet before reaching the propeller 34, and flow out of the outlet port 41 as one column of water.

[0016] By virtue of the provision of the shell member 40 and the fully opened outlet port 41, water flow is not thwarted by any interfering objects so that the drive force generated as a result of action of the propeller 34 can be fully utilized to propel the surfing device forward. Besides, since the handgrip 51 having the control button 52 mounted thereon is detachable from the positioning socket 44, the user can operate the control button 52 to control the propeller 34 in any posture, thereby affording the user with greater flexibility and freedom when performing a water activity.

[0017] Referring to Fig. 9, the second preferred embodiment of a propeller driven surfing device according to this invention is shown to be similar to that of the aforesaid embodiment in construction. This embodiment further includes a pair of shoulder straps 61 which are detachably mounted on the positioning sockets 44 of the

front surrounding segment 4 01 of the shell member 40, and a waist strap 62 which is detachably mounted on the rear surrounding segment 402 of the shell member 40 by means of dovetail joints, thereby facilitating carrying of the surfing device.

[0018] Referring to Figs. 10 to 12, the third preferred embodiment of a propeller driven surfing device according to this invention is shown to be similar to that of the first preferred embodiment in construction. This embodiment further includes a surfboard 70 which has a bottom surface 7 01. The shell member 4 0 is detachably coupled to the bottom surface 701 in a mortise-and-tenon engagement by way of a dovetail joint, for instance. Thus, the user can stand on the surfboard 7 0 and grip the handgrip 51 to operate the control button 52. It is noted that as the elongated body 20, the drive unit 30 and the shell member 40 are disposed at a middle position of the surfboard 5 70 where the center of gravity of the surfing device is located, the user can practice surfing with greater flexibility as if using a conventional surfboard.

[0019] Referring to Figs. 13 and 14, the fourth preferred embodiment of a propeller driven surfing device according 10 to this invention is shown to be similar to the third preferred embodiment in construction. In this embodiment, the control member 31 includes a wireless communication module which is disposed to control the drive motor 33 in response to a signal emitted from the operating unit 15 50 in a known manner, thereby dispensing with the signal cable 53.

Claims

1. A water propeller device, comprising:

an elongated body (20) having front and rear ends (201,202) opposite to each other along a longitudinal axis, and a tubular wall (203) extending in a longitudinal direction parallel to the longitudinal axis to interconnect said front and rear ends (201,2 02) so as to define an accommodation chamber (204) therein;

a drive motor (33) disposed in said accommodation chamber (204);

a power supply (32) disposed in said accommodation chamber (204), and operationally coupled to said drive motor (33);

a propeller (34) which is driven by said drive motor (33), and which is disposed outwardly of said elongated body (20) and rearwardly of said rear end (202), a shell member (40) including a front surrounding segment (401) which surrounds and which is spaced apart from said tubular wall (203) to define a passageway (43) therebetween, and a rear surrounding segment (402) which extends rearwardly from said front surrounding segment (401) in the longitudinal direction and which terminates at a distal end (403) that is disposed rearwardly of said propeller (34) and that is spaced apart from said propeller (34) in the longitudinal direction, said front surrounding segment (401) and said distal end (403) respectively defining a water intake port (42) and a water outlet port (41) which are disposed upstream and downstream of said passageway (43), respectively, such that water flows from said intake port (42) and out of said outlet port (41) through said passageway (43); and

a control member (31) which is disposed in said accommodation chamber (204) and which is electrically coupled to said drive motor (33) and said power supply (32) so as to control operation of said drive motor (33,)

characterized by:

said intake port (42) having a pair of intake port portions (421) which are disposed opposite to each other in a diametrical direction relative to the longitudinal axis such that water entering said passageway (43) through said two intake port portions (421) during action of said propeller (34) forms two water currents in said passageway (43), the two water currents meeting before reaching said propeller (34), and

said rear surrounding segment (402) being configured to converge towards the longitudinal axis from said front surrounding segment (401) to said distal end (403).

2. The water propeller device of Claim 1, further **characterized by** an operating unit (50) which is electrically coupled to said control member (31), and which is disposed to be movable relative to said shell member (40) so as to be operable to control operation of said control member (31).

3. The water propeller device of Claim 2, **characterized in that** said front surrounding segment (401) has a pair of positioning sockets (44) which are disposed diametrically opposite to each other, said operating unit (50) including a pair of handgrips (51), each of which has a plug (511) that is configured to be detachably inserted into a respective one of said positioning sockets (44).

4. The water propeller device of Claim 3, **characterized in that** said plug (511) and the respective one of said sockets (44) are configured to mate with each other in a mortise-and-tenon engagement.

5. The water propeller device of Claim 3 or 4, **characterized in that** said operating unit (50) further includes a control button (52) which is mounted on one of said handgrips (51) and which is electrically coupled to said control member (31).

6. The water propeller device of Claim 2, further **characterized by** a signal cable (53) which is electrically connected to said operating unit (50) and said control member (31).

7. The water propeller device of Claim 2, **characterized in that** said control member (31) includes a wireless communication module which is disposed to control said drive motor (33) in response to a signal emitted from said operating unit (50).

8. A propeller driven surfing device comprising:

a water propeller device according to any one of the preceding claims and
a surfboard (70) which has a bottom surface (701), said shell member (40) being detachably mounted on said bottom surface (701).

9. The propeller driven surfing device of Claim 8, **characterized in that** said bottom surface (701) of said surfboard (70) and said shell member (40) are configured to mate with each other in a mortise-and-tenon engagement.

10. The water propeller device according to any one of claims 1 to 7, further comprising
a pair of shoulder straps (61) which are detachably mounted on said front surrounding segment (401), and a waist strap (62) which is detachably mounted on said rear surrounding segment (402).

Patentansprüche

1. Wasser-Propellervorrichtung, enthaltend:

einen länglichen Körper (20), der einander entgegengesetzt entlang einer Längsachse ein vorderes und ein hinteres Ende (201, 202) hat sowie eine rohrförmige Wand (203), die in Längsrichtung parallel zur Längsachse verläuft und das vordere und das hintere Ende (201, 202) miteinander verbindet, so dass im Inneren eine Aufnahmekammer (204) gebildet ist;
einen Antriebsmotor (33), der in der Aufnahmekammer (204) angeordnet ist;
eine Leistungsversorgung (32), die in der Aufnahmekammer (204) angeordnet ist und betriebsfähig mit dem Antriebsmotor (33) verbunden ist;
einen Propeller (34), der von dem Antriebsmotor (33) angetrieben wird und der außerhalb des länglichen Körpers (20) und hinter dem hinteren Ende (202) angeordnet ist, ein Schalenelement (40), welches ein vorderes Hüllsegment (401), welches die rohrförmige Wand (203) umgibt und von dieser beabstandet ist, so dass dazwischen ein Kanal (43) gebildet ist, und ein hinteres Hüllsegment (402) umfasst, welches sich von dem vorderen Hüllsegment (401) in Längsrichtung nach hinten erstreckt und welches an einem distalen Ende (403) endet, das hinter dem Propeller (34) angeordnet ist und welches von dem Propeller (34) in Längsrichtung beabstandet ist, welches vordere Hüllsegment (401) und welches distale Ende (403) eine Wassereinlassöffnung (42) bzw. eine Wasserauslassöffnung (41) bilden, welche stromaufwärts bzw. stromabwärts des Kanals (43) dergestalt angeordnet sind, dass Wasser von der Einlassöffnung (42) aus der Auslassöffnung (41) durch den Kanal (43) strömt; und
ein Steuerelement (31), welches in der Aufnahmekammer (204) angeordnet ist und welches mit dem Antriebsmotor (33) und der Leistungsversorgung (32) elektrisch gekoppelt ist, um so den Betrieb des Antriebsmotors (33) zu steuern,
dadurch gekennzeichnet, dass
die Einlassöffnung (42) ein Paar Einlassöffnungsabschnitte (421) hat, die einander entgegengesetzt in diametraler Richtung relativ zur Längsachse dergestalt angeordnet sind, das in den Kanal (43) durch die beiden Einlassöffnungsabschnitte (421) während des Betriebs des Propellers (34) eintretendes Wasser zwei Wasserströme in dem Kanal (43) bildet, welche beiden Wasserströme sich treffen, bevor sie den Propeller (34) erreichen, und
das hintere Hüllsegment (402) so konfiguriert ist, dass es von dem vorderen Hüllsegment (401) zu dem distalen Ende (403) zu der Längsachse hin konvergiert.

