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COMPRESSED GAS CYLINDERS

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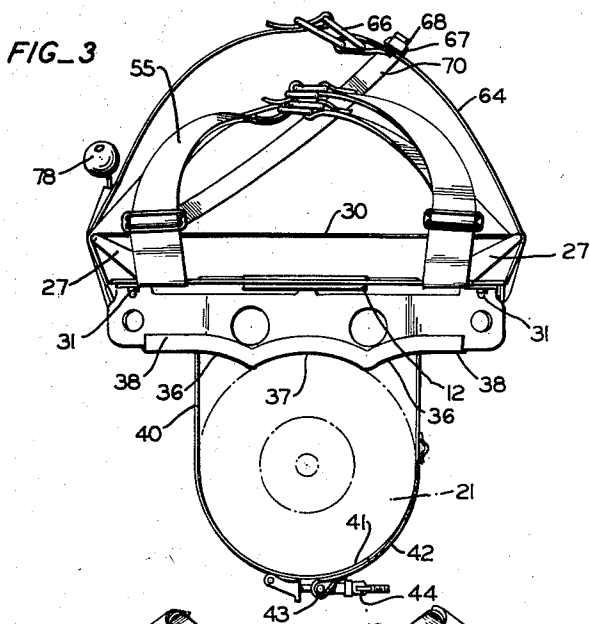
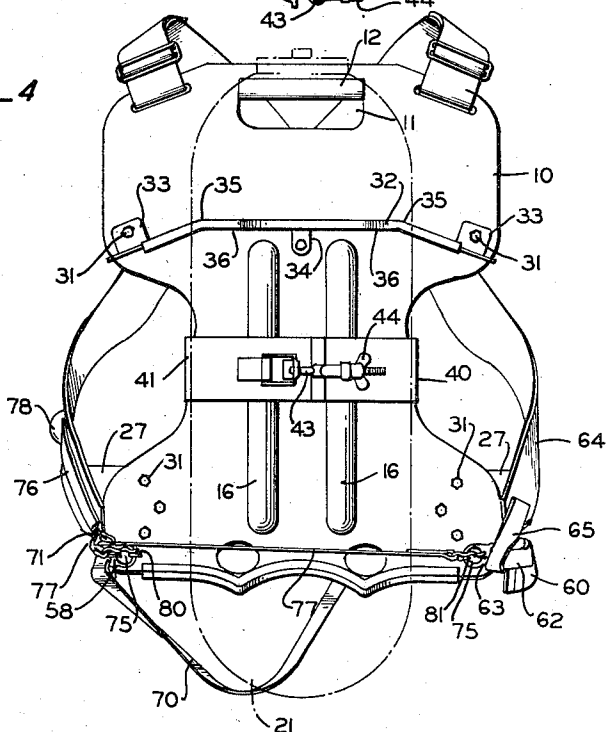


