



water gill, inc.

UNDERWATER INNOVATORS

At-Pac

FSDS Regulators

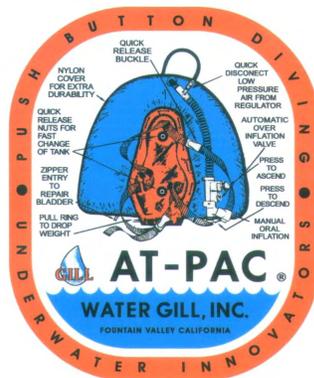
About the Author:

I received my first SCUBA certification in 1975 (NAUI Jr. Scuba Diver), by that time most major SCUBA manufacturers were producing some type of back buoyancy system. My first buoyancy compensator was a horse collar from US Divers and within a year I realized that there had to be a better way to dive and I saw it in a 1974 Skin Diver Magazine, the Water Gill At-Pac, I was hooked. Unfortunately, my local dive shop did not carry the At-Pac so I bought a ScubaPro BCP and used that for the next two years. Then in the winter of 1978 my local dive shop began carrying the Water Gill line. I immediately bought an At-Pac with a retractable blue bladder cover and a FSDS-10 regulator. I then went on to complete countless dives over the next 20 years using the very same equipment. When something works, you don't change.

I hope you enjoy this brief history of the Water Gill At-Pac and associated equipment. Email me if you have any comments, questions or more information to add to the history of Water Gill

John

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That's Me, 1987, preparing to dive in Marathon, FL Keys.

FSDS-10 regulator and At-Pac (9 years old) with the 1st generation retractable bladder cover.

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WATER GILL?

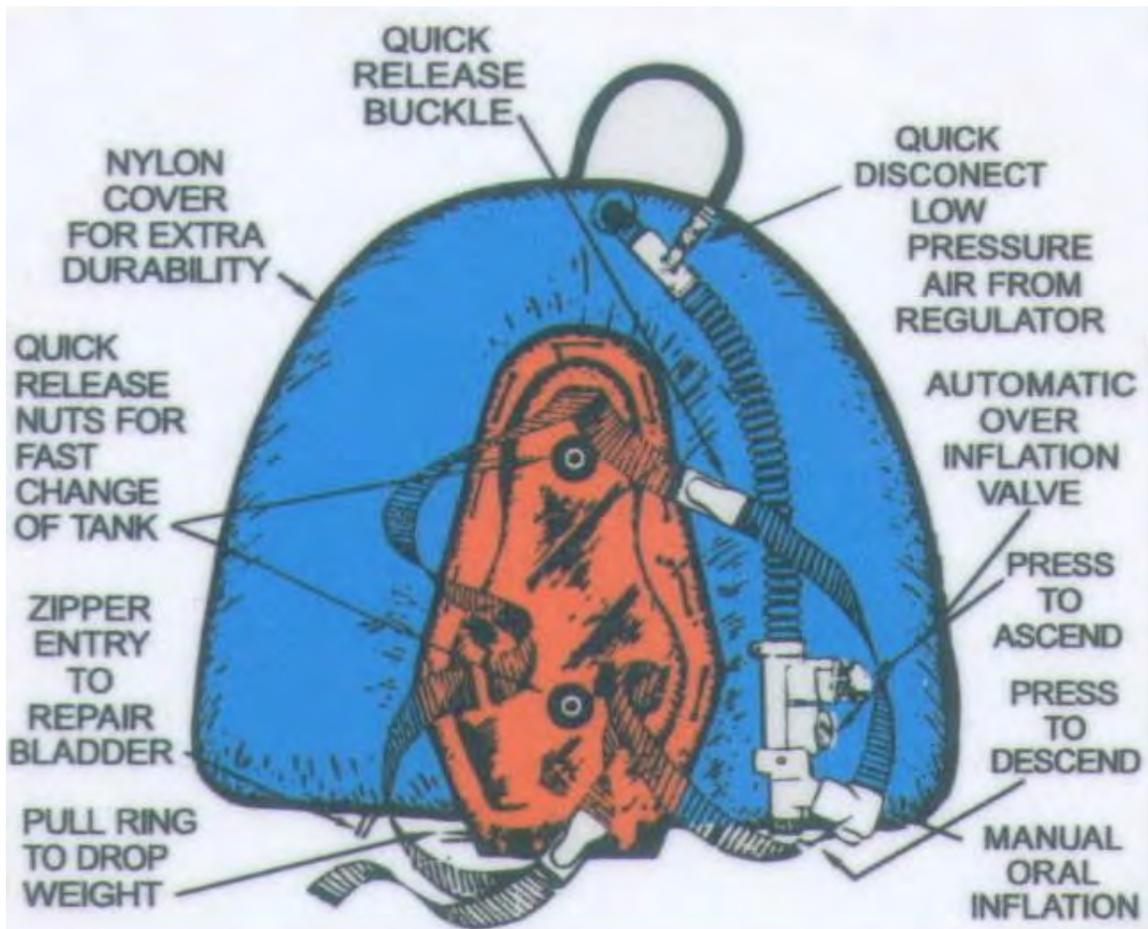
The above ad may or may not have had some significance with regards to Water Gill. "Water Gill began in the early 1950's as a Diving Shop and Fishing Charter owned by Bob Lorenz in Venice CA. I am not sure, but Bob just MAY be the Bob Lorenz who was in the 1967 film Mars Needs Women (the dates and locations coincide).

According to Sam Miller, The founders of Water Gill were Larry Scott & Bill Walters. They were members of the Jr. Neptunes sponsored by the Long Beach Neptunes Spear fishing club. They began producing the At Pac in their shop in Whittier. The bags were cut from truck inner tubes. From that beginning they developed Sea Pro

So ultimately we may never know, but we have the first indication of the name Water Gill associated with SCUBA.

II

The AT-PAC



THE WATER GILL AT-PAC:

In the late 1960's the "horse collar" vest was the only buoyancy system available to divers. The majority of these vests were equipped with a CO2 cartridge and detonator for emergencies and an oral inflation tube for the diver to add air to the vest. Virtually none of them had any other kind of inflation system.

Then, in November of 1970, a small company from California launches a product that for the first time puts the buoyancy cell on the diver's back, integrating the weights into the back-pack and, along with the tank and regulator, encapsulates it in a fiberglass shell. This was a radical departure from any thing any one had seen!

That month Water Gill, released the At-Pac. The At-Pac, short for Attitude Pack, was a back buoyancy pack that was truly the first buoyancy compensator. Actually November was not the "born on date". Sometime in the late 1960's a weighted back-pack was designed by Bill Walters; this back-pack/tank harness could be filled with lead shot so as to avoid the diver using a weight belt. (Appendix 1) Soon after this development, Walters developed a buoyancy control device that would revolutionize diving. That device became available to the public in November of 1970, it was called the At-Pac. The unit was the first true buoyancy control device that incorporated a buoyancy compensator, inflatable only by lp tank air or the diver's breath, back-pack with integrated weights and regulator in one system. The At-Pac could be used with or without a streamlined fiberglass fairing (spelled ferring in the 1976 Water Gill price list, and 1976 Skin Diver magazine). Early production of the At-Pac was at 538 S. Rose, Anaheim, Calif.. Sometime thereafter the company was relocated to Fountain Valley, Calif., 12 miles away, this area was the diving center of California.

The At-Pac was revolutionary in design and use. Needless to say while some embraced the new technology others shunned it. The Majority of the major SCUBA agencies claimed that the At-Pac was dangerous, would not float an unconscious diver on the surface safely and could not be used by students in basic scuba classes. There were even reports (unverified) that dive boats would not allow divers to use the At-Pac when they were originally released. Only in advanced training could the At-Pac be used with PADI and NAUI, this lasted until the early 1980's.

Operation:

Operation of the At-Pac was quite simple, the hard plastic back pack contained a chamber, accessible via an opening at the bottom with a stainless steel hinge/plate and a double pin that held lead buck-shot and marbles (marbles being used as filler) for the divers weighting needs. The lead and marbles could be shifted to adjust the desired "attitude". The wing was attached to the back pack by way of a nylon corded threaded through grommet holes in the wing and matching holes in the back pack, if a fairing was used it also was laced together with the wing/back-pack assembly. Two stainless steel bands, 8" apart, held the unit to the scuba tank and the assembly was attached to the bands by either nylon or brass custom tapered nut. The wing

assembly was inflated by an lp hose from the regulator's 1st stage to the air way that contained not only the inflator mechanism but also the over-pressure relief valve ("airway"). The airway was built in two parts, located at the elbow of the wing was the lp hose connection an internal lp hose went from that point connecting to the power inflator, over-pressure valve and oral inflator.

To vent air the diver would simply hold the airway above his head and press the oral inflator/release button on the airway. Not only was the unit as a whole "new" to the industry but each individual part of the unit was unique. It was an "all in one" dive system that could be assembled and donned on land or on a boat and worn into the water or the unit could be placed into the water and donned there. It also could be "ridden" on, to and/or from the dive site and could be inflated and anchored to the bottom while the diver snorkeled, the divers options were endless. (see Appendix 2)

Back-pack:

The back pack, or balance box as it has been called, was injection molded plastic that secured the tank to the diver and the buoyancy bladder which was attached via nylon cord webbed through holes in both the bladder cover and the perimeter of the back pack. Over the course of its manufacture the back pack went through roughly 4 variations.

The original back pack was capable of incorporating either 2 stainless steel bands to hold the tank, separated eight inches apart (Fig. 2) or could accept the single Scuba Pro band bolted to the center of the pack. (Fig 3 and Appendix 2) This was changed quickly only to accommodate just the double band (which was somewhat unique). The very early Balance Boxes were much more contoured and all the attachment holes had metal or brass grommets along with grommetted drain holes near the straps (Fig. 4). By 1974 the Boxes lost the grommets and became less contoured.

The harness used one buckle at the waist and on the left shoulder 2 brass twist-locks. This version of the At-Pac was debuted in the June 1972 issue of Skin Diver Magazine (Fig. 3). Later versions replaced the twist-locks with an additional stainless steel buckle on the shoulder.

All versions of the back pack, a up until the mid 1980's, had the standard stainless steel "trap door" at the bottom of the pack that enabled the diver to fill or release the weights, consisting of double "O" buck shot and glass marbles (as filler) (Fig. 5)



Fig. 2



Fig. 3



Fig. 4



Fig. 5

Airway:

The lp power inflator was built in two parts, located at the elbow of the wing was the lp hose connection (with or without quick disconnect) and the OPV (Fig. 3), an internal lp hose went from that point connecting to the power inflator and oral inflator, both of these units were made of chrome plated brass ("airway").

In late 1974 Water Gill released the second generation airway. The new airway moved the OPV down to and incorporated it with the oral/power inflator unit leaving only the top portion of the airway to house the lp inflator connector, the unit still had the lp hose running within the corrugated tube to the lower unit. (Fig 6) This new airway was much more efficient and paved the way for its incorporation with the FSDS regulator system. The new airway was made of ABS plastic but was also available in chrome plated brass.

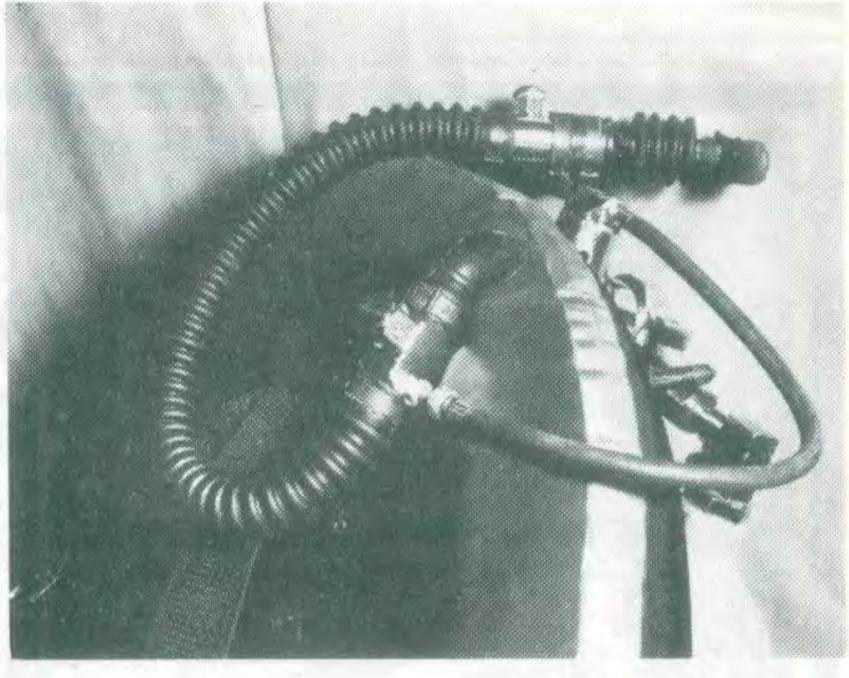


Fig. 6

Buoyancy Bladder:

The first At-Pacs of the early 70's looked to be a single bag construction (very much like the ScubaPro vests) with sealing tap along the outside edge. (Fig 7) It incorporated a ScubaPro OPV on the right side of the wing (Fig 3) and also one built into the Ip inflator block. I am unsure as to how long this style bladder was sold but by the time Skin Diver revisited the At-Pac, in June of 1975, the bladder was now two piece system, inner bladder made of impregnated nylon (black) and an outer nylon shell, available in black, red, orange, or blue. The wing OPV was lost and this style bladder remained unchanged until 1978 when Water Gill released the retractable bladder cover.

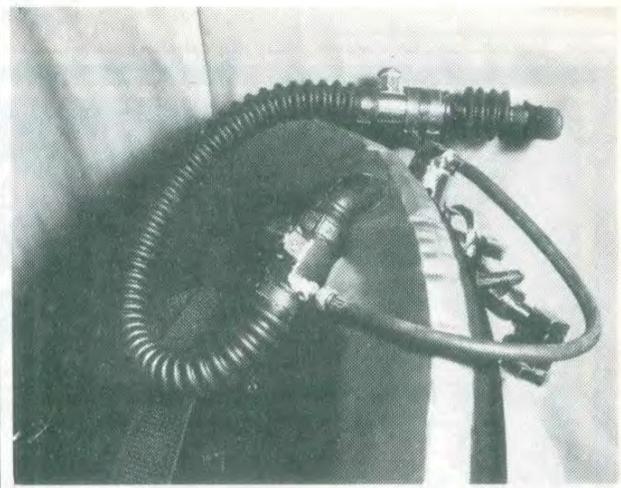


Fig. 7

One notable At-Pac was produced in 1976 for the Bicentennial, it consisted of a solid blue or red (or two tone blue one side, red the other) outer nylon bladder cover with white stars and the number "76" on either side. The airway housing was white, with red buttons and a blue oral inflator unit. Quite flashy! (Fig. 8)



Fig. 8

In 1978 Water Gill released the Retractable Back Buoyancy System, it still had the impregnated nylon inner bladder, but the outer nylon shell was replaced with an optional spandex type material that considerably reduced the overall size of the wing. (Fig. 9) The retractable bladder cover would also force the air from the bladder when venting from the airway.

Early models of the cover did not wear well and later models, made well into the 80's, had a seam lip that ran along the outside. The early versions were only available in royal blue, later versions were offered in a multitude of colors with or without colored piping.

That was the last change to the At-Pac by Water Gill, in 1979 the company was "sold" to Seapro, this change was rumored to be due to a lawsuit involving the retractable bladder.



Put the squeeze on buoyancy control

With the Watergill Retractable Back Buoyancy System

Now you can have large volume buoyancy control in a compact space, and have rapid, easy deflation regardless of your diving position with the new Watergill Retractable B/B System. Made of space age material, the System is a retractable cover that contains the At-Pac air bladder. When fully inflated, the System holds an even greater lift capacity than any other buoyancy unit. Under diving conditions, the retractable At-Pac offers less resistance, no noticeable shift in buoyancy and easier movement through tight spaces. Because the System self-retracts upon deflation, air is squeezed out quickly and completely regardless of your diving attitude. The Watergill Retractable B/B System . . . another plus from the company that dives the equipment it sells. For all of the advantages of the Watergill Retractable B/B System and the name of the Watergill dealer nearest you write: Watergill, 18030 So. Euclid St., Fountain Valley, Ca. 92708, Phone (714) 979-6730.

WATERGILL
It costs no more to buy the very best.

Fig. 9

At-Pac Issues/Problems:

No system is perfect and the At-Pac had its share of problems. The original airways would fail open and also the internal lp hoses would rupture. This would cause uncontrolled ascents in which the diver would be forced to jettison the At-Pac.

I was told by an old time diver/instructor that this happened so often that the spearfisherman (himself included) using them in Mexico developed a procedure on how to deal with the problem, when the malfunction would occur, they would take a big breath from the regulator, release both buckles, let the unit go to the surface. The unit would normally rupture and immediately sink, as the diver was making a free ascent, he would meet up with the unit on its way back down, take another breath from the regulator and finish his ascent.

The second generation airways still had issues with rupturing internal lp hoses which was not entirely solved until after 1977, when Water Gill began using blue Synflex hoses replacing the offending hoses, that were black. The second generation ABS airways were also prone to brakeage if something was dropped on them (like the At-Pac itself) causing them also to fail in the open position. There was also a small plastic collar that would wear or crack in the power inflator that would also cause the unit it self inflate.

The original inner bladders that were made from an impregnated nylon material would fail at the ultrasonically welded seams after a few years of use. This problem was corrected with the use of the urethane bladder. But the urethane bladders were not without their own problems. As the bladders aged the elbow that was ultrasonically welded to the bladder, would crack or brake completely off.

Regarding the back pack problems one sees with the older At-Pacs that used the stainless steel hinge/plate assembly would be the lip of the back pack that the hinge was attached to would crack or brake off the pack. Also technology in this instance seems to have gone backwards, the newer material used in the back packs in later Seapro models was not nearly as robust as the older material and one will see back packs cracked or broken on or around the weight box.

That being said, the At-Pac, post 1977, was a very robust piece of diving equipment and you still see the being used today. Also something can be said of the fact that a buoyancy compensator that was produced more that 30 years ago can still be serviced and virtually all parts are still in production!

