July 11, 1967 N. A. SLAVICK 3,329,966

CONTOUR GARMENT

Filed Jan. 3, 1964

Fig. 1.

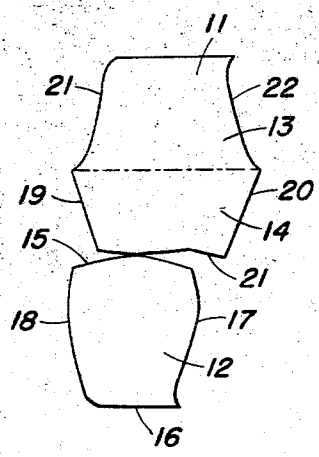


Fig. 3.



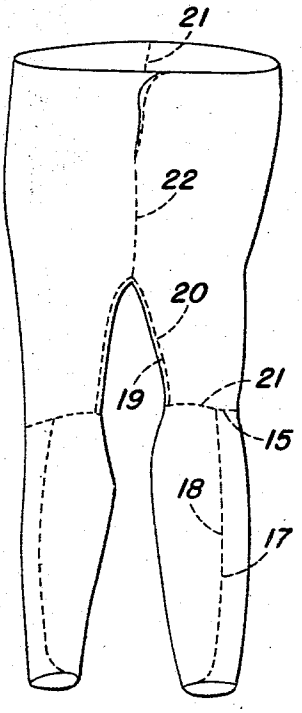


Fig. 2.

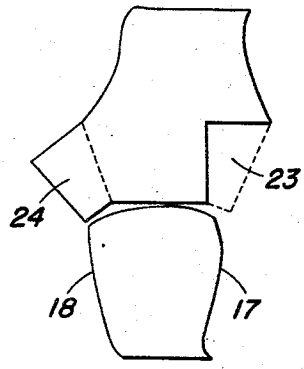


Fig. 4.

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CONTOUR GARMENT

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1 Claim. (Cl. 2—2.1)

This invention relates to a form-fitting garment in the nature of a pair of trousers. In particular, this invention relates to a garment of rubber, neoprene sponge or the like, suitable for use as an article of skindiving apparel, foul-weather gear or the like.

In the manufacture of garments such as skindiving pants and the like, designed to be used for active sports or work, while providing protection to the wearer against cold surrounding water or weather, it is desirable that the garment follow the contour of the wearer's body as closely as possible, both for freedom of action and for efficiency of insulation. This is particularly important in connection with skindiving apparel because the suit depends for its effectiveness on providing a thin layer of water next to the skin, which is warmed by body heat and thereafter serves as a protective layer against the colder surrounding water. The effectiveness of this protection is destroyed if the volume of water between the wearer and the suit is too great, or if the water is permitted to pass too freely in an out of the suit.

In the conventional method of manufacturing skindiving pants and similar garments, the garment is made of a stretchable material such as rubber or neoprene sponge, and advantage is taken of the stretchability of the material to provide a shape which, when donned, will conform itself to the shape of the body by undergoing elastic deformation. Thus, for example, it has been customary to make a pair of skindiving pants out of two pieces, each of substantially identical shape, having the general outline of a front or rear silhouette view of the lower half of the human body, and deviating therefrom to provide additional fullness where needed. In the case of the calves of the legs, for example, the shape (which would be bounded by more or less straight lines in a front or rear view) is provided with a lateral bulge in the region of the calf. When the suit is donned, it is deformed in such a way that material from the lateral bulge is displaced toward the rear of the leg to accommodate the calf muscle, and this displacement draws in the bulge so that the garment lies close against the side of the leg as well.

This method produces a garment which adheres closely to the contour of the body and provides a neat appearance coupled with effective insulation. Nevertheless, it suffers from certain disadvantages. For one thing, the displacement of material from the side to the rear of the leg sets up a lateral elastic tension which tends to draw the calf muscle around toward the side of the leg (normally the inner side) and thus contributes to discomfort and fatigue. For another, the presence of the lateral tension, in excess of the vertical tension present, tends to produce horizontal wrinkles behind the knee every time the leg is flexed. Production of such wrinkles is in itself a source of discomfort, and also tends to pump water into and out of the suit, thus adversely affecting its insulating properties.

