

April 19, 1966

L. L. COPELAND

3,246,337

DIVER'S APPAREL

Filed Feb. 14, 1962

3 Sheets-Sheet 1

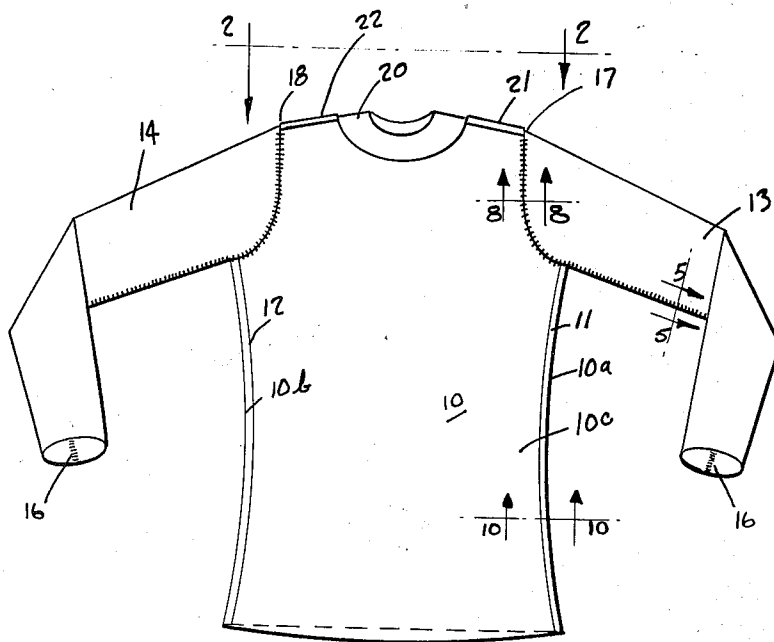


FIG. 1

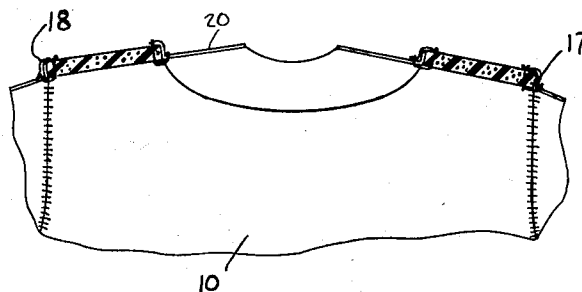


FIG. 2

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3 Sheets-Sheet 2

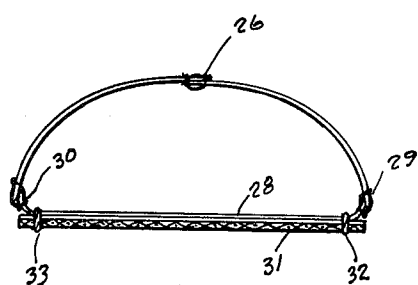


FIG. 4

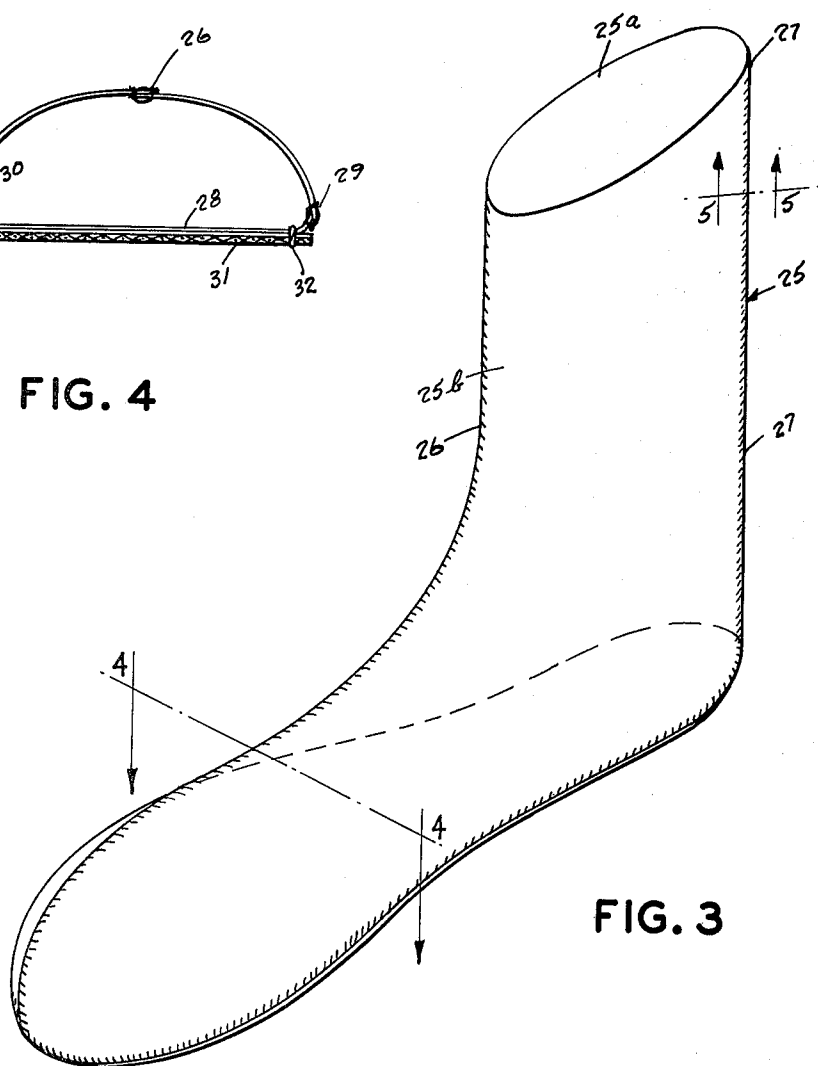


FIG. 3

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3 Sheets-Sheet 3

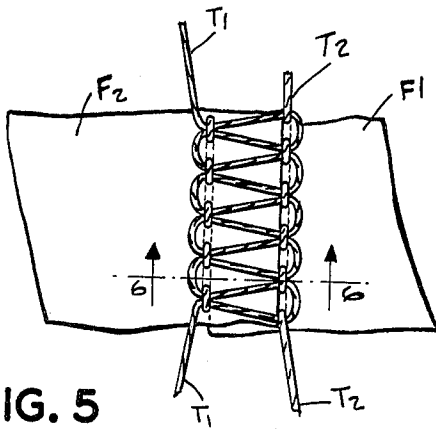


FIG. 5

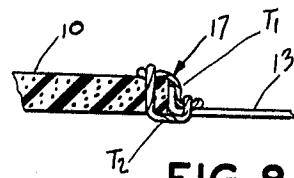


FIG. 8

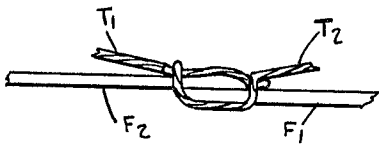


FIG. 6

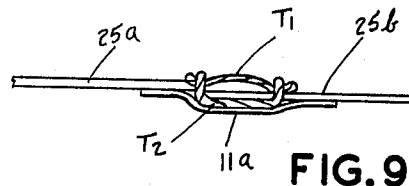


FIG. 9