2. Wasser-Propellervorrichtung nach Anspruch 1, ferner **gekennzeichnet durch** eine Betätigungseinheit (50), die mit dem Steuerelement (31) elektrisch gekoppelt ist und welche so angeordnet ist, dass sie relativ zu dem Schalenelement (40) beweglich ist, so dass sie zur Steuerung des Betriebs des Steuerelements (31) betätigbar ist.

3. Wasser-Propellervorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** das vordere Hüllsegment (401) ein Paar Positionierfassungen (44) hat, die einander diametral gegenüberliegend angeordnet sind, wobei die Betätigungseinheit (50) ein Paar Handgriffe (51) umfasst, welche jeweils einen Zapfen (511) aufweisen, der dafür konfiguriert ist, in eine jeweilige Positionierfassung (44) lösbar eingeführt zu werden.

4. Wasser-Propellervorrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** der Zapfen (511) und die jeweilige Fassung (44) so konfiguriert sind, dass sie in einer Zapfenverbindung miteinander in Eingriff

kommen.

5. Wasser-Propellervorrichtung nach Anspruch 3 oder 4, **dadurch gekennzeichnet, dass** die Betätigungseinheit (50) ferner einen Steuerknopf (52) umfasst, der an einem der Handgriffe (51) montiert ist und der mit dem Steuerelement (31) elektrisch verbunden ist.

6. Wasser-Propellervorrichtung nach Anspruch 2, ferner **gekennzeichnet durch** ein Signalkabel (53), welches mit der Betätigungseinheit (50) und dem Steuerelement (31) elektrisch verbunden ist.

7. Wasser-Propellervorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** das Steuerelement (31) ein drahtloses Kommunikationsmodul umfasst, welches so angeordnet ist, dass es den Antriebsmotor (33) ansprechend auf ein von der Betätigungseinheit (50) gesendetes Signal steuert.

8. Propellergetriebene Surfvorrichtung, enthaltend:

eine Wasser-Propellervorrichtung nach einem der vorstehenden Ansprüche und
ein Surfbrett (70), welches eine Unterfläche (701) hat, wobei das Schalenelement (40) an der Unterfläche (701) abnehmbar montiert ist.

9. Propellergetriebene Surfvorrichtung nach Anspruch 8, **dadurch gekennzeichnet, dass** die Unterfläche (701) des Surfbretts (70) und das Schalenelement (40) so konfiguriert sind, dass sie durch eine Zapfenverbindung miteinander verbunden werden.

10. Wasser-Propellervorrichtung nach einem der Ansprüche 1 bis 7, ferner enthaltend
ein Paar Schulterriemen (61), die an dem vorderen Hüllsegment (401) abnehmbar montiert sind, sowie einen Hüftriemen (62), der an dem hinteren Hüllsegment (402) abnehmbar montiert ist.

Revendications

1. Dispositif à hélice sur eau, comprenant:

un corps allongé (20) ayant des extrémités arrière et avant (201, 202) mutuellement opposées le long d'un axe longitudinal et une paroi tubulaire (203) s'étendant dans une direction longitudinale parallèle à l'axe longitudinal pour interconnecter desdites extrémités avant et arrière (201, 202) de manière à définir une chambre de logement (204) à l'intérieur;
un moteur d'entraînement (33) disposé dans ladite chambre de logement (204);
une alimentation électrique (32) disposée dans ladite chambre de logement (204) et couplée opérationnellement audit moteur d'entraînement (33);
une hélice (34) qui est entraînée par ledit moteur d'entraînement (33) et qui est disposée à l'extérieur dudit corps allongé (20) et en arrière de ladite extrémité externe (202), un organe en forme de coque (40) comprenant un segment frontal enveloppant (401) qui entoure et qui est espacé de la paroi tubulaire (203) pour définir un passage (43) entre, et un segment arrière enveloppant (402) qui s'étend vers l'arrière depuis ledit segment enveloppant frontal (401) dans la direction longitudinale et qui se termine à une extrémité distale (403) qui est disposée en arrière de ladite hélice (34) et qui est à distance de ladite hélice (34) dans la direction longitudinale, ledit segment frontal enveloppant (401) et ladite extrémité distale (403) définissant respectivement un orifice d'entrée d'eau (42) et un orifice de sortie d'eau (41) qui sont disposés respectivement en amont et en aval du passage (43) de sorte que l'eau s'écoule depuis ledit orifice d'entrée (42) et sort par ledit orifice de sortie (41) à travers ce dit passage (43); et
un organe de commande (31) qui est disposé dans ladite chambre de logement (204) et qui est couplé électriquement audit moteur d'entraînement (33) et à ladite alimentation électrique (32) de manière à commander l'opération dudit moteur d'entraînement (33),
caractérisé par
le dit orifice d'entrée (42) ayant des portions d'orifice d'entrée (421) qui sont disposés en opposition mutuelle dans une direction diamétrale par rapport à l'axe longitudinal de sorte que l'eau entrant dans ledit passage (43) à travers les deux dites portions d'entrée (421) pendant l'action de ladite hélice (34) forme deux courants d'eau dans ledit passage (43), les deux courants d'eau se rencontrant avant d'atteindre ladite hélice (34), et
le segment enveloppant arrière (402) étant configuré pour converger en direction de l'axe longitudinal depuis ledit segment frontal enveloppant (401) vers ladite extrémité distale (403).

2. Dispositif à hélice sur eau de la revendication 1, **caractérisé en outre par** une unité de fonctionnement (50) qui est couplée électriquement audit organe de commande (31) et qui est disposée pour être mobile de manière relative à l'organe formant coque (40) de manière à commander le fonctionnement dudit organe de commande (31).

3. Dispositif à hélice sur eau de la revendication 2, **caractérisé en ce que** ledit segment frontal enveloppant (401) présente une paire de douilles de posi-

tionnement (44) qui sont diamétralement opposées, ladite unité de fonctionnement (50) comprenant une paire de poignées (51), dont chacune présente une fiche (511) qui est configurée pour être insérée de manière amovible dans l'une respective desdites douilles de positionnement (44).

4. Dispositif à hélice sur eau de la revendication 3, **caractérisé en ce que** l'une respective desdites fiches (511) et ladite douille (44) sont configurées pour être accouplées dans une connexion du type à mortaise et tenon.

5. Dispositif à hélice sur eau de la revendication 3 ou 4, **caractérisé en ce que** ladite unité de fonctionnement (50) comprend un outre un bouton de commande (52) qui est monté sur l'une des poignées (51) et qui est couplé électriquement audit organe de commande (31).

6. Dispositif à hélice sur eau de la revendication 2, **caractérisé en outre par** un câble de signal (53) qui est connecté électriquement à ladite unité de fonctionnement (50) et ledit organe de commande (31).

7. Dispositif à hélice sur eau de la revendication 2, **caractérisé en ce que** ledit organe de commande (31) comprend un module de communication sans fil qui est disposé pour commander ledit moteur d'entraînement (33) en réponse à un signal émis par ladite unité de fonctionnement (50).

8. Dispositif de surf commandé par hélice comprenant:

un dispositif à hélice sur eau selon l'une des revendications précédentes et
une planche de surf (70) qui présente une surface de fond (701), ledit organe formant coque (40) étant monté de manière amovible sur ladite surface de fond (701).

9. Dispositif de surf commandé par hélice de la revendication 8, **caractérisé en ce que** ladite surface de fond (701) de la dite planche de surf (70) et ledit organe formant coque (40) sont configurées pour être accouplé dans une connexion du type à mortaise et tenon.

10. Dispositif à hélice sur eau de la revendications 1 à 7, comprenant en outre
une paire de bretelles d'épaule (61) qui sont montées de manière amovible sur ledit segment frontal enveloppant (401) et une lanière de ceinture (62) qui est montée de manière amovible sur ledit segment arrière enveloppant (402).

