Sept. 16, 1969 R. J. ARAGONA 3,467,091

UNDERWATER BREATHING DEVICES WITH VALVED AIR SUPPLY MEANS

Filed Jan. 4, 1968 4 Sheets-Sheet 1

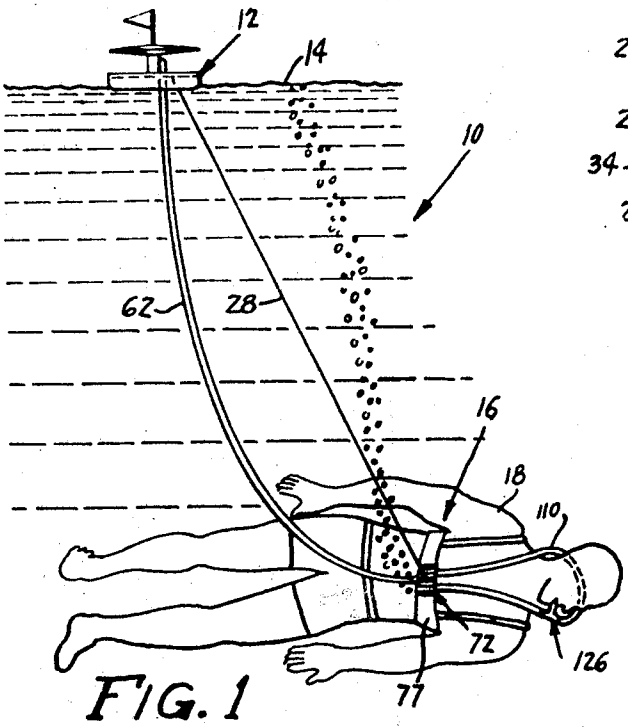


FIG. 1

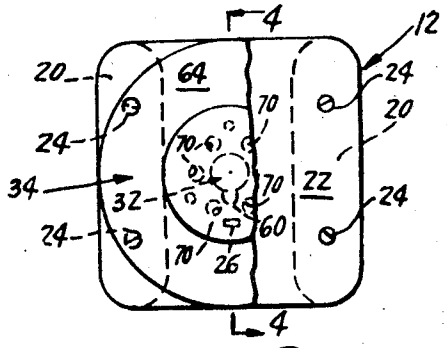


FIG. 2

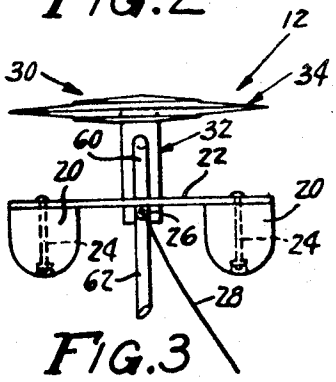


FIG. 3

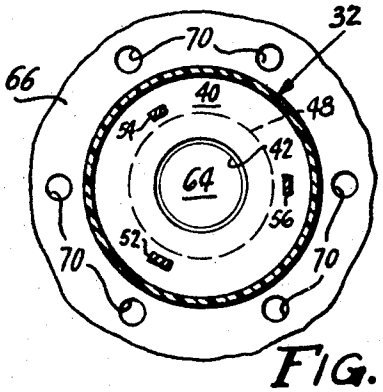


FIG. 6

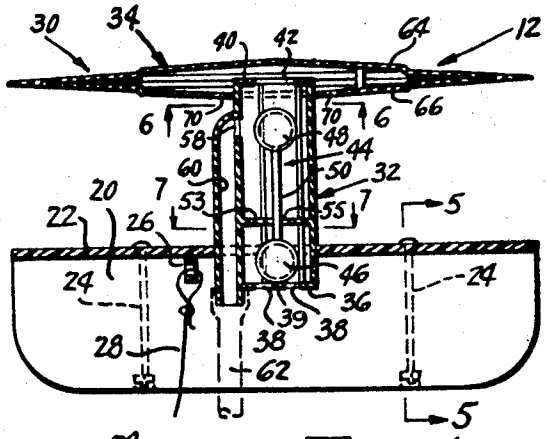


FIG. 4

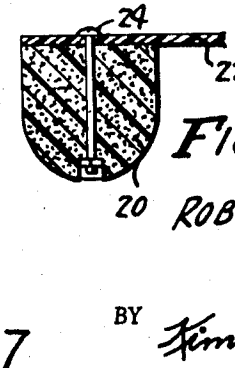