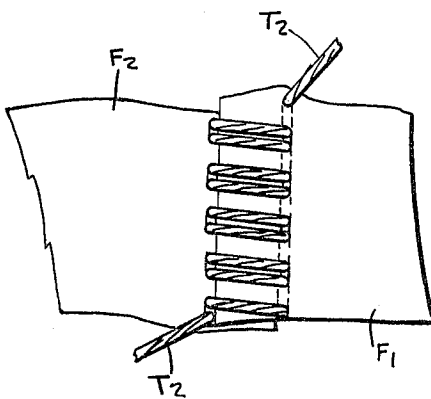


FIG. 7

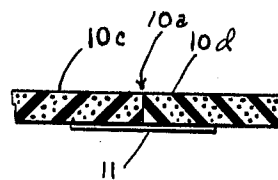


FIG. 10

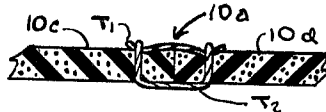


FIG. 11

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3,246,337

DIVER'S APPAREL

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Filed Feb. 14, 1962, Ser. No. 173,223
1 Claim. (Cl. 2—2.1)

This invention relates to diving suits and, more particularly, to the flexible suits commonly worn by skin divers as distinguished from the heavy metallic diving equipment used at greater depths. Also, the diving suit fabricated in accordance with the present invention is particularly adapted to exposure suits worn by aviators and explorers.