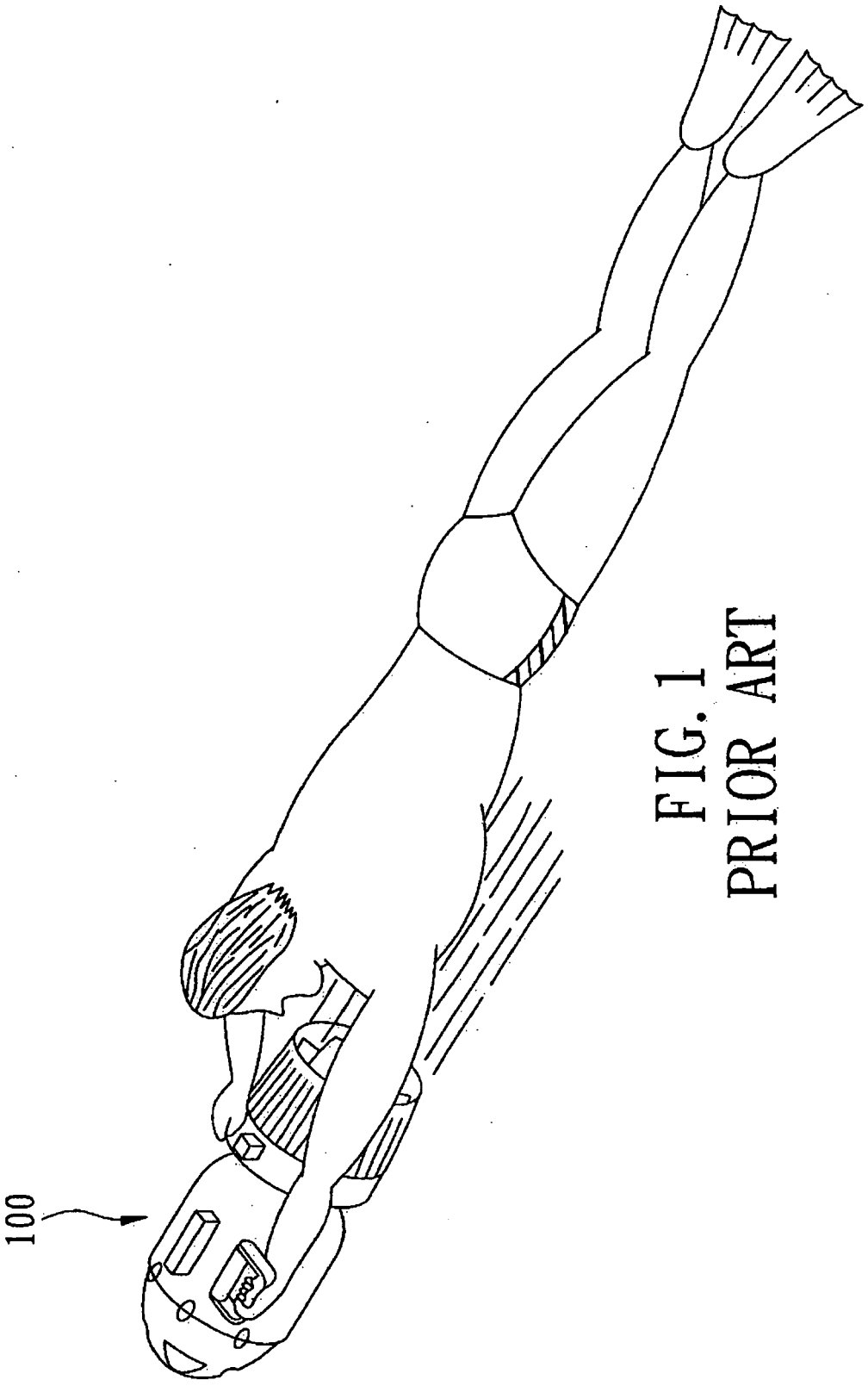

FIG. 1
PRIOR ART

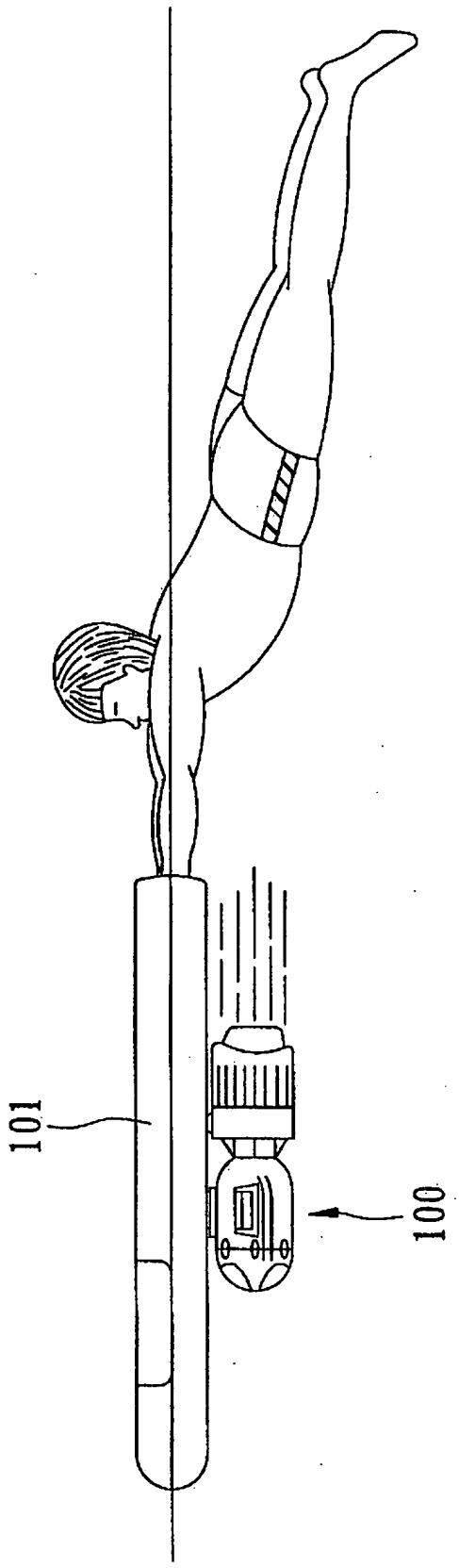

FIG. 2
PRIOR ART

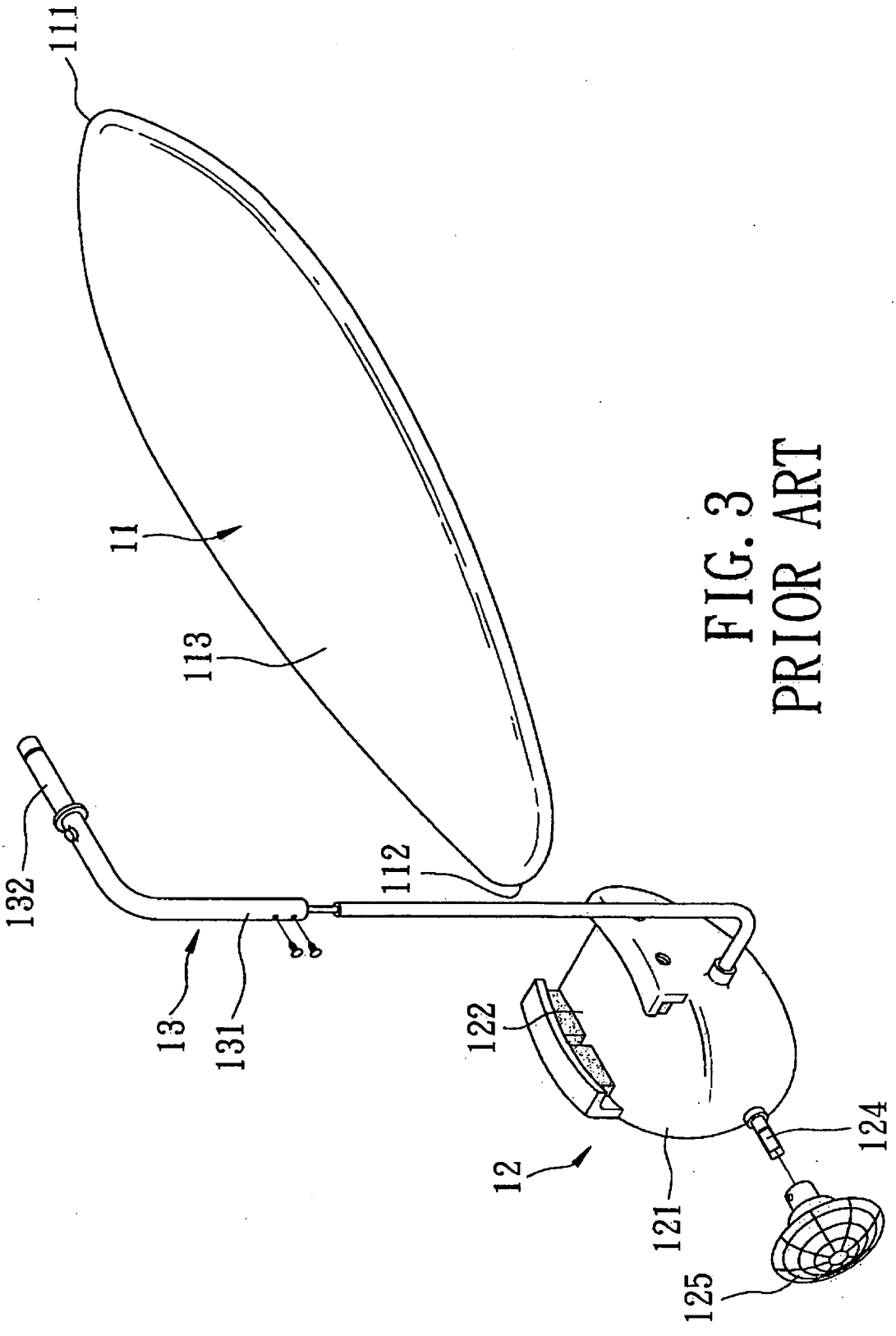

FIG. 3