FIG. 5

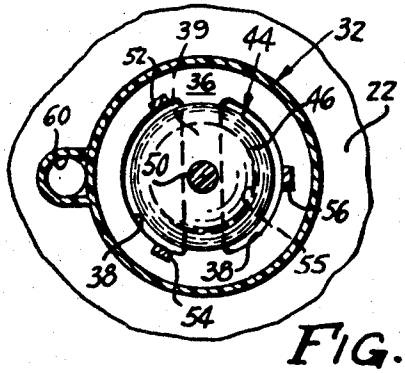


FIG. 7

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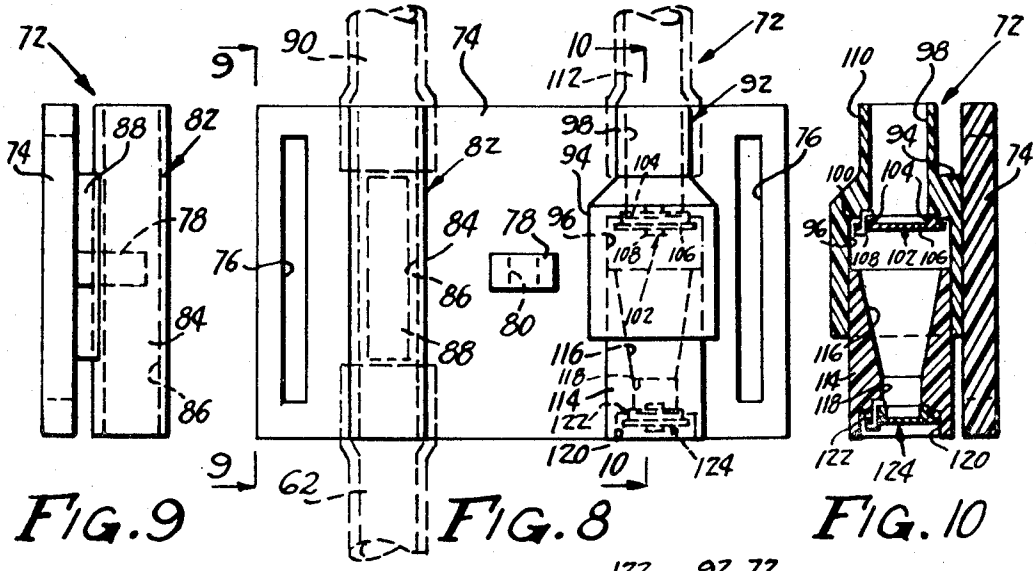


FIG. 9 FIG. 8 FIG. 10

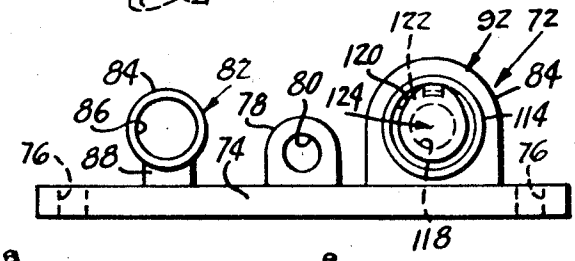


FIG. 11

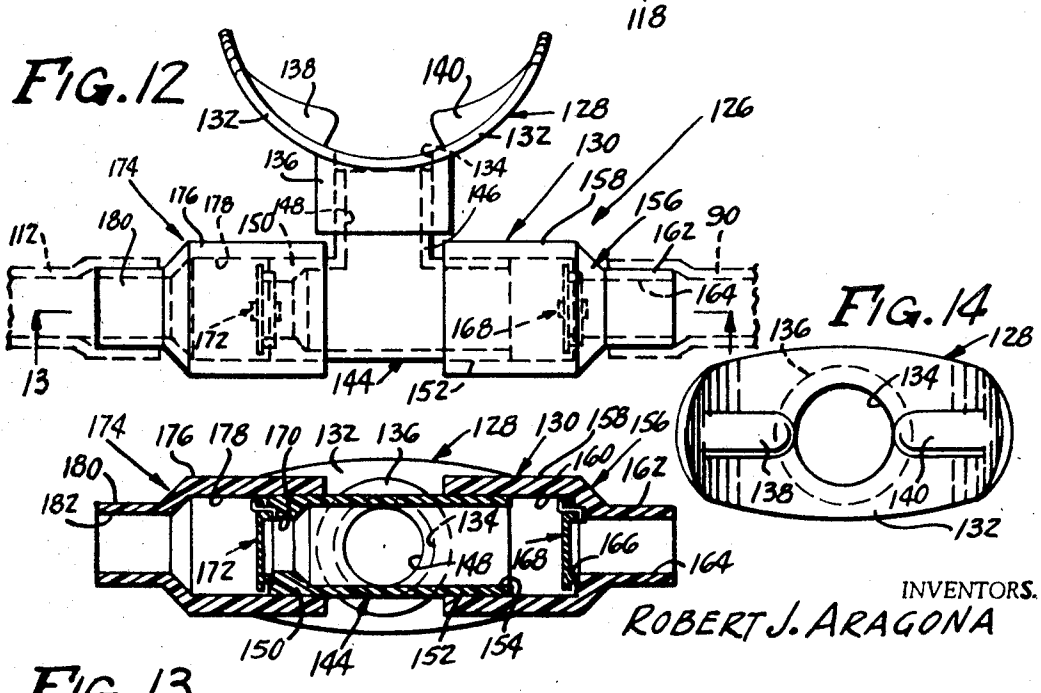


FIG. 12 FIG. 14 FIG. 13

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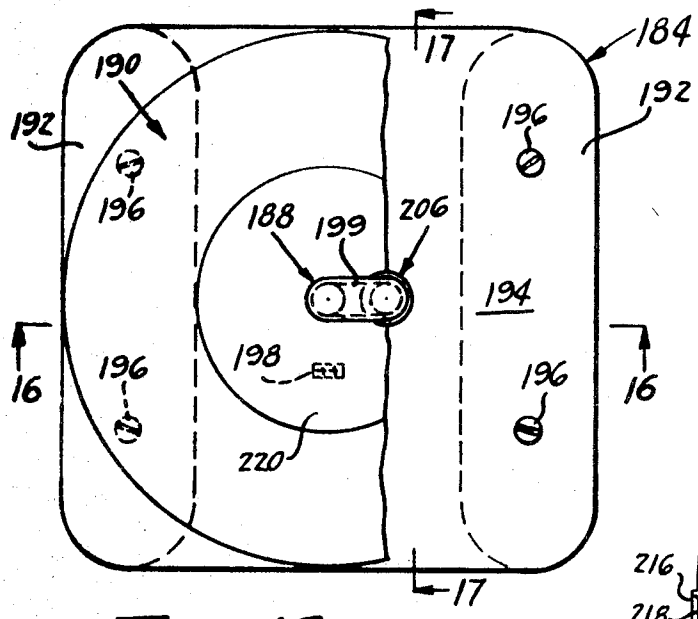