III

FAIRINGS

U.S. Patent March 29, 1977 Sheet 2 of 2 Des. 243,889

FIG. 3

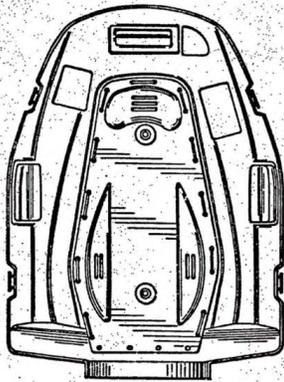


FIG. 4

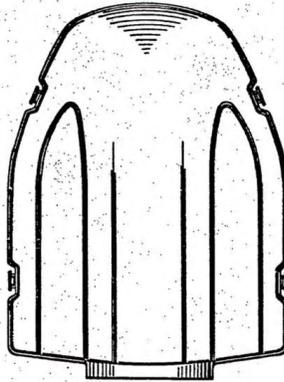


FIG. 5

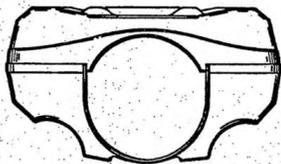


FIG. 6

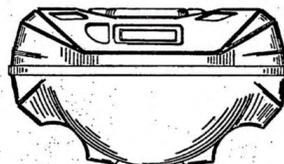
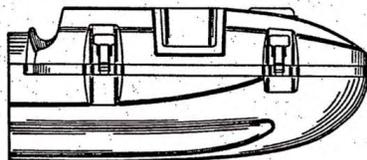


FIG. 7



Fairings (Ferrings):

The Fairings (or Ferrings as Water Gill spelled it in the 1976 Price sheet) is what really made the At-Pac 'Space Age". Even though the majority of At-Pac owners used the unit without the fairing, it is what is most associated with the At-Pac. The "steam lined" diving system. Yet when used, the shell created an excessive amount of drag and it felt to the diver that he or she was diving with a small boat on their back. All in all, there are at least 6 versions of the Water Gill Fairings produced thought out the years, ending production sometime in the late 1970s.

As stated, during Water Gill's production of the At-Pac, the fairing changed often though out the years, some of which looked almost to be custom made. The early versions enclosed the At-Pac and tank all in the fiberglass (matt and gel coat) shell with very small openings for the regulator hoses. Other versions of these had different openings for the regulator and airway hoses. The patent for this version was awarded in 1975. (see Appendix 3)

Later, the more common versions, patented in 1977 (see Appendix 3), made of ABS plastic, were open at the bottom and were held together via three clamps (left side, right side and top) or the post 1974 version with two clamps per side, opening for the airway and one large square on either side for the regulator hoses and SPG hosed. Unless the 2nd stages were small one had to remove the second stages from the hose to fit them through the openings. Another problem was that if the yoke screw was too big it would crack the fairings. To combat this the diver would have to mount the At-Pac high up on the tank. This occurred even with the FSDS regulators, it seems that when Water Gill produced the fairings is was more suited for the small yoke screws on the MKV and MKVII ScubaPro regulators.

The original patent contemplated the addition of a motor at the bottom of the fairing to propel the diver (see Appendix 2).

As for the choice of colors, the later fairings were available in either white, orange, black, red, yellow or blue. The blue fairings tended to be from almost aqua to navy blue, earlier fairings were a multitude of colors, including shocking green. The following pages illustrate all of the different versions I have found examples of to date.

The last 2 generations of the Water Gill fairings were available in 2 different sizes, single tank (would fit a 71.2 cu.ft tank only), double tanks and the last generation was also available in a single/double combo.

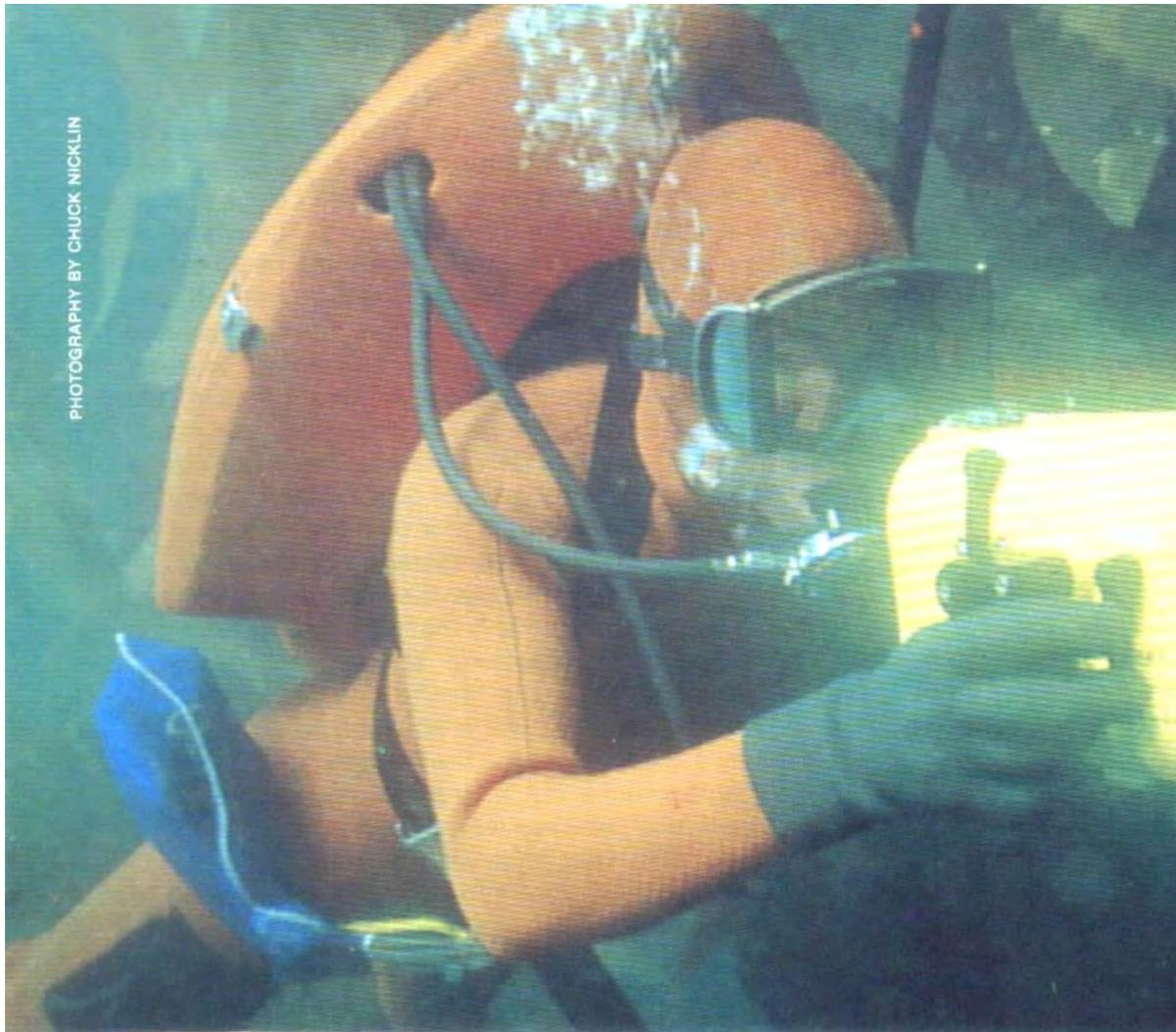


Photo by Chuck Nicklin

The above image may be one of the earliest fairings, note the extremely small hose openings, the sharper edges and single opening for the airway. It also appears that the back opens and encompasses the top nose.

Further, the next 4 pages represent pre-1974 models of Water Gill Fairings,



The next version is now more of a “clam shell” cut way but still retains the very small hose openings and you can see the solid bottom. Also the latches are now recessed.





This version continues to retain the solid bottom but there are now slots cut in the hose openings that will allow the diver to remove the regulator from the unit without disconnecting the hoses or second stages.

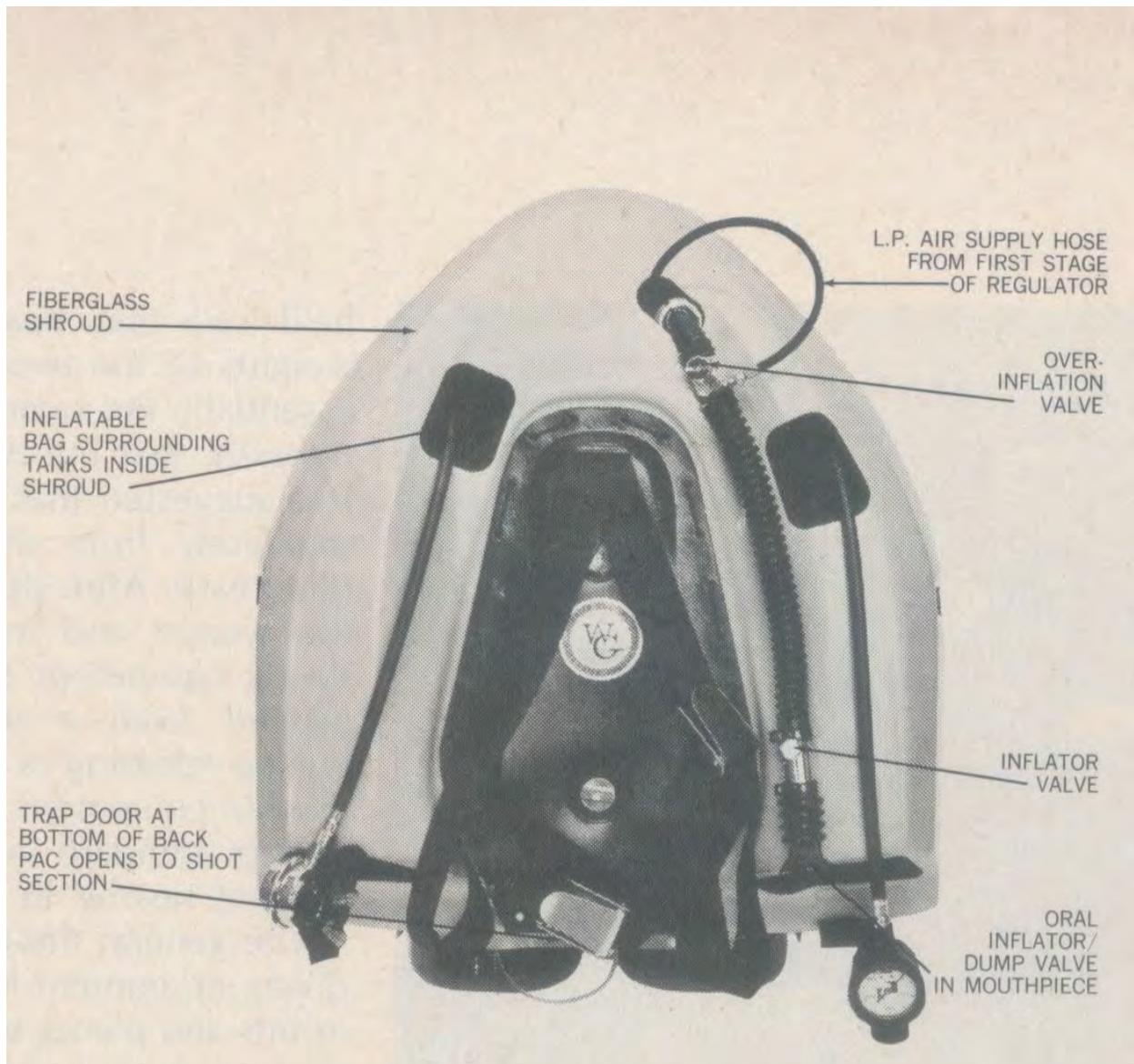


This version seems to be a transitional model. “Boxier” in shape, hose openings that located at the separation point. It may be a full “clam shell” opening as apposed to the earlier versions in which only partially opened.



Next version, from in or around 1974, looks closer to the “final” model sold by Water Gill. The above image, and the images on the following page, now has the large square openings for the hoses but retains the top latch as in the earlier models.





The image above was from the June 1974 Skin Diver Magazine second review of the At-Pac. Note that this model fairing is for double tanks but same era as the fairing on the preceding page and the At-Pac is still using the early Airway, . Later in 1974 Water Gill released the 2nd generation Airway.

The following three pages, are examples of the “final” version of the Water Gill fairings released in late 1974. It was available in single tank, double tank and a combination version. It had four latches, molded hand grabs and small air vents at the top of the shell. As a side note, the orange shell was purchased directly from Seapro by myself and I was told by the person on the phone that that one was their last one and that it had been sitting “out back” of the factory!







WATERGILL
AT-PAC.

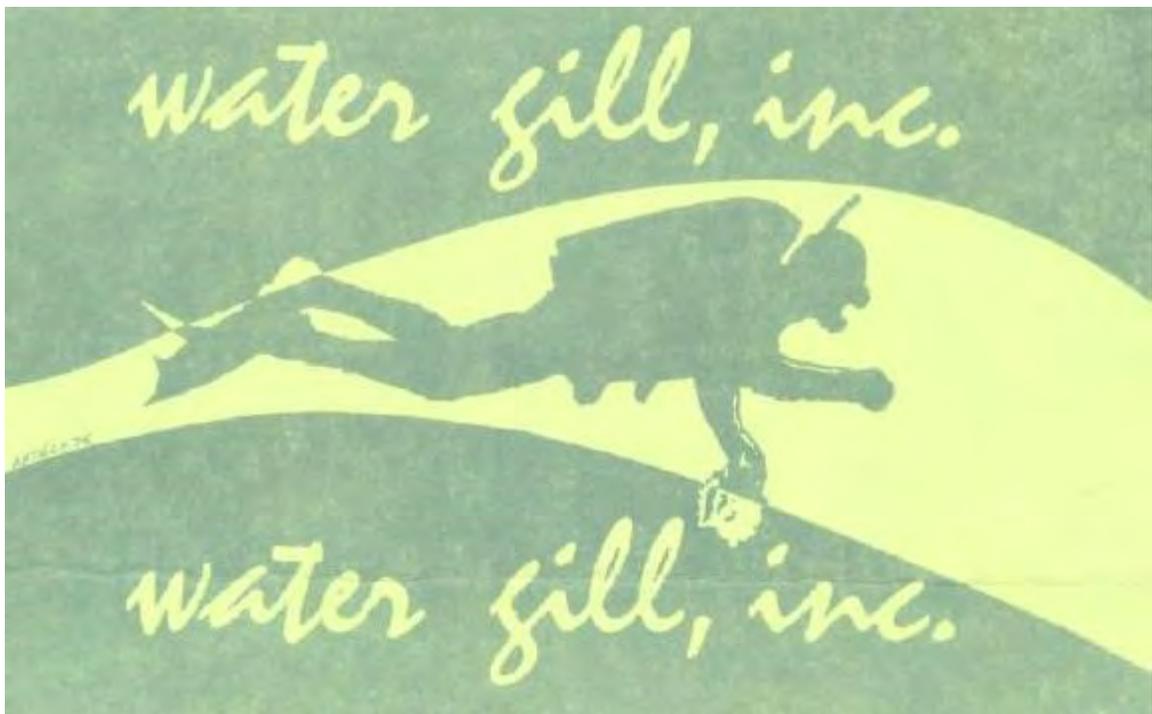


Lastly, is a example of a double tank model in the final version.

As a final remark, the “versions” may merely have been a continual modifications of what were essentially hand built fairing until the final version which were closer to a mass produced item.

IV

REGULATORS





Water Gill Regulators:

In the mid 1970's Water Gill also produced a series of regulators. These were quite unique in design and function and called the Fail Safe Diving System (FSDS), as Water Gill attempted to create a fail safe diving system that incorporated buoyancy systems and breathing systems in one. (see Appendix 4)

SECOND STAGES:

The second stages of the Water Gill regulators were very unique, much larger than most 2nd stages of the time and made of plastic. (Fig.10) The purge cover was attached to the main housing by 5 stainless steel screws followed by a fluorescent rubber cover snapped on to the front cover. The 2nd stages were available in orange, blue or black. Internally, the seat and arm were much longer than any standard regulator of the time. This design made for an extremely smooth breathing regulator, but the US Navy rated it a "C" due to air delivery. This problem quite possibly was due to the 1st stage and its inability to deliver the volume of air necessary for the second stage.

These second stages continued to be produced, virtually unchanged, until the demise of Seapro, the only change Seapro made was to offer the second stage with a chrome plated cover. There were even used on the early Brownies Third Lung.



Fig. 10

FSDS-10:

The FSDS -10 was a chrome plated brass piston design 1st stage (much like the ScubaPro MkV) with 1 HP port and 5 LP ports. (Fig. 11) The internal pressure (ip) was around 160 to 175 psi which was much higher than average regulators. Unfortunately, when breathed, the internal pressure in the 1st stage would drop close to 40 psi! The second stage required more volume than the 1st stage could deliver.



Fig. 11

FSDS-100

The second regulator Water Gill produced was the FSDS-100. This was to be the ultimate “fail safe” regulator that would warn you of low tank pressure by an audible “pop” and then automatically inflate your At-Pac. It would also automatically inflate your At-Pac if you stopped breathing (adjustable from 30 seconds to 5 minutes). The 1st stage housing contained 2 independent piston 1st stages in one. (see Skin Diver article from 1977). The factory set up was for the primary side to have an IP of 160 and the reserve side to have an IP of 210, when you stop breathing the high side leaks into the low side and over pressures the down-stream valve of the airway, inflating your At-Pac.

Later, under Seapro, they removed the first stages ability to inflate the At-Pac when not breathing and it would only inflate when the tank pressure dropped below 300 psi.

That was at least the theory, but in practice it did not work so well especially when the units began to age. I acquired a Seapro unit but could never get it to automatically inflate my At-Pac. So, I put the regulator on the bench and found that the low side was only showing about 120 psi and the high side is 145 psi. So I disassembled the unit, wiped it all down, re-lubricated all the o-rings and reassembled. By just doing that I was able to get the low side up to 140 but the high side went to 230! Yikes, considering lp hoses are only rated at 250. Obviously, this was not totally “fail safe”, but none the less different. Note the black paint on the RS Spring designating it as the 250 PSI spring. (Fig. 12)

From experience it seems that the “low” pressure piston springs in both the FSDS-10 and FSDS-100 would weaken during time.





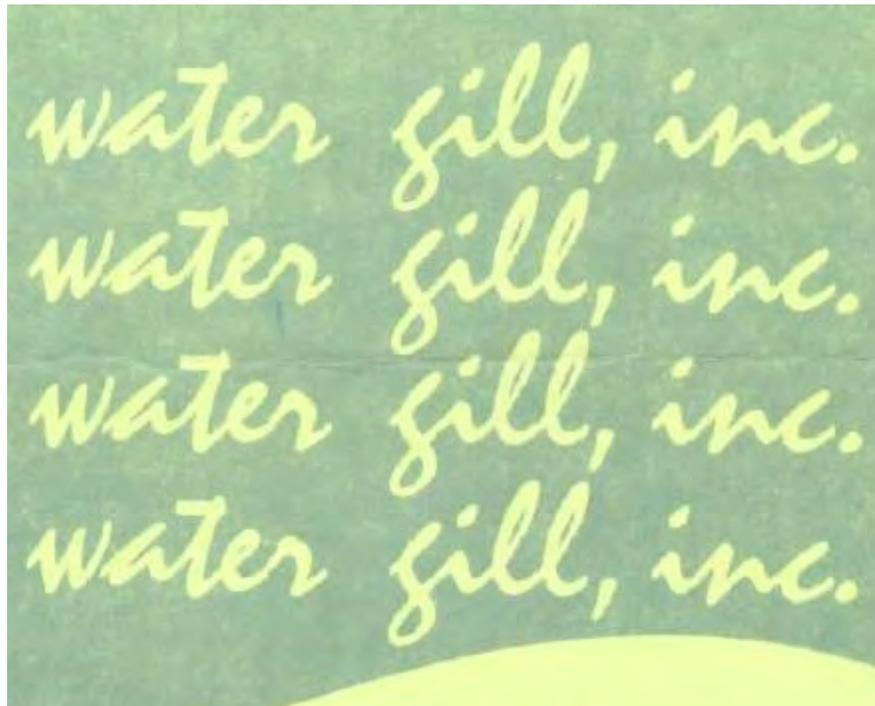
Fig. 12

Figure 12 shows the FSDS-100 (actually the Seapro FSDS-50) opened up. Between the two pistons is the actuator that allows the regulator to shift from the high side to the low side and over pressure the airway thus inflating the At-Pac. The empty hole below that actuator was, to the best of my knowledge, a holdover from the original Water Gill FSDS-100 and its ability to inflate when the diver stopped breathing.