PRIOR ART

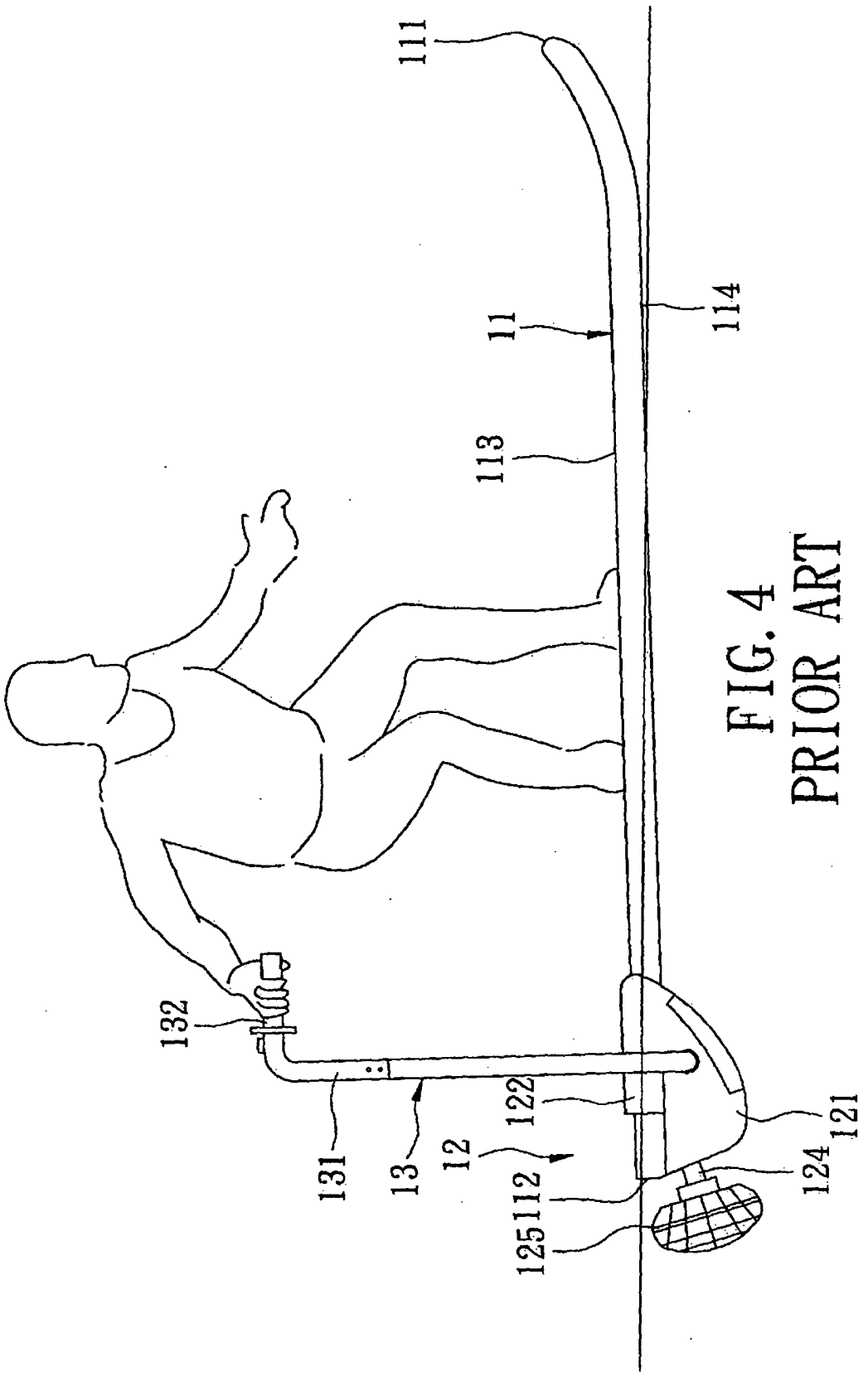

FIG. 4
PRIOR ART

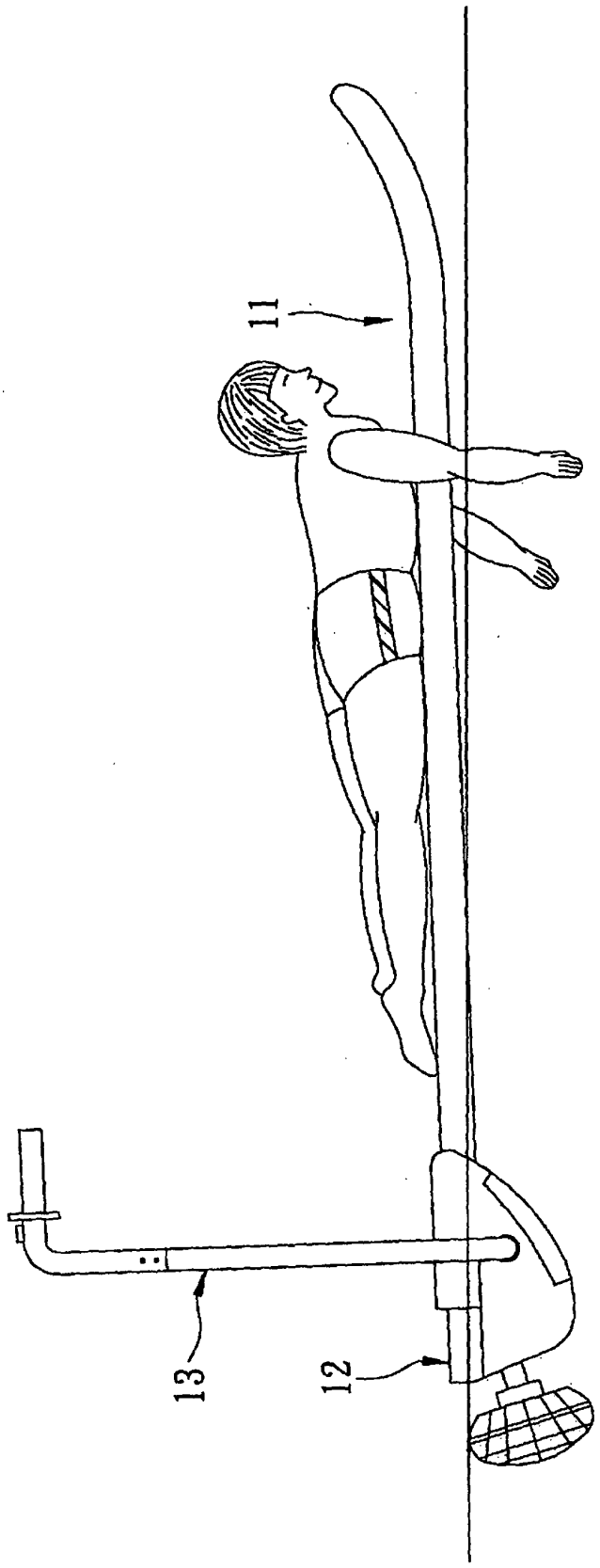

FIG. 5
PRIOR ART

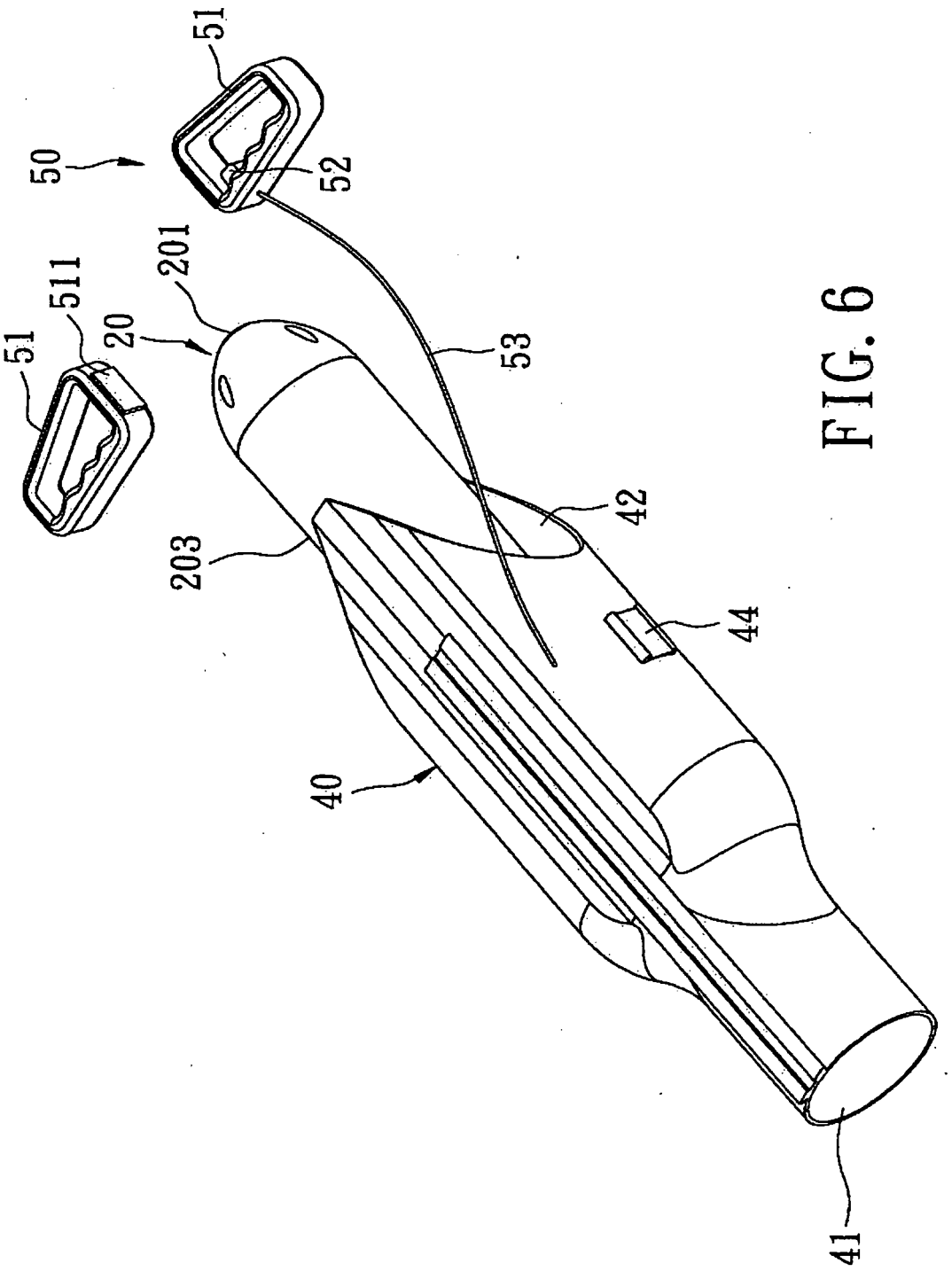

