

5714
X3075 E
X3092 R

(3)

April 7, 1970

W. R. BUSH

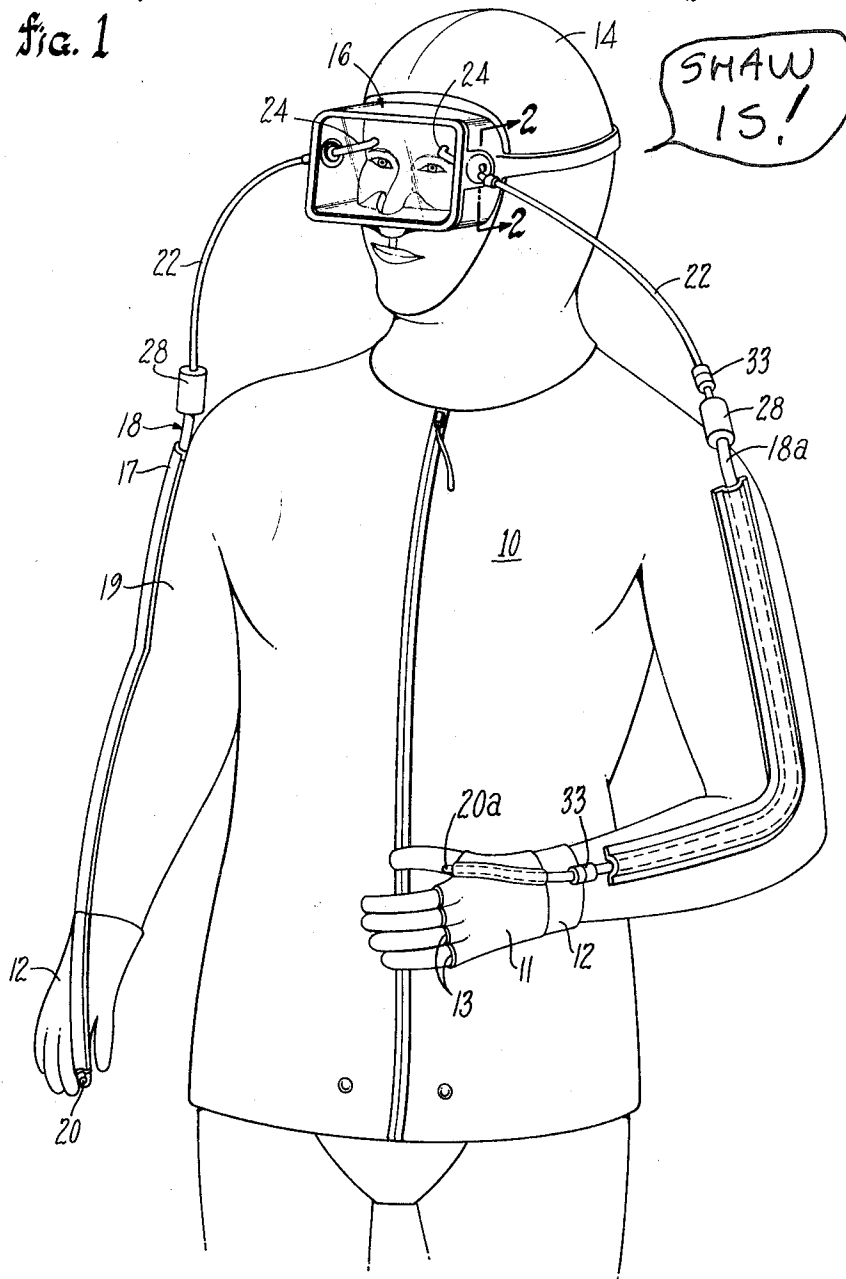
3,504,984

GARMENT

Filed March 13, 1967

2 Sheets-Sheet 1

fig. 1



INVENTOR.
WALTER R. BUSH

BY
Lindsey, Putzman and Hayes
ATTORNEYS

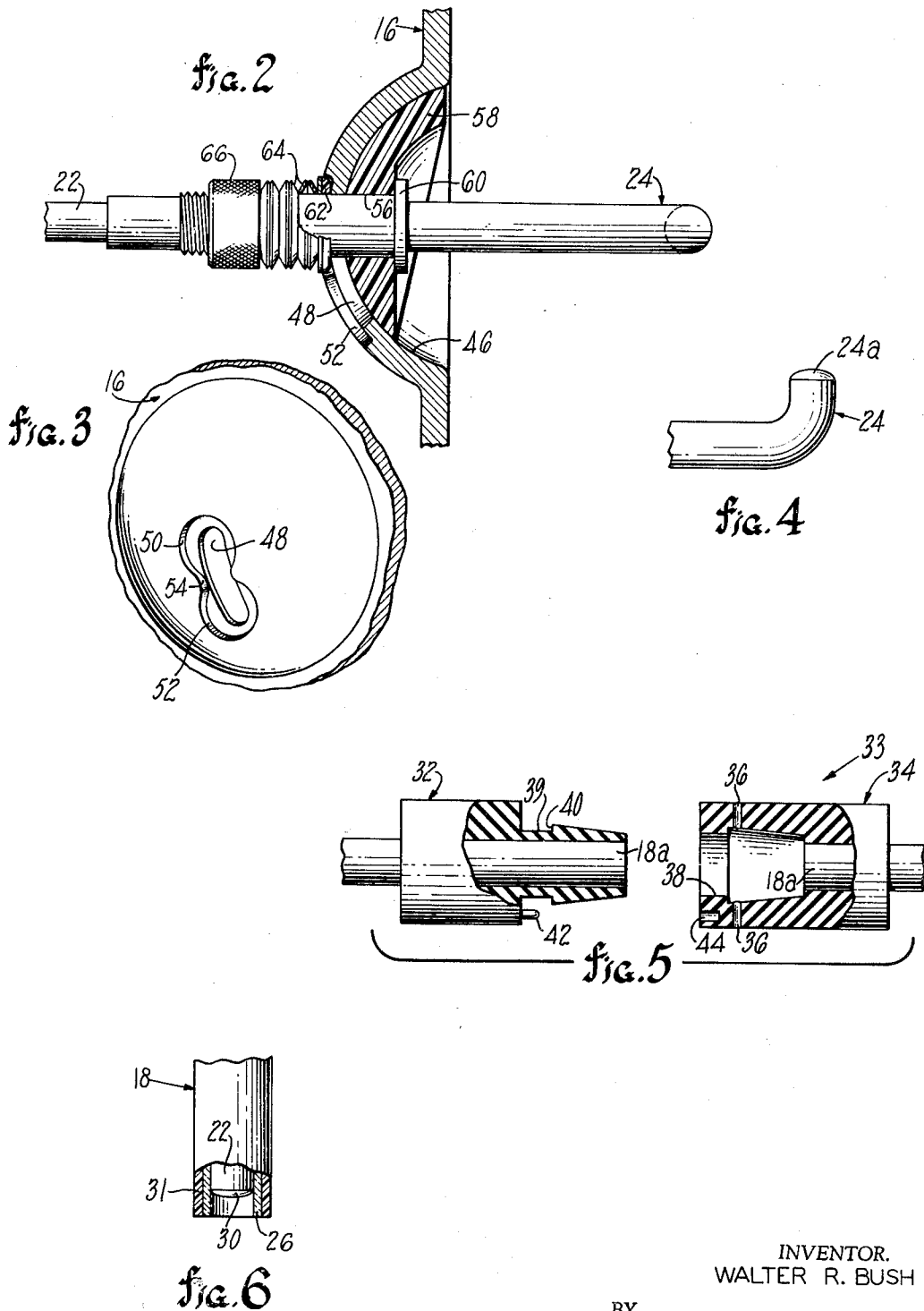
April 7, 1970

W. R. BUSH
GARMENT

3,504,984

Filed March 13, 1967

2 Sheets-Sheet 2



INVENTOR.
WALTER R. BUSH

BY
Lindsey, Postman and Hayes
ATTORNEYS

1

3,504,984
GARMENT

Walter R. Bush, West Simsbury, Conn., assignor to The Stanley Works, New Britain, Conn., a corporation of Connecticut

