Aug. 30, 1966 R. C. ZAMBRANO 3,269,129

BACK PACK FOR DIVERS' AIR TANKS

Filed June 29, 1965

Fig. 1.

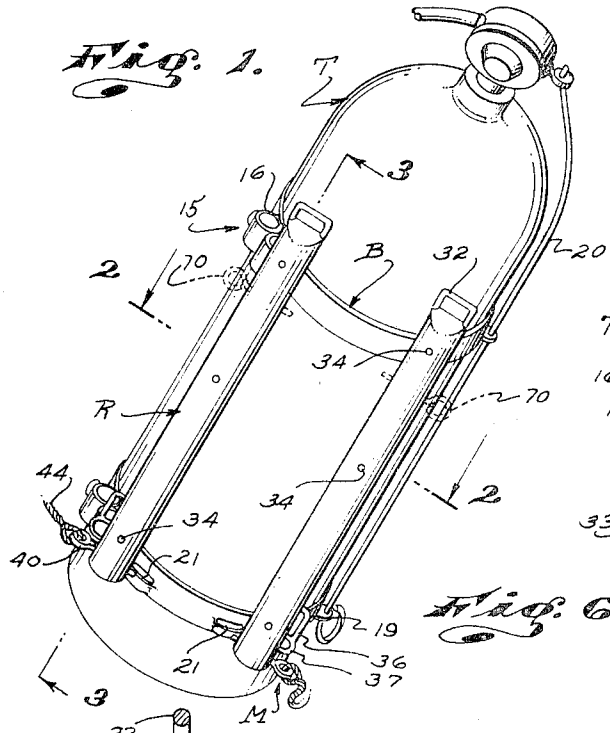


Fig. 2.

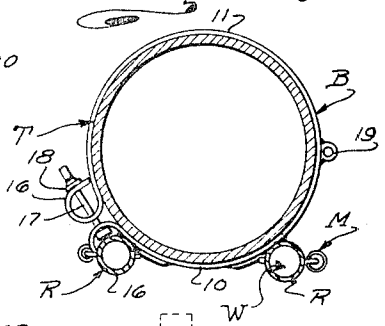


Fig. 6.

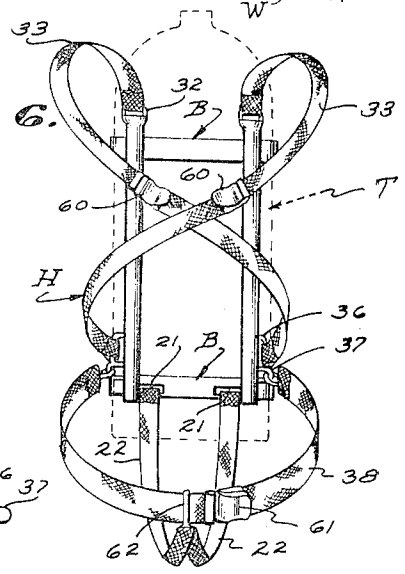


Fig. 3.

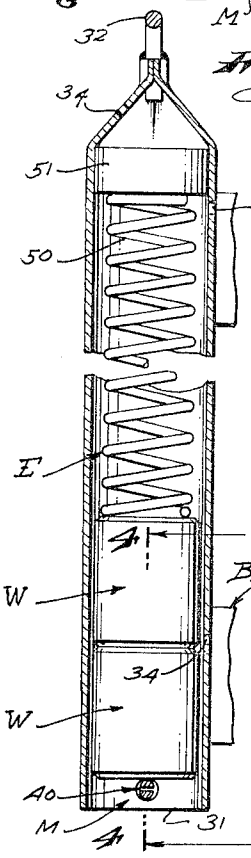


Fig. 5.

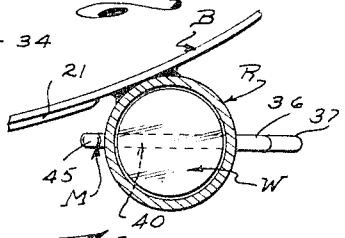


Fig. 4.