FIG. 6

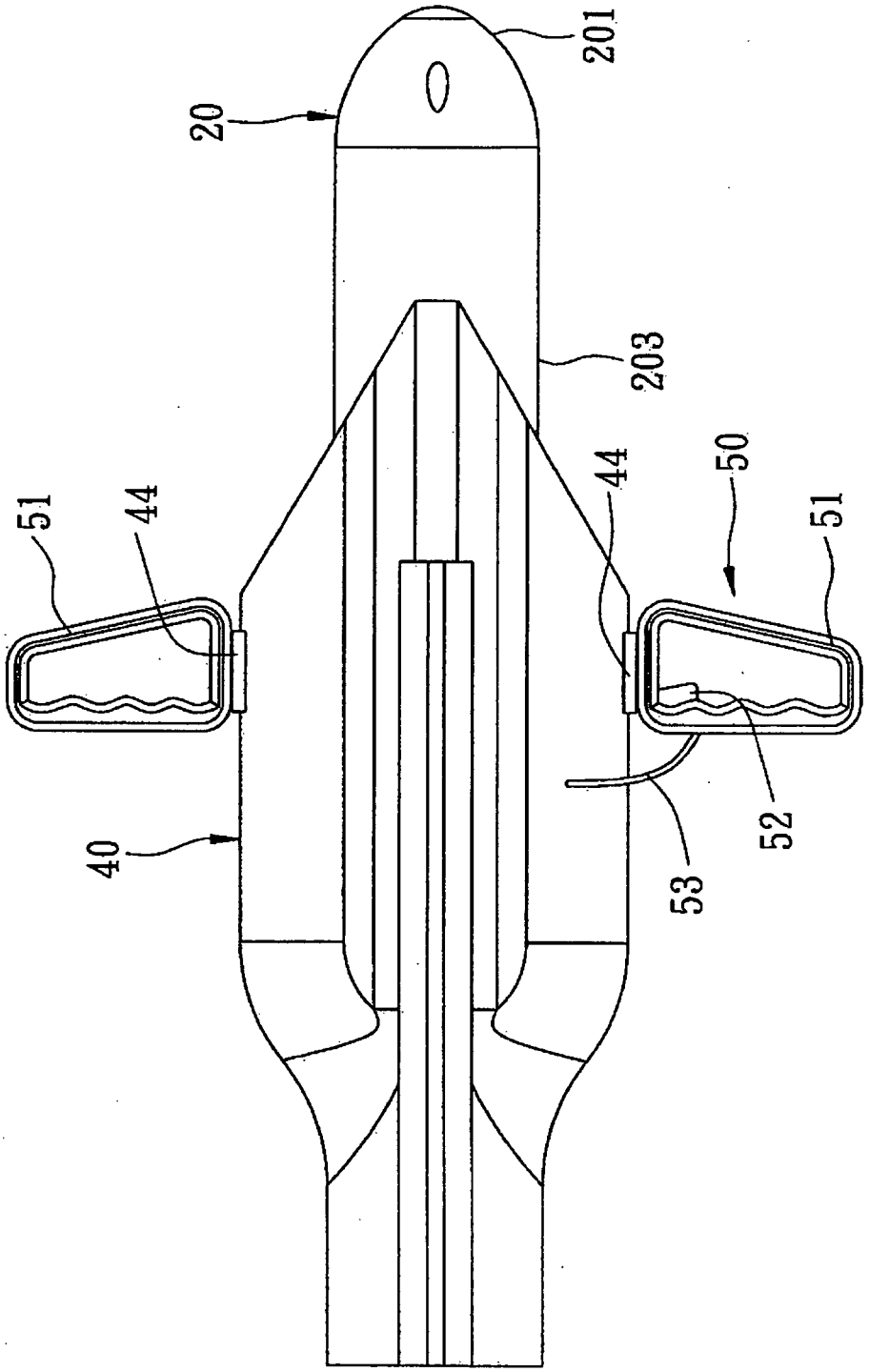

FIG. 7

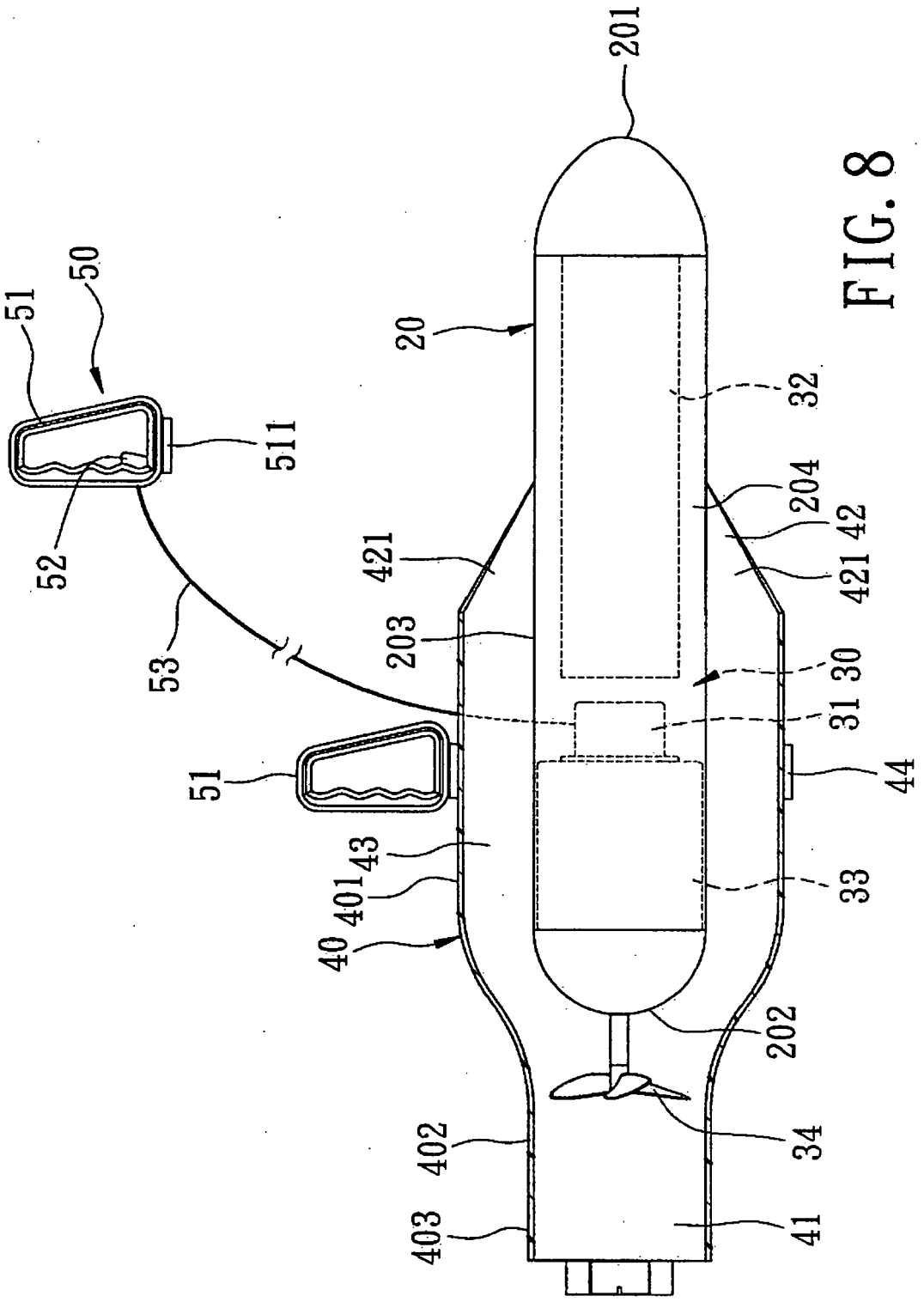
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FIG. 8

