March 23, 1965 D. L. HUE 3,174,664

BACK PACK ASSEMBLY

Filed Feb. 25, 1963 2 Sheets-Sheet 1

Fig. 1

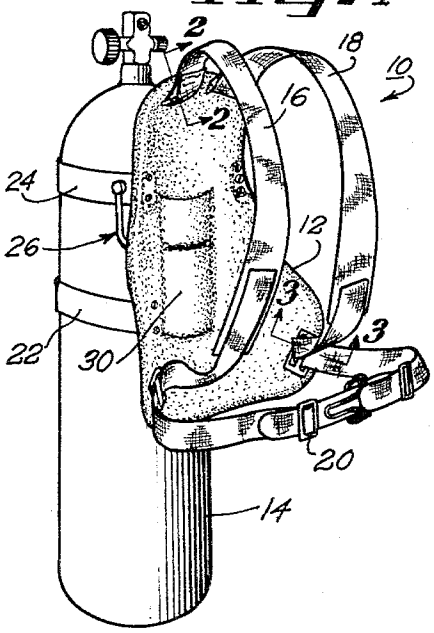


Fig. 5

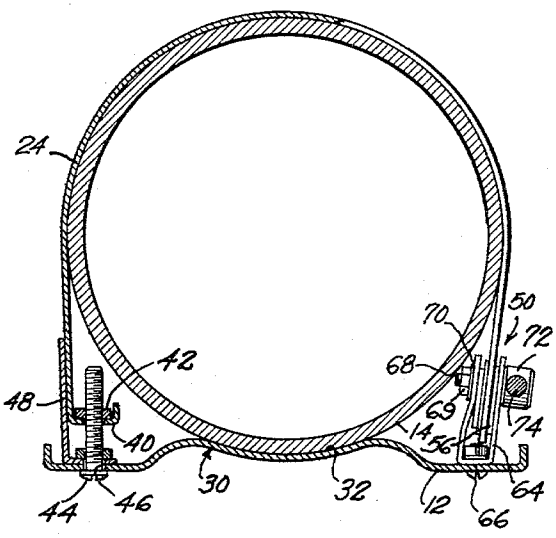


Fig. 6

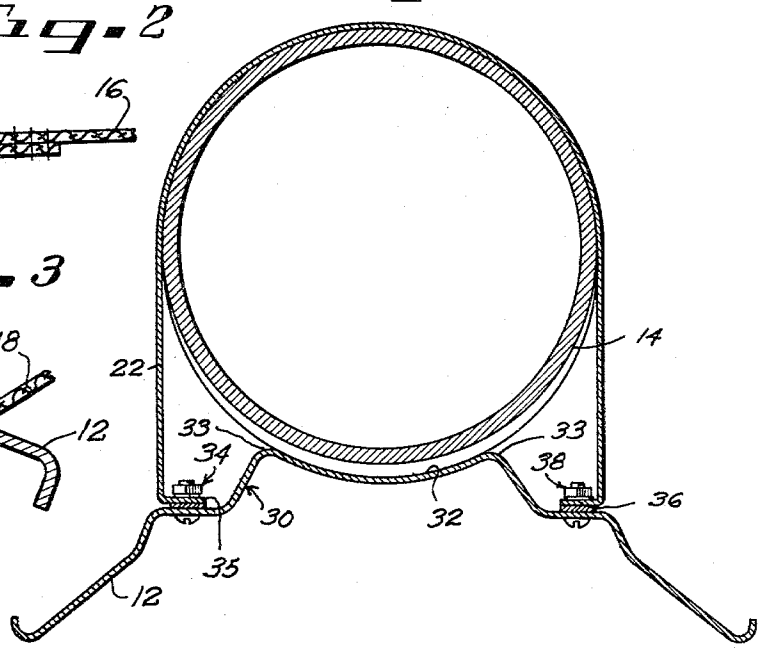


Fig. 2

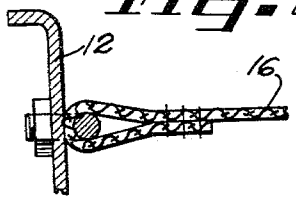
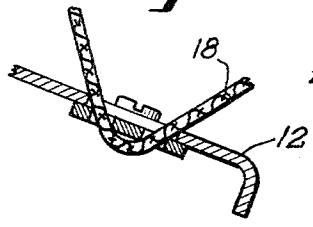