FIG_4



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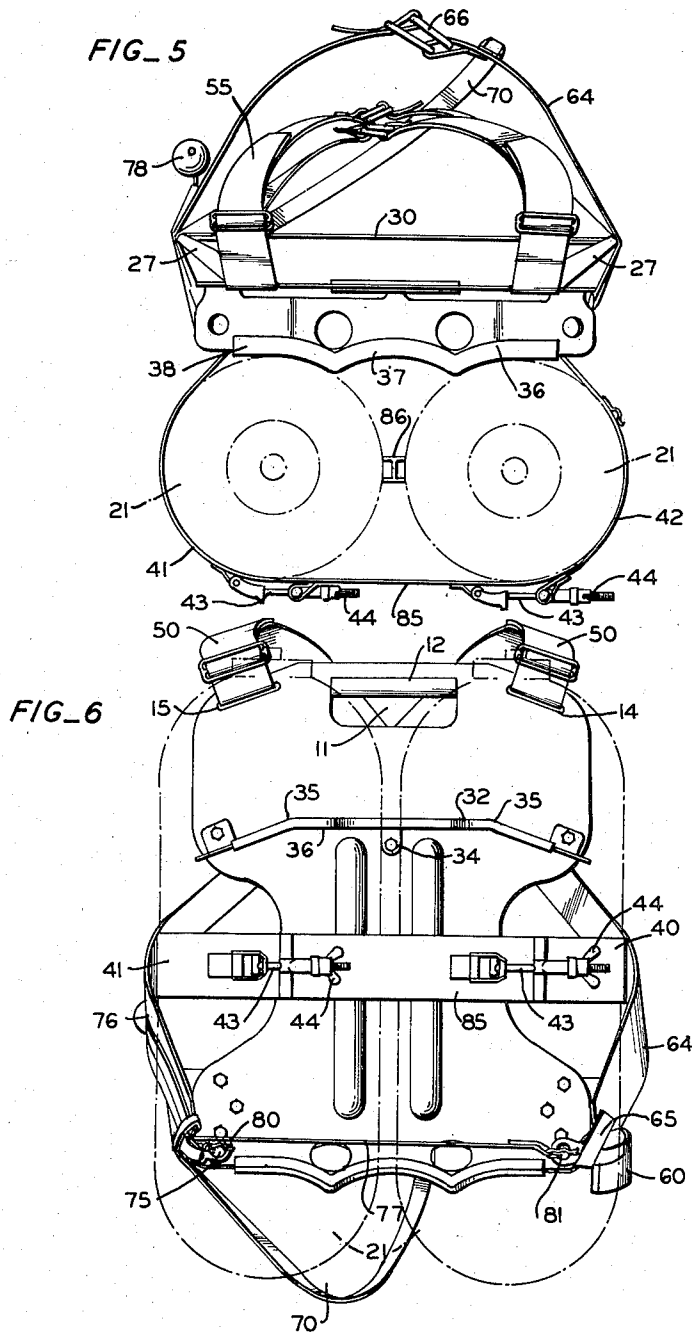
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BACK PACK AND HARNESS FOR CARRYING COMPRESSED GAS CYLINDERS

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5 Claims. (Cl. 224—5)

The following invention relates to back packs and harnesses for the transportation of compressed gas cylinders, such as air or oxygen on the backs of human beings, for breathing under water or in rare or contaminated atmosphere such as smoke, noxious or acrid fumes and the like. The invention is particularly useful in connection with the transporting and carrying of underwater diving equipment on one's own person, as a free, self-contained operating unit.

It is obvious that the equipment is intended to provide the means for sustaining human life under circumstances which are not only adverse, but without which human life could not be sustained. Therefore, safety, comfort and convenience are most important considerations, with that of safety being pre-eminent.

Accordingly, it is one of the objects of the invention to provide equipment of the type referred to, which has a complete and reliable means readily accessible for the instantaneous release of the equipment in case of emergency, which includes not only the release of the harness, but the release of the pack and the load secured on the pack. It is important that the safety release allows the wearer to free himself completely from the entire device when the release is brought into use.

It is a further object to provide a pack and harness which will give controlled balance of the load carried on the back of the wearer both in and out of water, in motion and stationary. This includes the elimination of planing drag when used under water and the elimination of buoyancy due to the pack or harness.

Still another object is to produce a harness and carrier which is antimagnetic and nonelectrolytic, and which is neutral to all salt and fresh water, so that the wearer will not be inadvertently hurt or injured or the equipment damaged by untoward contact.

Another object is to provide equipment which has no muscular or breathing restrictions and where there are no straps or harness under the arms of the wearer to restrict movement or effort in use.

Another object is the elimination of interference or collision of the head of the wearer with the breathing regulator connected at the top of the tank.

A further object is the provision of a back support which holds the pack frame away from the body, while, at the same time, bringing the weight of the load to bear against the small of the back of the user just above the waist, for maximum comfort and minimum fatigue and to eliminate abrasive action by the pack frame.

The convenience objectives are just as important. These include a device which will carry all makes of SCUBA equipment. Another is the provision of one piece of equipment which will carry one, two or three tanks as desired, which may be immediately attached or released. Another is the providing of a harness which is easy to get into and out of without the aid of a second person under nonemergency conditions, although skin diving by an individual by himself is not considered safe practice. Still another is the provision of a lightweight, corrosion-

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resistant base frame of great strength, which is held away from the body of the person adjacent the lower portion of the frame to provide maximum weight distribution and comfort.