The conventional suit used by skin divers is customarily fabricated of an elastomeric material and sometimes with non-elastomeric material but in both cases it is common practice to employ some form of slide fastener. Diving suits of this variety are, of course, not intended to prevent the water from surrounding the diver's body. They do provide, however, substantial thermal and abrasion protection because a layer of water is present between the suit and the diver's body. This layer of water is heated to substantially body temperature and is insulated from direct contact with the colder water by means of the rubber suit. The material of the suit together with the insulating layer of water thus provide a satisfactory working garment for skin divers and the like, which protects the diver's body from direct contact with the cold water. In addition, the substantial thickness of the diving suit and particularly the lower extremities thereof prevent abrasions and injury to the diver upon contact with sharp rocks, coral, marine incrustations, and other dangerous objects.

Heretofore it has been considered impossible or impractical to fabricate a skin diver's garment of the type described above without the use of some type of slide fastener. These slide fasteners are cumbersome and frequently get out of order, preventing their quick attachment or detachment, as the case may be. Despite the fact that the diving suits are of a rubber-like material, it has been found that the stretching required to get into the suit soon caused the usual stitches to tear the rubber, thus ruining the suit. This accounts for the universal use of the slide fasteners.

The primary object of the present invention is to provide an improved skin diver's blouse of elastomeric material having a torso portion formed of a non-reinforced elastomer and sleeves and neck portions formed of an elastomeric fabric.

A further object of the invention is to provide in a skin diver's blouse a relatively thick rubber torso, sleeves secured to said torso by means of overedge lock stitches and a neck portion secured to the torso by means of overedge lock stitches.

A further object of the invention is to provide a stretchable protective diver's blouse having a relatively thick rubber torso, a pair of fabric re-inforced elastic sleeves secured to said torso by means of overedge lock stitches and a neck band of elastomeric fabric secured to the torso by means of overedge lock stitches.

A further object of the invention is to provide in a skin diver's suit a protective covering for the lower legs, and feet fabricated of an elastomeric fabric closely encircling the foot and a protective sole secured to said fabric.

A further object of the invention is to provide a protective foot and leg covering for skin divers and the like which comprises a synthetic sole stitched to an insole, the stitches running on the inside thereof and an upper stitched to the insole so that the upper is at least as wide as the sole.

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Further objects will be apparent from the specification and drawings in which—

FIG. 1 is a front view of a blouse constructed in accordance with the present invention,

FIG. 2 is an enlarged sectional detail approximately at the shoulder line of the blouse of FIG. 1, as seen at 2—2,

FIG. 3 is a perspective of a shoe and leg protector constructed in accordance with the invention,

FIG. 4 is a section as seen at 4—4 of FIG. 3,

FIG. 5 is an enlarged detail showing the stitches employed in the sleeves of the blouse and the footgear,

FIG. 6 is a section as seen at 6—6 of FIG. 5 and at 5—5 of FIG. 1,

FIG. 7 is a bottom view of the seam of FIG. 5,

FIG. 8 is an enlarged sectional detail as seen at 8—8 of FIG. 1, showing the seam between the torso and the sleeves of the blouse of FIG. 1,

FIG. 9 is a sectional detail of a seam using a reinforcing tape,

FIG. 10 is an enlarged sectional detail as seen at 10—10 of FIG. 1, and

FIG. 11 is a view similar to FIG. 10 showing an overedge stitched butt joint for the elastomeric portion of the torso which may be used instead of the joint shown in FIG. 10.

Referring now more particularly to the drawings, my improved diver's and aviator's protective blouse comprises a torso 10 which is preferably formed of a relatively thick elastic material such as foam rubber. The torso portion 10 in a preferred form of the invention has a thickness of approximately $\frac{1}{2}$ of an inch. The torso is formed of a front panel 10c secured to a back panel 10d having edges 10a and 10b joined together with a butt joint as shown in FIG. 10. The edges 10a and 10b of the torso are adhesively secured to each other with a butt joint and reinforced with lengths of elastomeric tape 11 and 12 adhesively secured across the butt joint. The sleeves 13 and 14 are desirably formed of a knitted stretch fabric reinforced with an elastomeric material of rubber or cured latex. Each sleeve is provided with an overedge stitched seam 16 (FIGS. 5—7) which extends from the cuff to the shoulder. The shoulder of each sleeve is similarly stitched to the sleeve openings of the torso at 17 and 18 (FIG. 8) with the overedge lock stitch shown in more detail in FIG. 5. The neckband 20 is of the same or similar elastomeric fabric of which the sleeves are made and is stitched to the neck opening of the torso in the same manner as described in connection with the sleeve-shoulder seams. The torso may be formed of a single piece of elastomeric material or if desired, two pieces may be employed to form a front and back in which event shoulder joints 21 and 22 will be employed similar to the butt joints 10a and 10b. The seams shown in FIGS. 5—9 comprise stitches formed of threads T₁ and T₂ with T₂ penetrating the fabric sections F₁ and F₂ so that thread T₂ is sewed through the fabric portions and is therefore visible on one side only (FIG. 7), whereas thread T₁ crosses on top of the lapped fabric joints and appears only on the opposite side of the fabric joint (FIG. 5).

