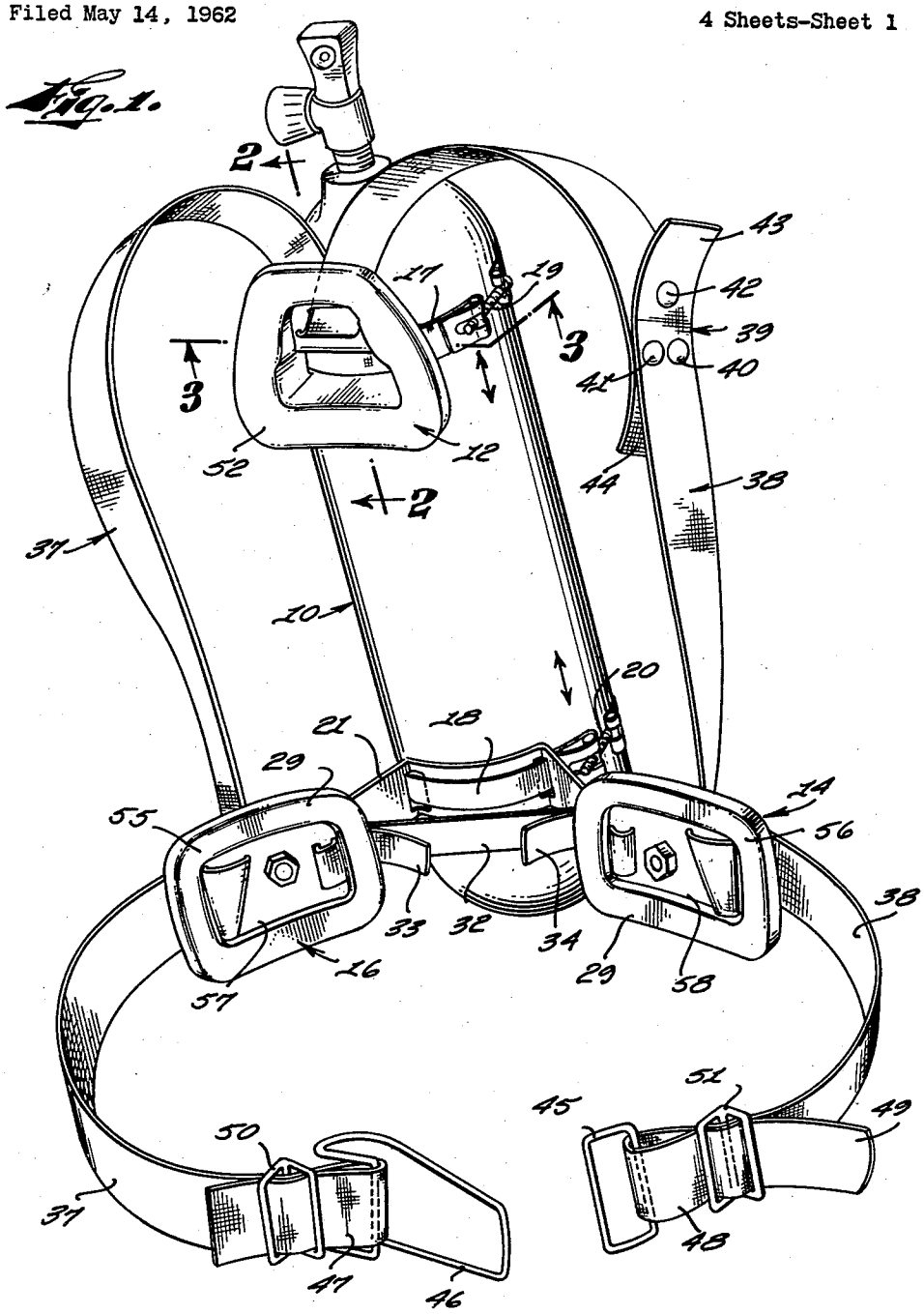
June 29, 1965 D. L. SENNE 3,191,828

HARNESS FOR GAS-FILLED CYLINDERS

Filed May 14, 1962 4 Sheets-Sheet 1

Fig. 1.



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HARNESS FOR GAS-FILLED CYLINDERS

Filed May 14, 1962 4 Sheets-Sheet 2

Fig. 2.