In the effort to overcome the above disadvantages, a number of more complicated designs have been proposed, in the effort to produce a garment that would have fullness where needed, without setting up lateral tensions. These in general proceeded along the lines of setting-in extra pieces of material at appropriate points. This approach has not met with great success, however, because it requires a considerable amount of skilled hand work to assemble the garment, and adds materially to the cost.

An object of this invention, therefore, is to provide an improved form-fitting, leg-covering garment.

Another object is to provide a garment which lies close against the body of the wearer without setting up lateral tensions.

Still another object is to provide a garment having little or no tendency to pump water in response to normal movements of the wearer.

Another object still is to provide such a garment, which is simple and inexpensive to manufacture.

A feature of the present invention is the use of a pattern comprising distinct portions for the lower and the upper part of each leg.

Another feature is the use of a construction in which the plane intersecting the seam of the lower leg portion and the center of the leg corresponds substantially to the vertical plane of symmetry of the lower leg.

Still another feature is the use of a construction in which a generally circular seam joining the upper and lower portions of each side of the garment is in a plane tilted forwardly from the horizontal.

Other objects, advantages and novel features of the present invention will become apparent from the following more complete description and claims and with reference to the drawings, in which similar features have been given the same reference numerals throughout.

In one particularly desirable embodiment, this invention contemplates a contour trouser comprising in combination a right half and a left half, each of said halves comprising an upper portion adapted to encircle substantially half of the wearer's body in the pelvic region, said upper portion terminating at its nether end in a closed curve defining a first aperture, a medial portion of generally tubular configuration adapted to encircle the thigh of the wearer, said medial portion terminating at its upper end in a closed curve defining a second aperture having a periphery substantially coextensive with that of, and joined to, said first aperture, said medial portion having a seam extending in a generally vertical direction along the inside of said thigh, said medial portion terminating at its nether end in a closed curve defining a third aperture, a lower portion of generally tubular configuration adapted to encircle the lower leg of the wearer, said lower portion terminating at its upper end in a closed curve defining a fourth aperture having a periphery substantially coextensive with that of, and joined to, said third aperture, said lower portion having a seam extending in a generally vertical direction along said lower leg, said lower portion terminating at its nether end in a closed curve defining a fifth aperture, said fifth aperture being of a size to snugly encircle the lower leg of the wearer in the general vicinity of the ankle.

In another preferred aspect, this invention contemplates a pattern for a pair of contour trousers or the like, comprising in combination a first portion of generally hexagonal configuration having a generally rectilinear top margin, a pair of upper side margins each forming an obtuse angle with said top margin, a bottom margin, and a pair of lower side margins each forming an obtuse angle with a line connecting the extremities of said bottom margin, and a second portion of generally quadrilateral configuration, said second portion comprising a generally rectilinear top margin of length substantially equal to that of the bottom margin of said first portion, a generally rectilinear bottom margin, and a pair of side margins connecting the extremities of said top margin of said second portion with the extremities of said bottom margin thereof.

Other desirable embodiments of the invention reside in various alternatives, modifications and subcombinations, as will appear more fully hereinafter, both in the specification and in the claim.

Referring now to the figures:

FIGURE 1 is a plan view of a two-part pattern for one half of a garment according to the present invention.

FIGURE 2 is a perspective view of an assembled garment according to this invention.

FIGURE 3 is another perspective view of a garment according to this invention, taken from a slghtly different angle.

FIGURE 4 is a plan view similar to FIGURE 1, showing a modified form of two-part pattern for one half of a garment according to the present invention.

As illustrated in the drawings, and more particularly in FIGURE 1, the garment according to this invention is made from a pattern which comprises two distinct portions, and may be conveniently made in two separate pieces, as illustrated, namely the upper, or pelvis-and-thigh-encircling portion **11** and the lower, or lower-leg-encircling portion **12**. Upper portion **11** may be considered as further subdivided into upper (pelvis-encircling) section **13** and medial (thigh-encircling) section **14**, separated by the short-and-long dashed line, and these are sometimes referred to separately elsewhere herein. As will be well understood to those skilled in the patternmaking art, pelvis section **13**, thigh section **14** and lower leg portion **12** may be cut in one, two, or three separate pieces, or in other ways, as desired. Because sections **13** and **14**, taken together, form a unitary shape, while portion **12** is almost completely separated from section **14** by deep lateral indentations, the most convenient cutting procedure is to cut sections **13** and **14** as one piece and portion **12** as a second, separate piece, and the drawings reflect this preferred method of operation.