FIG. 15

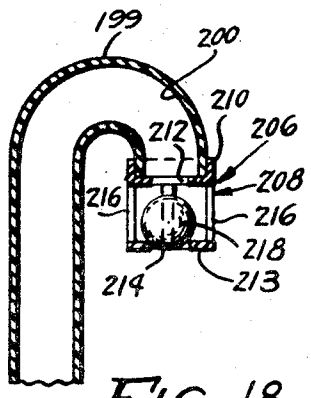


FIG. 18

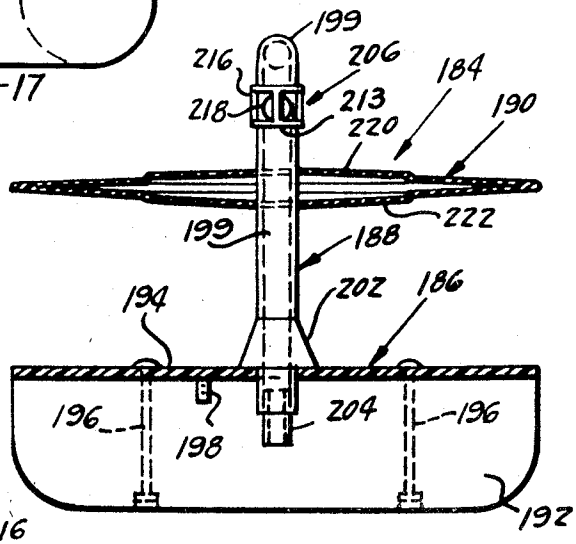


FIG. 17

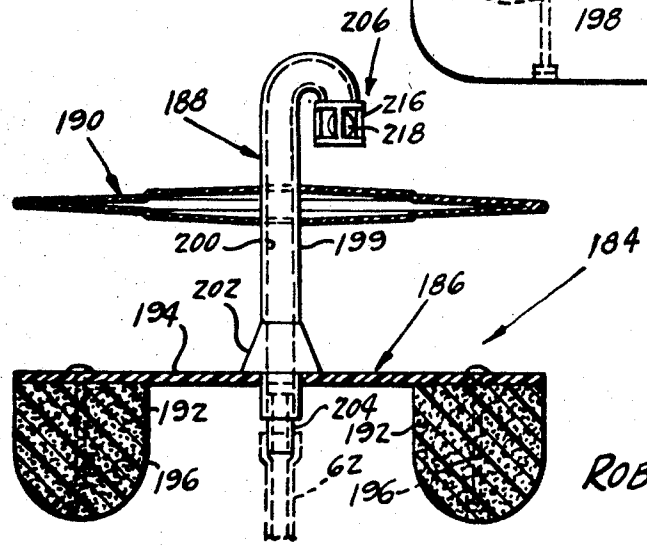


FIG. 16

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FIG. 19.

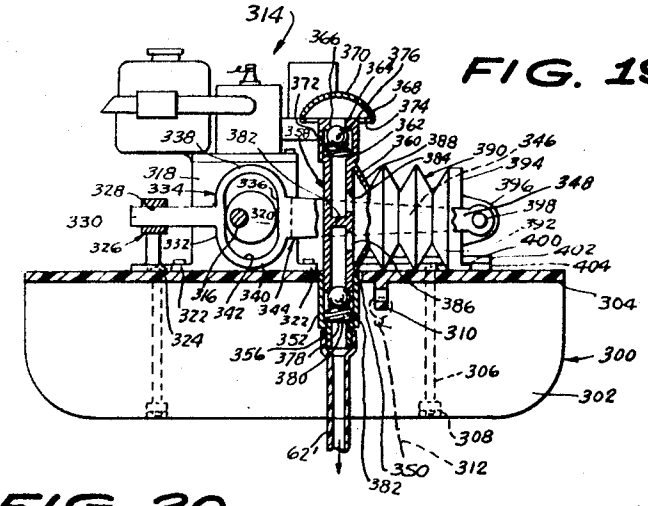


FIG. 20.

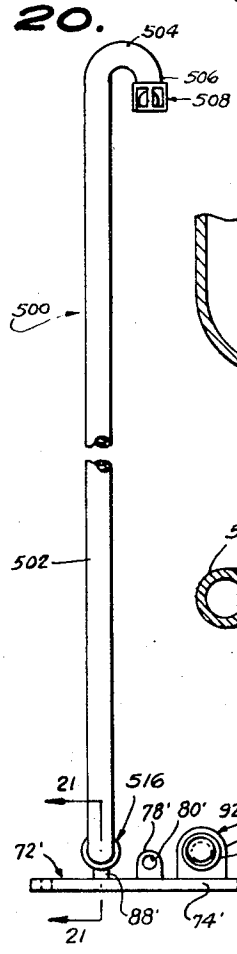


FIG. 21.

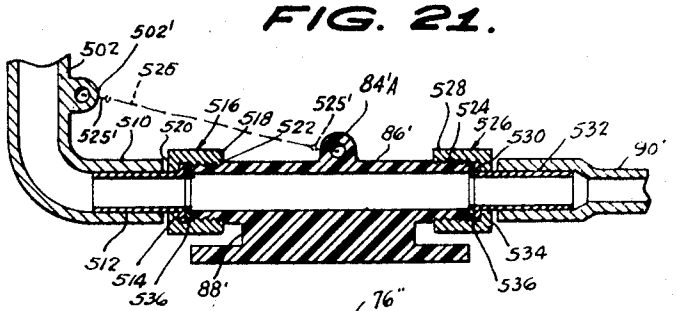
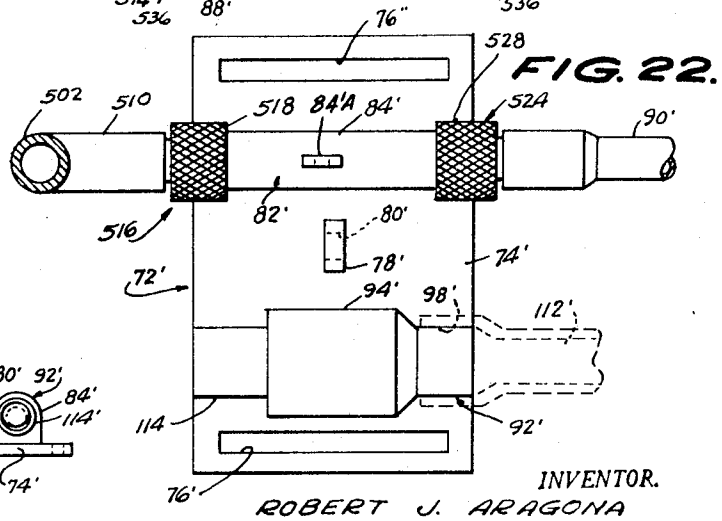


FIG. 22.