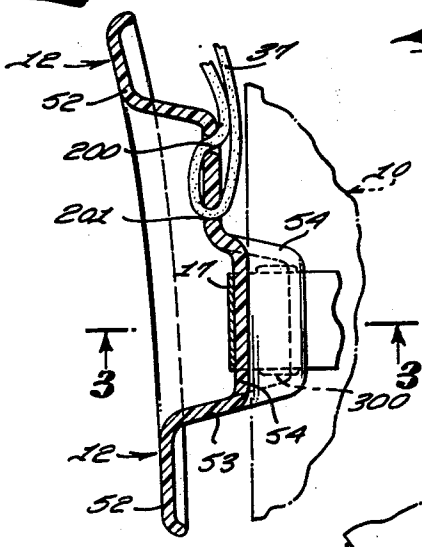


Fig. 5.

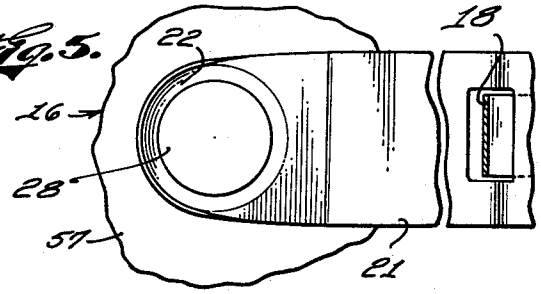


Fig. 3.

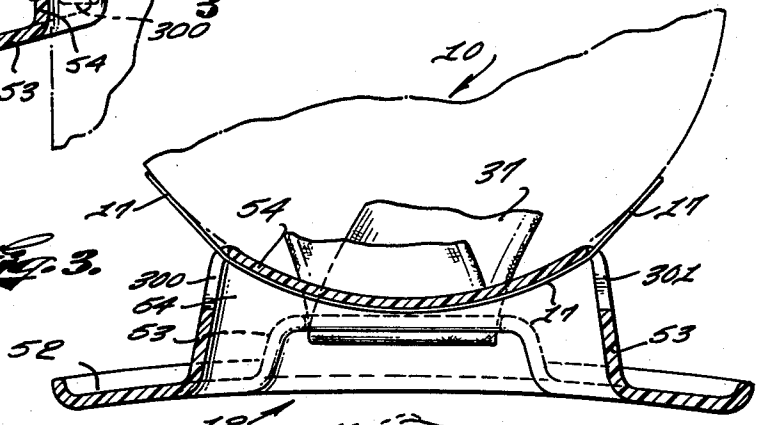
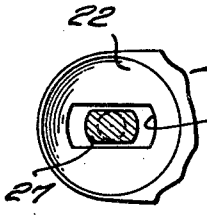


Fig. 6.



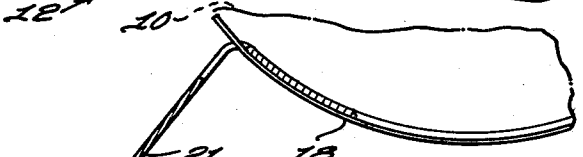
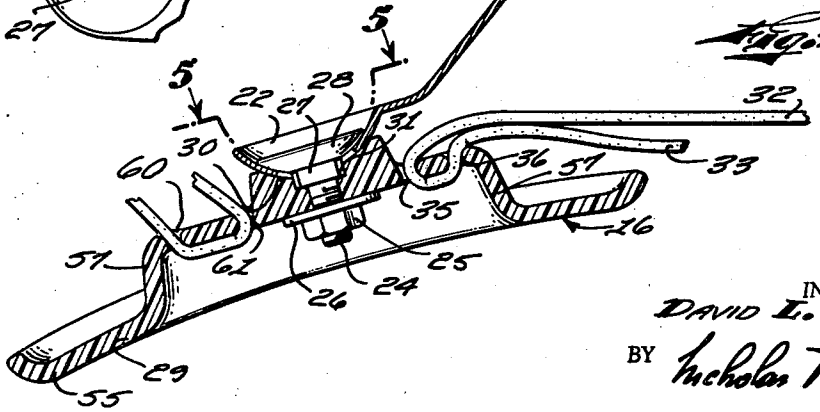


Fig. 4.



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HARNESS FOR GAS-FILLED CYLINDERS

Filed May 14, 1962 4 Sheets-Sheet 3

Fig. 7.