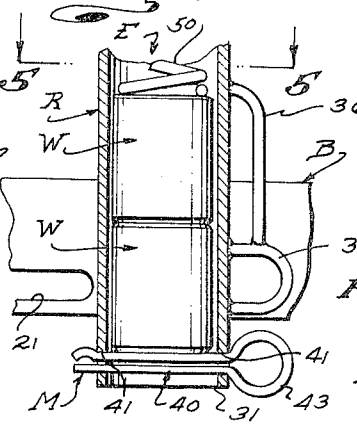
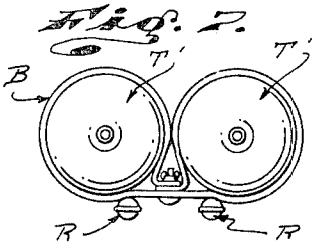


Fig. 7.



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BACK PACK FOR DIVERS' AIR TANKS

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This invention relates to aquatic air breathing equipment and is more particularly concerned with an improved back pack for carrying and securing air cylinders to divers' backs.

In the art of diving, that is, the art of swimming below the surface of the water for prolonged periods of time, divers are provided or equipped with tanks of compressed air, which tanks are secured to racks or back packs, strapped to the divers' backs by means of suitable harness. The air in the tanks is conducted through suitable hoses, valves and the like to the diver's mouth and respiratory system.

In addition to the above noted breathing equipment, divers are further provided with "wet suits," that is, they wear form fitting suits made of sponge rubber or the like, which suits serve to insulate their bodies from the cold water.

The aggregate of equipment employed by divers is buoyant and tends to float the divers to the surface of the water. Accordingly, the ordinary diving equipment further includes and requires weights to overcome the the buoyancy of the other equipment and to permit the divers to submerge. The weights are generally in the form of slotted lead blocks carried by belts, which belts are arranged above the waists of the divers. The belts are ordinarily provided with quick disconnect buckles and are such that the divers can, in case of emergency, release the weight belts and float to the surface of the water.

While such weight belts effectively sink the diver, they are not altogether practical and safe as they place the weights at and about the divers' waists and remote from the lower or one end of the air tank or tanks, which are the most buoyant and principal floatation piece of equipment worn. Ideally, the weights should be fixed to the tanks and should extend longitudinally thereof so as to provide proper balance and distribution of mass.

Further, the weights on the ordinary weight belts are not evenly distributed and are subject to turning about the divers' waists and is such a manner as to upset the balance of the diver and further, and more important, shift the safety or quick release buckles out of position, where the divers cannot find or reach them in case of emergency.

Still further, the air tanks and their related packs and harness, and other special gear or equipment carried by divers frequently come into contact with or overlie the weight belts, with the result that the weight belts cannot be released, or if released, catch and hang up on the other equipment when it is desired or becomes necessary to release the belts.

An object of my invention is to provide a weighted back pack for divers' air tanks so that the ordinary or conventional weight belts and their attending shortcomings and hazards can be eliminated.

It is another object of this invention to provide a back pack of the character referred to having weight carrying means which hold the weights in close proximity to the longitudinal sides of the buoyant air tanks.

Still another object of this invention is to provide a structure of the character referred to wherein the carrier means releasably hold the weights and involves and includes ejector means which serve to urge or jettison the weights upon demand.

The ordinary air tanks are of such length that their lower

ends extend downwardly below the waist of the divers. Accordingly, the back packs provided by the prior art are such that they hold the tanks in spaced relationship from the backs of the divers, particularly at or about the waists of the divers, to provide space for the weight belts that must be worn. Offsetting, the tanks in the above manner is undesirable in that it interferes with or upsets the balance of the divers and creates additional and undesirable drag or resistance in the water.

An object of this invention is to provide a rack of the character referred to which carries the weights and which is such that the tanks need not be offset or spaced from the divers' backs.