As you can see that is one big chunk of brass!

V

OTHER PRODUCTS



OTHER PRODUCTS

Water Gill did market a couple of other products, or at least attempted to, before changing to Seapro.

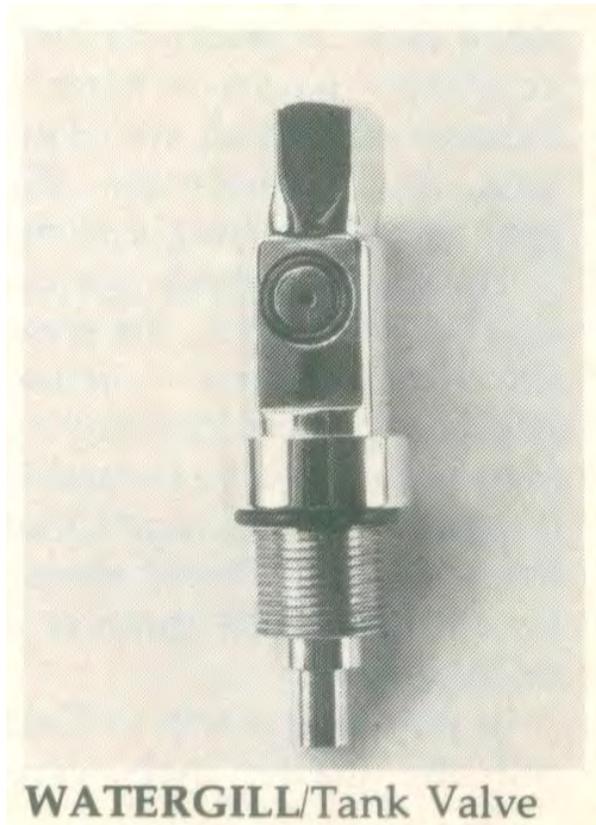
Horse-collar BC:

This was an odd find, especially from a company that revolutionize the industry with the first back buoyancy compensator. Although having never seen one for sale new over the years, one did show up on e-bay with the Water Gill (Gill) logo. The style of the logo would have placed its manufacture sometime around 1978. The photo depicts this unit with a standard hose/lp inflator, my assumption is that the original airway was replaced with an aftermarket inflator. One reason for this assumption is that at the time Water Gill only had one airway, second, the elbow on the bc is broken just like all the At-Pacs of that era, that being a typical failure point with age and the evidence that it was a standard attachment point for the original airways. The last reason is that during that time, Water Gill sold the At-Pac airway to a company called Stebco that used the airway on one of their horse collar bcs.



Valve:

The only information I have on this piece of equipment was from the 1978 DEMA show reported in Skin Diver magazine. There is no information and only a picture of a tank valve that looks strikingly like an updated medical valve, no special functions were mentioned.

**Tank:**

Shown on the price list, Water Gill marketed, among others, an 80 cu.ft. steel tank, which seems rare.

Vapor-ware:

Water Gill was working on a communication system and also a Phase III for the At-Pac/FSDS-100 which would include a depth-sensitive automatic inflator and ascent rate controller. This was the vision of Water Gill. As one can see from the original patents and products, made and envisioned, Water Gill's vision was to create a "single" piece of equipment that would take all the thinking out of diving. No longer would the diver have to monitor anything, just jump in and dive until your At-Pac brought you up!

This seems silly today, but when the At-Pac was originally developed, SPG's were rare, as were octopus regulators, dive computers and buoyancy compensators. How times change.

VI

MARKETING

The 26' Sport Convertible



The Water Gill At-Pac showing up in a 1976 Bertram Yacht add for the 26 foot Moppie. Notice that there is no tank in the unit and the inclusion of a Voit horse collar safety vest over the helm seat. Guess Bertram just liked the look of the fairing!

Almost immediately upon the release of the At-Pac there were vocal detractors of this new piece of equipment. The Majority of the major SCUBA agencies claimed that the At-Pac was dangerous, would not float an unconscious diver on the surface safely, weights could not be released in all positions and they also contended that since it lacked a CO2 detonation system that it was not a true "safety vest". In short, it was "crazy" and untested.

In reality, when you consider that, in the 1970's, when most divers either did not dive with a vest at all or used some type of may-west for surface emergency flotation only, the At-Pac was pretty revolutionary. Today you were be hard pressed to find CO2 inflation on any buoyancy compensators!

Water Gill addressed these issues in a unique way, by full page ads in magazines not only expounding on the virtues of this new unit but also offering a "free" lesson coupon redeemable at any participating Water Gill dealer! The following pages represent all of the ads through out Water Gills history, that I have found.

Free At-Pac lesson.

Learn to dive
with your brain,
not your back!

PUSH BUTTON DIVING... THE AT-PAC

- Eliminates the weight belt and its hazards.*
- Eliminates the hard work in diving.
- Eliminates negative buoyancy.
- Eliminates lifting problems.

The AT-PAC combines a diver's float, the weight belt, the buoyancy compensator and the tank and regulator into one compact unit and allows the diver to swim to his selected diving area without using air from the tank until he is ready to start his descent. The AT-PAC has been acclaimed as a major breakthrough in diving safety and comfort.

* See the Los Angeles County Underwater Safety Committee's report.

**Water Gill
Underwater
Innovators®**

18100 S. Euclid
Fountain Valley, Calif. 92708
Phone (714) 979-6730

This coupon entitles you to one free lesson in the use of the AT-PAC. You will be contacted by your local dealer for time and place.

Name _____
Address _____
City _____ State _____ Zip _____
Phone _____

DEALERS: If you are interested in buying an AT-PAC dealer, send this coupon to Water Gill and we will contact you.

Mid1970's Skin Diver Ad

Free At-Pac lesson.

Learn to dive
with your brain,
not your back!

PUSH BUTTON DIVING — THE AT-PAC

Eliminates the weight belt and its hazards.
Eliminates the hard work in diving.
Eliminates negative buoyancy.
Eliminates lifting problems.

The At-Pac combines a diver's float, the weight belt, the buoyancy compensator, the regulator, and the tank into one compact unit and allows the diver to swim to his selected diving area without using air from the tank until he is ready to make his descent. The At-Pac has been acclaimed as a major breakthrough in diving safety and comfort.*

*See the Los Angeles County Underwater Safety Committee's report.

Water Gill
UNDERWATER INNOVATORS[®]
18100 South Euclid
Fountain Valley, California 92708

Phone (714) 979-6730

This coupon entitles you to one free lesson in the use of the At-Pac. You will be contacted by your local dealer for time and place.

Name _____

Address _____

City _____

Phone _____

State _____

Zip _____

Deliver this coupon to your local dealer. If you are interested in becoming an At-Pac dealer, forward this coupon to Water Gill and we will contact you.



Don't buy an "imitation system."



Perhaps you have seen ads in various diving magazines telling you about some great new diving "system." When you investigate you find out that all they did was put a fiberglass cover over two tanks to hide what's underneath. And maybe the "system" still makes you

wear a weight belt. Turning tanks upside down and putting the valve on the bottom instead of the top doesn't make a "system."

The At-Pac by Water Gill is the first real system of its kind. You're going to see a lot of

imitations, but the At-Pac is the only system that eliminates the weight belt, covers the tanks and valves with a shatter-proof fairing, and has a built-in buoyancy control device with an advanced airway. Take a FREE At-Pac lesson and see why the At-Pac should be your system.



Water Gill UNDERWATER INNOVATORS 18100 S. Euclid, Fountain Valley, Calif. 92708 Phone (714) 973-6730

This coupon entitles you to one free lesson in the use of the At-Pac. You will be contacted by your local dealer for time and place.

Name _____
 Address _____
 City _____ State _____ Zip _____
 Phone _____

Dealers. If you are interested in becoming an At-Pac dealer, forward this coupon to Water Gill and we will contact you.

We would like you to meet the Chairman of the Board and the President of one of the three companies in the diving industry whose officers test their own equipment.



After forty years of accumulative diving, Ron Coleman and Bill Walters still grab the chance to test their new innovations. Major equipment breakthroughs like the At-Pac, the Underwater Communicator and the ABC Valve that brings the diver up at the proper rate per second, the Fail Safe Regulator that automatically inflates the At-Pac to bring you up if the breathing cycle stops. These are just a few of the underwater innovations that Watergill, Inc. is responsible for.

Because of the nature of these products, Watergill is sold only by diving retailers that understand and dive the equipment themselves. These retailers offer special classes in familiarization with Push Button diving. Send the coupon and we will send you the name of the closest Watergill retailer for their equipment familiarization classes.

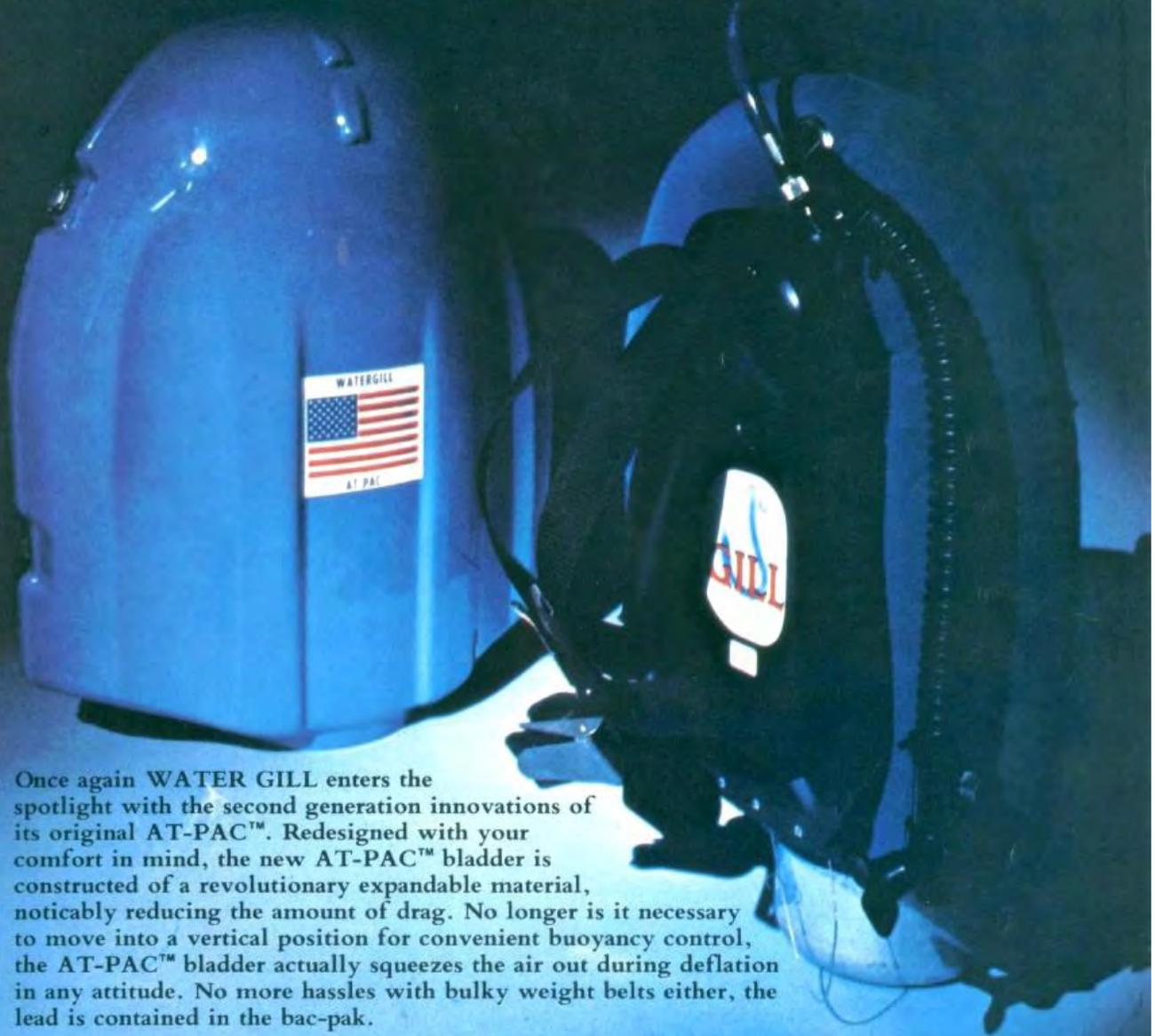
Watergill **UNDERWATER INNOVATORS** 18030 S. Euclid, Fountain Valley, Calif. 92708 Phone (714) 979-6730

This coupon entitles you to one free lesson in the use of the At-Pac. You will be contacted by your local dealer for time and place.

Name _____
 Address _____
 City _____
 Phone _____
 State _____
 Zip _____

Dealers. If you are interested in becoming an At-Pac dealer, forward this coupon to Watergill and we will contact you.

THE ORIGINAL AT-PAC™



Once again WATER GILL enters the spotlight with the second generation innovations of its original AT-PAC™. Redesigned with your comfort in mind, the new AT-PAC™ bladder is constructed of a revolutionary expandable material, noticeably reducing the amount of drag. No longer is it necessary to move into a vertical position for convenient buoyancy control, the AT-PAC™ bladder actually squeezes the air out during deflation in any attitude. No more hassles with bulky weight belts either, the lead is contained in the bac-pak.

So get into the act today! Visit your local AT-PAC™ dealer today or write for additional information. Fairings available in blue, red, black and white.

WATER GILL UNDERWATER INNOVATORS
18100 S. Euclid, Fountain Valley, CA 92708 714/979-6730

Dealer
Inquiries
Invited

The next 2 ads relate to the launch of the FSDS regulator from 1976 and 1978

HERE IS AN ENCORE FROM WATERGILL.

THE COMPANY THAT INVENTED "PUSH-BUTTON"[®] DIVING.

The F.S.D.S.[®]-100 Regulator is a "thinking" regulator. If you stop breathing for 30 seconds, the F.S.D.S.[®]-100 Regulator inflates your At-Pac[®] or B.C. and automatically brings you to the surface at a controlled, safe ascent rate. !

For the first time in diving history a complete diving system has been developed. Diving experts, world-wide, have endorsed and acclaimed the F.S.D.S.[®]-100 system as the most important equipment breakthrough since the invention of the demand regulator.

If you plan to up-grade your equipment or you want the safest equipment in diving, see the F.S.D.S.[®] system at your Watergill dealer.

For more details on the F.S.D.S.[®] and the booklet, *A New Concept in Underwater Safety*, presented at the 1975 NAUI I-Q, send \$2.00 to cover the cost of postage and handling to:

Watergill[®] UNDERWATER INNOVATORS
18030 S. Euclid,
Fountain Valley, Calif. 92708 Phone (714) 979-6730

* F.S.D.S.[®]
stands for Fail Safe Diving System.

Watergill[®] UNDERWATER INNOVATORS, 18030 S. Euclid, Fountain Valley, Calif. 92708 Phone (714) 979-6730

Intention: Send \$1.00 for the booklet: *A New Concept in Underwater Safety*
DEALERS SEE WATERGILL AT 1975 NAUI I-Q Show Booth Y-210

Name _____
Address _____
City _____ State _____ Zip _____
Phone _____

Order: If you are interested in becoming an At-Pac dealer, forward this coupon to Watergill. The coupon will contact you.

**If you don't think this is
the world's best regulator
we'll give you your money back.**



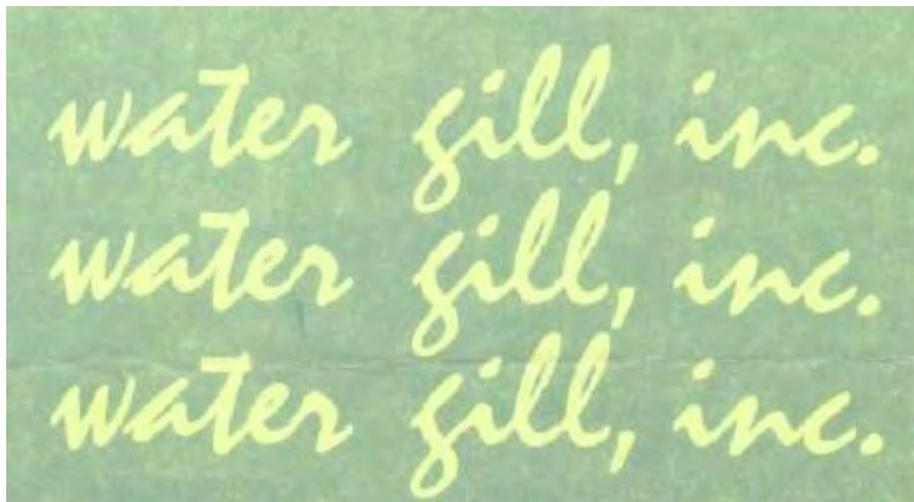
WATERGILL

It costs no more to buy the very best.

We're making no bones about it, the WATERGILL FSDS-100 (Fail Safe Diving System) is unquestionably the world's best regulator. And we're ready to back it up with a two week trial, money back guarantee. Here's why! The FSDS-100 is actually two regulators in one. The first unit provides front line air supply for normal breathing. The second unit acts as a back up safety regulator as well as an independent air supply for: Equipment recovery, automatic reserve air, concurrent buddy breathing, multiple tool usage, buoyancy control . . . in fact the FSDS-100 offers so many benefits that there isn't enough space in this ad to list them all. So if you're interested in owning the best value of any regulators get the whole story from one of our participating dealers. For the name of the WATERGILL dealer nearest you and a free copy of the FSDS-100 technical brochure write to: WATERGILL, 18030 So. Euclid Avenue, Fountain Valley, CA 92708. Phone (714) 979-6730.

VII

LOGOS



WATER GILL LOGOS :

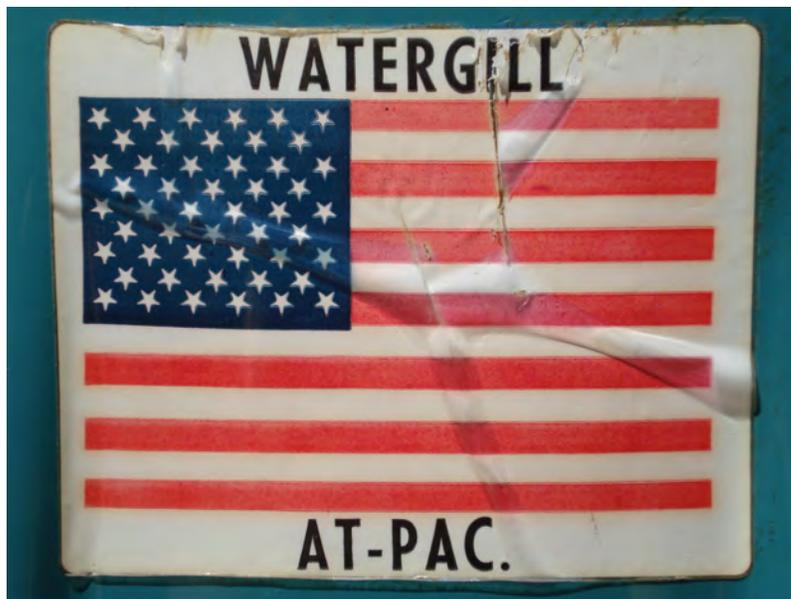
From research there seems to be only five logos used by Water Gill over the years, and one patch.