Filed Mar. 13, 1967, Ser. No. 622,484

Int. Cl. G02b 27/32, 5/14; B63c 11/00

U.S. Cl. 356-256

7 Claims

ABSTRACT OF THE DISCLOSURE

A wet suit having associated pairs of fiber optics bundles secured to its sleeves and gloves with the object ends thereof terminating adjacent the ends of the finger stalls of the gloves or the web between the thumb and forefinger to automatically point the object ends of the bundles toward an object to be viewed by the natural movement of the user. A light is provided at the other end of one of the bundles to illuminate the object and the second end of the other bundle is mounted by the head piece to selectively support the viewing end thereof in and out of the field of view of the user. The fiber optics bundles may be segmented and indexed to facilitate removal and assembly of the head piece and gloves of the wet suit.

This invention relates to improvements to garments and the like and is especially significant in connection with garments for divers working under adverse conditions of illumination and visibility.

An object of this invention is to provide a garment or other body covering designed to overcome the conditions of poor visibility.

Another object of the invention is to provide a device of the character described which is simple in design and efficient in use. Included in this object is the provision of such a device which automatically functions due to the natural movements of the user.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which is exemplified in the construction hereafter set forth, and the scope of the invention is indicated in the appended claims.

For a better understanding of the invention, reference is made to the accompanying drawings forming part of this specification in which

FIG. 1 is an elevational view of an exemplary garment incorporating two embodiments of the present invention, one associated with each arm of the garment;

FIG. 2 is a fragmentary enlarged cross-sectional view along lines 2-2 of FIG. 1 showing a bi-stable mount suitable for use in the practice of the invention;

FIG. 3 is a fragmentary side view of the diver's mask of FIG. 2 with the image transmitting conduit removed;

FIG. 4 is a fragmentary plan view showing a suitable image viewing end of the image transmitting conduit of FIG. 2;

FIG. 5 is an exploded fragmentary view partly in section showing a detachable joint suitable for use in the practice of this invention; and

FIG. 6 is a fragmentary elevation view partially broken away showing an image pickup end of the conduit of the invention.

Referring now to the drawings in detail in which like numerals indicate like parts throughout the several figures, there is shown, for purposes of illustration, the application of the present invention a "wet" suit of the type conventionally used by divers. The "wet" suit 10 is made of

2

a rubber product such as foam rubber or foam neoprene, and, as shown, includes removable gloves 12 and head covering 14 made of like material. A mask 16 also forms part of the headpiece.

In accordance with this invention, a garment or other covering for the arm or hand incorporates a pair of associated light transmitting conduits which are pointed toward a poorly illuminated object by the normal movement of the wearer as, for example, a diver working underwater.

In FIG. 1 there is shown, associated with the right arm of the wearer of the wet suit, an embodiment of the invention wherein a composite pair 18 of associated light transmitting conduits are secured to the sleeve of the wet suit by a strip of material 17 having its edges secured to the sleeve 19 to form a channel for receiving the pair of conduits. The composite pair of conduits terminates in an image pickup or object end 20 which is shown as being similarly secured to the knuckle side and a finger stall of the glove 12 in alignment with the finger stall and terminating substantially at the tip thereof so as to be pointed beyond the end of the associated finger, e.g., the index finger; it being understood that the pair of conduits could be otherwise secured so as to be automatically pointed by the normal movement of the arm.