Further objects are to provide a construction of maximum simplicity, economy, and ease of manufacture, also such further objects, advantages and capabilities as will fully appear and as are inherently possessed by the device and the invention described herein.

Invention further resides in the combination, construction and arrangement of parts illustrated in the accompanying drawings, and while there is shown therein a preferred embodiment thereof, it is to be understood that the same is merely illustrative of the invention and that the invention is capable of modification and change, and comprehends other details of construction without departing from the spirit thereof or the scope of the appended claims.

Referring to the drawings:

Figure 1 is a side elevational view of the pack frame and attached harness, with the harness extended to simulate the position on a human. A single compressed gas cylinder is shown in position on the frame, in broken lines;

Figure 2 is a front elevational view of the equipment shown in Figure 1, but without any representation of the gas cylinder;

Figure 3 is a top plan view of the apparatus and cylinder shown in Figure 1;

Figure 4 is a rear elevational view of the apparatus and equipment shown in Figure 1;

Figure 5 is a top plan view of the pack and harness shown in Figure 1, but as adapted to carry two cylinders;

Figure 6 is a rear elevational view of the pack and harness showing the adaptation required for carrying two cylinders instead of one;

Figure 7 is a plan view on a reduced scale, of the left side V shoulder and belt unit; and

Figure 8 is an enlarged side elevational view of one of the cone pins used in the emergency harness release.

Referring now more particularly to the drawings in which like reference numerals indicate like parts in the several views, and with particular reference to Figures 1, 2 and 4, the basic structure is a base frame 10, which is formed of sheet metal, preferably an aluminum alloy which is antimagnetic and nonelectrolytic, and made in the general shape of an hour glass or a figure 8 with the loops both at top and bottom flattened. Adjacent the top at the center of the base frame is an opening 11, along the upper edge of which is placed a U-shaped member 12, which together form a hand hole and grip for handling and carrying the equipment when not in use. The frame may be structurally strengthened by the outwardly directed, raised vertical ribs 16 which pass through the waist of the frame 10. Adjacent the top of the base frame 10 are two oppositely disposed, diagonal slots 14 and 15. It may be desirable to bend the corner portions 24 and 25 of the base frame upwardly along the broken line indicated to form ears which would include the slots 14 and 15, although this is not necessary.

The lower portion 19 of the base frame 10 is bent outwardly along the horizontal line 18 at an angle of 45° from the plane of the base frame. The lower marginal edge of the portion 17 is scalloped symmetrically so that the center portion 20 is the arc of a circle on the precise radius to receive the curvature of the cylinder 21. The adjacent portions 22 and 23 of the marginal edge 17 are also arcs of a circle to accommodate the curvature of two cylinders placed side by side as in Figure 6. The lower marginal edge 17 with its curves 20, 22 and 23 may be covered with a U-shaped cushion tank protector 26 (see Figure 1). Adjacent the bend 18 of the lower

marginal portion 19 and at either side of the frame are a pair of outwardly angled, inwardly directed back webbing hangers 27. The webbing hangers are provided at their extremities with vertical slots 28 through which and between which a yielding back support webbing 30 is secured. The webbing 30 may be of any suitable yielding member, yieldably applying pressure to the back of the user in the small of the back just above the waist. This keeps the pack itself from rubbing on the back of the user and prevents any abrasive action due to extended wearing of this apparatus. The hangers 27 are secured to the base frame 10 by acorn capped carriage bolts 31, or by any other suitable means. Preferably these hangers should be removably attached by the bolts with fiber washers or gaskets to prevent release or loosening under any unintentional circumstance.