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United States Patent Office 3,467,091 Patented Sept. 16, 1969

3,467,091

UNDERWATER BREATHING DEVICES WITH VALVED AIR SUPPLY MEANS

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Filed Jan. 4, 1968, Ser. No. 695,734
Int. Cl. A62b 7/00
U.S. Cl. 128—145 1 Claim

ABSTRACT OF THE DISCLOSURE

A snorkel type of underwater breating apparatus including a float supported source of air under pressure connected with a valved air passage, and an air hose; the float and air hose being attached to a harness worn on the swimmer's body whereby the float may be towed by the swimmer; and the mouthpiece has a pair of conduits which are supported on the harness, one being attached to the air hose and the other opening into the water. In an alternate construction, the air passage comprises an elongated length of a hollow tubular member having an end thereof normally exposed to the ambient atmosphere and the other end connected to the harness to be towed by the swimmer as before.

Cross-reference to related application

This invention relates to an improvement over the copending patent application of Jerome T. Fryling and myself, patent application Ser. No. 460,031, filed June 1, 1965, now Patent No. 3,370,586 and entitled "Underwater Breathing Device With Valved Float."

Background of invention

As in the patent supra, this invention relates to an underwater breathing device which is so constructed and arranged as to preclude the inadvertent inhalation of water by the user, and is directed to the achievement of the objects recited in its parent case and others, all of which are recapitulated and developed infra.

Thus, one of the primary objects of the instant invention is to provide an underwater breathing device which utilizes the breathing power of the user to inhale air from an above water air station.

Another object of this invention is to provide an above water air inlet station which precludes the inhalation of water into the air distribution system of an underwater breathing device.

A further object of this invention is to provide an underwater breathing device in which exhaust air is admitted rearwardly of the face of the user.

A still further object of this invention is to provide an underwater breathing device having a single hose communicating with the surface in order to avoid tangling of hoses.

Still another object of this invention is to provide pivotally mounted pressure operated check valves to control the flow of air within the apparatus.

The invention has as a still further object thereof the provision of a float having an air inlet station which precludes the entry of water into the breathing apparatus.

Still another object of this invention is to provide a float supported source of air under pressure valved to preclude entry of water into the air inlet system.

It is still another object of this invention to provide an elongated normally upright rigid air supplying conduit for direct connection at one of its ends with the air inlet system of the apparatus, the other end comprising a valved air inlet exposed to the ambient atmosphere.

As still a further object of this invention, it is proposed

to provide threaded coupling means throughout the air inlet system of the apparatus.

This invention contemplates, as a still further object thereof, the provision of apparatus of the type described supra, the apparatus being noncomplex in construction and assembly, inexpensive to manufacture and maintain, and which is rugged and durable in use.

Other and further objects and advantages of the instant invention will become more evident from a consideration of the following specification when read in light of the annexed drawings.

In the drawings:

FIGURE 1 is a pictorial view showing the underwater breathing apparatus of the instant invention as it appears in use;

FIGURE 2 is a top plan view of the float device utilized in the underwater breathing apparatus of the instant invention, certain parts being broken away for clarity of illustration;

FIGURE 3 is a front elevational view of the float of FIGURE 2;

FIGURE 4 is a longitudinal sectional view of the float of FIGURE 2, taken along line **4—4** thereof and viewing in the direction of the arrows;

FIGURE 5 is a transverse sectional view of FIGURE 4 taken along line **5—5** thereof and viewing in the direction of the arrows;

FIGURE 6 is a cross-sectional view of the device of FIGURE 4 taken along line **6—6** thereof and viewing in the direction of the arrows;

FIGURE 7 is a cross-sectional view of the float of FIGURE 4 taken along line **7—7** thereof and viewing in the direction of the arrows:

FIGURE 8 is a top plan view of the inlet and outlet connections carried by a user;

FIGURE 9 is an end elevational view of the structure of FIGURE 8 as seen along line **9—9** viewing in the direction of the arrows;

FIGURE 10 is a longitudinal sectional view of the fresh air conduit, taken along line **10—10** of FIGURE 8 and viewing in the direction of the arrows;

FIGURE 11 is a front elevational view of the structure of FIGURE 8;

FIGURE 12 is a top plan view of a mouthpiece and air conduits of the instant invention;

FIGURE 13 is a longitudinal cross-sectional view of the air conduits shown in FIGURE 12 taken along line **13—13** and viewing in the direction of the arrows;

FIGURE 14 is a front elevational view of the mouthpiece of FIGURE 12;

FIGURE 15 is a top plan view of another embodiment of a float of the instant invention, certain parts being broken away for clarity of illustration;

FIGURE 16 is a transverse sectional view of the float of FIGURE 15, taken along line **16—16** thereof and viewing in the direction of the arrows;

FIGURE 17 is a longitudinal cross-sectional view of the float of FIGURE 15, taken along line **17—17** thereof and viewing in the direction of the arrows;

FIGURE 18 is a cross-sectional view of the air inlet of the float shown in FIGURES 15 to 17;

FIGURE 19 is a detail cross-sectional view of a float supported means for supplying air under pressure to the air inlet distribution system of this invention, FIGURE 19 illustrating a still further embodiment;

FIGURE 20 is an end elevational view of the back or harness and air inlet means constructed according to a still further embodiment of this invention;

FIGURE 21 is an enlarged fragmentary detail cross-sectional view FIGURE 21 being taken substantially on the vertical plane of line **21—21** of FIGURE 20, looking in the direction of the arrows; and

FIGURE 22 is a top plan view of the assembly shown in FIGURE 20.