Fig. 3



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Fig. 4

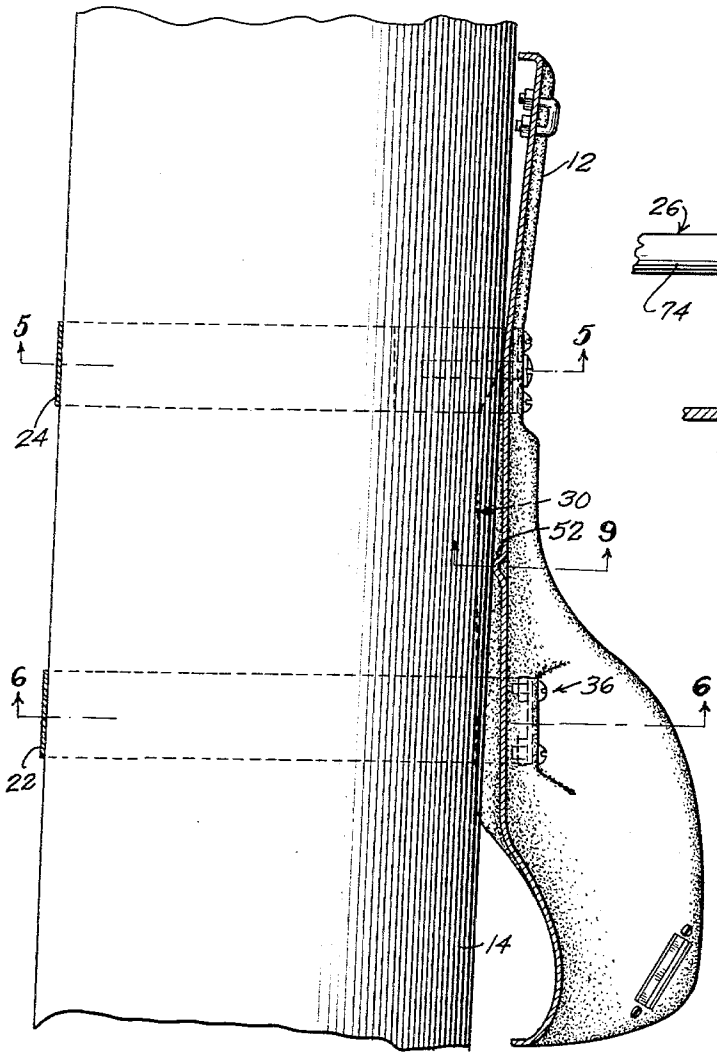


Fig. 7

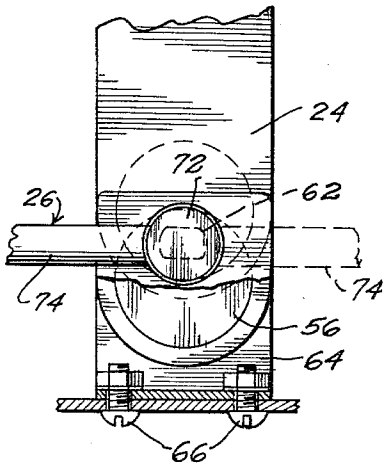


Fig. 8

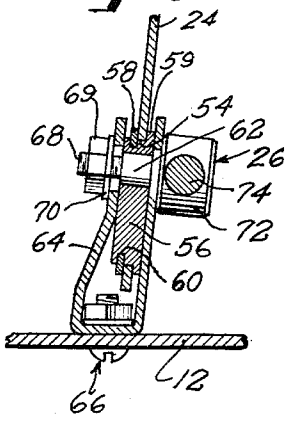


Fig. 9



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3,174,664
BACK PACK ASSEMBLY