Above the reinforcing ribs 16 and adjacent the lower portion of the upper loop of the base frame 10, a front tank support 32 is placed and secured. The front tank support 32 is attached to the base frame 10 by ears 33 adjacent the ends thereof, which ears are bent upwardly, and is also attached by a central ear 34 which is bent downwardly. The end portions of the front tank support are bent downwardly at 35 at an angle of approximately 20° from the lateral plane. The point 35, however, is beyond the curves 36 which correspond to the arcs 22 and 23 of the lower marginal edge. Likewise, the center portion has a true arc of a circle 37 which corresponds with the arc 20 along the lower margin. As is the case with the marginal edge 17 the arcs 36 and 37 may be sheathed with a U-shaped cushion 38. The front tank support 32 may be secured to the base frame 10 in any suitable manner, but is shown here as being attached by acorn capped bolts 31.

Secured to the rear face of the base frame 10 at the waist thereof is a stainless steel band 40, having its two free ends 41 and 42 adapted to encompass a single cylinder 21 of compressed fluid, substantially as shown in Figure 3. The ends 41 and 42 are provided with a suitable interlocking means which is generally designated 43, which is preferably adjustable as indicated by the wing nut 44, so that the cylinder 21 will remain in position in its cradle formed by the arc 37 of the front tank support and the arc 20 of the outwardly turned lower portion 19 of the base frame 10. The band 40 is preferably stainless steel of an appropriate alloy in order to provide the strength and flexibility required for this purpose.

The harness is composed of several pieces, starting with the two shoulder straps 50. These are preferably made from a woven material of sufficient width so that they will not cut into the shoulders of the wearer. For all practical purposes, a width of some two inches has been found most satisfactory. The free ends 51 of the straps are passed through their respective slots 14 and 15 at the top of the base frame from inside to outside and brought over the top and then over back against themselves and through the strap slides 52. The free ends are long enough so that there will be plenty of length for adjustment even with respect to persons of a large size. The opposite ends of the straps 50 are looped as at 53 to secure a pair of D-rings 54. These strap ends are long enough so that they permit a crossing thereof over the chest of the wearer in such a manner that the D-rings are positioned just slightly below the chest. In this arrangement there is no restriction in breathing as the unrestricted crossover permits the normal movement caused by the expansion and retraction of the chest on inhaling and exhaling. The lower strap at the left side of the wearer is of V-shape construction (see Fig. 7) and comprises the web member 55 and a belt member 56 securely stitched together at one end in the required V-shape by reinforcing patch 57, which patch

also retains at the apex, a flat metal clip 58 having a hole 59 therethrough. The right belt strap portion 60 is provided at one end with a half tab portion 62 and is provided with a metal clip 63 similar to the metal clip 58. The right lower shoulder strap 64 has a half width loop secured to the end thereof, said loop being designated 65. The half tab 62 on the right belt member 60 passes through the loop 65 of the lower shoulder strap portion 64. On the other end of the belt member 60 is provided a pair of D-rings 66 so that the ends of the two belt members 56 and 60 may be joined together around the waist of the wearer and tightened or loosened for instantaneous adjustment by pulling or lifting on the free end. Adjacent the D-ring members 66 on the right belt member 60, is a depending tab 67 securing a pair of smaller D-rings 68 downwardly, and substantially at right angles to the positioning of the larger D-rings 66. The crotch strap 70 is preferably of half width, but is made of the same stout webbing material. It is provided at one end with a loop 71 through which passes the clip member 58 and thus provides the rearward fastening. The free end 72 is held in adjustable position by the D-rings 68.