Referring now more specifically to the drawings, reference numeral **10** designates, in general, an underwater breathing apparatus constructed in accordance with the teachings of this invention and comprising a float or buoy shown generally at **12** which is adapted to ride on the surface **14** of a body of water, and an air distribution system which carries the general reference numeral **16**, the latter being shown as secured to an underwater swimmer or user **18** to supply the user with sufficient quantities of air for breathing purposes.

Referring now to FIGURES 2 to 7 inclusive, float **12** includes two laterally spaced floatable supports or pontoons **20** which may be of wood, styrofoam or the like, and which are fixedly secured to a horizontal transverse platform **22** by a series of substantially vertical conventional nut and bolt connecting members **24**. Dependingly secured to the under side of platform **22** between pontoons **20** is an eye **26** which acts as a securing means for a tow rope or wire **28** as more fully explained hereinafter. It should be noted that the configuration of pontoons **20** and eye **26** provides an easily towable float as shown in FIGURE 3. It is apparent that the configuration of FIGURE 3 is more easily towed than is an innertube, for example, which presents a frictional surface transverse to the direction of travel.

Secured centrally of platform **22** is a mushroom-shaped structure shown generally at **30** which houses the air inlet mechanisms of the instant invention. Mushroom-shaped structure **30** comprises a vertical tube shown generally at **32** secured to platform **22** so that a portion of tube **32** extends below platform **22** and a horizontal disc indicated generally at **34** secured to the uppermost end of vertical tube **32**.

Tube **32** includes a bottom wall **36** which is provided with a pair of openings **38** separated by a cross bar **39**, each opening having the confiuration of a segment of a circle, and a top wall **40** having an aperture **42** for the entry of air as will be more fully explained hereinafter. Disposed within tube **32** is a valve closure indicated generally at **44** comprising a lower float **46**, an upper ball-shaped closure member **48** and a shaft **50** fixedly connecting float **46** and valve closure **48**.

As more fully explained hereinafter, valve closure member **44** must be made of a material which floats in water, such as for example, wood, styrofoam, plastic or the like. Secured between upper and lower walls **36**, **40** and forming a guide means for valve closure member **44** are three spaced rods **52**, **54**, **56** to insure that valve closure member **44** reciprocates linearly so that ball closure **48** will close aperture **42**. Also secured within tube **32** is a flange **53** having an aperture **55** that cooperates with ball valve or float **46** to create an air lock within tube **32** to preclude the entry of water into the air distribution system leading to a swimmer. Secured to one side of tube **32** and communicating with the interior thereof through opening **58** is an air outlet tube **60** to which is secured a fresh air conduit **62** as is more fully explained hereinafter.

Horizontal disc **34** includes an upper impervious circular plate **64** and a lower plate **66** having a central aperture **68** formed therein and in which is fixedly secured the upper end of the tube **32**. The lower plate **66** is also provided with a series of laterally spaced air inlets **70**. The plates **64**, **66**, as shown in FIGURE 4, are spaced apart at their center to provide an air conduit between the air inlets **70**, opening **42**, opening **58** in tube **32**, tube **60** and fresh air conduit **62**.

From the previously mentioned structure, it is seen that the float or buoy **12** provides an air supply for an underwater swimmer in which it is practically impossible in inhale water. For example, the positioning of air inlets **70** beneath horizontal disc **34** precludes the inhalation of water produced by waves on surface **14**. The use of a floating reciprocable valve **44** results in the closing of aperture **42** when float **46** is raised by an upsurging wave while the placement of opening **58** precludes the wave from entering tube **60** and fresh air conduit **62**.

Referring now to FIGURES 8 to 11 inclusive, there is shown generally at **72** a support means comprising a substantially planar platform **74** having an elongate slot **76** at each end thereof for the reception of a body encompassing strap **77** which secures support means **72** to the torso of a swimmer as shown in FIGURE 1. Support means **72** includes a centrally mounted upstanding lug **78** having an aperture **80** into which is looped wire **28** for towing float **12**. As previously mentioned, the relationship between eye **26**, rope or wire **28**, and lug **78** results in the movement of float **12** over surface **14** in a most expeditious manner.

Secured to platform **74** between upstanding lug **78** and one edge of platform **74** is an air inlet support generally shown at **82** comprising a cylindrical tube **84** having an interior conduit **86** and secured to plate **74** by a depending bracket **88**. As shown in FIGURE 8 one end of air inlet **82** is secured to fresh air conduit **62** while the other end of fresh air conduit **82** is secured by a second fresh air conduit **90** to a breathing apparatus held in the mouth of a swimmer as is more fully explained hereinafter.

Secured on the support means **72** on the other side of upstanding lug **78** is an air exhaust support generally indicated at **92** including a first support section **94** secured to platform **74** in any conventional manner and having a first enlarged aperture **96**, a second smaller aperture **98** communicating therewith and a shoulder **100** formed at the juncture of apertures **96**, **98**. Pivotally mounted on shoulder **100** is a flap-type check valve indicated generally at **102** comprising an annular upstanding sealing ring **104** secured to shoulder **100** and a circular closure plate **106** mounted on an S-shaped spring **108** one end of which is secured to shoulder **100**. As shown in FIGURES 8 and 10, closure plate **106** overlaps annular sealing ring **104** with spring **108** providing the biasing forces necessary to effectuate a one-way closure.

Fitted about a smaller section **110** of first support **94** is an exhaust air conduit **112** which conducts the exhaust gas from a breathing apparatus held in the mouth of a swimmer as will be more fully explained hereinafter.