It is a feature of this invention to provide a rack having longitudinally outwardly opening tubular tank and back engaging rails or tubes in which weights can be advantageously slidably engaged and releasably retained.

It is a further object of this invention to provide a structure of the character referred to which is easy and economical to manufacture and a construction which is highly effective and dependable in operation.

The various objects and features of my invention will by fully understood from the following detailed description of a typical preferred form and carrying out of my invention, throughout which description reference is made to the accompanying drawings, in which:

FIG. 1 is an isometric view of my new pack related to an air tank;

FIG. 2 is a sectional view taken as indicated by line 2—2 on FIG. 1;

FIG. 3 is a sectional view taken as indicated by line 3—3 on FIG. 1;

FIG. 4 is a sectional view taken as indicated by line 4—4 on FIG. 3;

FIG. 5 is a sectional view taken as indicated by line 5—5 on FIG. 4;

FIG. 6 is an elevational view of my new back pact with the harness provided related thereto and showing the tank in dotted lines; and,

FIG. 7 is a diagrammatic cross-sectional view showing a two-tank pack incorporating the present invention.

A rack provided by the present invention and illustrated in the accompanying drawings, is an elongate structure having top and bottom ends and front and rear sides. The rack is adapted to engage and support an elongate cylindrical air tank T, at its rear side and is adapted to be arranged and carried by a diver, with its forward side extending longitudinally of and against the diver's back.

A suitable harness H is provided to releasably secure the rack to the diver.

The rack is extremely simple in form and construction and includes, generally, a pair of vertically spaced, axially aligned, annular, tank engaging clamp bands B having front and rear portions **10** and **11** and a pair of elongate, laterally spaced, back engaging and weight carrying tubular stringers or rails R.

The rails R are open at their lower ends and each slidably receives one or more cylindrical weights W.

A suitable manually operable retaining means M is provided at the lower end of each rail R to releasably retain the weights W therein.

An ejector means E is related to each rail to jettison the weights from the rails upon release of the retaining means.

In addition to the foregoing, the construction further includes means on the bands B and rails R for connecting with elements or parts of the harness H.

The bands B are simple split bands, formed of strap or ribbon steel and are provided at their ends with suitable screw actuated clamping means **15**. The clamping means **15** can be of any suitable design or construction

and is shown as including a radially outwardly projecting loop **16** formed at each end of each band, a bolt **17** engaged through and extending between the loops and an advancing nut **18** on the bolt and engageable with one of the loops to draw the loops together and the band into tight clamped engagement about the tank T.

The means **15** are preferably arranged at one forward quarter of the band, as illustrated in FIG. 2 of the drawings, where they are out of the way and will not interfere with the diver and with other equipment.

In practice, the bands B can be provided with laterally outwardly projecting apertured guide tabs **19** to slidably receive an operating rod **20** for a reserve air release valve ordinarily provided on divers' air tanks, and in accordance with common practice.

The lower or bottom band B is further provided with a pair of circumferentially spaced slots **21** in its forward central portion, which slots are adapted to receive and connect with the rear ends of a pair of forwardly extending thigh straps **22** of the harness H.

The rails R are alike. Each rail is a simple elongate member formed of tubular steel and has a lower open end **30** and a closed upper end **31**. The upper end of each rail is provided with a loop **32**, which loop is adapted to connect with the upper rear end of a shoulder strap **33** of the harness H.

In practice, the loop **32** of each rail is formed by an inverted U-shaped member formed of rod stock and is arranged with its leg portions within the upper end of the rail. The upper end of the rail is collapsed or crimped closed and into tight engagement with the leg portions of the U-shaped member. The U-shaped member and the rail are fixed together as by welding.

It is to be understood that the loops can be of any suitable design or construction and the particular loop construction illustrated and described above is only one suitable form or carrying out of the invention.

The rails are fixed to the front portions of the bands B, as by welding, in lateral spaced parallel relationship, so that the upper and lower end portions thereof project above and below the upper and lower bands a predetermined, desired distance and so that the straight horizontally disposed base portions of the U-shaped members establishing the loops **32** extend laterally and transverse the plane of the construction.