In the illustrated embodiment and as best shown in FIG. 6, the associated pair 18 of light transmitting conduits are shown as comprising two separate optically isolated concentrically arranged light transmitting conduits. The core conduit 22 is provided for transmitting the image from the image pickup or object end 20 to the image viewing end thereof and the peripheral conduit 26 extends to a light source schematically illustrated as power pack 28 to transmit light to the image pickup end 20 (FIG. 1). A focusing lens 30 is shown as being provided to pickup a sharp image of the object to be viewed, and the peripheral conduit 26 is shown as projecting beyond the focusing lens 30 to shield the image pickup end of core conduit 22 and lens 30 from direct illumination by light delivered by peripheral conduit 26.

As shown in FIG. 1, the image viewing end of image transmitting conduit 22 shown as being rigid and as extending into and being tiltably mounted on the mask 16 for displaying the image in the field of vision of the diver.

FIG. 1 also illustrates a somewhat modified form of the invention, which facilitates the removal of glove 12 or mask 16 is illustrated in association with the left sleeve of the wet suit. In this embodiment, the associated pairs 18a of light transmitting conduits are formed with a plurality of conduit sections joined together at their ends. A joint 33 suitable for use in practice of this invention is shown in FIG. 5 wherein the two ends forming the joint are held in coaxial alignment by a pair of self-aligning coupling members 32, 34 provided with mating external and internal tapers respectively. As shown, the hollow coupling member 34 is ported as at 36 to permit the escape of trapped water in the event the joint is assembled underwater. The entrance portion 38 of the coupling member 34 is shown as being of reduced cross section so as to encircle necked down portion 39 of the second coupling member 32 and to engage the peripheral shoulder 40 when assembled to secure the parts together, it being understood that either the entrance portion 38 or the tapered end of coupling member 32 is resilient to enable the coupling members to be assembled. An aligning pin 42 engageable with opening 44 is provided to correlate the orientation of the joined ends of the conduit sections.

In this second embodiment, the image pickup or object end is shown as being secured to the hand portion of the left arm of the user by a securing means such as an elastic glove 11 which is worn over the wet suit glove 12. Elastic glove 11 is shown as having no finger stalls but

having finger openings 13 to receive the fingers of glove 12 in a manner similar to a golf glove. With the image pickup end 20a of the composite conduit 18a secured to elastic glove 11 to overlie the web between the thumb and index finger and pointed to the natural grasping area between these fingers, it will be seen that such a mounting of the image pickup end will automatically locate it for pointing toward an object grasped by these fingers without interfering with the use of the hand. It will be further apparent that the elastic glove 11 could be worn on a bare hand without the use of the conventional wet suit glove 12, if desired.

FIGS. 2, 3 and 4 illustrate one arrangement for providing a bi-stable support for the image viewing end 24 of the image transmitting conduit 22 in and out of viewing position. As shown, the mask 16 is provided with an internal spherical socket 46, the wall of which is provided with an elongated vertical slot 48 having a pair of external counterbores 50, 52 spaced apart by a narrow necked portion 54. The image transmitting conduit 22 passes through the slot 48 in the mask and an aligned aperture 56 in a spherical pad 58 which matingly engages the socket 46. A flange 60 secured to the image transmitting conduit abuts a wall of the pad 58, and an axially slidable washer 62 is resiliently biased into either of the counterbores 50, 52 by a stack of Belleville washers 64 to secure the image viewing end 24 in one of its bi-stable positions. The Belleville washers 64 bottom on a bias adjusting nut 66 threaded onto a sheath of the conduit 22. With such a construction, the user may tilt the viewing end 24 into and out of his field of view as desired in use.

As shown in FIG. 4, the image viewing end 24 of conduit 22 is turned at an angle so as to present the viewing face thereof directly in front of the eye of the user. A suitable lens forming an eyepiece 24a may be provided if required by the distance between the viewing face and the eye.