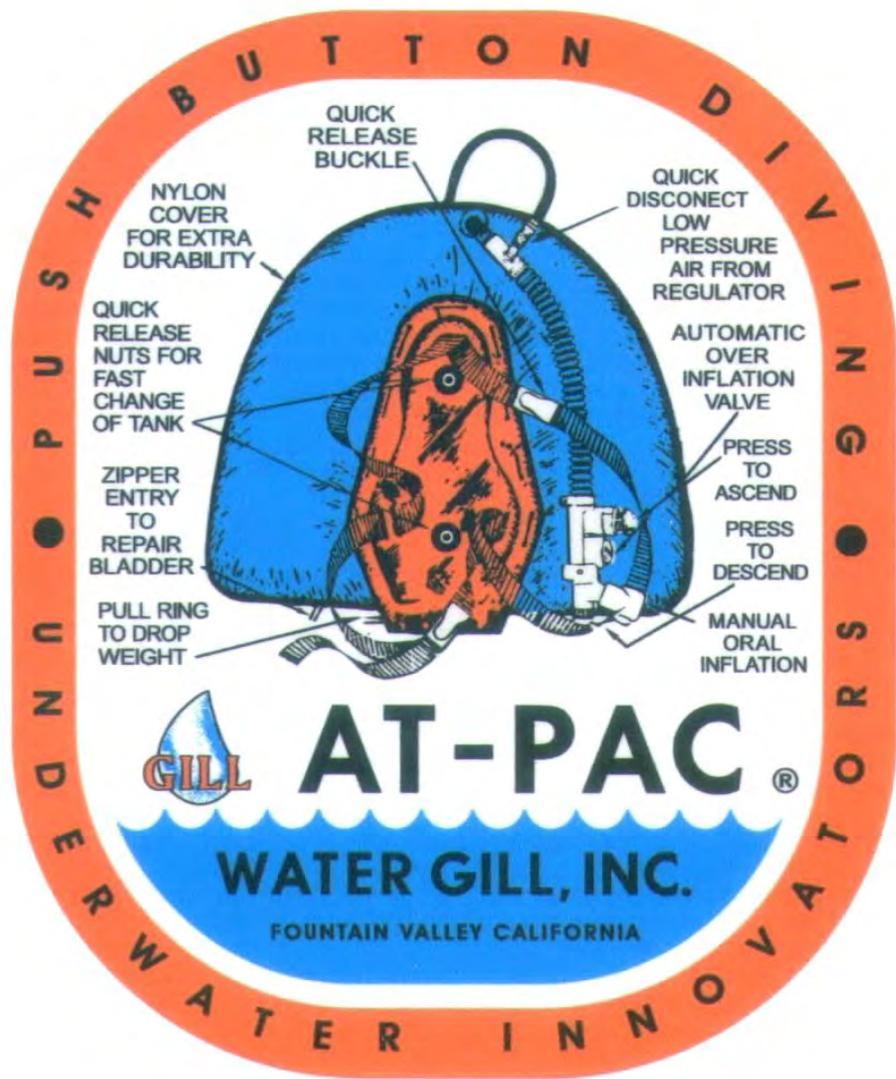
Early 1970's label



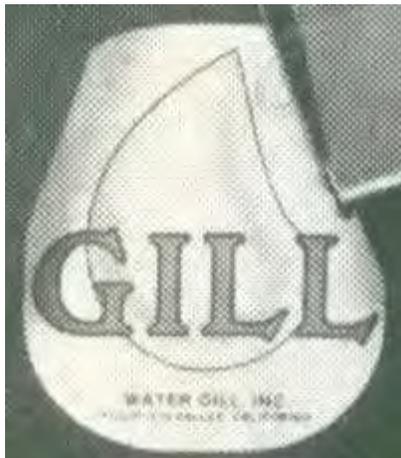
Mid to late 1970's



Mid to Late 1970's Ferring Label



Reproduction 1978 Label



1977-1979 Label

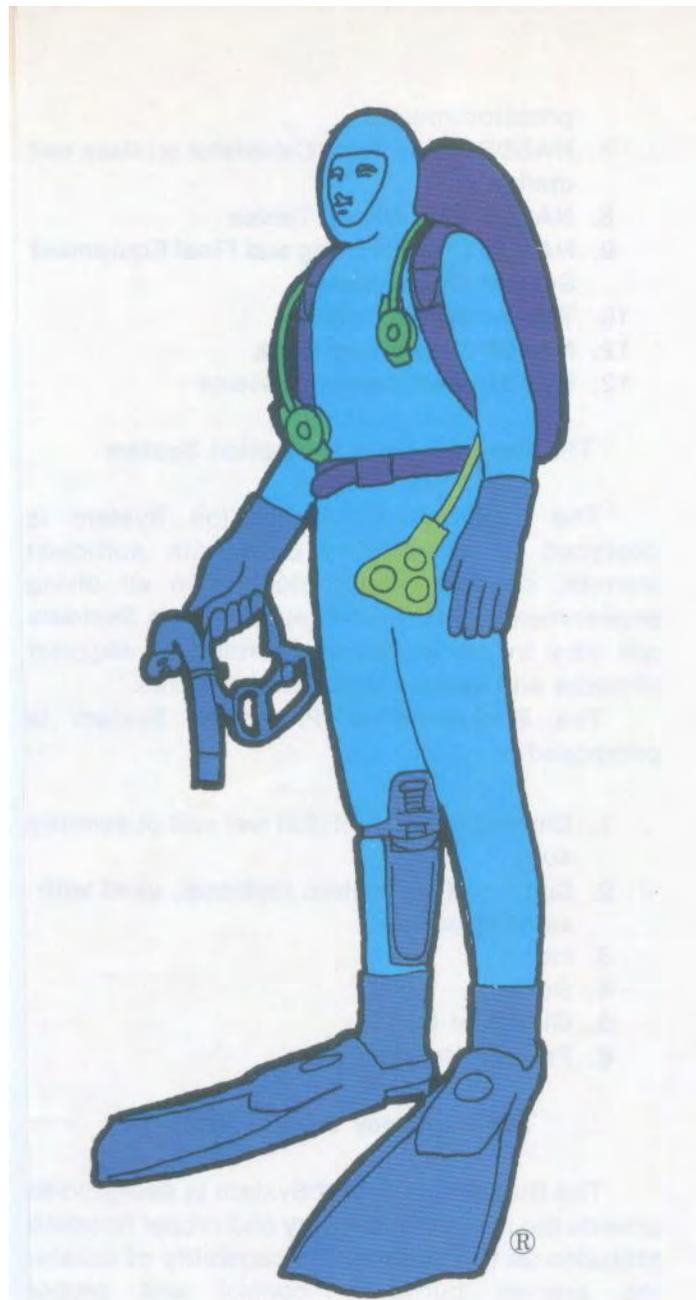


1976 Patch

VIII

NASDS

National Association of SCUA Diving Schools

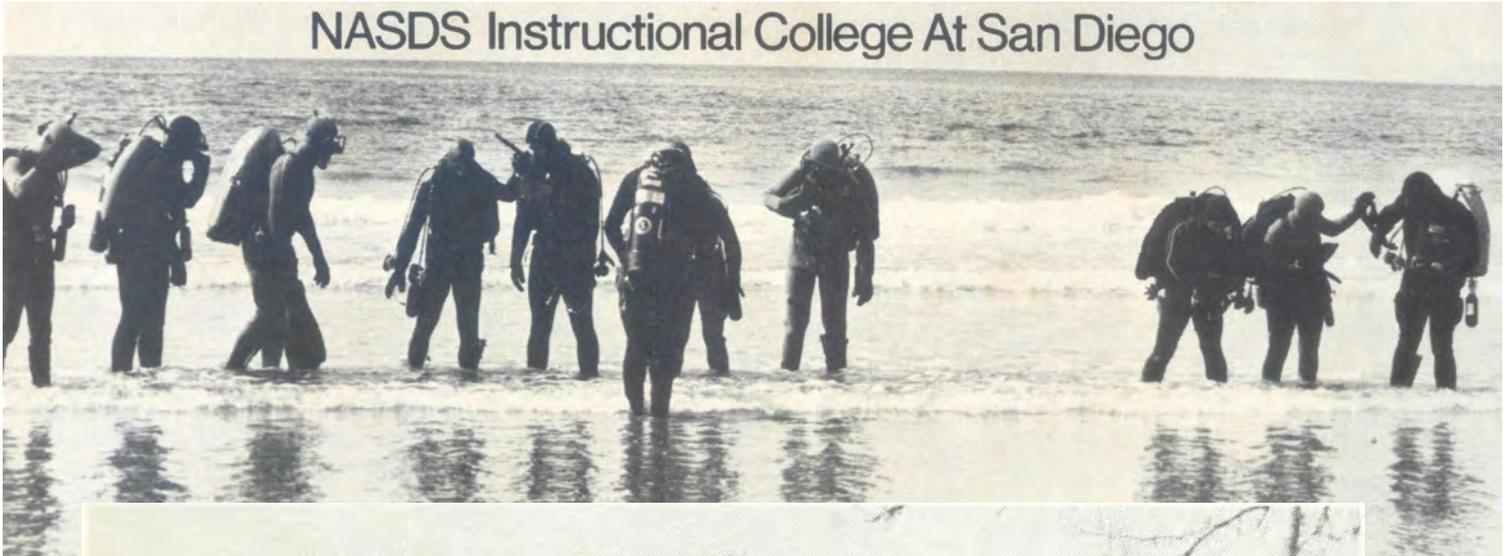


National Association of SCUBA Diving Schools - NASDS:

The National Association of Skin Diving Schools (NASDS) made the At-Pac one of the corner stones of its teaching philosophy. The At-Pac is prominently displayed throughout NASDS's teaching materials and also its logo in which the diver is wearing the At-Pac in a fairing.

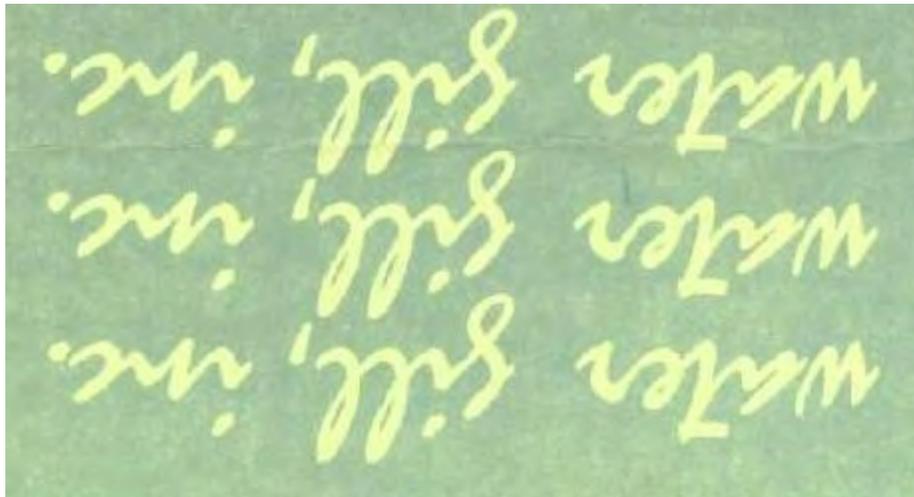
The first photo is from the NASDS collage in 1974, below that is from the NASDS "Dive In" in Washington state in 1976.

NASDS Instructional College At San Diego



IX

SEAPRO



SEAPRO AND BEYOND:

Although Seapro was the company that came after Water Gill there is early evidence that the name Seapro was there at the beginning of the company. Below are 2 labels from pre-1974 fairings showing the two names side by side.



At-Pac

When Seapro took over manufacture, they continued to sell a revised version of the retractable bladder cover but never actively marketed it. What they did market was the standard bladder (now slightly larger than the original Water Gill bladder), the only significant changes to the At-Pac were the replacement of the impregnated nylon inner bladder with a clear urethane bladder and the replacement of the hinge/plate/double pin assembly at the opening of the weight chamber with a single pin and plastic "cap" and they modified the airway adding the lp connector to the base of the airway with the OPV valve and oral inflator. They continued to offer the airway in brass or ABS plastic.

The At-Pac is still produced today by a company called DiveTek in California with a standard inflator.

Regulator:

When Seapro took over manufacture of FSDS-100, it became known as the FSDS-50. In advertisements, the function that the regulator would inflate your At-Pac if the diver stopped breathing, was dropped. The unit I acquired was a Seapro unit, the internal parts required for that function were not in the unit and there was not an "air bleed" into that chamber. The FSDS-50 was totally changed later to still include a dual piston design but looked more like a US Divers Calypso IV body. Second stages remained the same but for the addition of a chrome cover.

Next pages are just two examples of early adds as Seapro.

Seapro AT-PAC leaves you with time on your hands

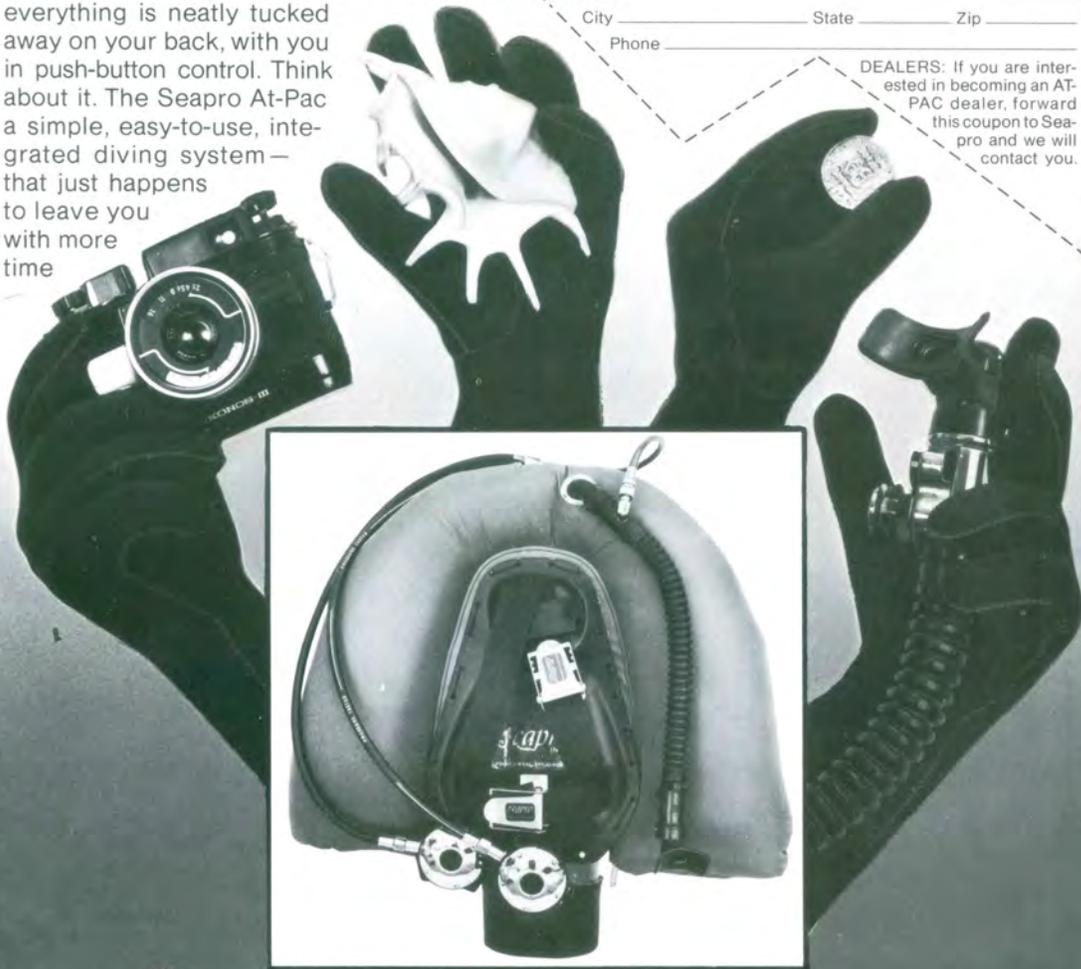
There's no telling how much more you can get out of diving with more free time to use your hands. Take better pictures. Collect more marine life. Hold a steady bead on your catch. You may even find something strange to hold. And with the Seapro At-Pac you'll have room to hold it. No air bags sticking out in front. No sagging weight belt. No dangling straps and hoses. With the Seapro At-Pac everything is neatly tucked away on your back, with you in push-button control. Think about it. The Seapro At-Pac a simple, easy-to-use, integrated diving system — that just happens to leave you with more time

on your hands for better diving. Test dive the Seapro At-Pac at your local Seapro dealer. For the inside facts write Seapro, 18030 South Euclid Avenue, Fountain Valley, CA 92708 (714) 979-6730.

This coupon entitles you to one free lesson in the use of the AT-PAC. You will be contacted by your local dealer for time and place.

Name _____
Address _____
City _____ State _____ Zip _____
Phone _____

DEALERS: If you are interested in becoming an AT-PAC dealer, forward this coupon to Seapro and we will contact you.



Seapro A new company with a proven product line.

I'd like you to meet my new lifeguard.