The manner of attaching the harness to the base frame 10 is, of course, an important feature because this primarily relates to the safety of use. A pair of cone-shaped pins 75 are secured at the opposite marginal edges of the upturned base frame portion 19. The cone pins 75 have a transverse aperture therethrough adjacent the apex (see Figure 8). The apertures 59 of the metal clips 58 and 63 are large enough to loosely fit over the respective cones 75. It will be observed that along the lower outer face of the lower shoulder strap 55 and adjacent the apex of the V-shape of this unit, is a longitudinal sheath 76 through which passes a rip cord 77, the outer end of which is secured to a ball member 78. The ball grip 78 is positioned conveniently on the harness but not in such a way as to interfere with any movement or activity of the wearer. Along the free length of the rip cord 77 are spaced two humped cotter pins 80 and 81. The straight shank of the cotter pin in each instance passes through the transverse aperture in the cone pins 75 and are held in this position by a hump in the opposite shank on the outside, which hump surrounds the dome-like apex of the pins 75. It will be observed, therefore, that when the plate 63 is placed over the appropriate cone pin 75 and the cotter pin 81 slid into place thereover, that the entire right side of the harness is secured in position, including the belt members and the crotch strap. Likewise, when the plate 58 is placed in position over the pin 75 on the left-hand side and the cotter pin 80 slipped into position thereover, the entire left side of the harness is secured in position. Thus, in the event of an emergency, all the wearer has to do is to grasp the ball 78 with his right hand and pull sharply upwardly across his chest, with a firm but perfectly normal movement. In so doing, both of the cotter pins will be pulled free of the cone pins 75 and out of position. Since the pins 75 are cone-shaped, the attaching plate clips 63 and 58 can no longer remain thereon or be retained thereby and therefore slip off, freeing the wearer completely from the harness and the equipment.

One of the greatest difficulties in SCUBA diving arises from the inability of the diver to either release completely or adjust the fit of his harness underwater. Difficulties usually arise from (a) the complexity of the harness equipment itself; (b) the coldness and resulting stiffness of the wearer's hands and fingers, and (c) the inflexibility of prior D-ring fastenings. The carrier described herein completely eliminates the hazards resulting from these difficulties and in some instances eliminates the difficulties themselves.

As another safety measure, the D-rings 54 on each of the upper strap members 50 have a safety tab 83 secured to the lower of the two D-rings 54. By merely pulling

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upwardly on the safety tabs 83 the shoulder strap fastenings are completely released or loosened as the wearer may wish. If the wearer wishes to tighten the harness, he merely has to pull down on the through tab ends of the upper strap members 50. This is also the means by which one would normally rid himself of the carrier and harness. Only three quick movements, i.e., a tug on the rip cord pulling pins 80 from engagement on cone pins 75, quick upward pulls on safety tabs 83, are all that are required to completely release the wearer from the harness and equipment. These are enormous safety features and of vital concern to any user, since all of these adjustments as well as complete release can be accomplished with ease and swiftly regardless of whether the wearer is above or under water.

With reference to Figures 5 and 6 the base frame is shown with the necessary adjustments for carrying two cylinders 21 instead of one. No alteration in the equipment is required, except that a strap extension 85 is needed since, obviously, the strap 40 is not long enough to reach around two cylinders. The extension strap 85 has identical counterparts of the cooperating fastening means 43 so that it is readily secured in position with adjustable tension means provided by the wing nuts 44. With a larger extension 85, three cylinders can be attached.

The two tanks are secured in parallel relationship, in cradles formed by the arcs 36 on the upper tank support 32 and the arcs 22 and 23 in the lower peripheral edge of portion 19 of the base frame. To keep the tanks from rubbing and to maintain their properly spaced position, a small spacer 86 is provided therebetween.

A third tank or cylinder may be added by the use of spacer cradle members and a longer extension strap 85.

It will be observed that the structure provides the means for accomplishing all of the objectives set forth, as well as many more which will readily become apparent in use of the equipment.

I claim:

1. In supporting equipment for gas cylinders and the like carried on the back of the user, the combination of an hour-glass shaped base frame, said frame having its lower marginal edge bent outwardly and symmetrically scalloped to cradle one gas cylinder centrally, or two placed side by side, a transverse support secured to said base frame above the waist thereof, said transverse support being correspondingly symmetrically scalloped forming the upper end of said cradle, means attached to said base frame for removably securing cylinders in said cradle, means adjacent the lower portion for resiliently spacing said frame from the user, chest crossing harness straps removably secured to the upper portion of said base frame, belt and lower harness straps for engagement with said crossing straps releasably secured to said lower base frame, rip cord means secured to the juncture of one of said lower harness straps and belt straps for instantly releasing said belt and lower harness straps from said base frame, and fastening means for joining said chest crossing harness straps and lower harness straps for instantaneous adjustment of the fit or instantaneous release.