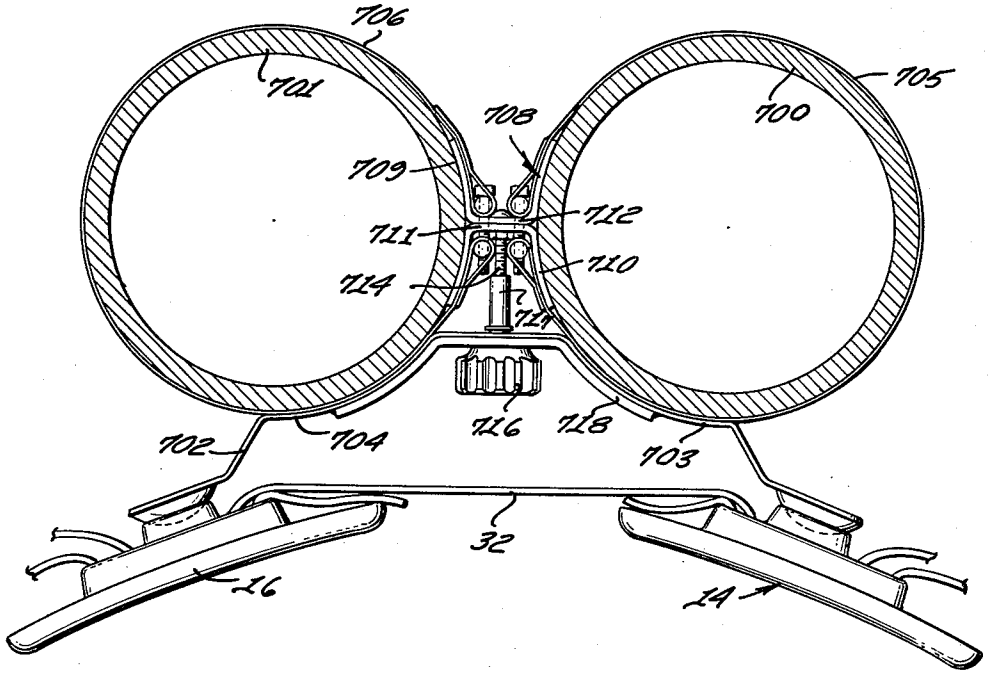


Fig. 8.

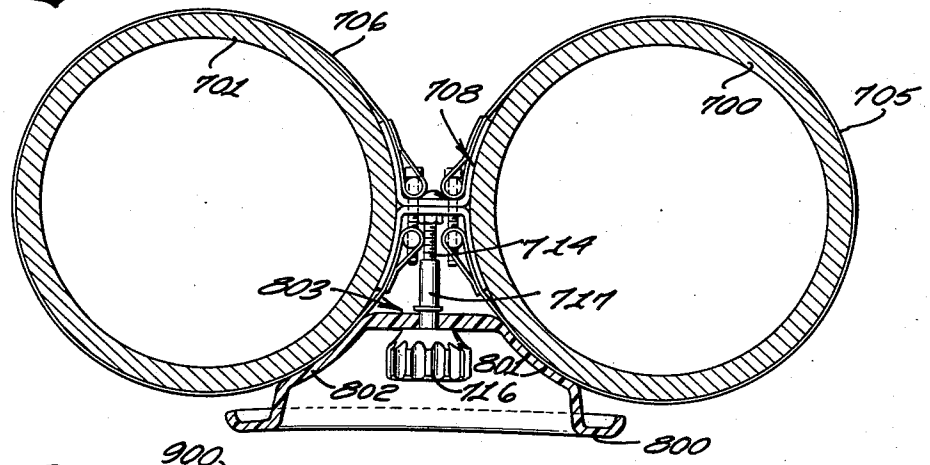
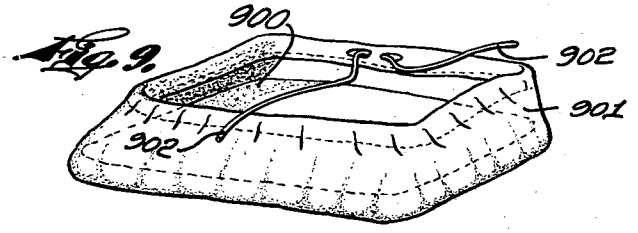


Fig. 9.



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June 29, 1965 D. L. SENNE 3,191,828

HARNESS FOR GAS-FILLED CYLINDERS

Filed May 14, 1962 4 Sheets-Sheet 4

Fig. 10.