Lower portion **12** is roughly the shape of a trapezoid bounded by upper margin **15**, lower margin **16** and side margins **17** and **18** connecting the extremities of the upper and lower margins. Side margins **17** and **18** are both somewhat convex in their upper portions, to provide fullness in the region of the calf of the leg. In addition, side **17** is cut slightly concave toward its lower end, to provide a closer fit in the part of the leg below the calf, where the diameter is smaller.

The top margin of lower portion **12** is slightly convex, for a reason which will presently appear.

The lower margin of section **14** is roughly rectilinear, but in the preferred embodiment shown in FIGURE 1, may be seen to be composed of two substantially straight segments, one at a slight angle to the other, defining a shallow re-entrant angle. One or both of these segments may have a slight convex curvature, as shown. This preferred configuration is related to the convex configuration of the upper margin of portion **12**, as will also presently appear.

In assembling the garment from the pattern as illustrated in FIGURE 1, edge **17** is brought around and joined to edge **18**, to form a generally tubular member adapted to encase the lower leg of the wearer. Here, as elsewhere in the present specification and claim, when reference is made to the joining of edges or surfaces of the material from which the garment is made, it is to be understood that the edges or surfaces may be joined by fusing, cementing, sewing, or in any other conventional manner.

When edges **17** and **18** have been joined, the shape of the tubular member thus formed conforms closely to the shape of the lower portion of the human leg.

The next step is to join side edges **19** and **20** of section **14**, to form a generally tubular thigh-enclosing member.

Because the top margin of section **12** and the bottom margin of section **14** are of substantially equal linear extent, when the respective side edges are joined, they form apertures defined by closed curves of substantially equal peripheries. The two closed curves are then joined to form a continuous tubular member adapted to enclose the thigh and lower leg, and having the shape (when relaxed) of a pair of intersecting cylinders having longitudinal axes one at a slight angle to the other. This angle is brought

about by the slight convexity of the upper margin of portion **12**, cooperating with the slight effective convexity of the bottom margin of section **14**, which, when joined as described, approximate (although they do not precisely correspond with) the elliptical intercept curve of two cylinders intersecting at a slight angle. Various modifications of the basic design are possible, as will be obvious to those skilled in the art, so long as there is provided an excess of material at the front of the knee joint over that present at the rear thereof, so that the garment, in the relaxed condition, assumes the attitude of a slightly flexed knee. It will be noted that the intersection of the two substantially rectlinear segments of the bottom margin of section **14** falls at the point of joining of sides **17** and **18** of lower portion **12**. This configuration permits a continuous edge-to-edge joining of the closed curve formed by the lower edge **21** of section **14** with that formed by upper edge **15** of portion **12**, along the intersection of the generally cylindrical members formed by section **14** and section **12**, respectively.

Finally, side edges **21** and **22** of pelvis-enclosing section **13** are joined to the corresponding edges of another similar assembly (a mirror-image of the first) to form a completed garment.

Although the joining of the various edges has been described, for the sake of clarity, as being carried out in a specific order, it is to be understood that the steps may be carried out in any convenient sequence. The joining may be accomplished in any appropriate manner, for example by sewing, using a butted seam with a zig-zag stitch, a lap seam, simple straight stitching of overlapping unfolded edges, etc., or by cementing butted or lapped edges, or by sewing or cementing both edges to a piece of tape laid over the edges to be joined, or in various other ways which will readily occur to those skilled in the art. In practice, it is preferred to use a butt seam joined by either cementing or zig-zag stitching or both, which may be covered and reinforced by a cemented-on overlay of trim tape.

Because of the novel construction of the garment according to the present invention, it possesses a distinctive form-fitting shape in the relaxed condition, and has numerous advantages over previously-available garments.