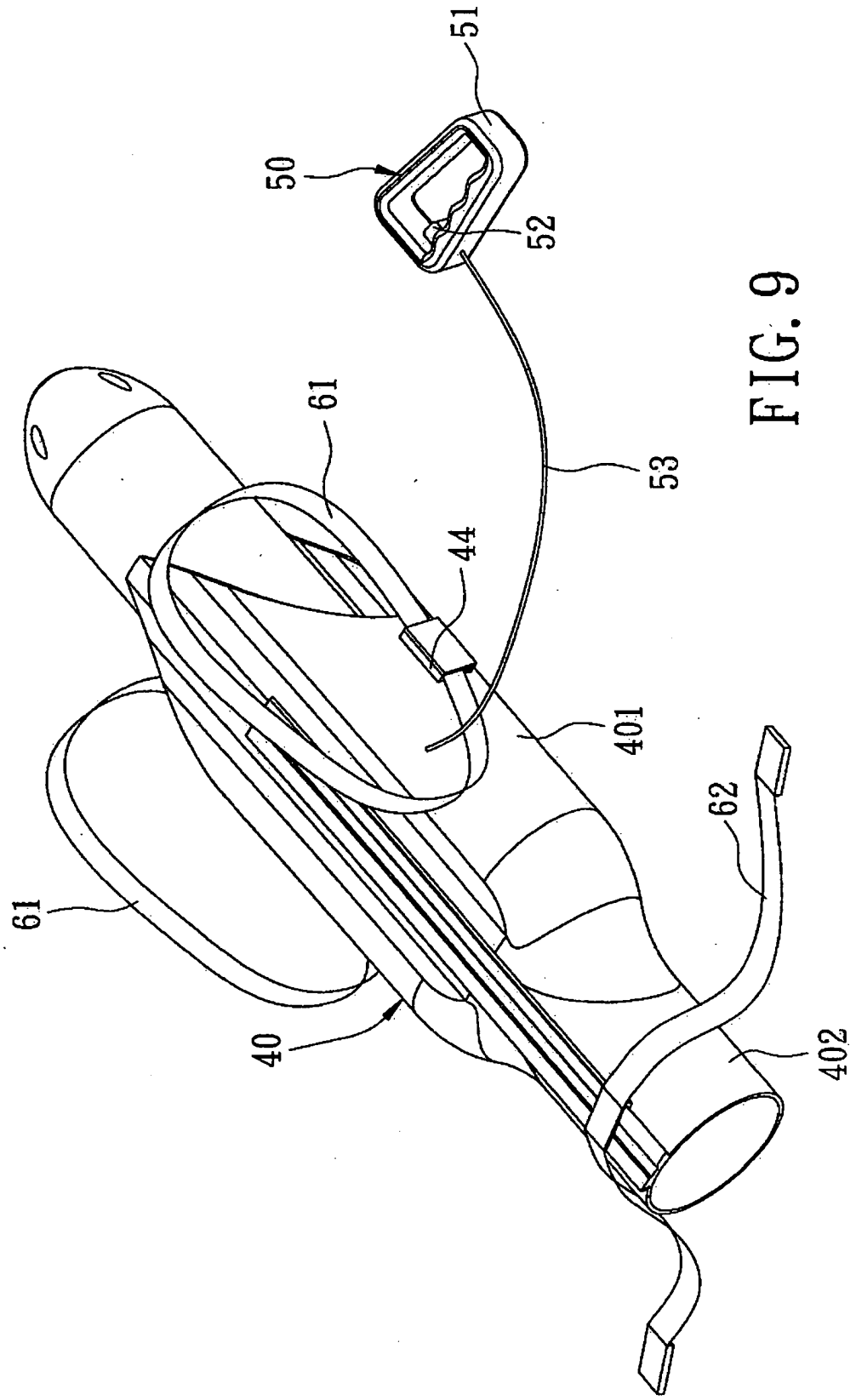

FIG. 9

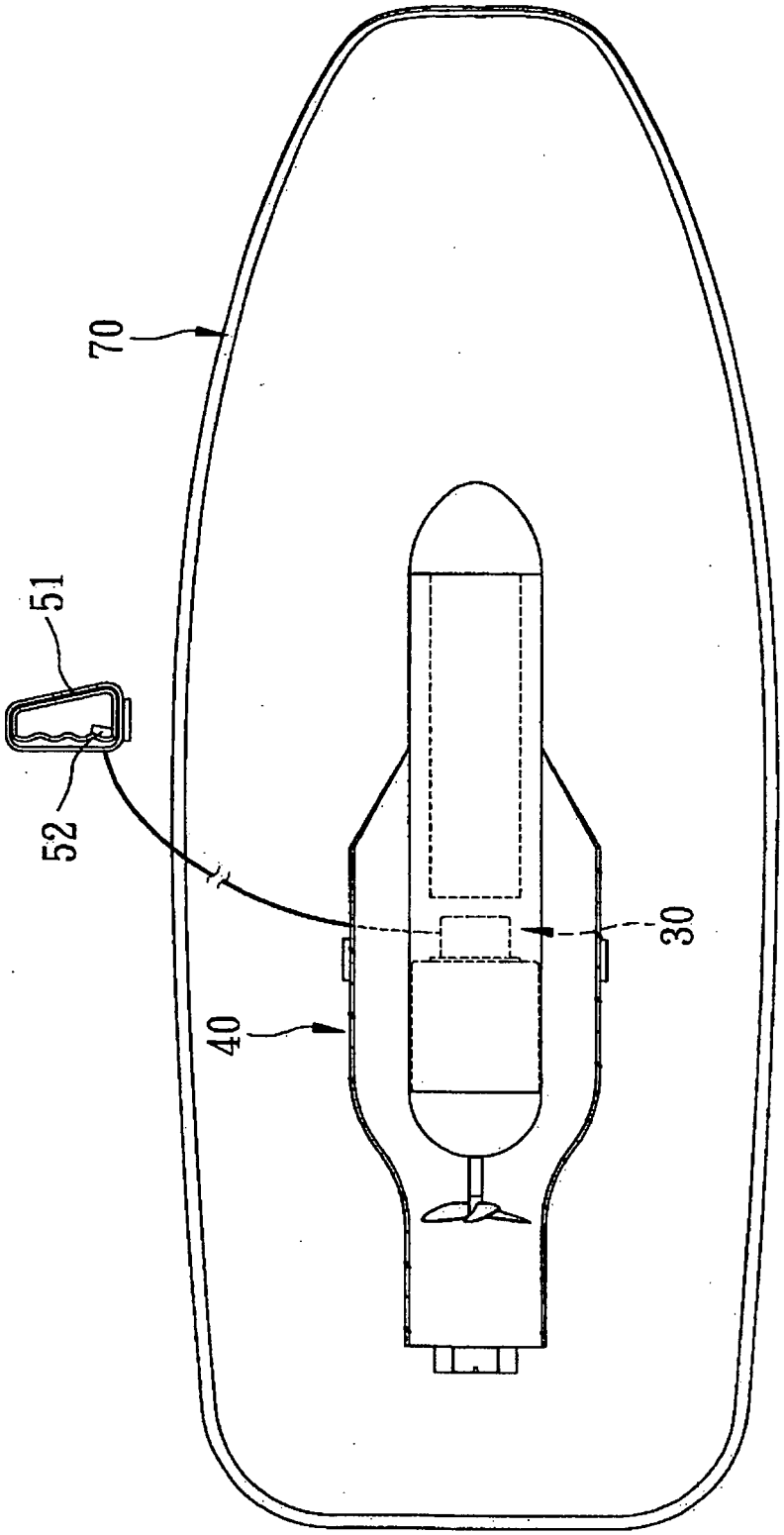

FIG. 10