Each rail R is provided with one or more vent holes **34** at its upper closed end and at spaced points throughout its longitudinal extent to bleed air from within the rails when the construction is submerged, to bleed or drain water from within the rails when the construction is removed from the water and to allow for the free flow of water into the rails, above the weights, when the weights are jettisoned from within the rails, as will hereinafter be described.

The lower end of each rail is shown as including a laterally outwardly projecting metal loop **36** to connect with the lower end of the shoulder strap **33** of the harness H and a metal loop or eye **37** to connect with an end of a waist strap or belt **38** of the harness H, as will be hereinafter described and as clearly illustrated in FIG. 6 of the drawings.

The loop **36** and eye **37** are, in the form of the invention illustrated, established of vent rod stock, welded to the exterior of their related rails.

The weights W that I provide are simple, short, cylindrical slugs of heavy material, such as lead, and are freely slidably entered into their related rails from the lower open ends **31** of the rails. In practice, the weights W are provided in one-half and one pound sizes so that any desired aggregate weight, within one-half pound, can be provided, which is well within permissible tolerances.

The weights are sufficiently short in longtudinal extent so that they will separate and drop off and away from the construction and from each other, when jettisoned and so that they will not bind and become stuck in the construction.

The manually operable, releasable retaining means for the weights W is related to the lower open end of the rails R and can be of any suitable or desired construction.

In the case illustrated, the means M for each rail is shown as including an elongate pin **40** in the nature of a cotter pin, slidably entered in and extending between a pair of axially aligned openings, **41** in diametrically opposite sides of the lower end of the rail. The leg portions **42** of the pin or cotter key, extend across the rail and below the lower end of the lowermost weight W and prevent downward and outward shifting of the weights relative to the rail. The head or loop end **43** of the pin occurs at the exterior of the rail at one side thereof and is preferably arranged to project laterally outwardly from the construction, below the harness loops **36** and eyes **37** where it is readily accessible to the diver.

In practice, suitable lanyards or pull cords **44** can be connected with the heads of the pins or keys, to extend to some remote and more readily accessible position or location, as circumstances require or as desired.

In practice, the legs of the pin or keys are sprung apart slightly and fit the openings **41** freely. One leg **42** of the pin is provided with an outwardly projecting, rounded, enlargment **45** at its outer terminal end, which enlargement occurs at the exterior of the rail and yieldingly engages the exterior of the rail, opposite the side of the rail that the head **43** occurs and effectively yieldingly holds the key or pin in place.

With a free, resilient fit, such as set forth above, it will be apparent that the key or pin **40** is not subject to binding and hanging up in the openings in the rail with which it is related and can easily be drawn or pulled.

The ejecting means E that I provide can vary widely in form without departing from the spirit of this invention. In the case illustrated, the means E is shown as including an elongate compression spring **50** arranged within each rail R to extend longitudinally thereof. The upper end of the spring in each rail is seated on or at the upper closed end of the rail and its lower end engages the upper end of the uppermost weight W.

In practice, a suitable seat **51** can be provided in the upper end of the rails for the upper ends of the springs.

The spring **50** normally extends to the lower open end of the rail with which it is related and is biased or loaded by the weights W when the weights are entered into the rail and in such a manner that the spring normally yieldingly urges the weights downwardly and outwardly from the lower open end of the rail.

The springs **50** also serve to prevent the weights from shifting longitudinally in their related rails, when the construction is turned upside down, as is often the case when the construction is in use.

With the construction set forth above, when the construction is in use and it is desired to jettison the weights W, it will be apparent that the diver need only pull and withdraw the keys or pins **40**, whereupon the weights W are jettisoned by the ejecting means E.

The harness H illustrated in the drawings serves to releasably hold the pack or rack in fixed position against the diver's back, with the rails R thereof seated and extending longitudinally along each side of the diver's back.