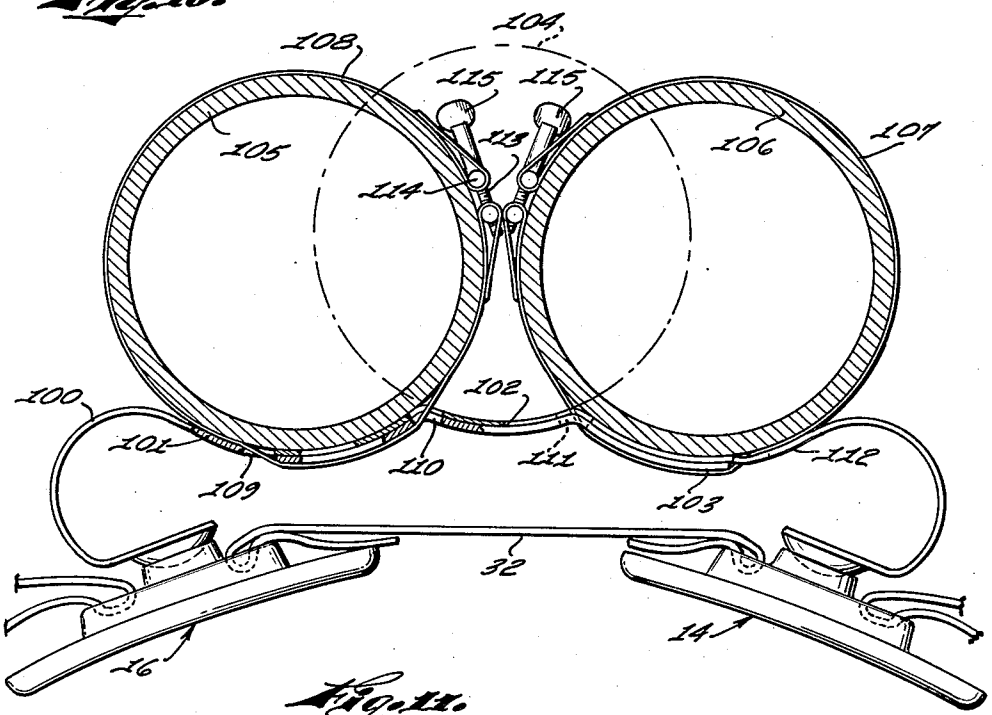
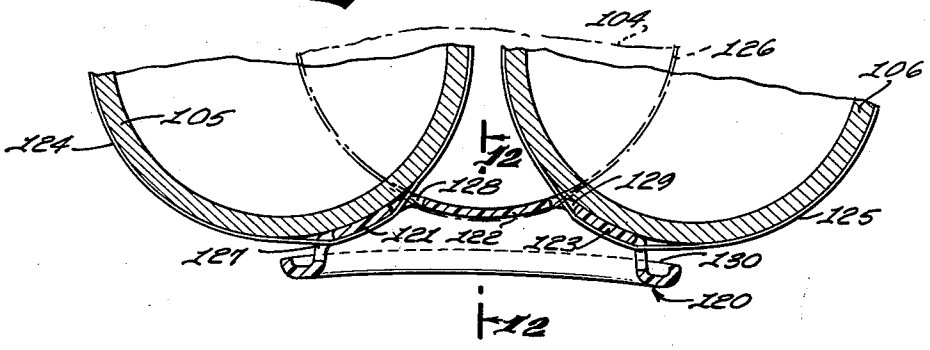


Fig. 11.



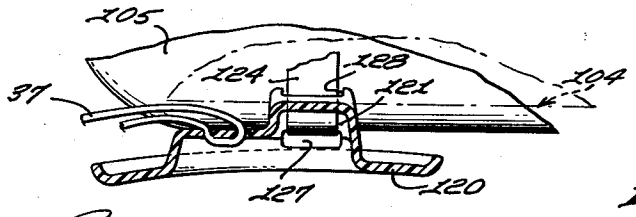


Fig. 12.

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United States Patent Office 3,191,828 Patented June 29, 1965

3,191,828

HARNESS FOR GAS-FILLED CYLINDERS

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Filed May 14, 1962, Ser. No. 194,589
9 Claims. (Cl. 224—25)

This invention relates to improvements in cylinder harnesses worn by underwater swimmers for strapping cylinders filled with compressed air which supply air to a diver through a self-contained underwater breathing apparatus known as "scuba." The harnesses of this type are also used by welders when it becomes impossible to use conventional cylinder-supporting hand trucks in inaccessible places.