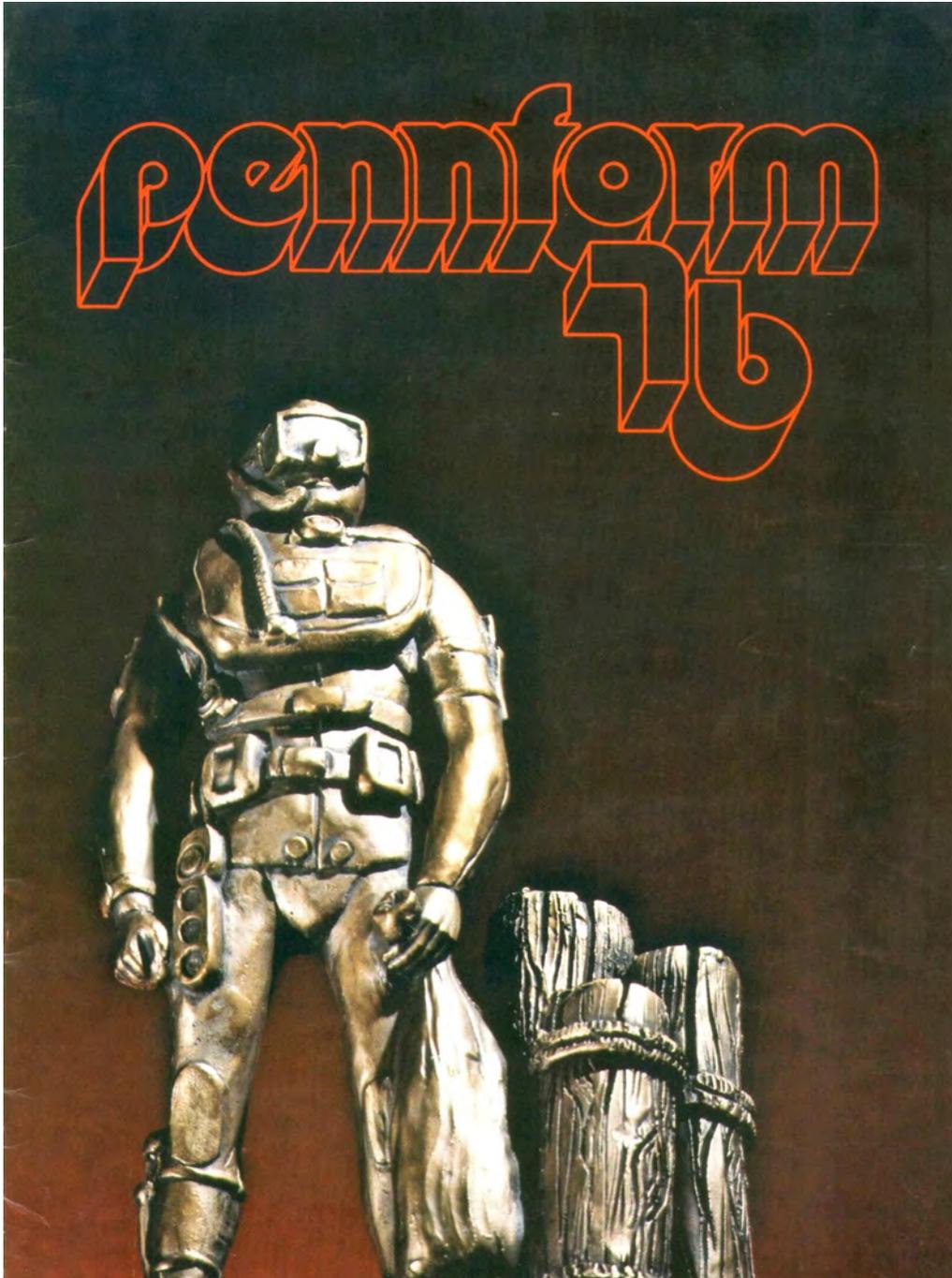
Feeling safe underwater, so I can enjoy all my bottom time, is important to me. And diving with the revolutionary Seapro FSDS-50 Automatic Reserve Regulator gives me the confidence that a failsafe "lifeguard" is on duty watching over my air supply at all times. When tank pressure drops to 300 P.S.I. my lifeguard's automatic reserve immediately starts pumping air into my B.C. Then I'm on my way up slowly and safely at just the right time. If I still want to stay down, I push an override button. In case I panic or begin hyperventilating, the harder I breathe the faster my B.C. inflates to protect me. That's why I call the Seapro FSDS-50 Automatic Reserve Regulator my "lifeguard." You only have to use it once to know it's a lifesaver. Test dive the revolutionary Seapro FSDS-50 at your local Seapro dealer. For the inside facts write: Seapro, 18030 South Euclid Avenue, CA 92708. Phone (714) 979-6730.

**Seapro FSDS-50
Automatic
Reserve
Regulator/
Buoyancy
System**

Seapro *A new company with a proven product line.*

X

PENNFORM



A specialty company out of the mid-west, known for their gauge consoles, produced a couple of products specifically designed for the At-Pac, a carrying bag and a handle that attached to the stainless steel bands.

THE MANHANDLERS

TANK CARRYING HANDLES
FOR USERS OF AT-PAC
BUOYANCE SYSTEMS

two

models to choose for the
style bands you use

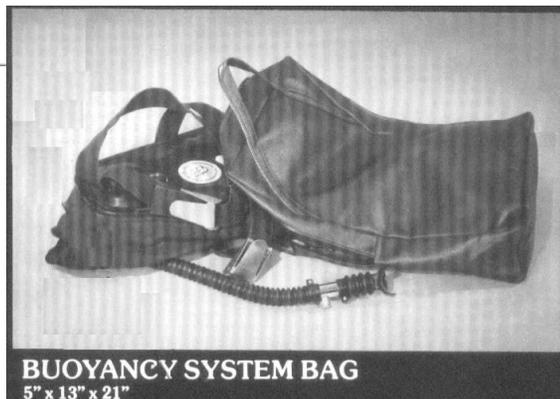
permanent type, for
bolt fastened bands

detachable type, for
quick release bands

The "Sure Grip" textured handle, permanently molded over a heavy duty stainless steel insert, makes tank carrying problems a whole lot easier. A convenience which no At-Pac owner should be without.



AVAILABLE IN BLUE OR BLACK



BUOYANCY SYSTEM BAG
5" x 13" x 21"

XI

Skin Diver Magazine

Put A Little Easy In Your Dive With This **REVOLUTIONARY FLOTATION DEVICE**

BY LOU FEAD

The opportunity is now available for divers to eliminate the words "difficult" and "discomfort" from most of their sport diving. Progress has made its mark with a significant development enabling divers to include the word "easy" into sport diving.

How would you like to do away with the multiplicity of straps that are necessary to hold your buoyancy vest, tank and weight belt? How would you like to go through the surf on a scuba dive without the weight of a tank on your back? How would you like to be able to talk comfortably to your buddy on your snorkel trips to and from your diving area? How would you like to adjust your buoyancy on the bottom without having to take the regulator out of your mouth? If you're as lazy a diver as I am, your answer to all of these questions would be yes.

The answers are found in the ATPAC, recently introduced to the sport diving world by Watergill, and currently being stocked by professional dive stores such as the Diving Locker of San Diego and Escondido. The ATPAC combines the operational features of an air supplied buoyancy vest, a back pack and a weight belt.

The buoyancy bag provides a lifting capability of about 60 pounds of variable positive buoyancy. It can be inflated by the oral inflator which is similar to those on buoyancy compensators already in use in sport diving. The standard method of inflation, however, is with the inflator valve located next to the mouthpiece on the oral inflator hose. The inflator valve is pressed to open, and closes automatically when released. The inflator valve supplies air from your regulator's first

stage. Deflation of the buoyancy bag is accomplished by opening the oral inflator and is very rapid when the valve is held open with the hose held vertically. The bag has an over-pressure relief valve which is set at approximately one p.s.i. This valve prevents the bag from bursting if it is fully inflated at depth and subsequently brought to the surface, or if the valve sticks open.

The back pack features of the ATPAC are comparable to several back packs already on the market. The ATPAC can be adjusted to fit all standard single and double tank configurations simply by using the proper tank bands. The waist straps and shoulder straps are continuous for easy adjustment. To achieve a snug fit, simply pull the waist strap to tighten the shoulder straps. The waist strap has a quick release buckle, and one shoulder strap has twist locks for easy removal.

The weight chamber is located inside the back pack between the diver's back and his tank. The chamber is filled with lead pellets and glass marbles in proper proportions to determine the buoyancy of the ATPAC and tank for your diving needs. The lead pellets provide the weight, and the marbles fill the remaining space so the lead doesn't shift around. The chamber has a fall-away trap door which holds the lead and marbles inside. To release the weight, reach for the bottom of the back pack with your left hand, grab the trap door hinge pin ring, pull the ring and release the lead and marbles. The total capacity of the chamber is about 30 lbs.

The operation of the ATPAC is a joy. To prepare the ATPAC for a dive, take the whole unit to the water's edge, attach your regulator to the tank and

connect the inflator air supply hose. Operate your regulator, inflator valve, and oral inflator to insure proper operation. Fully inflate the bag, and you're ready to go through the surf or off the boat. Complete your other preparations for diving — dive plan confirmed, lights checked, goodie bag ready, camera loaded, wet suit on, mask defogged, fins on, buddy check completed. You can forget about adjusting your buoyancy vest, tank and weight belt.

Grab your ATPAC by the shoulder straps or tank valve and back into the surf; the buoyancy bag will support the weight of the unit. When the ATPAC is completely afloat, continue backing in through the surf or start snorkeling. Either tow or push the ATPAC through the surf. While you're penetrating the



PHOTOS BY CHUCK NICKLIN & WATERGILL



The Atpac is a combination back pack, air supplied buoyancy vest and weight belt — all in one convenient package! The standard method of inflation is with the valve located next to the mouthpiece on the oral inflator hose. It is pressed to open, and closes automatically when released. Donning the Atpac in the water is simple: Put your arms through the harness, push the tank valve down and then duck under the unit. The Atpac will retail for \$160.

surf, think back on how it used to be when you clumsily walked with the tank on your back and then snorkeled with the tank pushing you down into the water. Now you can float with your body and lungs on the surface of the water. Not only can you see better, but you can breathe much easier and, therefore, work less. If you're entering from a boat, lower the ATPAC into the water and let it float nearby until you are ready to enter. Don't bother with the hazardous gymnastics of donning your tank in the rocking boat. Don't worry about forgetting your weight belt. Simply throw the ATPAC into the water (but not from higher than 12 feet) and follow it for fun. You may, of course, wear the ATPAC for normal surf or boat entries.



Snorkeling while wearing a tank has never been anyone's idea of fun. The ATPAC changes that. Snorkel comfortably with your face well out of the water using the ATPAC as a surf mat or surface float. You can see the world better than when just your snorkel tip was out of the water. You can watch underwater if you want and still maintain a position so that your lungs are higher on the surface for easier breathing. You can move through the water with about half the effort because of reduced water resistance. You can maneuver over kelp just like an air boat by turning the ATPAC over with the tank on top. Drape the regulator, submersible gauge and anything else that dangles, over the tank. And, finally, you can handle emergencies better

because you can get rid of your heavy gear simply by releasing the ATPAC (it won't swim far by itself). To be freed from the unrelentless weight of the tank and weight belt on the surface is a joy worth savoring.

Some divers prefer to wear the ATPAC for entries and snorkel trips. Its buoyancy capabilities make it preferable to the standard configuration even though the freedom is not as complete as when it's being towed. When snorkeling face down, the buoyancy and weight of the ATPAC are opposing each other at the same point slightly above the diver's back. The diver equipped with standard gear faces the buoyancy of the vest pushing up from below his chest, the weight of the tank pushing down on his back, and the weight belt pushing down at his hips. The result is that the diver's chest is squeezed, causing discomfort and breathing difficulty. The standard diver also has to expend part of his kicking power in order to keep his fins near the surface to put their thrust in the direction of travel. The standard diver can relax by snorkeling on his back, but then he's being pulled apart by the buoyancy of the vest and the weight of the belt and tank. Snorkeling on your back as an ATPAC diver is like sitting in an armchair. The weights and buoyancy are both beneath the diver, therefore, the buoyancy supports not only the tank and weights, but it keeps the diver partially out of the water. For resting during a swim to a dive site, the ATPAC diver may choose from one of three natural positions. He may lie face down while breathing through his snorkel. He may lie flat on his back almost completely out of the water. Or he may rest with his legs down, with his body inclined forward about 18 degrees from the vertical.

Prior to diving, the diver must don the ATPAC in the water if he has chosen not to wear it. The procedure is simple because of the stability of the ATPAC. Once your arms are partially through the shoulder harness, push the tank valve down, let the tank boot come up and over your head, duck under the unit, then gently kick forward and up to assume the 18 degree tilt position. The ATPAC will maintain that position while the waist straps are adjusted and the shoulder harnesses tightened. Trade snorkel for regulator, deflate the bag and descend with your buddy.

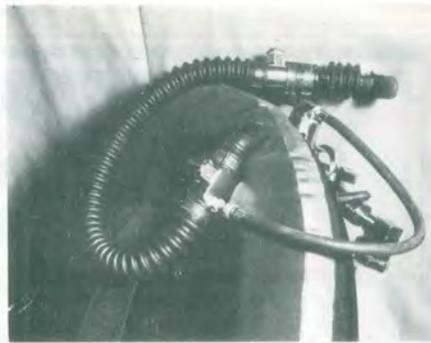
Underwater the utility of the buoyancy control feature of the ATPAC comes into full play. As the diver descends, he can add air to the buoyancy bag with one hand by simply pressing the inflator valve. He can slow his descent or even stop it. There's no need to remove the regulator to oper-

(Continued on Page 84)

THE ATPAC

(Continued from Page 65)

ate the oral inflator. As a diver varies his depth during a dive, he can increase his positive buoyancy with the inflator valve, or decrease it by venting some air from the bag. This is accomplished by opening the oral inflator when raised



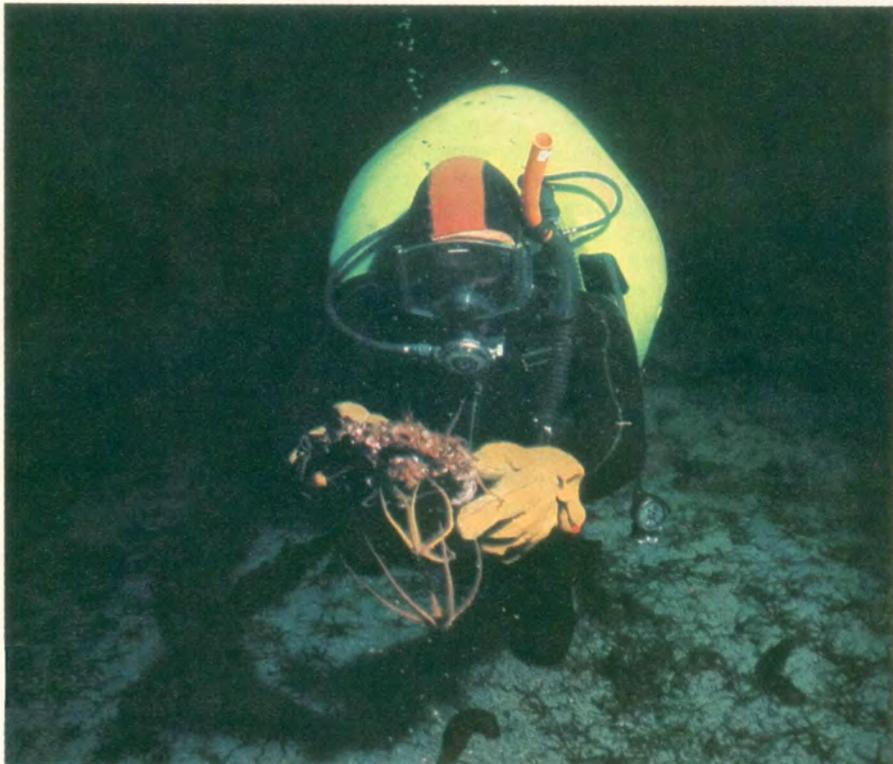
above his head. Since the air in the bag is supplied by the tank, divers will have buoyancy adjustment capability throughout the dive, unlike the other buoyancy compensators which have a separate bottle. To ascend at the completion of a dive, the diver inflates the bag slightly for positive buoyancy, then opens the oral inflator to control his ascent. There's no need to swim to the surface while using the ATPAC.

With the ATPAC, returning to the beach or the boat is even more fun than getting to the dive area. It permits conversation about the new and exciting experience you've just shared with your buddy with the luxury of floating unencumbered on the surface. How often have you swallowed water trying to discuss the dive when nearly submerged on the surface? The ATPAC puts all that in the past.

The recent University of Rhode Island report on scuba accidents noted that there seemed to be little coordinated development of sport diving equipment. The ATPAC is the start in answering the URI recommendations for equipment specifically designed for sport diving. And, it's a very good start. Professional dive shops can assist you in matching the ATPAC to your tank and your diving. For me, the ATPAC makes diving more fun. >



At-Pac proponents claim a main advantage of the system is the ease of descents and ascents for properly weighted divers. While on the bottom, neutral buoyancy can be maintained with one hand even if a diver has picked up goodies.



photography by Jack McKenney

A SECOND

By Lou Fead

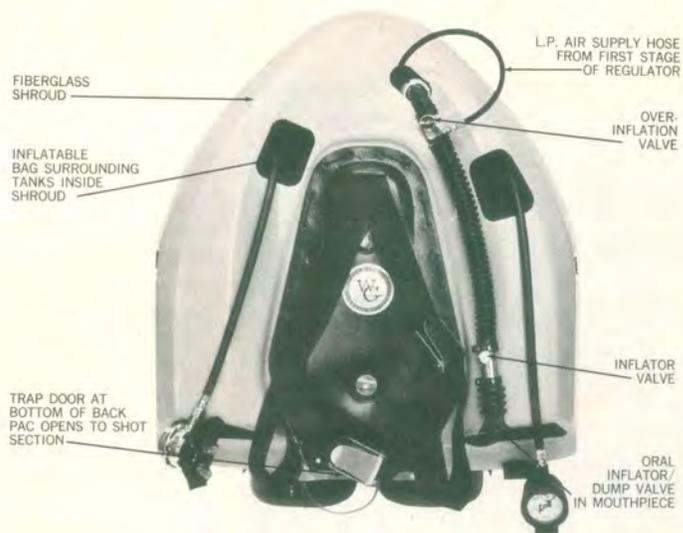
Two years have passed since the At-Pac was introduced to the sport diving world by Watergill, Inc. In those two years, thousands of divers have bought the At-Pac for their personal use. Many more divers were introduced to it by the June, 1972, issue of SKIN DIVER which featured the At-Pac as a "revolutionary back pack." The article described the At-Pac as a single unit combining the operational features of an air-supplied buoyancy vest, a back pack, and a weight belt.

The current model of the At-Pac, much improved internally, still provides the basic benefits which delighted the early users: easy surface snorkeling maneuverability of the heaviest diving equipment, elimination of strap clutter on a diver's body, and push-button buoyancy control.

Talkative divers have heartily endorsed the opportunity for continual surface conversation before the dive, after the dive, and even when penetrating the surf, that comes from the surface handling characteristics of the At-Pac. Little and big divers, who previously suffered with overlapping and hidden straps from equipment built for the "standard" diver, have delighted in seeing their toes and waist strap, all at the same time. Photographically inclined divers have been happy that the At-Pac's single-handed submerged buoyancy control releases them from diving chores to concentrate on their photographic fun. Such was the "revolution" in sport diving fun.

Many facts and fictions about the At-Pac have since been generated by those who know and those who don't. To clear the air and separate fact from fiction, let's take a look at the pros and

LOOK AT THE AT-PAC



The At-Pac combines features of a back pack, a buoyancy vest and weight belt.

cons of the At-Pac system of diving.

The proponents of the At-Pac point to every phase of a dive to extol its virtues. The At-Pac diver can comfortably carry all his diving gear at the same time to the dressing area by wearing his At-Pac, carrying his gear bag in one hand and his tank in the other, for balance. Assembling the gear and getting dressed takes much less time and is easier since there is no need to separately don a vest, then a tank, then a weight belt.