An image transmitting conduit 22 suitable for use in the practice of this invention may be formed by a bundle of a multiplicity of optically distinct fibers of small diameter and comprising highly transparent glass or plastic cores coated with a glass or plastic covering of lower refractive index. The ends of the bundles of fibers are secured or bonded together so that the individual fibers at the two ends have a similar placement or orientation relative to each other to produce at one end the image picked up at the other.

The light transmitting conduit 26 may be formed in a similar manner, and as illustrated in the drawings may encircle the image transmitting conduit 22 to provide a composite pair of associated conduits. Such a composite conduit is preferably covered with a protective sheath such as sheath 31 (FIG. 6) formed of any suitable material, for example, an epoxy resin and the bundles of fibers forming either conduit 22 or conduit 26 may be of any desired cross section. A light transmitting conduit formed of a bundle of fibers as hereinbefore described is inherently flexible along any longitudinal portion thereof in which the individual fibers are not bonded together. It will therefore be readily apparent that the longitudinal portions of the conduits 22 and 26 may readily be made flexible so as to flex with the movement of the user as desired or rigid as for example at the image viewing end 24.

It will be apparent that image transmitting conduits, one associated with each hand, may be utilized so that an object may be seen stereoptically or alternatively, two objects may be viewed simultaneously. Moreover, while one specific manner is disclosed for securing the conduits for movement in accordance with the normal movement

of the arms and hands of the user, it is apparent that the conduits may be secured in another manner as, for example, by a pair of parallel conduits attached to move with different fingers of a hand, within the scope of this invention.

As will be apparent to persons skilled in the art, various other modifications and adaptations of the structure above described will become readily apparent.

I claim:

1. A garment having a sleeve with an associated pair of light transmitting conduits secured thereto to extend longitudinally thereof, each of said conduits having an object end positioned substantially at the free end of said sleeve and a second end remote therefrom nearer the attached end of the sleeve; a light source placed at the second end of one of said conduits for transmitting light along said one of said conduits and beyond its object end; means for positioning said object ends adjacent the free end of the garment wearer's arm so that said object ends may be pointed by the normal movement of said arm toward an object to be illuminated and viewed; said garment including means for positioning the second end of the other of said conduits to present the images of an object to be viewed in the field of view of the wearer.

2. A garment as recited in claim 1 wherein an associated pair of light transmitting conduits is secured to each of the sleeves of the garment.

3. A garment as recited in claim 1 wherein the garment includes a headpiece and the second end of said other of said associated pair of conduits is movably mounted relative to the headpiece for positioning the same in and out of the field of view of the wearer.

4. A garment as recited in claim 3 wherein the garment includes a glove and the object ends of the conduits are mounted on the knuckle side of the glove.

5. A garment as recited in claim 4 wherein the glove is provided with finger stall means and the object ends of the conduits are mounted to move with said stall means and terminate adjacent the tip thereof.

6. A garment as recited in claim 4 wherein the object ends of said conduits are mounted to overlie the web of the glove between the thumb and index fingers of the wearer to point the same toward an object grasped between said fingers.

7. A garment as recited in claim 4 wherein said conduits are longitudinally segmented and indexed to facilitate the removal of the glove and the headpiece and to orient the same upon assembly.

References Cited

UNITED STATES PATENTS

2,655,663	10/1953	Hoagland	2-2.1 X
3,020,806	2/1962	Castrucci	350-96 X
3,216,778	11/1965	Davies et al.	350-96 X
3,285,242	11/1966	Wallace	128-23
3,391,405	7/1968	Wiswell	2-2.1

FOREIGN PATENTS

449,770	7/1936	Great Britain.
1,076,538	7/1967	Great Britain.
1,103,172	3/1961	Germany.
1,229,748	12/1966	Germany.

RONALD L. WIBERT, Primary Examiner

R. J. WEBSTER, Assistant Examiner

U.S. Cl. X.R.

2-2.1; 61-70; 350-96