It is an object of this invention to provide a harness including shoulder and waist straps and three pads attached to a cylinder or a plurality of cylinders, and to the straps, the pads being adapted to rest on the back of the wearer of such harness and the cylinders acting as a "backbone" for such harness.

It is an additional object of this invention to provide the harness of the above type which is light in weight, easily releasable in case of emergency, and, because of the contoured and swiveled type of mounting of the pads, they fit the back of the user and yet hold the cylinders in spaced relationship with respect to the back of the user of such harness so as to provide maximum degree of freedom of movement to the wearer of such harness.

It is an additional object of this invention to provide a three point suspension harness which is capable of accommodating either one or two tanks, with one tank generally centered relative to the harness as a whole when only one tank is desired, and the two tanks being mounted side-by-side when two tanks are strapped to the harness.

Other objects of the invention will become more apparent from a more detailed description given with the aid of the drawings in which:

FIGURE 1 is a perspective view of the harness clamped to a single cylinder;

FIGURE 2 is a cross-section taken along line 2—2, FIG. 1, of the upper pad;

FIGURE 3 is a cross-section taken along line 3—3 illustrated in FIGS. 1 and 2 of the upper pad;

FIGURE 4 is a cross-section, taken along line 4—4, FIG. 1, of the lower pad;

FIGURE 5 is a top view, taken along line 5—5, FIG. 4, of that portion of the lower pad which includes the connection between the pad and a bridge member which interconnects the two lower pads;

FIGURE 6 is a cross-section of the swivel joint interconnecting the outer end of the bridge member with a pad;

FIGURE 7 is a transverse section of two cylinders and an end view of two lower pads and of the harness elements suitable for supporting two cylinders;

FIGURE 8 is a transverse section of the upper pad and two cylinders;

FIGURE 9 is a perspective view of a cushion cover which is used in connection with the harness pads;

FIGURE 10 is a transverse sectional view of two cylinders and an end view of the harness for supporting either one or two tanks with the section being taken beyond the two lower pads;

FIGURE 11 is a transverse sectional view of the upper pad of the harness suitable for holding either one or two tanks; and

FIGURE 12 is a cross-sectional view taken along line 12—12, FIG. 11, of the upper pad shown in FIG. 11.

Referring to FIGS. 1–6, they illustrate a three-point suspension harness in which the cylinder 10 itself acts as a rigid member integrating the three load-bearing pad units 12, 14 and 16 connected to the tank by means of clamps comprising an upper strap 17 and a lower strap 18, respectively. The straps are fastened to cylinder 10 by means of T-bolts, trunnions and nuts 19 and 20, which thus rigidly connect pad 12 and a bridge member 21 to cylinder 10. The bridge member 21 is connected to the pad units 16 and 14 in the manner illustrated in FIG. 4. This connection comprises a swivel joint composed of the following elements: a cup member 22 having a longitudinal slot 23, and a bolt 24 having a nut 25, a washer 26, a shank 27 having the cross-sectional shape illustrated in FIG. 6, and a cup 28. The shank passes loosely through slot 23 and then terminates in cup 28 which forms a sliding joint with cup 22. In this manner cup 22 and bolt 24 permit pad unit 16, with its body-engaging surface 29, to change position with respect to bridge 21. The main body portion of pad unit 16 is provided with the concave seat 30 engaging cup 22 in the manner illustrated in FIG. 4. Cup 22 forms a sliding engagement with seat 30 and this is achieved by dimensioning bolt 24 and shank 27 so that shank 27 bottoms the shank seat 31 before it can tightly engage cup 22, with the result that there is a free sliding engagement between cups 22 and 28. From FIGS. 4–6, it will be seen that cups 22 and 28 and seat 30 all present matching spherical surfaces so that, within the limits afforded by the play between shank 27 and slot 23, the pad unit 16 is mounted on bridge member 21 for universal movement. Thus, the entire pad unit 16 is free to swivel to the extent permitted by the spacing between shank 27 and slot 23, which as mentioned previously, has a larger open area than the cross-section of shank 27.