Entering the water from a boat is simple because the inflated At-Pac can be thrown in first, then the unencumbered diver can follow, without the balance problems caused by the ocean motion of the boat. Entering through the surf becomes a breeze by dragging the At-Pac through, or, by floating face up and kicking after shuffling out to the surf.

Snorkeling, as the older diver knows it, disappears when traveling backward on an At-Pac. Snorkeling face down also becomes easier because the tendency to roll over caused by the tank-vest-weight buoyancy relationship does not exist. Resting is more effective since the At-Pac leaves the diver in a comfortable snorkeling position, or on his back, or in a nearly vertical position, if that is his choice—or completely free if he has it off.

The proponents continue with the submerged capabilities that enthrall them. Easy rapid vertical venting of the buoyancy bag, coupled with a deep exhale, quickly takes the properly weighted diver beneath the surface. One hand operation of the inflator valve controls the diver's descent such that he can arrive at the bottom, regardless of

depth, nearly perfectly trimmed for neutral diving. It's great to be in control of a descent without kicking fins!

Buoyancy adjustment on the bottom can be done, still with one hand, while the diver is shooting photos, stalking lobsters, gliding through kelp, or marveling at the beauty of a vertical wall. That adjustment can include maintaining neutrality while picking up about 30 pounds of goodies to return to the surface world. Ascent is a no-sweat-no-kick evolution accomplished by adding a slight amount of positive buoyancy to start, then controlling to that same positive buoyancy during rising by venting the excess expanding air.

The At-Pac opponents have raised some points of discussion that deserve serious consideration, because they involve the basic approaches to diving.

The observant diver notices early in his examination of the At-Pac that the internal weights can be jettisoned only when the top of the At-Pac is higher than the bottom. The weights will not fall out if the trap door is above the weights; that is when the diver is in a head down position. That raises the question, "How do you drop the weights in an emergency when your head is down?" The answer is that the weights needn't be dropped in an emergency. The At-Pac's buoyancy bag can be inflated, in any position, to a total of about 60 pounds of lift, which is considerably more than a dropped weight belt can provide. In fact, a neutrally compensated At-Pac diver, unless he is quite deep, can gain increasing positive buoyancy easily by ascending a few feet to make the air in his buoyancy bag expand.

A continued discussion of the At-Pac's weight-dropping characteristics leads to the "out-of-air" diver who cannot inflate his At-Pac and still needs to drop weights. The simplest solution for that situation is to jettison the whole At-Pac, which he can do quickly because the releases are always clear. Jettisoning the At-Pac is accomplished by unfastening waist and shoulder quick release buckles, turning slightly right toward the pack, and slipping the right arm out of its strap.

But, what about the lead shot in the At-Pac; why not drop it? Dropping shot is done mainly on the surface when the buoyancy bag has been rendered useless in some way. If entanglement is the reason for dropping the belt, it should be obvious that dropping the At-Pac with tank would be more effective because it is probably the tank that is entangled.

The significant concern in the weight belt dropping question is: what should a diver do when he is in distress? Many have been instructed to drop the weight belt, but that doesn't always work. Accident studies show that panicked divers do not drop their weights. Divers without wet suits often don't wear weight belts to drop. A diver wearing only a light weight belt, as in the case of the diver with heavy tanks or natural negative buoyancy, gains little buoyancy by dropping his belt. The proper action in an emergency is to think, "What's wrong and how can I fix it?"

At-Pacs are too heavy! Obviously, if a diver picks up his At-Pac system assembled for diving, he'll call it heavy. Similarly, if he picks up his tank, back pack, vest, and weight belt all at once,



Divers Bernie Campoli and Bill Miller tried the At-Pac in open water. They found it easiest to put the unit on in the water, letting it slip over their heads. Lead shot weights are held in the unit by a trap door, shown below.



he'll call that heavy, too. The total weights of the two diving systems are essentially the same, so it can't be said honestly that the At-Pac is too heavy. It is suggested that the tank be carried separately from the At-Pac for handling ease. After donning, however, all the weight and inertia of the heavy diving equipment can be instantly jettisoned from a diver through two-buckle releasing of the At-Pac. The jettisoned equipment is not lost, as in the case of standard systems, because it is floating nearby as a recoverable unit.

The general thought in diving is that diving equipment has been considered in bits and pieces too long, as noted in the initial University of Rhode Island sport diving accident study. The At-Pac represents the first real integration of sport diving equipment to reduce the incompatibilities of the separately designed equipment essentials.

The opponents' argument which merits detailed attention is that which concludes a vest is superior to the At-Pac because it will float an unconscious diver face up on the surface instead of face down, as the At-Pac supposedly would. Let's imagine the situation which could include a diver floating unconscious on the surface. Such a situation has immediate drastic consequences if the diver is unassisted by anybody or any buddy.

If a diver is alone, and unconscious, the position and condition in which he floats depends on the type of vest worn, how it's worn, and the position of the diver when he passes out. To set a general conclusion for vests would be folly. Each diver should evaluate his own vest by completely relaxing with lungs about half full, to simulate an unconscious diver, and letting the vest determine how he floats. Experience has shown that, even though a lot of the vests tend to turn the diver face up, many do not support the mouth out of the water.

For the diver who passes out underwater and ascends unconsciously, the final floating condition is a matter of chance and equipment. If the vest is partially inflated on ascent, it may be over expanded, according to Boyle's Law, and ruptured by the time it reaches the surface (unless it has an overpressure relief valve, in which case it will be fully inflated). Pool and ocean testing of relaxed divers ascending with no physical control concludes that the final position cannot be predicted; that it is only luck if the diver's mouth is out of the water.

The At-Pac performs as well as many vests in this regard; sometimes face up, sometimes face down, but usually on the side. The difference comes when a buddy is near to assist. The At-Pac's buoyancy provides an unencumbered access to the unconscious diver, who can easily be rolled on his back and maintained in a face up condition with his mouth out of the water, with no effort other than inflating the buoyancy bag and rolling the body.

A few minor objections usually included in an opponents' discussion of the At-Pac are: it is hard to get into on dry land, its weights stick together and won't drop even if released, and it costs too much.

Donning the At-Pac is relatively easy, if the diver utilizes the technique that best fits his capability. Some divers set the At-Pac on a bench, then back into the gaping shoulder straps, snug up the waist strap and stand up. Others sit into the At-Pac when it is on the ground, adjust the straps, then roll to the side to stand up; while there are even some who lie flat on the pack to adjust the straps, then roll to stand up. Any method seems easier to me than the hassle of donning a vest, then a tank, then a weight belt.

The supposed "sticking together" of the lead weights and marbles may occur if the At-Pac is over-stuffed with those items, in violation of the recommended loading procedure. Each pre-dive check includes shaking the At-Pac to ensure the weights are loose.

The cost concern should disappear with two thoughts. One, the cost of the vest-pack-belt system with somewhat the same features, but lacking the integrated capabilities and convenience of the At-Pac system, is generally only about one fourth less. Some combinations even cost more than the At-Pac. Two, for many divers the At-Pac represents the Cadillac of sport diving systems, and you can't get a Cadillac at Camaro prices.

The At-Pac represents a step change in diving equipment caused by the demands of thinking divers. Divers will continue to see more change because all manufacturers of diving equipment are continuing to respond by designing, building, testing, and distributing new and more efficient diving systems for the pleasure of the diving public. It pays in increased enjoyment for every diver to constantly monitor and personally evaluate the continued progress of sport diving equipment. >

THE WATERGILL FSDS-100

By Lou Fead

We are in La Jolla Canyon at 70 feet and have been for over 35 minutes. It is just about time!

Pop! Hissss! There goes my reserve. I shift the override to "off." This hiss stops, but my Automatic Reserve has already started my ATPAC and myself toward the surface to complete another fun dive with air left in my tank.

An Automatic Reserve! What is that? It is the latest development in Watergill Inc.'s quest for design which allow the sport diver to concentrate on diving instead of operating equipment.

The Automatic Reserve is just one part of Watergill's FSDS-100 Regulator, which also automatically inflates the ATPAC if the primary second stage is *not* breathed from routinely. Besides being automatic, the FSDS-100 has two independent first stage pistons, so it is its own spare part.

The FSDS-100 has made me a Phase II Automatic Diver. Read more so you can find how to make the advance toward automation with me.

AUTOMATIC RESERVE VALVE FEATURE

For years the dive community has been struggling to develop an effective means to prevent divers from running out of air. Many methods have been tried: reserve valves (R, J, DCAR), submersible pressure gauges, and sonic alarms have been the main efforts. They are all lacking in one way or another: reserve valves can be bypassed too easily, submersible gauges must be read to be effective, and alarms disturb the tranquility of diving.

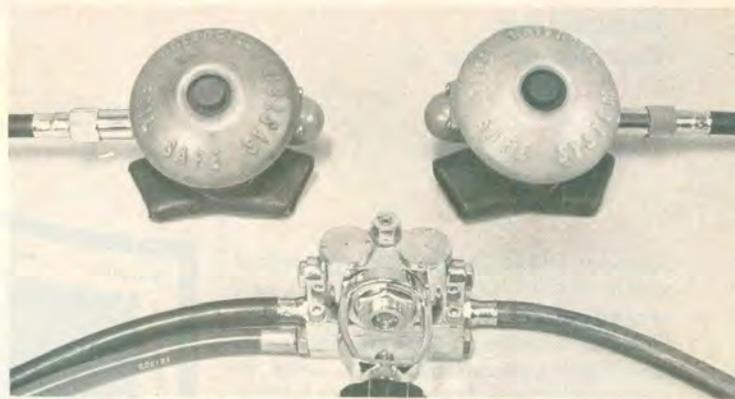
The Automatic Reserve Valve in the FSDS-100 warns the diver of a low air supply with a "pop" and a quiet "hiss" as automatic inflation of his ATPAC starts. The gentle, but firm, upward lift of the inflation confirms the warning physically. To ignore this, the diver must definitely decide to stay down by manually overriding the inflation *in addition* to venting the excess air from his ATPAC. That process soon becomes such a bother that even old "suck-the-tank-dry" divers have changed their ways and surface automatically at the reserve level.

Divers react to the Automatic Reserve by saying they do not want to be *shot* to the surface automatically without control. But, the "pop" warns you inflation is starting at 400 psi. Full inflation of the ATPAC's buoyancy bag takes approximately two minutes. Ascent is controlled by manually overriding the automatic inflation and venting the excess air. Venting gets rid of more air than inflating can supply.

AUTOMATIC INFLATION FEATURE

The benefit of having the diver's ATPAC inflate automatically after a period of non-breathing, is poignantly obvious to 19 past ATPAC owners known to Watergill. They had thrown their uninflated ATPAC's off boats for easy donning in the water. The ATPAC's made the dives without the divers, in water too deep for recovery.

If those ATPAC's had the FSDS-100, they would have de-



photograph by Geri Murphy

scended for about two minutes, inflated automatically because no one was breathing from the primary second stage, and surfaced shortly thereafter. That is certainly an effective equipment recovery system.

Automatic inflation should reduce any hesitancy in considering jettisoning equipment in a ticklish diving situation. Equipment jettisoned in the past would normally have been lost. Automatic inflation brings the equipment back.

Automatic inflation can also be of use to an unconscious and non-breathing diver. Regardless of where he loses consciousness, on the surface, ascending, descending, or on the bottom, the system will operate to inflate and ascend to, or stay on, the surface. If an automatically ascending diver did nothing to retard his ascent from a depth of 120 feet, he and his ATPAC would be going at a rate of five feet per second on reaching the surface, according to open water tests. That is about the same rate submarine escapees reach in their buoyant ascent training. Once the buoyancy bladder is filled, inflation will continue to slightly overpressurize the bladder and lift the airway relief valve. The valve will then honk loudly in the water to attract attention and say that something is amiss. Not only does the FSDS-100 bring lost equipment to the surface, it tells the world it is lost.

TWIN PISTON FIRST STAGE FEATURE

The FSDS-100 Regulator has two first stage positions in one housing. They work together to provide automatic reserve and inflation functions, but are as independent, breathing-wise, as two separate regulators. One first stage can stop operating and the other can continue. If the primary first stage stops, the secondary may be used by screwing the second stage into it and overriding the automatic features. Though the diver will be lacking these features, his installed spare will allow him to dive. A dive without automation is better than no dive at all.

The benefit of two-regulators-in-one is obvious when two divers are breathing from one first stage and two second stages. The FSDS-100 can give each diver his own regulator, a second and a first stage, to get full airflow with each breath. No more interference, even if both inhale at the same time. That should reduce panic induced by hard breathing.

Cave and wreck divers can also use the FSDS-100, with an extra second stage, as a redundant regulator system for safety. Its two first stages, each with its own second stage, can be compactly attached to the entire air supply to eliminate the need for separate regulators, separate air supplies, and extra piping and valving.

The twin first stage design of the FSDS-100 adds a great deal of reliability to my diving. I like it, not only for its design, but for its looks, also.

CONSTRUCTION

The FSDS-100 is a twin-piston, balanced, two-stage, single-hose regulator. Both the primary and secondary pistons

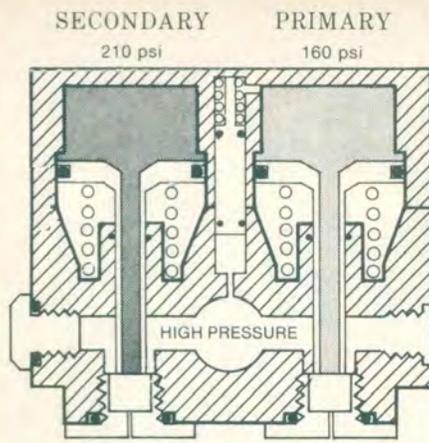


FIG. 1

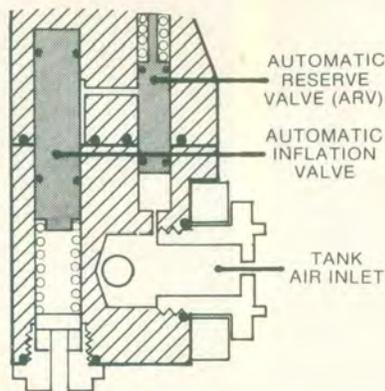


FIG. 2

The two piston chambers of the FSDS-100 operate on independent and different intermediate pressures above ambient (Fig. 1). This pressure differential is the basis of the automatic inflation and the automatic reserve functions (Fig. 2). If no breath is taken within a certain period of time, the automatic devices will begin inflation and bring the diver immediately to the surface.

deliver at least ten cubic feet of air per minute, at the surface, to their respective low-pressure ports. Each piston chamber has one high-pressure port. A full-capability configuration for the FSDS-100 would include its first and second stages, a submersible pressure gauge, an octopus left-hand second stage, and an ATPAC air inlet hose. There is still a port for a low-pressure accessory air tool hose without any adapter.

The first stage housing contains the primary and secondary piston assemblies, the Automatic Reserve Valve, and the Automatic Inflation Valve. It is made of chrome-plated brass. The pistons, springs, and valve components are stainless steel. The pistons are coated with Everlube for O-ring endurance. Buna-N O-rings are used exclusively. The high-pressure seats are Teflon.

The second stage is the downstream type, as are all Watergill second stages, either right or left hand. It is made of high-strength ABS plastic for light weight and durability. The diaphragm lever is extra-long for increased mechanical advantage to provide better response to slight inhalation demands. Inhalation resistance is factory-set at seven-eighths of an inch of water at the surface. Exhalation resistance is one-half inch of water. Rubber daylight covers the front of the plastic diaphragm covers to protect them from dings and make them highly visible, even in deep water.

AUTOMATIC OPERATION DETAILS

The Automatic Reserve Valve is spring-loaded in a passage between the high-pressure sides of the two first stage pistons. When tank pressure reduces to 400 psi over ambient, the spring opens the valve to let 210 psi air from the secondary piston flow into the primary piston low-pressure side. The higher pressure travels down the hose to the air inlet valve in the ATPAC airway to force its way past the valve into the buoyancy bladder. The manual override collar must be in "automatic" with at least 200 psi of air in the tank for automatic reserve inflation.

The Automatic Inflation Valve connects the low-pressure sides of the twin pistons. It meters the continual flow of 210 psi air from the secondary piston to the 160 psi side of the primary piston. If the primary piston is not breathed from for a while, the pressures will equalize at about 200 psi. Just as in automatic reserve inflation, the higher pressure bleeds past the air inlet valve to inflate the buoyancy bladder. The Automatic Inflation Valve spring can be adjusted to make equalizing take from 15 seconds to 5½ minutes. It is factory-set at two minutes. Again the manual override collar must be in automatic with 200 psi tank pressure for automatic inflation.

The manual override collar on the ATPAC air inlet button is automatic when it is down. It can be put down simply by momentarily depressing the air inlet button. That operation was designed so any effort to inflate the buoyancy bladder would put the FSDS-100 in automatic. To override any automatic inflation, the diver pulls the override collar up.

COST

The FSDS-100 can be purchased, along with one hour of mandatory practical instruction, by a certified diver. The training is in addition to the three hours required for an ATPAC, but can be concurrent if both are bought together. Even though the FSDS-100 and ATPAC bear many resemblances to traditional dive equipment, their uniqueness of operation requires training to fully utilize their capabilities and avoid confusion.

The FSDS-100, consisting of the twin-piston first stage and one downstream second stage in any color, retails for \$190. An ATPAC air inlet valve with manual override retails for \$13.50. An additional second stage, either right or left hand, sells for \$68. The combination, at \$272, is less than its equivalent of two balanced single-hose regulators and is a better buy because it includes the automatic features.

Watergill Inc. unconditionally guarantees the stationary parts of the FSDS-100 for the lifetime of the original owner, the moving parts for two years. The guarantee covers factory or design defects and includes replacement parts at no cost.

MAINTENANCE

Post-dive maintenance of the FSDS-100 is the same as for any dive equipment: a thorough rinsing in clean fresh water.

The Watergill second stages are designed for dismantling with a small screwdriver for field removal of any sand, debris, or corrosion. Such contaminants can void the automatic inflation capabilities by causing leaks. Watergill recommends a semi-annual servicing by an authorized dealer.

FUTURE

Watergill has been pursuing a vision of safe dive equipment with three major phases of development. The first was the ATPAC, a coordinated single piece of equipment for total buoyancy control. Using the back-buoyancy principle which Bill Walters patented, the ATPAC eliminated the strap clutter on a diver while providing push-button control of buoyancy.