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Filed Feb. 25, 1963, Ser. No. 260,779
8 Claims. (Cl. 224—5)

The present invention generally relates to self-contained under water breathing apparatus and it relates more particularly to a pack-type harness for mounting the compressed air tank on the back of the diver in a new and improved manner whereby the tank may be easily attached or removed from the pack.

In scuba diving, as the name implies, the diver carries a supply of air on his person as he travels under water. Normally, this air supply is a cylindrical tank of compressed air which is connected to his mouth, through a pressure regulator and air feed device, thus enabling him to remain under water for long periods of time until his supply of air is exhausted. Experience has shown that the best place to carry this tank is on the diver's back with the tank extending parallel to the spine. It has also been found desirable to employ a back plate or frame on which the tank is mounted and which is, in turn, secured to the diver by means of a plurality of belts which extend around the waist and over the shoulders of the diver. This technique provides a relatively comfortable support for the tank which does not interfere to any appreciable extent with the normal movements of the diver.

There are times when it becomes desirable to separate the relatively heavy tank from the back plate and with prior art type devices this generally requires that the pack be removed from the diver and several threaded parts be disconnected or at least loosened. A comparably time consuming procedure is required to secure the tank onto the back plate. It would be desirable to provide an easier and faster way of enabling the diver both to secure the tank to the back plate and to remove the tank from the plate.

Another failing of the prior art structures for securing the air tank to the back plate manifests itself by way of loose tanks. Obviously a loose tank is a source of real danger and fear to a scuba diver and a tight, play-free connection between the tank and the back plate should be maintained at all times.

A principal object of the present invention is to provide new and improved means for securing a tank to a back plate or frame.

Another object of the present invention is to provide a new and improved pack harness for a compressed air tank which includes means for quickly and easily separating the tank from the harness.

Still another object of the present invention is to provide new and improved means for firmly connecting a compressed air tank to a supporting frame.

Briefly, the above and further objects are realized in accordance with the present invention by providing a back plate having new and improved cam operated means utilizing a pair of flexible bands and an intermediate fulcrum member for securing the tank to the back plate in a releasable manner.

The above and further objects and a better understanding of the present invention may be had by reference to the following detailed description taken in connection with the accompanying drawings in which:

FIG. 1 is a generally pictorial illustration showing a compressed air tank attached to a back plate in accordance with the teachings of the present invention;

FIG. 2 is an enlarged fragmentary sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is a longitudinal sectional view of the device of the present invention, the upper and lower portions of the compressed air tank being removed;

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 4 assuming the entire device to be shown therein;

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 4 assuming the entire device to be shown therein;

FIG. 7 is an enlarged fragmentary view illustrating the cam operated mechanism of the present invention in an open or released position;

FIG. 8 is a sectional view of the cam operated mechanism of FIG. 7 showing it in a closed or locked position; and

FIG. 9 is a sectional view taken along the line 9—9 of FIG. 4 assuming the entire device to be shown therein.

Referring now to the drawings, and more particularly to FIG. 1, there is shown a scuba diving pack harness 10 including a contoured back plate 12, a generally cylindrical compressed air tank 14 which is attached thereto, and a pair of flexible belts or straps 16 and 18 which are respectively secured to the plate 12 and to each other by means of a buckle 20 to provide a harness for attaching the pack to the diver's back. In FIG. 2 is shown in detail the way in which the belt 16 is secured to the top part of the back plate 12 and in FIG. 3 is shown in detail the way in which the belt 18 is secured to the bottom part of the back plate 12.