Band 18 is fastened to bridge 21 by spot welding it to the bridge. This connection between band 18 and bridge 21 may take a variety of forms, such as the above-mentioned welding, riveting by providing a relatively large slot in bridge 21 so that the entire T-bolt can be slipped through the slot, etc. The two lower pad units 14 and 16 can be drawn closer to each other by means of a take-up strap 32, which has two free ends 33 and 34. These two free ends are passed through two respective slots 35 and 36 in pad unit 16, and identical slots in pad units 14. The length of the take-up strap can be adjusted so as to make pad units 14 and 16 span either a shorter or a longer arc and thus adjust the position of the lower pad units 14 and 16 to the desired portion of the small of the back and also increase the clearance between the cylinder 10 and the wearer's back.

The harness straps, made of cotton or nylon webbing, are composed of two pieces, one piece being piece 37 and the second piece being piece 38, the two pieces being fastened to each other by means of a snap joint 39 having three or more snaps 40, 41 and 42 which can be disconnected very quickly in case of an emergency by pulling at the free end 43. The body portions of all three pad units are provided with slots for threading the free ends 43 and 44 of the webbing through the slots in the manner indicated in FIGS. 1, 2 and 3. The belt portion of the webbing is provided with a quick-release rectangular loop 45 and hook 46 combination. Hook 46 is fastened to loop 47 by means of a slide buckle 50 and loop 45 is fastened to a loop 48 formed by a free end 49 which is threaded through a slide fastener 51. The entire harness thus can be released very quickly by unfastening hook 46 from loop 45 and by snapping open the three snaps 40, 41 and 42.

The details of construction of the upper pad unit 12 are

illustrated in FIGS. 2 and 3. Pad unit 12 is provided with two slots 200 and 201 which are used for fastening the upper pad unit to strap 37 and it is also provided with two slots 300 and 301 which are used for passing strap 17 through these slots. Strap 17 thus forms a clamp for securing the upper pad unit to cylinder 10. The body portion of pad unit 12 is generally cup-shaped, an outwardly projecting flange 52 extending about the mouth thereof. The body portion includes a shallower portion constituting a pedestal 53 and a deeper portion constituting a pedestal 54. Pedestal 54 is used for engaging and supporting cylinder 10 and the upper portion of pedestal 53 which is provided with two slots 200 and 201 is used for threading strap 37 through pedestal 53. In this manner cylinder 10 is removed from the slots 200 and 201 sufficiently to permit free adjustment of strap 37 through slots 200 and 201.

The body portions of lower pad units 14 and 16 are also generally cup-shaped and provided with outwardly projecting flanges 56 and 55, respectively, which each extend around the open mouth of the respective body portion. The cup-shaped body portions can be considered as constituting pedestals 57 and 58 which carry the swivel joints, by which the pad units 14, 16 are connected to the bridge member 21. Suitable slots 60 and 61, FIG. 4, are provided to receive and retain the shoulder straps.

FIGURES 7 and 8 illustrate an embodiment of the harness suitable for supporting two tanks. FIGURE 7 is the transverse section of the two cylinders 700 and 701 and an end view of pads 14 and 16 which are identical to those illustrated in FIG. 1, and, therefore, are similarly numbered. The difference between what is shown in the earlier figures and FIGURES 7 and 8 resides in the shape of a bridge member 702 which has two concave sectors 703 and 704 which act as two seats for mounting cylinders 700 and 701. The two clamping straps 705 and 706 are welded or riveted to the concave sectors 702 and 703. In order to hold the two cylinders rigidly together, an H shaped yoke 708 is provided which consists of two U-shaped members 709 and 710 welded together at the points of contact between the two cross-members 711 and 712. The H-shaped yoke 708 is provided with an opening and a set screw 714 is attached to the H member by means of a knob nut 716. The set screw 714 is then used for fastening the two cylinders 700 and 701 to the bridge member 702 by means of a nut 716 and a threaded stem 717. The central portion of bridge 702 is reinforced by means of a bracket 718 which is permanently welded to bridge 702.

FIGURE 8 illustrates the type of mounting that is used for attaching the two cylinders 700 and 701 to the upper pad unit 800, which differs from the upper pad units for the single tank in the following: the raised pedestal 803 is provided with two concave sectors 801 and 802 which are used for attaching the two cylinders to the upper pad 800. A knob nut 716, stem 717, a set screw 714 and an H-shaped member 708 are used for connecting the two cylinders to pad unit 800. Therefore, the fastening means are identical in FIGS. 7 and 8.