Secured within enlarged aperture **96** is a second cylindrical support **114** comprising a first frusto-conical aperture **116** communicating through a circular aperture **118** to an enlarged circular aperture **120**. As shown in FIGURES 8 and 10, the differences in diameters of apertures **118**, **120** creates a shoulder **122** on which is mounted a flap-type check valve **124** of identical configuration with check valve **102**.

As will be more fully explained hereinafter, the exhaled air from a swimmer travels through conduit **112** into aperture **98** and opens flap-type check valve **102** against the biasing forces produced by spring **108**. Unless the swimmer is taking very short breaths, the amount of air exhaled will not only open check valve **102** and fill the volume between check valves **102**, **124**, but will also open check valve **124** with the exhaled air escaping through a body of water as indicated in FIGURE 1. It should be apparent that the use of two check valves in air exhaust support **92** precludes the possibility of an inflowing rush of water reaching a swimmer.

Referring now to FIGURES 12 to 14 inclusive, there is indicated generally at **126** a breathing apparatus including a mouthpiece indicated generally at **128** and a distribution T indicated generally at **130**.

Mouthpiece **128** comprises an arcuate substantially semicircular flange **132** having a centrally disposed aperture **134** about which is secured a collar **136** for engagement with distribution T **130**. Mouthpiece **128** also includes a pair of centrally mounted coplanar sections **138**,

140 which a swimmer may grasp between his teeth in a conventional manner.

Distribution T 130 includes a male T shown generally at 144 having a first leg 146 formed with an aperture 148 fixedly secured in collar 136 of mouthpiece 128. T 144 also includes a second leg 150 and a third leg 152, legs 150, 152 forming a common aperture 154 communicating with aperture 148 and consequently with aperture 134 of mouthpiece 128.

Secured about leg 152 of T 144 is a connecting member shown generally at 156 comprising an enlarged cylindrical body 158 having an enlarged aperture 160 fixedly receiving leg 152. Connecting member 156 also includes a smaller cylindrical section 162 having a smaller aperture 164 communicating with aperture 160 and forming a shoulder 166 formed at the junction of the apertures. As intimated previously, fresh air conduit 90 connects fresh air support 82 with cylindrical section 162, thus providing fresh air communication between float 12 and mouthpiece 128.

Mounted on shoulder 166 is a flap-type check valve 168 of identical configuration with check valves 102 and 124, as more fully explained hereafter. Leg 150 of male T 144 forms an aperture 170 of smaller diameter than aperture 154 with a check valve indicated generally at 172 mounted on the annular ring of leg 150.

An exhaust connection indicated generally at 174 includes a first enlarged cylindrical section 176 forming an enlarged aperture 178 fixedly secured about leg 150 and a second smaller cylindrical section 180 forming a smaller aperture 182 communicaitng with opening 178. As previously indicated, exhaust hose 112 provides communication between exhaust air connection 92 and mouthpiece 128.

In the operation of breathing apparatus 126, mouthpiece 128 will be grasped in the teeth of a user so that the user may breathe through the mouth. Upon inhalation, check valve 172 will remain closed with check valve 168 opening, thus providing a flow of fresh air from float 12 through fresh air conduit 62, fresh air support 82, fresh air conduit 90 and distribution T 130. Upon exahalation, check valve 168 will close with check valve 172 opening thus allowing the flow of stale air from mouthpiece 128 to exhaust air support 92 through exhaust air conduit 112. As previously explained, check valves 102, 124 will open upon the flow of fresh air through support 92, thus discharging exhaled air rearwardly of the user as indicated in FIGURE 1.

Referring now to FIGURES 15 to 18 inclusive, there is indicated generally at 184 a modified form of a float which may be utilized with the remainder of the components of the instant invention and which comprises a supporting structure indicated generally at 186, an air inlet tube shown generally at 188 and a horizontal disc indicated generally at 190.

Supporting means 186 is of similar configuration to that of float 12 and comprises a pair of parallel spaced apart floating supports or pontoons 192 secured to a horizontal transverse platform 194 by any conventional fastening means, such as nuts and bolts 196. Dependingly secured to the underside of platform 194 is an eye 198 for securement with a tow rope or tow wire as previously explained. Air inlet tube 188 comprise an inverted J-shaped tube 199 forming a central aperture 200 and secured to platform 194 by a frusto-conical connecting member 202. Tube 199 extends below platform 194 and is connected to a fresh air conduit 62 by an intermediate connecting member 204.

The upper end of tube 199 is equipped with a ball-type check valve indicated generally at 206 which is composed of a valve cage shown generally at 208 in FIGURE 18. Valve cage 208 includes an upper plate 210 having a circular valve seat 212 coaxial with opening 200 of air inlet tube 199. Valve cage 208 also includes a lower plate 213 having an aperture 214 and a plurality of valve guides 216 connecting plates 210 and 213. A ball valve 218 is positioned within valve cage 208 such that air may normally flow through valve seat 212 into tube 198, but should water attempt to enter tube 199 it will carry floatable ball valve 218 into seating engagement with valve seat 212.

Horizontal disc 190 includes an upper surface 220 and a lower surface 222 spaced apart at their centers as shown in FIGURE 17. It should be apparent that horizontal disc 190 isolates valves 206 from any wave action initiating from water surface 14 except for a breaker, which will necessarily approach valve 206 from an upwardly direction thus allowing valve seat 212 to be open under ordinary conditions. It is apparent that this construction provides a substantially continuous source of air for an underwater swimmer.

FIGURE 19 illustrates still another embodiment of this invention. In this figure, reference numeral 300 designates a float similar to the float 12. As such, the float 300 includes a pair of laterally spaced buoyant supports or pontoons 302, only one of which is shown in this figure. The pontoons 302 may be formed of wood, styrofoam or the like, and are fixedly secured to the underside of a normally horizontal transverse platform 304 having a substantially rectangular configuration. The pontoons 302 and platform 304 may be connected together by a series of normally upright conventional bolt 306 and nut connecting members 308, or by other means known in the arts. Dependingly secured to the underside of the platform 304 and inwardly spaced from the peripheral edges thereof is an eye 310 which, if desired, may be utilized as means for securing a tow rope or wire 312, shown in dotted lines, in the manner fully explained hereabove.