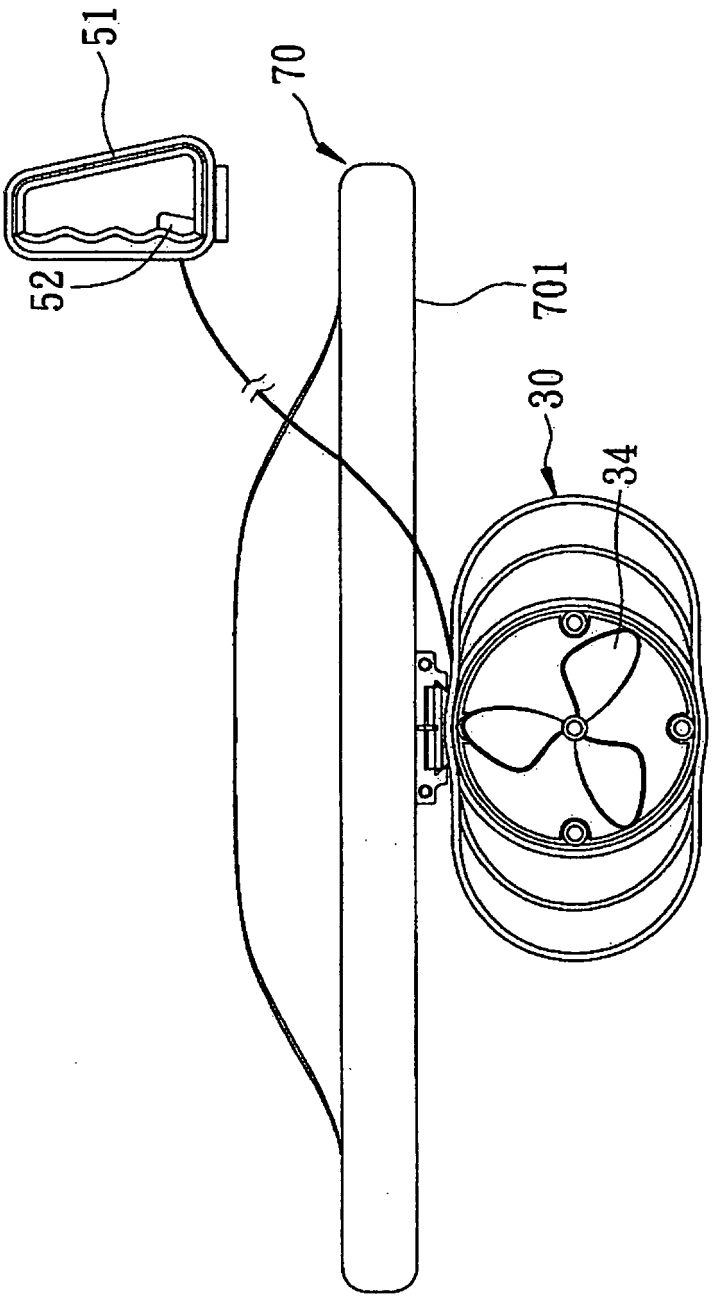

FIG. 11

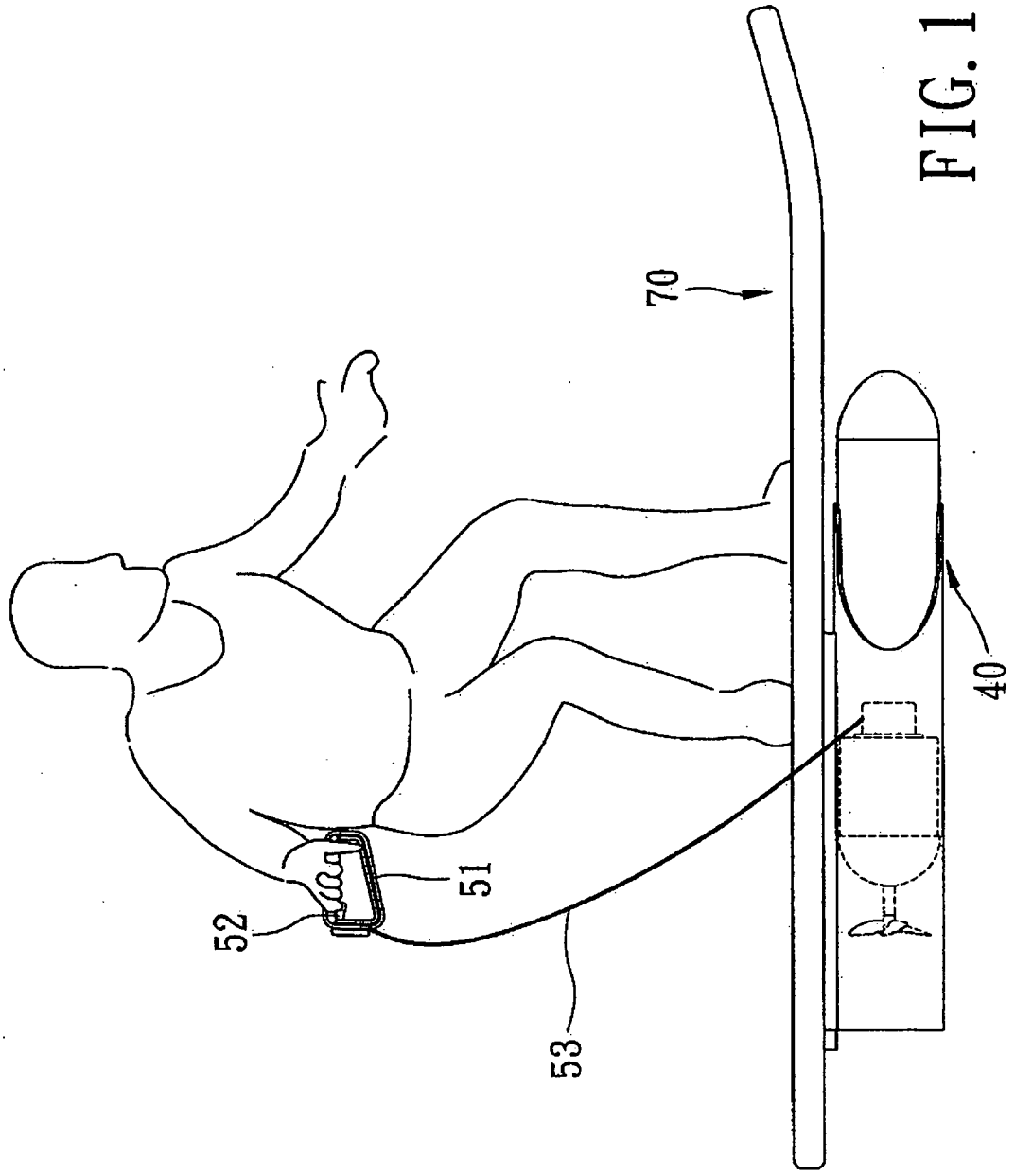

FIG. 12