FIGURE 9 illustrates a perspective view of the cushion cover which is provided with a sponge rubber layer 900 and an outer cover 901, which is provided with a draw string 902 for fastening such cushion cover to the outwardly projecting flanges of the pad units 12, 14 and 16 in FIGS. 1 and 7, and pad unit 800 in FIG. 8. The cover 901 preferably is made of a plastic material or some impregnated fabric material, preferably of the type which forms a very low coefficient of friction with human skin and especially so when wetted with water.

FIGURES 10, 11 and 12 illustrate an additional version of the harness which is suitable for mounting either one or two cylinders. The only difference that exists between the versions which have already been illustrated in the earlier figures, and what is illustrated in FIGS. 10, 11 and 12 resides in the fastening means and the bridge member 100 which now is provided with three concave sectors 101, 102 and 103. The central sector 102 is used for mounting a single tank 104 indicated in dotted lines, and sectors 101 and 103 are used for mounting two cylinders 105 and 106. The mode of fastening tanks 105 and 106 to bridge 100 is also different in that only bands or straps 107 and 108 are used, which are threaded through slots 109 and 110 in sector 101, and slots 111 and 112 in sector 103. The two bands are then tightened to the tanks by means of T-bolts, trunnion and a nut 113, 114 and 115, respectively.

FIGURE 11 illustrates the transverse section of the upper pad unit 120 which is provided with three concave sectors 121, 122 and 123 which are used for mounting either one or two cylinders 105, 104 and 106 with the aid of bands 124, 125 and 126 which are threaded through slots 127, 128, 129 and 130 provided in pad unit 120.

The longitudinal section of the upper pad unit 120 is illustrated in FIG. 12, which is self explanatory in the light of the description of the prior figures.

In all of the embodiments of the invention shown and described, three pad units are employed, the first being clamped to one end portion of the tank or cylinder and the second and third being secured to the ends of a bridge member which is secured to the other end portion of the tank or cylinder by a clamp connected to the central portion of the bridge member. With the clamps properly secured to the tank or cylinder, the pad units are spaced from each other in triangular fashion and the flexible body harness constituted by straps or webbing 37, 38 is effective to secure the device to the wearer with the first pad unit engaging the central portion of the wearer's upper back and second and third pad units engaging the lower portion of the wearer's back each at a different side thereof, so that the desired three point suspension is accomplished. Adjustment of either or both clamps lengthwise of the tank or cylinder compensates for the differences in back length of various wearers, while the tension strap 32 allows the spacing between the two lower pad units to be adjusted to suit the particular wearer. Further adjustability to suit each wearer, and assurance of better freedom of movement, are afforded by the swivel joints via which the lower pad units are connected to the bridge member. In all cases, the dimensions and configurations of the pad units and the bridge member assure that the tank or cylinder will be spaced away from the wearer adequately to allow arching of the wearer's back.

The bridge member connecting the two lower pad units is advantageously an elongated strip, as shown, formed from a resiliently deformable material such as stainless steel. The body portions of the pad units can be formed of synthetic resin, stainless steel or anodized aluminum, for example.

While particularly advantageous embodiments of the invention have been chosen for illustrative purposes, it will be understood by those skilled in the art that various changes and modifications can be made therein without departing from the scope of the invention, as defined in the appended claims.

What I claim as new is:

1. In a device for mounting on the back of a wearer the gas supply cylinder of a self-contained underwater breathing apparatus, the combination of

first, second and third load-bearing pad units;

first clamp means for securing said first pad unit to the upper end portion of the cylinder;

a bridge member having its end portions secured each to a different one of said second and third pad units, said bridge member maintaining said second and third pad units spaced from each other;

second clamp means connected to said bridge member between the ends thereof for securing the combination of said bridge member and said second and third pad units to the lower portion of the cylinder,

said pad units being interconnected through the cylinder, when secured to the cylinder by said first and second clamp means, with said first pad unit at least generally centered on the longitudinal axis of the cylinder and said second and third pad units spaced apart generally transversely of the cylinder; and

flexible body harness means connected to said pad units for securing the device to the wearer with said first pad unit engaging the central portion of the wearer's upper back and said second and third pad units each engaging the wearer's lower back on a different side thereof.

2. A device in accordance with claim 1 and wherein each of said pad units comprises

a main body portion, and

a peripheral flange joined to said main body portion and disposed to face the wearer's back when the pad unit is secured to the cylinder by the corresponding one of said clamp means,

said main body portion of said first pad unit having a concave seat portion for engagement with the cylinder,

said bridge member having spherical end portions and said body portions of said second and third pad units having spherically concave seat portions engaging said end portions to allow universal adjustment of said second and third pad units on said bridge member,

the dimensions of said body portions and said bridge member being such that the cylinder is spaced from the wearer's back, when the device is secured by said body harness means, to allow arching of the wearer's back.