Reference numeral 314 designates, in general, a conventional lightweight gasoline motor and of a type well known in the art. The motor 314 includes as a component thereof the drive shaft 316 which extends laterally and exteriorly from the crankcase 318. Fixedly connected on the drive shaft 316 is an off-center relationship is the eccentric disc 320. The crankcase 318 is flanged as at 322 to receive bolts 324 therethrough for connection with the platform 304 in the usual manner to fixedly connect the motor 314 thereto.

Reference numeral 326 denotes a conventional upright bushing having its lower end fixedly connected to the platform 304, the upper end of the bushing 326 is bored as at 328 to provide an elongated transversely extending opening preferably cylindrical about a normally horizontal axis. The bore 328 slidably receives for reciprocation therethrough one end of an elongated substantially cylindrical shaft 330, the other end of the shaft 330 being integrally connected to the side wall 332 of an open oblong ring 334. As is seen in FIGURE 19, the ring 334 includes a second side wall 336 oppositely disposed with respect to the side wall 332, and a pair of opposed arcuate end walls 338, 340, the side and end walls being integrally connected together to form the inner continuous peripheral oblong track 342. The ring 334 receives the eccentric disc 320 therein for sliding engagement with the track 342 to serve a function to be described.

Integrally formed with the side wall 336 and projecting laterally therefrom in a direction away from the shaft 330 is a bifurcated member 344 which includes a pair of elongated oppositely disposed laterally spaced and substantially parallel arms 346, 348 which are disposed adpacent their connected inner ends in vertically spaced relation and at diametrically opposed sides of an opening 350 which extends transversely through the platform 304 intermediate the opposed ends thereof.

Fitted in the opening 350 is the upper end of a substantially hollow cylindrical side wall 352 of a valve assembly 354. The lower end of the side wall 352 is reduced in diameter to provide a neck 356 to which is connected one end of a fresh air conduit 62' corresponding

to and functioning exactly as the conduit **62** heretofore described.

Seated in the upper end of the side wall **352** and fixedly secured therein is the lower end of a substantially rigid vertically elongated and substantially hollow tubular cylindrical pipe **358** having its upper end disposed above the platform **304**. The pipe **358** includes a cylindrical side wall **360** having an enlarged hollow cylindrical head **362**. The upper terminal end of the side wall **360** terminates in a transversely extending closure wall **364** centrally apertured as at **366**. A plurality of struts **368** radially project from the upper end of the cylindrical head **362** and the outer ends of the struts **368** are integrally connected to the circumferential marginal edge of a concave-convex wave shield **370**, the shield **370** being mounted with its apex falling on the center line of the aperture **366**. In forming the enlarged head **362** a shoulder **372** is provided which serves as an abutment for one end of a spiral spring **374**, the other end of the latter receiving and supporting a ball check valve **376** and constantly biasing the same for movement to seat across the inner end of the aperture **366** to close and seal the same.

In a like manner, and in forming the neck **356**, the construction provides an inwardly disposed cylindrical shoulder **378** on the side wall **352**, and this shoulder serves as an abutment for one end of a spiral spring **380**. As is seen in FIGURE 19, the other end of the spring **380** supports a second ball check valve **382** which is constantly biased for movement to seat against and close the lower end of the pipe **358**. The side wall **360** of the pipe **358** is also provided with an integrally formed transversely extending divider wall **382** and a pair of air openings **384**, **386**, disposed, respectively, on opposite sides of the divider wall **382** and in longitudinally spaced coaxial alignment relative to the side wall **360**.

Fixedly connected and sealed to the outer side of the side wall **360** and spanning and enclosing the openings **384**, **386** is one end section **388** of a conventional air bellows **390** having an opposed end section **392** fixedly connected and sealed to an upright plate **394**.

The pipe **358**, bellows **390** and plate **394** are positioned between the arms **346**, **348** intermediate the ends thereof, and the plate **394** is fixedly connected to a laterally extending lug **396**, and the latter is connected by a pin **398** to the outer terminal ends of the arms **346**, **348**. The lower end of the plate **394** is integrally connected to a laterally projecting shoe **400** which is slidably received for reciprocable movement below a hold-down rail **402** which extends longitudinally of the platform **304**. As is seen in FIGURE 19, the hold-down rail **402** is mounted in spaced relationship relative to the platform **304** on a block **404**, and the latter is rigidly secured to the platform **304** by conventional means.

The construction and operation of the air pump described above is well known to those skilled in this art and needs but little description. With the driving motor **314** operating, the drive shaft **316** rotates to cause the eccentric disc **320** to move through its path and trace the track **342**. With the eccentric disc **320** in the position shown in FIGURE 19, the bifurcated member **344** has moved to its maximum position to the right to effect the greatest expansion of the bellows **390**. Now as the eccentric disc **320** is turned by the shaft **316** in either direction of its movement, the member **344** including its arms **346**, **348** are moved to the left as viewed in FIGURE 19. This movement causes, of course, the collapse or compression of the bellows **390** in the conventional manner.

With the expansion of the bellows **390**, air is drawn below the shield **370** and the ball check valve **364** is unseated to permit the air to pass through the aperture **366** and into the pipe **358**. Air leaves the pipe **358** through the opening **384** and enters the bellows **390**. As this operation takes place the ball check valve **382** is maintained in its seated position.

Now as the bellows is compressed as described below, the ball check valve **376** closes and the ball check valve **382** opens to admit the compressed air to pass into the fresh air conduit **62** to serve the functions heretofore described. It will be understood, of course, that as the disc **320** continues its turning movement, the bellows **390** will be expanded, as before, permitting the ball check valve **382** to again seat and the ball check valve **376** to open.