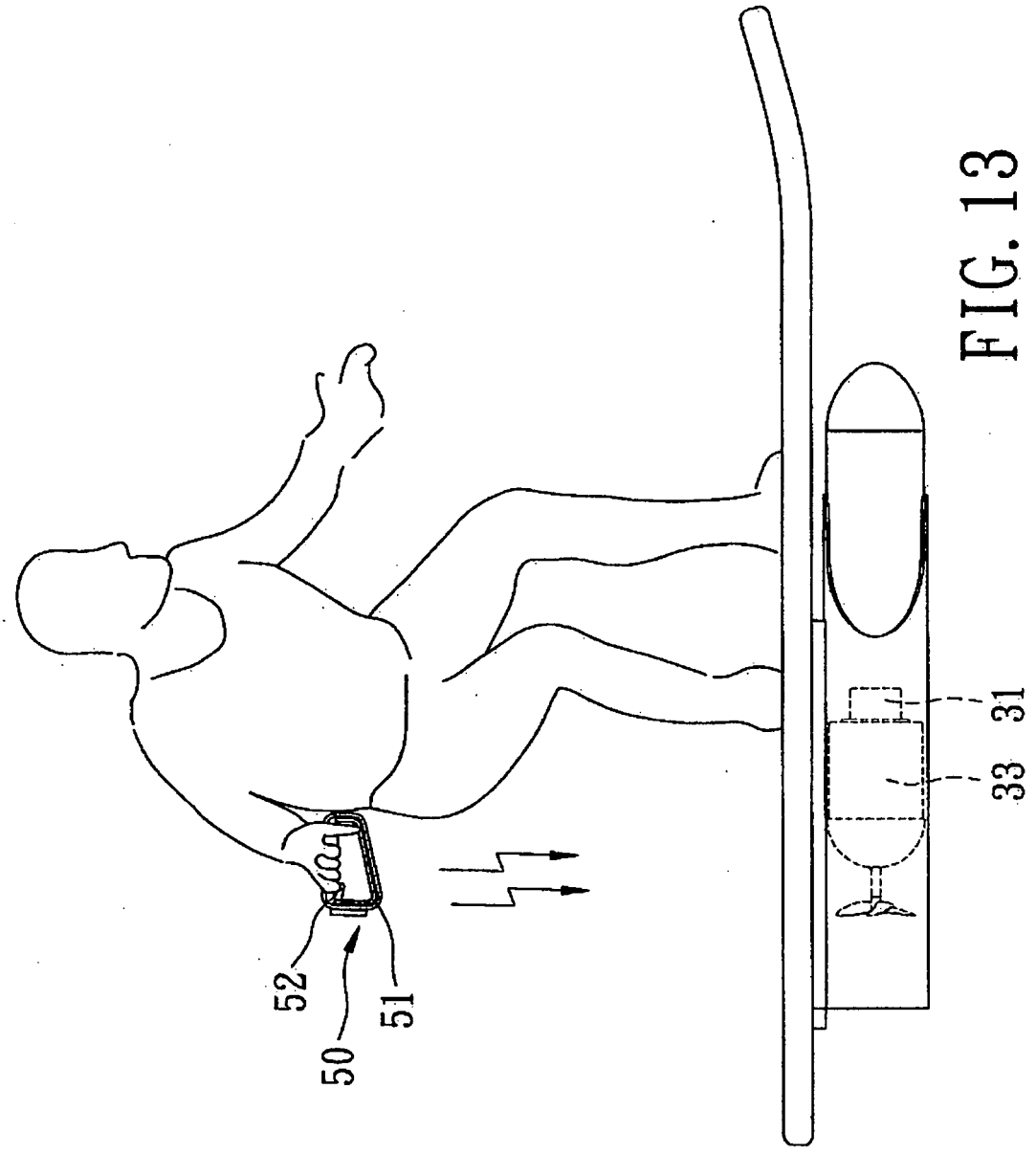

FIG. 13

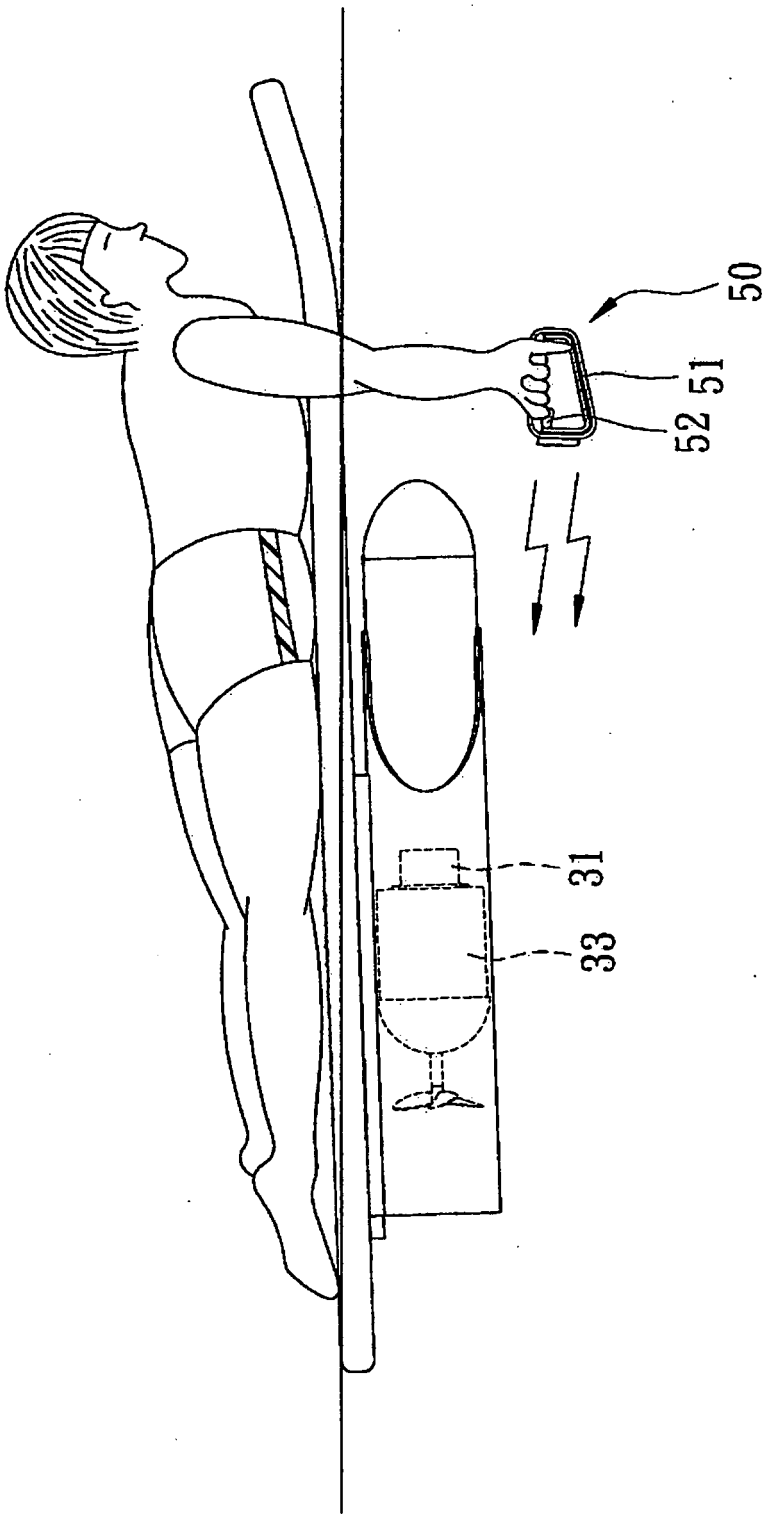

FIG. 14