As more fully described hereinafter, the tank 14 is secured to the contoured back plate 12 by means of a lower flexible band 22, which is attached at its ends to the back plate 12 and which encircles the tank 14, and an upper band 24 which is also secured at its ends to the plate 12 and which partially encircles the tank 14 at a position above that of the lower band 22. A handle 26 on a camming mechanism which is pivotally attached to the plate 12 provides means for tightening and loosening the top band 24 to quickly lock the tank 14 to the plate 12 and to quickly unlock or release the tank 14 from the plate 12.

As best shown in FIGS. 4, 5 and 6, the back plate 12, which constitutes a rigid supporting member and is preferably formed of metal, comprises a rearwardly off-set central section 30, having a concave rearwardly facing surface 32 terminating in a pair of longitudinally extending ridges 33. As thus far described, the surface is a longitudinal portion of a cylinder conforming to the general shape of the tank 14. The lower band 22, which is preferably a thin sheet metal strap, is secured to the plate 12 along one side of the off-set central section 30 by means of a screw and nut assembly 34 which extends through suitable apertures in the off-turned end 35 of the band 22. The opposite end 36 of the band 22 is also off-turned and is similarly secured to the back plate 12 on the other side of the off-set central section 30 by means of a nut and bolt assembly 38.

In order to adjustably secure the upper band 24 to the back plate 12 to accommodate different tank sizes, the end 40 of the band 24, best shown in FIG. 5, is bent partially back upon itself over a nut 42 which is threadedly received on a bolt 44 extending through a suitable aperture 46 in the plate 12 to one side of the center section 30 near the top thereof. A guide bracket 48 is secured to the back plate 12 and extends a substantial distance upwardly of the normal point of attachment of the band 24 to the nut 42 so as to prevent cocking of the nut 42 relative to the screw 44.

The opposite end of the band 24 is secured to the plate 12 by means of a quick release camming and locking assembly 50, which enables rapid tightening and loosening of both bands 22 and 24 over the tank 14 in a single operation. This camming mechanism is described in greater detail hereinafter.

Approximately midway between the points of attach-

ment of the bands **22** and **24** to the back plate **12**, the off-set central section **30** includes a rearwardly facing, arcuate ridge **52**, which as best shown in FIGS. 4 and 6 extends between the ridges **33**, and provides a fulcrum or pivot edge for the tank **14** during attachment thereof to the back plate **12**. FIG. 4 shows the tank **14** in a locked position wherein it is held against the cross ridge or fulcrum **52** and against the upper portions only of the side ridges **33**. Hence, a three-point attachment of the tank **14** to the plate **12** is provided with the lower end of the tank **14** spaced a substantial distance from the bottom of the pack. When, therefore, the cam assembly **50** is operated to effectively lengthen the upper band **24**, the tank **14** will pivot counterclockwise about the fulcrum **52** as viewed in FIG. 4 thereby to simultaneously loosen the lower band **22**. This frees the tank so that it may slide through the bands and off the back plate. In like manner, when the clamping assembly **50** is operated to tighten the upper band **24**, the lower end of the tank **14** is pivoted away from the lower edge of the back plate to tighten the lower band **22** and to minimize any interference between the lower end of the tank and the diver.

Considering the cam assembly **50** in greater detail, and referring to FIGS. 5, 7 and 8, the upper band **24** is provided near its right-hand end as shown in FIG. 8 with an enlarged aperture **54** through which extends a circular camming member **56**. A snap-acting locking ring **58** is secured in a groove **60** adjacent to the band **24** to secure the same in place against an annular flange **59**. The camming member **56** is fixedly connected at an off-center position to a non-circular pin **62** which is journalled in a generally channel-shaped bracket **64**. As shown, the bracket **64** is fixedly attached to the plate **12** adjacent the off-set portion **30** by means of a nut and bolt assembly **66**. One end of the shaft **62** is threaded at **68** to receive a nut **69** and washer **70**, and the other end thereof is suitably secured to the handle member **26** as by brazing. The handle member **26** includes a hub portion **72** from which extends the rod **74** which provides the finger grip for rotating or pivoting the shaft **62** in the bracket **64** thereby to rotate the eccentric **56** and move the band **24** from the lower locked position, as viewed in FIG. 8 and in solid lines in FIG. 7, to the upper or released position as shown in dotted lines in FIG. 7. It will be noted that with the handle in the locked position as shown in solid lines in FIG. 7, the cam mechanism is over-center, whereby the pull exerted thereon by the band tends to hold the cam assembly in the tightened or locked position.