The modified seam of FIG. 9 includes a reinforcing tape 11a adhesively secured over the thread T₂ or optionally over the other thread T₁.

An important feature of the blouse and footgear described herein resides in the fact that the diver is able to remove and put them on without danger of rupturing the material or the seams. Each piece of material is readily stretchable in an amount sufficient to permit manipulation of the arms and head therethrough.

Particularly the type of overedge lock stitches employed in or at stitched seams are capable of expanding

and contracting with the elastomeric material. This is an extremely important feature of the present invention since the stitched seams can all expand to permit passage of the arms, elbows and head through the sleeve and neck openings without hindrance and without rupturing the material. As will be noted, the seam can expand and contract only in a direction substantially parallel to the line of direction of the seam.

In the case of exposure suits used by aviators and also for skin divers' suits where it is anticipated the divers will walk on coral or other marine incrustations likely to cause injury, I provide protective foot and leg wear employing the above important features of the invention. The combined shoe and leg protector shown in FIGS. 3 and 4 comprises 2-piece upper 25 formed of flat pieces 25a and 25b of stretch fabric having an elastomeric backing and stitched front and back at 26 and 27. The upper pieces 25a and 25b are in turn stitched to an inner sole 28 at 29 and 30 (FIG. 4). Stitches 26, 27, 29 and 30 are all stretchable overedge lock stitches of the type shown in FIG. 5. Previous to applying the stitch 26 and preferably before stitching seams 29 and 30, the outer sole 31 is stitched to the inner sole 28 at 32 and 33. It will be observed that the seams 29 and 30 overhang the outer sole 31 so that contrary to conventional construction, there is substantially no projection of the outer sole 31 beyond the sides of the footgear which would prevent its being used inside an ordinary shoe or boot. This feature is important for aviators and others who are required to wear emergency equipment. The heavy military boots ordinarily worn must be quickly discarded in the event of personnel being thrown into the water. The usual fabric socks afford little or no protection against sharp objects, whereas the present emergency shoes having outer soles preferably formed of a long-wearing woven material such as nylon will withstand considerable hard usage before wearing through. The present footgear is lightweight and can be easily worn inside ordinary boots. Furthermore, the absence of the side outer sole extending beyond the uppers does not hinder the quick removal of boots or shoes, leaving the protective shoes on the feet under conditions of extreme emergency. Even without the above important features of my improved protective footwear, they are also useful for skin divers and others who require a lightweight protective covering for the feet and ankles.

It will be understood that the underwater apparel described in accordance with the present invention may be varied or modified without departing from the scope thereof. For example, the thickness of the elastomeric torso and the sleeves may be increased or decreased in accordance with the particular conditions to be encountered. The fabric neck portion as well as the sleeves may be made of a knitted stretch yarn to provide sufficient elasticity. This construction eliminates tearing and pro-

vides a more comfortable and more snugly fitting garment. Greater freedom of movement is permitted and the necessity of using a powder is eliminated. The absence of a slide fastener facilitates getting into and out of the garment and also increases comfort.

The diving suit and footgear described herein afford maximum protection and overcome the serious defects found in previous equipment intended for the same purpose. The absence of slide fasteners and the provision of expandable and contractable seams joining the stitchable portions of the garments provide the needed answer to clothing of this type.

Having thus described my invention, I claim:

A protective garment for underwater use and the like comprising a torso member formed of sheet rubber, said torso comprising a front panel of stretchable rubber, a back panel of stretchable rubber, and extensible overedge lock stitches forming seams joining the side edges of said front and back panels in butt joint relationship, said abutting edges being compressed substantially within the said seam and the extensible stitches forming said seams expanding and contracting only in a direction substantially parallel to the line of direction of the seam thereby allowing said seam to expand without any rupture thereof, an elastic fabric neckband secured to the top of the torso member, and fabric sleeve members secured to the upper part of said torso member along a series of seams, said seams including expandable and contractable overedge lock stitches by which said sleeve members are stitched to the torso member whereby said seams can expand and contract only along their length with said members to permit passage of the arms and elbows through sleeve openings without any rupture of the seams.

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