2. In supporting equipment for gas cylinders and the like carried on the back of the user, the combination of an hourglass shaped base frame, said frame having its lower marginal edge bent outwardly and symmetrically scalloped to form the lower cradle portion for holding one gas cylinder centrally, or two placed side by side, cone pins on said lower frame portion, a transverse support secured to said base frame above the waist thereof, said transverse support being correspondingly symmetrically scalloped forming the upper end of said cradle, means attached to said base frame for removably securing cylinders in said cradle, means adjacent the lower portion for resiliently spacing said frame from the user, chest crossing harness straps removably secured to the

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upper portion of said base frame, belt and lower harness straps for engagement with said crossing straps said belt and lower straps being releasably secured to said cone pins, rip cord means for instantly releasing said belt and lower harness straps from said cone pins, and fastening means for joining said chest crossing harness straps and lower harness straps for instantaneous adjustment of the fit or instantaneous release.

3. In supporting equipment for gas cylinders and the like carried on the back of the user, the combination of an hourglass shaped rigid base frame, said frame having its lower marginal edge bent outwardly and symmetrically scalloped to form the lower cradle portion for holding one gas cylinder centrally, or two placed side by side, cone pins on said lower frame portion, a transverse support secured to said base frame above the waist thereof, said transverse support being correspondingly symmetrically scalloped forming the upper end of said cradle, means attached to said base frame for removably securing cylinders in said cradle, yielding means adjacent the lower portion bearing against the user just above the waist for spacing said frame from the user, chest crossing harness straps removably secured to the upper portion of said base frame, belt straps and lower harness straps for engagement with said chest crossing harness straps releasably secured to said cone pins, rip cord means for instantly releasing said belt and lower harness straps from said cone pins, and fastening means for joining said crossing harness straps and said lower harness straps for instantaneous adjustment of the fit or for instantaneous release.

4. A pack harness for carrying compressed gas cylinders comprising in combination a rigid frame having substantially a figure 8 outline, the lower marginal portion of said frame being bent outwardly and symmetrically scalloped to form the lower end of a cradle for compressed gas cylinders, a transverse rigid upper support mounted on said frame above the narrows thereof said support being symmetrically scalloped to form the upper end of said cradle, means mounted on said frame for securing said compressed gas cylinders thereon, a resilient member bearing against the back of the wearer just above the waist and spacing the frame from the wearer, adjustable length chest crossing harness straps removably attached to the upper portion of said frame passing over the shoulders of the wearer and crossing at the chest, belt straps and lower harness strap portions releasably secured to said frame at either side, said lower strap portions being also in quick releasing engagement with said chest crossing harness straps, and a rip cord retained on one of said lower harness strap portions for instantaneously releasing the engagement of said belt straps and lower harness strap portions from said frame.

5. A pack harness for carrying compressed gas cylinders comprising in combination a rigid frame having substantially a figure 8 outline, the lower marginal portion of said frame being bent outwardly and symmetrically scalloped to form the lower end of a cradle for compressed gas cylinders, a transverse rigid upper support mounted substantially perpendicularly on said frame above the narrows thereof said support being symmetrically scalloped to form the upper end of said cradle, adjustable clamping means mounted on said frame at the narrows thereof for securing said compressed gas cylinders thereon, inwardly directed brackets on said frame suspending a resilient member therebetween, a resilient member bearing against the back of the wearer just above the waist and spacing the frame from the wearer, adjustable length chest cross harness straps removably attached to the upper portion of said frame passing over the shoulders of the wearer and crossing at the chest, cone pins secured on the lower marginal portion of said frame, belt straps, lower harness straps and a crotch strap adjustably associated with said belt straps releasably se-

cured to said frame at either side on said cone pins, said lower harness strap portions being also in quick releasing engagement with said chest crossing harness straps, and a rip cord retained on one of said lower strap portions for instantaneously releasing the engagement of said belt straps, said lower harness strap portions and said crotch strap from said cone pins on said frame.

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