Any desired pump monitoring means (not shown) of a conventional design may be utilized in connection with the air pump apparatus to ensure that at no time will an excessive amount of fresh air under pressure be admitted to the underwater breathing equipment.

FIGURES 20, 21 and 22 illustrate a snorker device constructed in accordance with this invention. The snorkel is seen to comprise an elongated substantially hollow cylindrical conduit **500** having a cylindrical side wall **502**. The snorkel **500**, adjacent one of its ends, is reverted as at **504** to provide an extension **506** facing the other end of the conduit **500** and being disposed substantially parallel to the longitudinal axis of the side wall **502**. The extended end **506** is equipped with the ball check valve **508** identical in construction with respect to the check valve **206** described above.

The conduit **500** is formed of a rigid material, any desirable lightweight plastic material is preferable, and the other end of the conduit **500** is bent, substantially at right angles with respect to the longitudinal axis of the side wall **502** to terminate in the end **510**.

The end **510** has fixedly secured therein by conventional means, one end of an elongated substantially hollow cylindrical sleeve **512**, the other end of the sleeve being flanged as at **514**. Slidably and rotatably mounted on the sleeve **512** is a coupler **516** which includes an internally threaded side wall **518** also cylindrical in configuration and a centrally apertured end wall **520** which is adapted to abut against the flange **514**. This coupling construction is old and well known in the several arts.

With specific reference to FIGURES 21 and 22, reference numeral **72'** designates substantially the same structure described above and illustrated in FIGURES 8 to 11, inclusive. As such, the support means **72'** includes a substantially planar platform **74'** having an elongated slot **76'** at each end thereof for receiving the body encompassing strap (not shown) described above. The support means **72'** includes a centrally mounted upstanding lug **78'**, as before, the lug being provided with the aperture **80'** which serves the function heretofore described.

Secured to the platform **74'** between the upstanding lug **78'** and one edge of the platform **74'** is an air inlet support **82'**, the structure of which is somewhat modified with respect to the structure of the support **82** described above. The air inlet support **82'** comprises an elongated substantially cylindrical tube **84'** having an interior conduit **86'**, and the tube **84'** is secured to the platform **74'** by a depending bracket **88'**. One of the ends of the tube **84'** is externally threaded as at **522** for threaded engagement with the internally threaded coupler **516**, and the other end of the tube **84'** at its other end is externally threaeded as at **524** for threaded engagement with a second coupler **526** which is identical to the coupler **516**. As such, the coupler **526** includes the internally threaded side wall **528** having a centrally apertured end wall **530** at one of its respective ends. The end wall **530** encompasses one end of an elongated substantially hollow cylindrical sleeve **532** flanged as at **534**. As is seen in FIGURE 21, the two flanges are adapted for abutting engagement with one another, and the coupler **526** is both slidably and rotatably mounted on the sleeve **532**. The other end of the sleeve **532** is telescoped within and is fixedly secured to the adjacent end of a second fresh air conduit **90'**. The other end of the conduit **90'** is adapted for connection to the breathing apparatus heretofore described above. Sealing gaskets **536** are, preferably, interposed

between the flanges **514**, **534** and the adjacent threaded ends **522**, **524** of the tube **84'**.

In the use of the apparatus described and shown in FIGURES 20 to 22, inclusive, the conduit **502** is of such length as to permit the diver or swimmer to swim underwater to a depth which is substantially fixed by the length of the conduit. While the conduit may be free of all supports other than its coupled connection with the support **72'**, it is preferable that some means be provided to prevent the inadvertent turning of the conduit about the longitudinal axis of the end **510**. To accomplish this object, the side wall **502** may have an eye **502'** integrally formed therewith or otherwise secured thereto. A similar eye **84'A** is formed on the tube **84'**, and the two eyes **502'**, **84'A** are then connected together via an elongated guy wire **525** as by conventional connector means **525'** at each end thereof.

The threaded coupling means described and illustrated in this last embodiment of the invention provide means against the accidental separation of the fresh air supply conduits from the tube **84'** which might otherwise take place during use by the wearer of the equipment.

The remaining elements mounted on the support means **72'** are identical to those shown and described above and require no explanation here as to the nature and construction thereof. Being identical, these elements bear the same reference numerals as before but to which has been added the prime mark.

Having described and illustrated a plurality of embodiments of this invention in detail, it will be understood that the same are offered merely by way of example, and that this invention is to be limited only by the scope of the appended claim.

What is claimed is:

1. Apparatus for supplying fresh air to underwater breathing apparatus comprising

water buoyant support means including a platform having a transverse opening extending therethrough, a pair of pontoons secured to said platform on the underside thereof and in spaced relationship relative to one another and at opposite sides of said opening:

means for supplying air under pressure mounted on the upper side of said platform and comprising

an elongated substantially hollow pipe having a lower end secured in said opening and projecting below said underside of said platform, said pipe having an upper end extending above the upper side of said platform and opening to the atmosphere, an elongated conduit having one end thereof connected on said lower end of said pipe and its other end operatively connected with said underwater breathing apparatus, one-way check valve means normally biased to their closed positions and disposed adjacent, respectively, said upper and lower ends of said pipe, a divider wall extending transversely of said pipe intermediate its ends, said pipe having a pair of air openings formed therein, said air openings being disposed, respectively, one on each side of said divider wall;

a bellows air pump mounted on said platform and having an end of its bellows connected on said pipe and spanning said air openings;

said air pump being operable on expansion of said bellows to open the upper check valve against its bias to draw air into said upper end of said pipe, the adjacent air opening, and into said bellows, and said air pump being operable on compression of said bellows to force the air therein through the lower air opening to unseat the lower check valve means to force the air therein through the lower air opening to open the lower check valve means to pass the air under pressure through the lower end of said pipe through said conduit to said underwater breathing apparatus.

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