In operation, when it becomes desirable to attach the tank **14** to the back plate **12**, the plate is placed face down on a horizontal supporting surface and the handle **26** is moved to the upper released position such that both of the bands **22** and **24** are sufficiently loose that the tank **14** can be slipped therein. With the tank **14** in the desired longitudinal position along the plate **12**, its center of gravity is below the fulcrum **52** as viewed in FIG. 4 so that it lies against the lower edge of the plate **12**. Hence, the lower band **22** is loose. Now, the handle **26** is pivoted to the downward position as shown in FIG. 1 whereby the upper band **24** is effectively shortened to pivot the tank **14** about the fulcrum **52** thereby simultaneously to tighten the lower and upper bands **22** and **24**. The force on the two bands is thus equalized as is the force of deformation on the back plate **12**. An extremely tight and secure mount for the tank is thus provided and variations in dimensions caused by normal shop tolerances in no way affect the security of this mount. Thereafter, when it is desirable to separate the tank from the plate **12**, the handle **26** is pivoted to the upper position whereby the upper band **24** is extended and loosened by the cam assembly and simultaneously the lower band **22** is also loosened so that the tank **14** may slide through the bands **22** and **24** out of engagement with the back plate **24**.

Inasmuch as commercially available tanks vary somewhat in size, adjustment in the length of the upper band **24** may be made by means of only one screw **44**. This single screw effectively provides adjustment for both bands. Since this is an adjustment which need rarely be made, it is best done with a screw driver. On the other hand, no special tools are required to operate the frequently used camming mechanism **50**.

While the present invention has been described in connection with a particular embodiment thereof, it will be understood that those skilled in the art may make many changes and modifications without departing from the true spirit and scope of the present invention which is intended to be covered by the appended claims.

I claim:

1. A pack harness for use with an elongated tank of compressed gas, comprising
   a substantially rigid back plate,
   means attached to said plate and positionable about the body of a person for securing said plate to the person's back,
   first and second tank encircling bands attached to the rear side of said plate at spaced locations on said plate, each of said bands being sized to normally loosely receive the elongated tank,
   a rearwardly extending fulcrum member on said plate between said bands,
   and manually operable means for tightening one of said bands to exert a force on said tank to pivot it about said fulcrum member to tighten the other of said bands.

2. The combination of claim 1 wherein said manually operable means comprises
   an eccentric member attached to said one band near one end thereof, and
   means pivotally securing said eccentric member to said plate.

3. The combination of claim 1 wherein said fulcrum member is elongated in a direction parallel to the planes of said bands.

4. The combination of claim 1 wherein said fulcrum member is integral with said plate.

5. The combination of claim 3 wherein said fulcrum member is a rearwardly extending deformation in said plate.

6. The combination of claim 5 wherein said one band is disposed above the other of said bands when said plate is on a person's back and said manually operable means includes a control lever disposed closely adjacent one side edge of said plate on the rear side thereof, whereby said tank is releasable by said person by manipulation of said lever.

7. The combination of claim 1 wherein said plate includes a pair of parallel ridges disposed on opposite sides of said fulcrum member and against which ridges said tank is held when secured to said plate.

8. The combination of claim 7 wherein said parallel ridges extend both above and below said fulcrum member when said back plate is in an upright, vertical position.

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