The shoulder straps **33**, there being two such straps, have their upper ends suitably secured to the loops **32** at the upper end of the rails, extend forwardly over the diver's shoulders, then diagonally across the diver's chest and then rearwardly about the diver's side and to the loops **36**, with which they are suitably coupled. The straps **33** are split or divided at the front and the sections are releasably secured together by suitable quick disconnect buckles **60**, similar to the safety belt buckles commonly employed in automobiles and aircraft.

The waist strap or belt **38** is connected with the eyes **37** by suitable flag or snap hooks and extends about the waist of the diver. The belt is provided at its center and front with a quick disconnect buckle **61**.

The thigh straps **22** extending forwardly from the slots **21** in the lower band B, extend between the diver's crotch and are releasably coupled to the belt **38**, at the center thereof, by loop **62** carried by the straps **21** and through which the belt extends.

The thigh straps **22** with their related slots **21** and loop **62** are not, under most circumstances, necessary and can be eliminated.

While the particular harness H illustrated and set forth above has proven to be extremely effective and dependable, it will be apparent that the harness H can be varied widely in form without departing from the spirit of the invention.

In the event that another form of harness is desired or is to be employed, certain of the slots, loops and eyes must be eliminated and/or relocated to accommodate the desired form of harness.

In FIG. 7 of the drawings, I have diagrammatically illustrated another form of the construction wherein the clamp bands B' are formed or shaped to handle a pair of elongate tanks T' in side by side relationship. The clamping means **15'** employed in this second form of the invention is slightly different and the location or disposition of the rails R' with the bands B' is slightly different, than in the first form of the invention.

It is believed that the distinguishing characteristics between the first and second form of the invention are clear and apparent from a study of the drawings and that further detailed description of the second form of the invention can be dispensed with. Accordingly, applicant will not burden this specification with further detailed description of the second form of the invention.

In practice, when a diver is making a deep dive, much energy is expended to keep the body directed downwardly. In such a case, if the weights, in the instant construction were free to shift longitudinally in the rails, the diver could tip his body downwardly so as to shift the weight to the upper end of the rails and thereby adjust his trim so that little or no effort would be required to maintain a diving attitude.

A normal trim could be established thereafter by urging the body upright and causing the weights to shift to the other end of the rails.

To gain the above end, I can, if desired, remove the springs from the rails, or, as illustrated in phantom lines in FIG. 1 of the drawings, provide removable lock pins **70** in the upper portions of the rails to engage below the lower ends of the springs when they are fully compressed in the rails and to hold them ineffective.

Having described only preferred, typical forms and applications of my invention, I do not wish to be limited to the specific details herein set forth, but wish to reserve to myself any modifications and/or variations that may appear to those skilled in the art and which fall within the scope of the following claims.

Having described my invention, I claim:

1. A back pack of the character referred to including, a pair of elongate parallel, vertical, tubular rails having open lower ends, longitudinally spaced tank engaging clamp bands fixed to and extending between the rails, a plurality of weights slideably engaged within the rails, manually operable retaining means at the lower ends of the rails and releaseably retaining the weights within the rails, and harness means including a plurality of body engaging straps fixed to the rails and bands and adapted to releaseably hold the pack on the back of a person carrying the pack.

2. A back pack of the character referred to including a pair of elongate, parallel, vertical, tubular rails having open lower ends, longitudinally spaced tank engaging clamp bands fixed to and extending between the rails, a plurality of weights slideably engaged within the rails, ejector means within the rails and normally yieldingly urging the weights downwardly and out of the rails, manually operable retaining means at the lower ends of the rails and releaseably retaining the weights within the rails, and harness means including a plurality of body engaging straps fixed to the rails and bands and adapted to releaseably hold the pack on the back of a person carrying the pack.