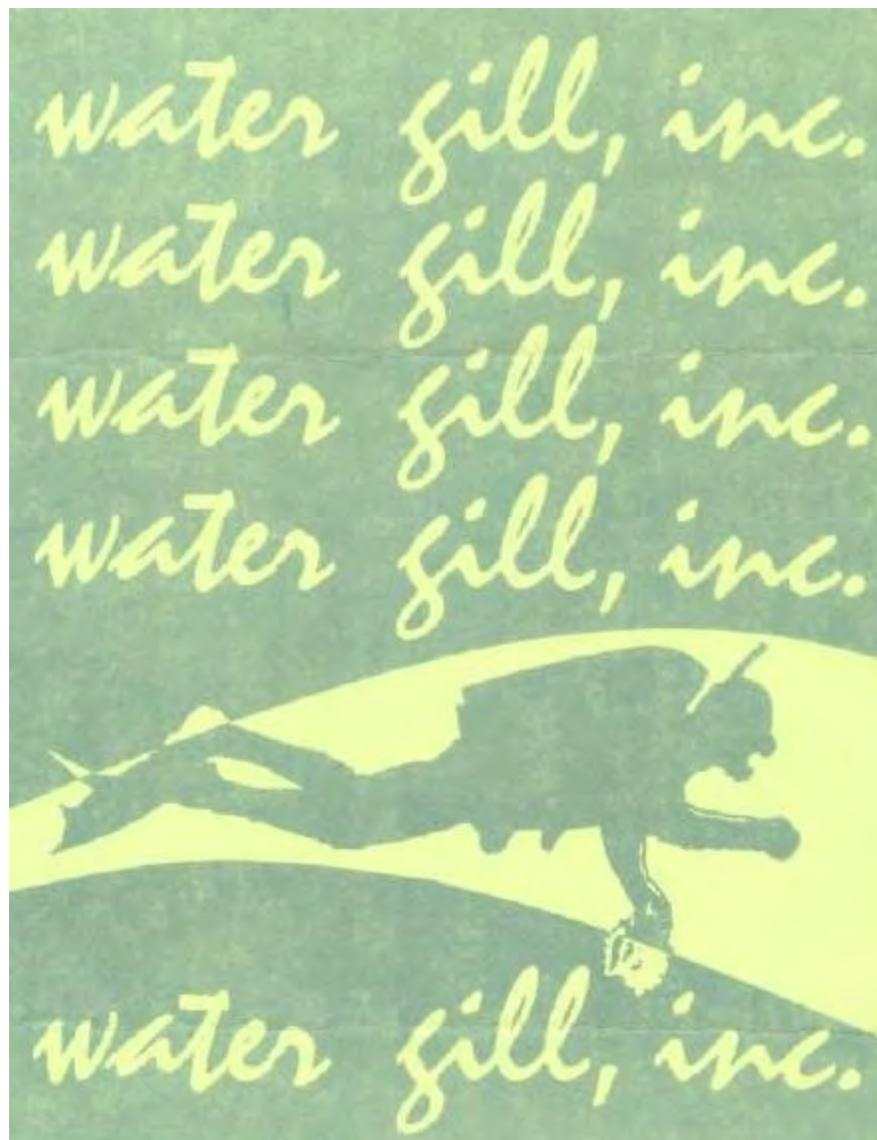
Phase II is the FSDS-100. The out-of-air diver can now become a curious relic of the laborious past, thanks to the Automatic Reserve Valve. False economic hesitation at jettisoning equipment has been eliminated, thanks to automatic inflation which recovers dumped gear. Two independent regulators in one reduces significant regulator failure. FSDS-100 divers can concentrate on their dive objectives knowing their equipment is working for them, not against them.

Phase III completes the dream with a depth-sensitive automatic inflator and an ascent rate controller.

Push-button diving arrived in 1971. The FSDS-100 has arrived in 1977, after three years of at-sea testing, to open the door for automation in sport diving. Soon the final components of Watergill's fail-safe diving system will arrive to make automatic diving a reality. Try the FSDS-100 with an ATPAC. You may prefer it as much as you do a car to a horse!

XII

APPENDICES



Appendix 1

United States Patent

[15] **3,670,509**

Walters

[45] **June 20, 1972**

[54] **BUOYANCY ADJUSTMENT BACK PACK**

3,374,636 3/1968 Mason61/70
 3,263,432 8/1966 Maskell61/70

[72] Inventor: **William D. Walters, 2940 Andros Ave.,
 Costa Mesa, Calif. 92626**

OTHER PUBLICATIONS

[22] Filed: **Aug. 10, 1970**

U.S. Naval Institute Proceedings, August, 1964, pages 54 & 62 relied upon.

[21] Appl. No.: **62,450**

Primary Examiner—J. Karl Bell
Attorney—Fulwider, Patton, Rieber, Lee & Utecht

[52] U.S. Cl.61/69, 114/16 R

[51] Int. Cl.B63c 11/30

[58] Field of Search.....61/69, 70; 114/16 R, 16 T;
 224/5

[57] **ABSTRACT**

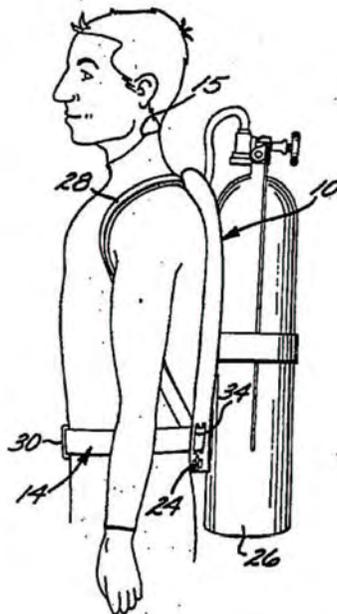
A buoyancy adjustment back pack for use by divers. The back pack is capable of supporting a usual air tank or tanks but also includes a compartment containing a pelleted or fluent mass which can be partly jettisoned to adjust the buoyancy of the diver, or completely jettisoned in an emergency.

[56] **References Cited**

UNITED STATES PATENTS

3,161,028 12/1964 Odum et al.....61/69 R

5 Claims, 7 Drawing Figures



Appendix 2

United States Patent [19]
Walters

[11] **4,016,616**
 [45] **Apr. 12, 1977**

[54] **DIVER FLOTATION APPARATUS** 3,436,777 4/1969 Greenwood 9/313
 3,487,647 1/1970 Brecht, Jr. 114/16 E
 [75] **Inventor: William D. Walters, Costa Mesa, Calif.** 3,670,509 6/1972 Walters 61/69 R
 3,820,348 6/1974 Fast 114/16 E
 [73] **Assignee: Lawrence S. Scott, Seal Beach, Calif.**
 [22] **Filed: June 12, 1975**
 [21] **Appl. No.: 586,505**

Primary Examiner—Trygve M. Blix
Assistant Examiner—Stuart M. Goldstein
Attorney, Agent, or Firm—Fulwider Patton Rieber Lee & Utecht

Related U.S. Application Data

[63] Continuation of Ser. No. 295,508, Oct. 6, 1972, abandoned, which is a continuation-in-part of Ser. No. 152,112, June 11, 1971, abandoned.
 [52] **U.S. Cl.** 9/339; 61/69 R; 114/16 E
 [51] **Int. Cl.²** B63C 11/30
 [58] **Field of Search** 114/16 A, 16 E; 115/6.1; 9/301, 311, 313, 336, 339; 61/69 R, 69 A, 70, 71; 128/142.2, 142.4

[57] **ABSTRACT**

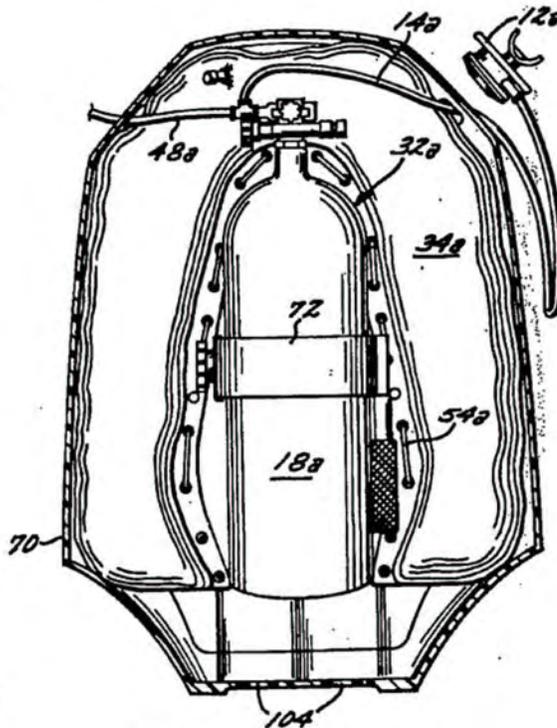
Diver flotation apparatus including buoyancy compensation apparatus in the back pack over the diver's back, and including an inflatable portion connected to the diver's air supply through a diver operated valve for filling the inflatable portion to achieve buoyancy compensation. The back pack incorporates internal weights, the amount and character of which can be changed to adjust the center of gravity of the diver and equipment. This allows a diver to easily adjust and maintain an optimum buoyancy and attitude relative to the water surface.

References Cited

UNITED STATES PATENTS

2,864,101 12/1958 Kissenberger 9/339
 2,982,105 5/1961 Akers 61/70
 3,379,023 4/1968 Crose 61/70

6 Claims, 19 Drawing Figures



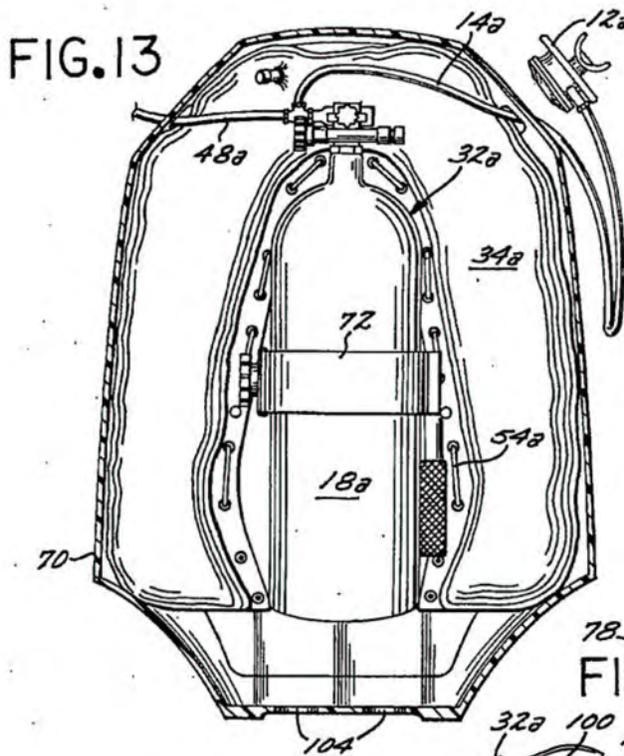


FIG. 13

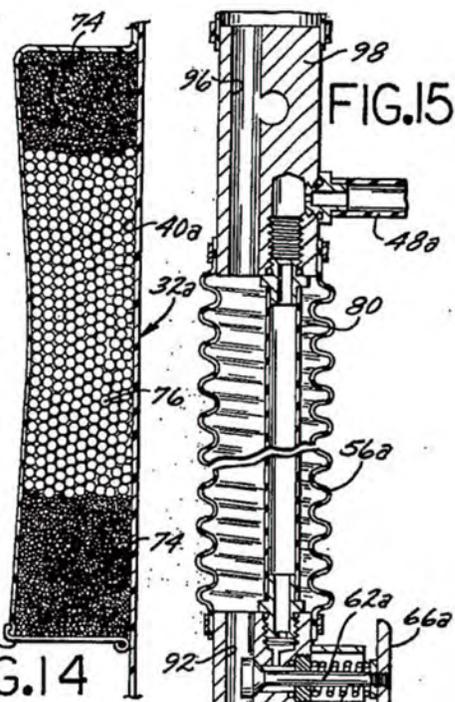


FIG. 14

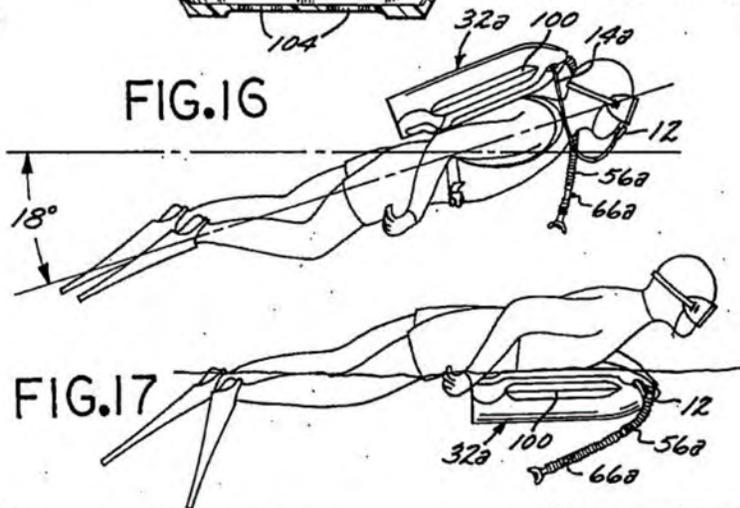


FIG. 16

FIG. 17

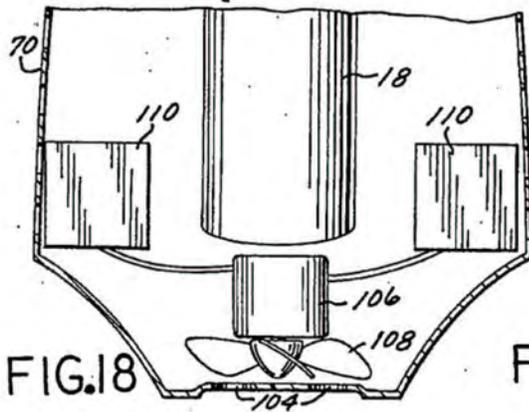


FIG. 18

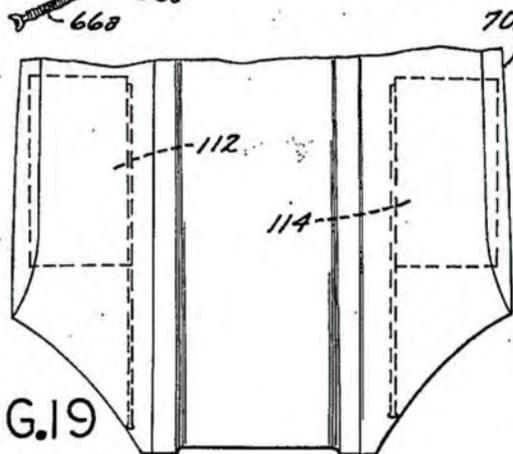


FIG. 19

236,388

DIVER BACK PACK

William D. Walters, 2940 Andros Ave.,
Costa Mesa, Calif. 92626

Filed June 5, 1972, Ser. No. 260,062

Term of patent 14 years

Int. Cl. D3-02

U.S. Cl. D87-1 R

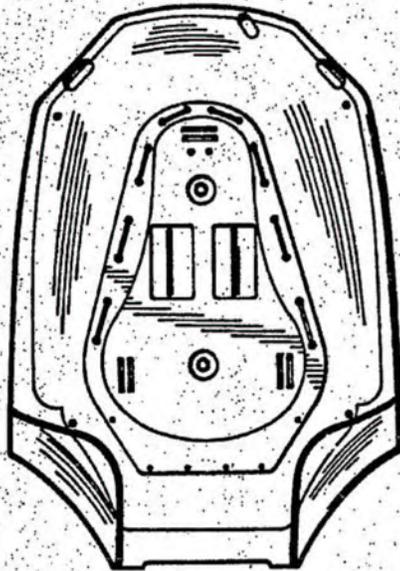


FIG. 1

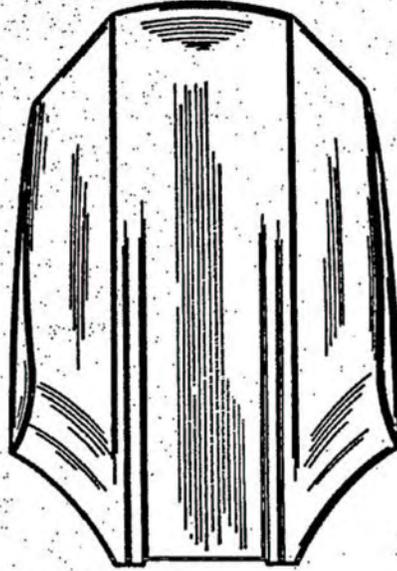


FIG. 2



FIG. 3

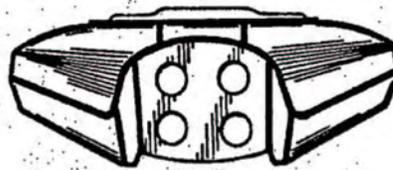


FIG. 4



FIG. 5

[54] SCUBA DIVER BACK PACK

[75] Inventor: William D. Walters, Costa Mesa, Calif.

[73] Assignee: William D. Walters, Costa Mesa, Calif.

[**] Term: 14 Years

[21] Appl. No.: 615,237

[22] Filed: Sept. 22, 1975

[51] Int. Cl. D21-02

[52] U.S. Cl. D87/1 R

[58] Field of Search D34/41, 43; D12/65; D87/1 R

[56] References Cited

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- D. 205,643 8/1966 Strader D34/41
- D. 236,388 8/1975 Walters D87/1 R

OTHER PUBLICATIONS

Skin Diver, Nov. 1973, back cover, UDS-1 System back on page.

Primary Examiner—Alan P. Douglas
Attorney, Agent, or Firm—Francis A. Utecht

[57] CLAIM

The ornamental design for a scuba diver back pack, substantially as shown and described.

DESCRIPTION

FIG. 1 is a perspective view of the inner side of a scuba diver back pack showing my new design; FIG. 2 is a perspective view of the outer side thereof; FIG. 3 is a front elevational view thereof; FIG. 4 is a rear elevational view thereof; FIG. 5 is a bottom plan view thereof; FIG. 6 is a top plan view thereof; and FIG. 7 is a left side elevational view thereof, the opposite side being a mirror image.