3. A device in accordance with claim 1 and wherein said bridge member is an elongated strip of resiliently deformable material, and

the device further comprises

adjustable tensioning means interconnecting the end portions of said bridge member for adjusting the spacing between said second and third pad units.

4. In a device for mounting an elongated tank on the body of a wearer, the combination of

a first load-bearing pad unit having a body-engaging surface;

first attaching means connected to said first pad unit for securing the same to one end portion of the tank with the body-engaging surface of said first pad unit directed laterally away from the tank, said first attaching means comprising

a first clamp adapted to be actuated into rigid engagement with the tank at any of various points along said one end portion thereof, said first pad unit being at least generally centered transversely of the tank when said first clamp is rigidly engaged with the tank;

second and third load-bearing pad units each having a body-engaging surface;

second attaching means for securing said second and third pad units to the other end portion of the tank, said second and third pad units being spaced apart and said second attaching means comprising

bridging means connected to said second and third pad units and extending therebetween, and

a second clamp connected to said bridging means between said second and third pad units and adapted to be actuated into rigid engagement with said other end portion of the tank to locate said second and third pad units in positions such that the body-engaging surfaces thereof face away from the tank generally in the same direction as does the body-engaging surface of said first pad unit and said second and third pad units are spaced each on a different side of a line passing through the body-engaging surface of said first pad unit and parallel to the longitudinal axis of the tank; and

flexible body harness means connected to said pad units for securing the device to the wearer with the body-engaging surface of said first pad unit engaging a central area of the upper portion of the wearer's back and the body-engaging surface of said second and third pad units each engaging the lower portion of the wearer's back on a different side of the center thereof, when said clamps are rigidly engaged with the tank,

the combination of said pad units and said attaching means being so dimensioned that the tank is spaced from the wearer to allow arching of the wearer's back when the device is secured to the wearer by said harness means.

5. A device in accordance with claim 4 and wherein said bridging means comprises a resiliently deformable member having

an intermediate portion of such shape as to conform to the surface of the lower portion of the cylinder, and

a pair of arms diverging from said intermediate portion, said second and third pad units each being attached to the end portion of a different one of said arms; and

the device also comprises

adjustable tensioning means interconnecting the end portions of said arms for adjusting the spacing between said second and third pad units.

6. A device in accordance with claim 4 and wherein each of said pad units comprises

a generally cup-shaped body portion, and an outwardly projecting flange extending about the mouth of said body portion;

the body portions of said second and third units each being provided with a spherical depression opening away from the flanges of said pad units, and

said bridging means having spherical end portions engaged each in a different one of said depressions.

7. In a device for mounting an elongated tank on the back of a wearer, the combination of

a first load-bearing pad unit presenting a body-engaging surface and having a seat portion opposite said body-engaging surface shaped for direct engagement with the lateral surface of one end portion of the tank;

a first clamp connected to said first pad unit for securing the same to the tank with said seat portion engaged with said one end portion;

a bridge member having an intermediate portion shaped for direct engagement with the lateral surface of the other end portion of the tank;

second and third load bearing pad units secured each to a different end of said bridge member and each presenting a body-engaging surface;

a second clamp connected to said bridge member for securing the same to the tank with said intermediate portion engaging the lateral surface of said other end portion and with said bridge member extending generally transversely of the tank,

said pad units being disposed to generally define a triangle, when so secured to the tank, with said first pad unit at least generally centered on the longitudinal axis of the tank and said second and third pad units spaced apart transversely of said axis; and

flexible body harness means connected to said pad units for securing the device to the wearer with said first pad unit engaging the central portion of the wearer's upper back and said second and third pad units each engaging the wearer's back on a different side thereof.

8. A device in accordance with claim 7 and wherein said bridge member is a strip of resiliently deformable material and includes a pair of divergent end portions,

the device further comprising

adjustable tensioning means interconnecting said end portions for adjusting the spacing between said second and third pad units.

9. A device in accordance with claim 7 and further comprising

universal joint means at each end of said bridge member,

said second and third pad units being secured to said bridge member via said universal joint means and said universal joint means providing limited freedom of movement of said second and third pad units relative to said bridge member.

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