3. A back pack of the character referred to including, a pair of elongate parallel, vertical, tubular rails having open lower ends, longitudinally spaced tank engaging clamp bands fixed to and extending between the rails, a plurality of weights slideably engaged within the rails, manually operable retaining means at the lower ends of the rails and releaseably retaining the weights within the rails, and harness means including a plurality of body engaging straps fixed to the rails and bands and adapted to releaseably hold the pack on the back of a person carrying the pack, said retaining means including a pin extending through and between a pair of openings in the opposite sides of each rail below the weights therein and having manually engageable means at the exterior and one side of the rails to facilitate pulling the pins.

4. A back pack of the character referred to including a pair of elongate, parallel, vertical, tubular rails having open lower ends, longitudinally spaced tank engaging clamp bands fixed to and extending between the rails, a plurality of weights slideably engaged within the rails, ejector means within the rails and normally yieldingly urging the weights downwardly and out of the rails, manually operable retaining means at the lower ends of the rails and releaseably retaining the weights within the rails, and harness means including a plurality of body engaging straps fixed to the rails and bands and adapted to releaseably hold the pack on the back of a person carrying the pack, said retaining means including, a pin extending through and between a pair of openings in the opposite sides of each rail below the weights therein and having a manually engageable head at one side of the rail and a projection yieldingly engaging the other side of the rail.

5. A back pack of the character referred to including, a pair of elongate parallel, vertical, tubular rails having open lower ends, longitudinally spaced tank engaging clamp bands fixed to and extendingly between the rails, a plurality of weights slideably engaged within the rails, manually operable retaining means at the lower ends of the rails and releaseably retaining the weights within the rails, and harness means including a plurality of body engaging straps fixed to the rails and bands and adapted to releaseably hold the pack on the back of a person carrying the pack, said rails having vent openings remote from their lower open ends to bleed air from within the rails and to allow for the free flow of water into the rails when the weights are shifted out of the rails.

6. A back pack of the character referred to including a pair of elongate, parallel, vertical, tubular rails having open lower ends, longitudinally spaced tank engaging clamp bands fixed to and extending between the rails, a plurality of weights slideably engaged within the rails, ejector means within the rails and normally yieldingly urging the weights downwardly and out of the rails, manually operable retaining means at the lower ends of the rails and releaseably retaining the weights within the rails, and harness means including a plurality of body engaging straps fixed to the rails and bands and adapted to releaseably hold the pack on the back of a person carrying the pack, said rails having vent openings remote from their lower open ends to bleed air from within the rails and to allow for the free flow of water into the rails when the weights are shifted out of the rails.

7. A back pack of the character referred to including, a pair of elongate parallel, vertical, tubular rails having open lower ends, longitudinally spaced tank engaging

clamp bands fixed to and extending between the rails, a plurality of weights slideably engaged within the rails, manually operable retaining means at the lower ends of the rails and releaseably retaining the weights within the rails, and harness means including a plurality of body engaging straps fixed to the rails and bands and adapted to releaseably hold the pack on the back of a person carrying the pack, said retaining means including a pin extending through and between a pair of openings in the opposite sides of each rail below the weights therein and having manually engageable means at the exterior and one side of the rails to facilitate pulling the pins, said rails having vent openings remote from their lower open ends to bleed air from within the rails and to allow for the free flow of water into the rails when the weights are shifted out of the rails.

8. A back pack of the character referred to including a pair of elongate, parallel, vertical, tubular rails having open lower ends, longitudinally spaced tank engaging clamp bands fixed to and extending between the rails, a plurality of weights slideably engaged within the rails, ejector means within the rails and normally yieldingly urging the weights downwardly and out of the rails, manually operable retaining means at the lower ends of the

rails and releaseably retaining the weights within the rails, and harness means including a plurality of body engaging straps fixed to the rails and bands and adapted to releaseably hold the pack on the back of a person carrying the pack, said retaining means including, a pin extending through and between a pair of openings in the opposite sides of each rail below the weights therein and having a manually engageable head at one side of the rail and a projection yieldingly engaging the other side of the rail, said rails having vent openings remote from their lower open ends to bleed air from within the rails and to allow for the free flow of water into the rails when the weights are shifted out of the rails.

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