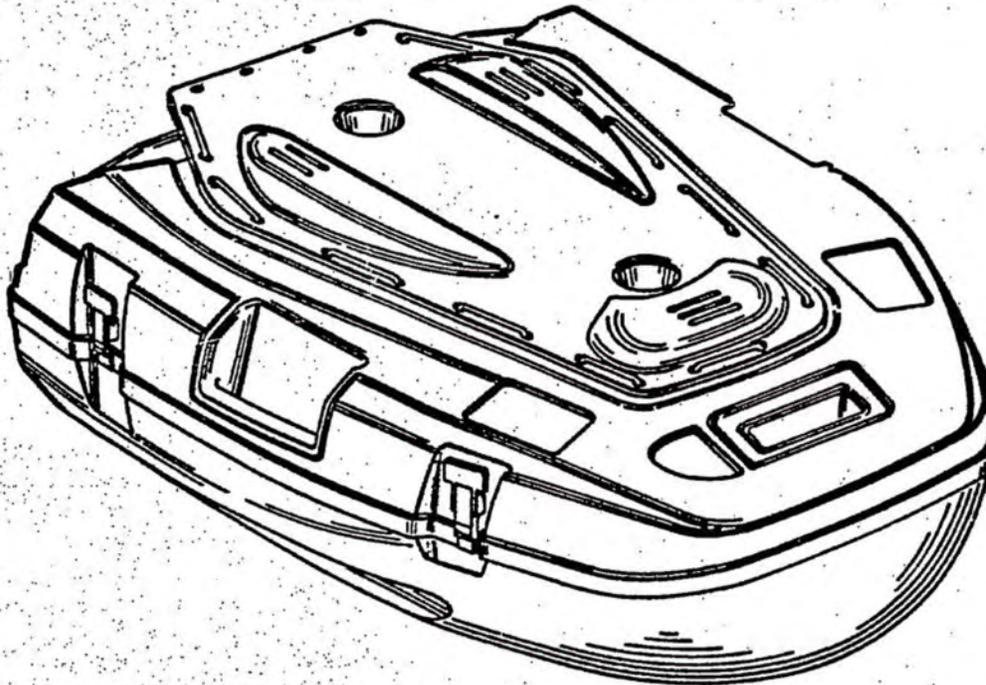


FIG. 3

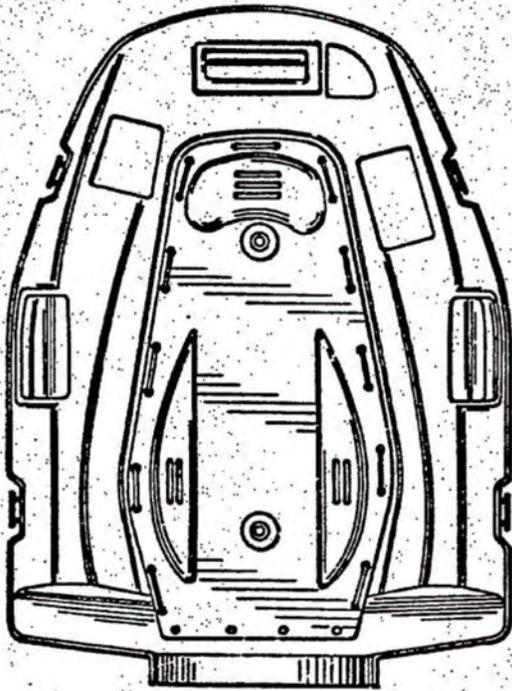


FIG. 4

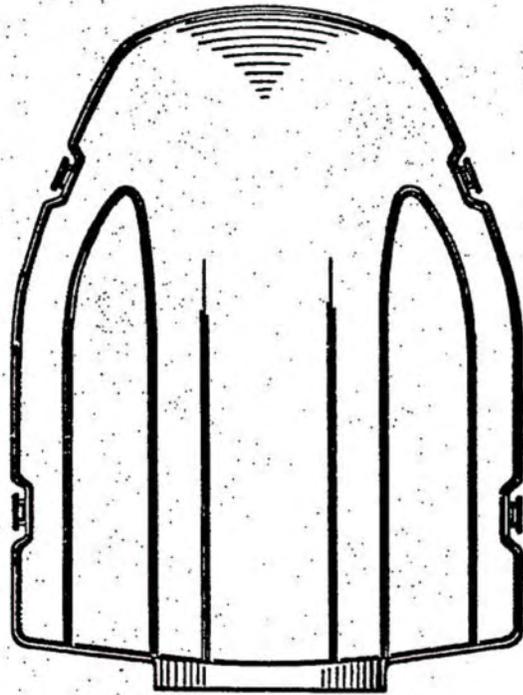


FIG. 5

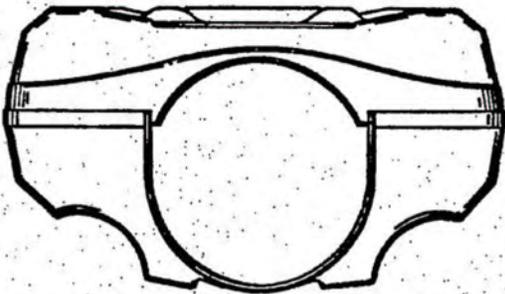


FIG. 6

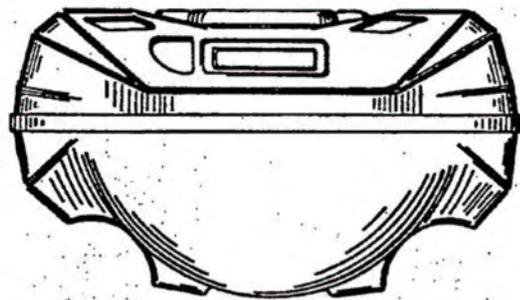
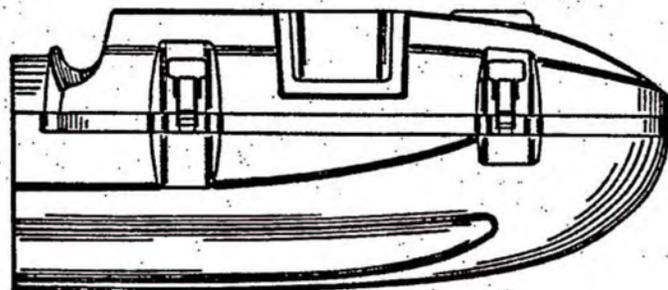


FIG. 7



Appendix 4

United States Patent [19]
Scott

[11] **4,176,418**
 [45] **Dec. 4, 1979**

[54] **APPARATUS FOR AUTOMATIC INFLATION OF DIVER FLotation MEANS**

[76] **Inventor:** Lawrence S. Scott, 3570 Columbia St., Seal Beach, Calif. 90740

[21] **Appl. No.:** 851,041

[22] **Filed:** Nov. 14, 1977

[51] **Int. Cl.²** B63C 9/24

[52] **U.S. Cl.** 9/313; 9/342

[58] **Field of Search** 9/313, 341, 311-312, 9/314-328, 336, 342, 329; 137/798-799; 251/142, 149.6, 149.7, 144; 128/142.2, 146.4, 146.5, 142.4

[56] **References Cited**

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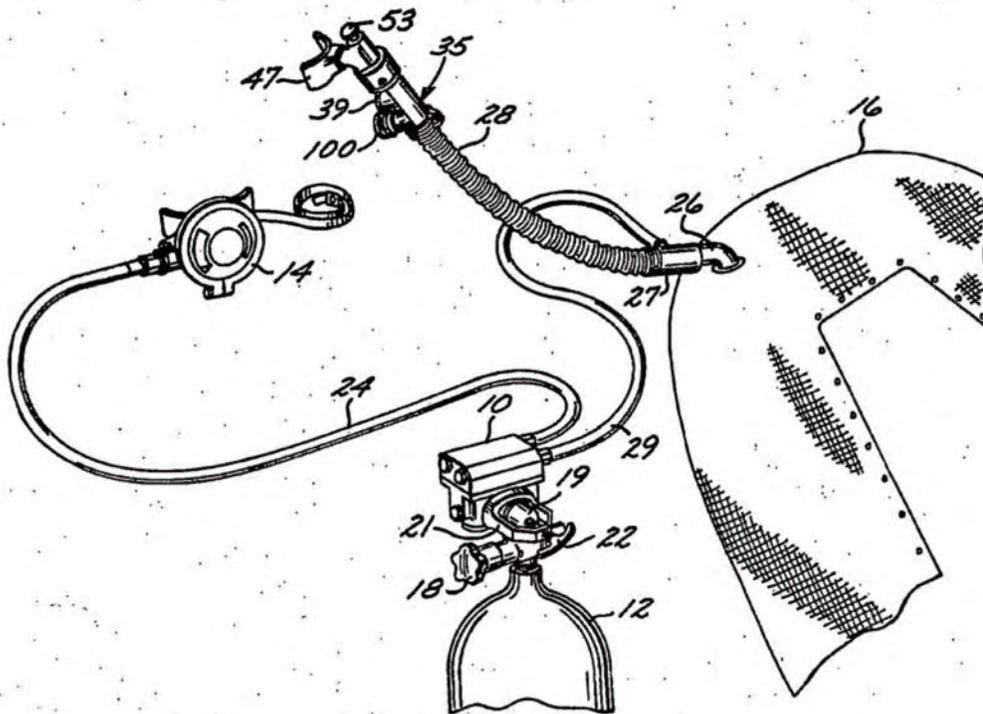
3,147,499	9/1964	Nelson et al.	9/313
3,436,777	4/1969	Greenwood	9/342
3,898,705	8/1975	Schuler	9/313

Primary Examiner—Douglas C. Butler
Attorney, Agent, or Firm—Fulwider, Patton, Rieber, Lee & Utecht

[57] **ABSTRACT**

Apparatus for automatic inflation of a diver flotation device in response to cessation of breathing by the diver, or in response to pressure reduction of the air source to a predetermined reserve pressure. The apparatus includes high and low pressure systems, the low pressure system being coupled to the diver flotation device and to the diver breathing device. A pair of valves interposed between the high and low pressure systems are responsive to termination of diver breathing and reduction of the source pressure to a predetermined reserve pressure, respectively, to open and allow air from the high pressure system to pass into the low pressure system. This inflates the flotation device and brings the diver to the surface.

8 Claims, 18 Drawing Figures



1976 Water Gill Price Sheet

water gill, inc.

water gill, inc.

water gill, inc.

water gill, inc.



AXTELL 75

water gill, inc.

RETAIL PRICE LIST

CAT. NO.	DESCRIPTION	RETAIL
AT-PACS		
A60	Single At-Pac— Orange, Blue, Black, Red Bands for steel 45, 60, 72.	\$200.00
A60-A	Single At-Pac— Orange, Blue, Black, Red Kam Bands for steel 45, 60, & 72.	210.00
A60-B	Single At-Pac— Orange, Blue, Black, Red Bands for steel 45, 60, 72 Quick Disconnect.	210.00
A60-AB	Single At-Pac— Orange, Blue, Black, Red Kam Bands for steel 45, 60, 72, & Quick Disconnect.	220.00
A50	Double At-Pac— Orange, Blue, Black, Red Double Bands for 60 & 72's.	205.00
A50-B	Double At-Pac— Orange, blue, Black, Red Double Bands for 60 & 72's Quick Disconnect.	220.00
A40	At-Pac for Alum.— Orange, Blue, Black, Red Bands for aluminum 80 & 100.	200.00
A40-A	At-Pac for Alum.— Orange, Blue, Black, Red Kam Bands for aluminum 80 & 100.	210.00
A40-B	At-Pac for Alum.— Orange, Blue, Black, Red Bands for alum. 80 & 100 Quick Disconnect.	210.00
A40-AB	At-Pac for Alum.— Orange, Blue, Black, Red Kam Bands for alum. Quick Disconnect.	220.00
A30	At-Pac for Large Tanks— Orange, Blue, Black, Red, Bands for Nemfor 100 & Watergill 80.	205.00
A30-B	At-Pac for Large Tanks— Orange, Blue, Black, Red, Bands for Nemrod 100 & Watergill 80, Quick Disconnect.	210.00
RWB	Centenial Colors— 76's, Stars, Red & Blue Cover, Red, White and Blue Airway. Add to Cost Please add RWB to the At-Pac Catalog number.	20.00
BRASS	Airway with solid brass air inlet body and solid brass front mouthpiece assembly. Please add the word "Brass" to catalog number.	24.00
*	Special Color Charge— ½ & ½ Combinations.	8.00
FERRINGS		
A400	Single Ferring— White, Blue, Orange, Black, Red or Yellow.	100.00
A300	Double Ferring— White, Blue, Orange, Red or Yellow.	120.00
A200	Combination Ferring— White, Blue, Orange, Red or Yellow (for single or double tanks).	135.00
COVERS AND BLADDERS		
A31	Bladder cover, nylon— Orange, Blue, Black, Red.	30.00
A31-1	Bladder cover, nylon— ½ & ½ Combinations.	38.00
A31-RWB	Bladder cover, nylon— Red, and Blue cover with Stars and 76's.	40.00
A32	Inside Air Bladder.	40.00
*	Name Printed on bladder cover.	6.50
*	Name engraved on back pack.	6.50
BANDS		
A95	Single bands— 1 set complete, 45,60, 72 c.f. steel tanks.	26.50
A44	Double bands—1 set complete, 45, 60, 72 c.f. steel tanks.	32.00
A45	Double bands— 1 set complete, 45, 60, 72, c.f. steel. Blue, Black, Orange or Yellow.	34.00
A44-80	Double bands— 1 set complete, 80 and 100 steel.	38.00
A47	Kam bands— 1 set complete, steel 45, 60, 72, alum. 80 and 100.	41.00
A42-1	Single bands— 1 set complete, steel 80 and 100.	28.00
A42-2	Single bands— 1 set complete, aluminum 80 and 100.	28.00
A80	Tapered Nut— Nylon.	1.25
A80-B	Tapered Nut— Brass.	4.00

CAT. NO.	DESCRIPTION	RETAIL
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HOSES AND STEMS

A121-S	External Hose, Standard includes stem.	\$
A121-B	External Hose, Quick Disconnect (includes stem).	18.00
A126-S	Standard Stem.	1.50
A126-B	Quick Disconnect Stem.	4.00
L-127	90° Elbow for Stem.	2.00
A121-2	Extra Long High Pressure Hose, 33 inches.	20.00
A121-3	Extra Long Low Pressure Hose, 33 inches.	13.50

AIRWAYS AND PACKS

B-90	Airway Complete— Solid Brass air inlet body and front mouthpiece assembly.	75.00
BAI-90	Airway Complete— ABS with Brass inserts.	45.00
B-90C	Conversion Kit— Necessary parts to convert BA-90 to B-90 airway.	45.00
BAI-90	Conversion Kit— Necessary parts to convert BA-90 to BAI-90 airway.	35.00
RWB-90	Airway Complete— ABS with Brass inserts.	65.00
A94	Pack assembly complete with hinge and straps.	55.00
A94-1	Pack assembly with hinge only.	38.00
A97	Hinge complete with wire and pin.	9.00

LEAD SHOT MARBLES, AND MISCELLANEOUS

A160	Lead Shot— 25 pound bags only.	1.50 Lbs.
A161	Marbles— 8 pound box.	1.30 Lbs.
A168	"Y" Adapter.	9.50
A167	Patch Kit (25 Neoprene Patches only).	2.00
A167-N	Patch Kit (25 Nylon Patches and glue).	5.00
SP-500	Rubber cover for airway clamp screws.	.10
S100	Silicone Spray— 12 16 oz. cans.	3.50 ea.
GB-N	Nylon Gear Bag.	19.50

REGULATORS

FSDS-10	Regulator— Balanced first stage with four L.P. outlets and second stage.	125.00
FSDS-100	Regulator— Fail Safe Dual Balanced first stage system and second stage.	175.00
FSDS-5	Second stage only— Down Stream, Black, Orange and Blue.	65.00

LOCATOR COMMUNICATION SYSTEM

LCS-1	Locator Communicator.	180.00
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TANKS

A174	72 Tank— Galvanized.	105.00
A175	72 Tank— Blank vinyl.	115.00
A175-1	72 Tank— Blue vinyl.	115.00

CAT. NO.	DESCRIPTION	RETAIL
HOSES AND STEMS		
A121-S	External Hose, Standard includes stem.	\$
A121-B	External Hose, Quick Disconnect (includes stem).	18.00
A126-S	Standard Stem.	1.50
A126-B	Quick Disconnect Stem.	4.00
L-127	90° Elbow for Stem.	2.00
A121-2	Extra Long High Pressure Hose, 33 inches.	20.00
A121-3	Extra Long Low Pressure Hose, 33 inches.	13.50
AIRWAYS AND PACKS		
B-90	Airway Complete— Solid Brass air inlet body and front mouthpiece assembly.	75.00
BAI-90	Airway Complete— ABS with Brass inserts.	45.00
B-90C	Conversion Kit— Necessary parts to convert BA-90 to B-90 airway.	45.00
BAI-90	Conversion Kit— Necessary parts to convert BA-90 to BAI-90 airway.	35.00
RWB-90	Airway Complete— ABS with Brass inserts.	65.00
A94	Pack assembly complete with hinge and straps.	55.00
A94-1	Pack assembly with hinge only.	38.00
A97	Hinge complete with wire and pin.	9.00
LEAD SHOT MARBLES, AND MISCELLANEOUS		
A160	Lead Shot— 25 pound bags only.	1.50 Lbs.
A161	Marbles— 8 pound box.	1.30 Lbs.
A168	"Y" Adapter.	9.50
A167	Patch Kit (25 Neoprene Patches only).	2.00
A167-N	Patch Kit (25 Nylon Patches and glue).	5.00
SP-500	Rubber cover for airway clamp screws.	.10
S100	Silicone Spray— 12 16 oz. cans.	3.50 ea.
GB-N	Nylon Gear Bag.	19.50
REGULATORS		
FSDS-10	Regulator— Balanced first stage with four L.P. outlets and second stage.	125.00
FSDS-100	Regulator— Fail Safe Dual Balanced first stage system and second stage.	175.00
FSDS-5	Second stage only— Down Stream, Black, Orange and Blue.	65.00
LOCATOR COMMUNICATION SYSTEM		
LCS-1	Locator Communicator.	180.00
TANKS		
A174	72 Tank— Galvanized.	105.00
A175	72 Tank— Blank vinyl.	115.00
A175-1	72 Tank— Blue vinyl.	115.00

CAT. NO.	DESCRIPTION	RETAIL
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TANKS, CONTINUED

A175-2	72 Tank— Orange vinyl.	115.00
A175-3	72 Tank— Red vinyl.	115.00
A175-4	72 Tank— Yellow vinyl.	115.00
A164	60 Tank— Galvanized.	95.00
A171	60 Tank— Black vinyl.	105.00
A171-1	60 Tank— Blue vinyl.	105.00
A171-2	60 Tank— Orange vinyl.	105.00
A171-3	60 Tank— Red vinyl.	105.00
A171-4	60 Tank— Yellow vinyl.	105.00
A165	80 Tank— Galvanized.	112.00
A166	80 Tank— Black vinyl.	120.00
A166-1	80 Tank— Blue vinyl.	120.00
A166-2	80 Tank— Orange vinyl.	120.00
A166-3	80 Tank— Red vinyl.	120.00
A166-4	80 Tank— Yellow vinyl.	120.00
A178	Twin 72 Tanks— Galvanized.	\$295.00
A179	Twin 72 Tanks— Black vinyl.	310.00
A179-1	Twin 72 Tanks— Blue vinyl.	310.00
A179-2	Twin 72 Tanks— Orange vinyl.	310.00
A179-3	Twin 72 Tanks— Red vinyl.	310.00
A179-4	Twin 72 Tanks— Yellow vinyl.	310.00
A173	Twin 60 Tanks— Galvanized.	270.00
A169	Twin 60 Tanks— Black vinyl.	290.00
A169-1	Twin 60 Tanks— Blue vinyl.	290.00
A169-2	Twin 60 Tanks— Orange vinyl.	290.00
A169-3	Twin 60-b Tanks— Red vinyl.	290.00
A169-4	Twin 60 Tanks— Yellow vinyl.	290.00

ALL WATERGILL TANKS ARE STEEL.

* Double Tanks include "K" manifold, bands, bolts, and tapered nuts.

VALVES

A180-K	"K" Valve.	23.00
A180-J	"J" Valve.	40.00
A182-K	Crossover double manifold.	59.00
A182-J	Crossover double manifold (single "J" reserve).	75.00

DECALS

A800	At-Pac embroidered cloth patch.	1.00
A850	Class poster.	6.00
A851	Counter poster.	*
A852	Window Decal— Dealer.	*
A854	Flag Decal.	.85
A54	Tank Decal.	.60