The thigh portion **14** is so related to the pelvis portion **13**, that when the edges **21** and **22** of the pelvis portion are disposed respectively along the vertical front and rear bisectors of the wearer's pelvic region, the seam formed by jointure of edges **19** and **20** of thigh portion **14** lies generally vertically along the inside of the wearer's thigh. The pattern may of course be modified by removing a segment from the area bounded by one of the side edges **19** and **20** of section **14** and replacement of it with a similarly shaped segment added to the area bounded by the other of said edges. This type of modification is illustrated in FIGURE 4, which shows a portion of the pattern removed from area **23** (the original shape of the pattern being indicated by dotted lines) and replaced with a segment of similar size and shape added at **24**. The pattern, modified as shown in this illustration, will produce a garment having a seam running laterally from the crotch under the seat, and then vertically down the back of the thigh to join the seam in lower-leg portion **12** running down the back of the lower leg. Although this and similar modifications are within the ambit of the invention, the preferred embodiment for most purposes is that shown in FIGURE 1, because it places the thigh seam in the most inconspicuous position, along the inside of the thigh, thus leaving the rest of the upper leg covered by a smooth, uninterrupted sheath of material.

The completed garment, made from a pattern corresponding to that shown in FIGURE 1, is illustrated in perspective in FIGURE 2. The positions of the seams formed by joining the various edges are indicated in FIGURE 2 by means of dotted lines. They may or may not be visible in the finished garment, depending on the

methods of joining and trimming employed. As shown in FIGURE 2, the finished garment has a seam running vertically down the front of the pelvic region, formed by joining edge **21** with the corresponding edge of a mating piece. Another seam runs vertically down the center of the back of the garment (i.e. the seat seam), formed by joining edge **22** with its counterpart. A third seam, formed by jointure of edges **19** and **20**, runs vertically down the inside of the thigh, from the crotch to the knee, and intersects with a fourth seam running circumferentially around the leg in the knee region, formed by jointure of edges **15** and **21**. From another point on the fourth, or circumferential seam, a fifth seam, formed by jointure of edges **17** and **18**, runs generally vertically down the back of the lower leg to the bottom of the garment, in the vicinity of the ankle.

The completed garment, as shown in another perspective view in FIGURE 3, has, in the relaxed condition, a shape conforming very closely to the shape of the lower half of the human body. This fact results in the advantage that, when the suit is worn, it provides a snug fit at all points without undergoing elastic deformation in order to do so. This, in turn, means that the snug fit is achieved without setting up lateral tensions that lead to discomfort and fatigue.

When the preferred form of pattern is used, in which edge **21** is effectively concave and edge **15** is slightly convex, the shape of the garment in relaxed condition is that of a body with knees slightly bent as illustrated in FIGURE 3. This feature is not essential, but is advantageous because the maximum elastic deformation encountered in normal flexing and straightening of the leg is held to a minimum.

Because lateral tensions are effectively eliminated, the garment according to the invention has little or no tendency to form wrinkles behind the knee or elsewhere in the course of normal activity. Moreover, the avoidance of such wrinkles, and of areas having free spaces between the suit and the surface of the wearer's body, results in a suit of outstanding insulating properties and having little or no tendency to pump water in and out in the course of normal movements of the wearer.

While this invention has been described with reference to certain preferred embodiments and illustrated by way of certain drawings, these are illustrative only, and the invention is not to be construed as limited, except as set forth in the appended claim.

I claim:

A contour trouser for skin-diving or the like comprising in combination a right half and a left half, each of said halves comprising an upper portion adapted to encircle substantially half the wearer's body in the pelvic area

and one of said wearer's legs substantially to the knee, said upper portion being of a generally hexagonal configuration, having a generally rectilinear top edge, a pair of upper side edges, a pair of lower side edges, and a lower edge; said lower edge having a generally convex front section extending from a midpoint thereof to one of said lower side edges and a generally concave section extending from said midpoint to the other of said lower side edges; said upper portion being poined at its lower side edges and thereby terminating at its lower edge in a closed curve defining a first aperture, and a lower portion of generally tubular configuration adapted to encircle the lower leg of the wearer, said lower portion having an upper convex edge terminating at its ends in a closed curve defining a second aperture having a periphery substantially coextensive with that of, and joined to, said first aperture, said lower portion having generally downwardly converging side edges joined by a seam extending in a generally vertical direction along the rear portion of said lower leg, said lower portion thereby terminating at its nether end in a closed curve defining a third aperture, which is of a size to snugly encircle the lower leg of the wearer in the general vicinity of the ankle, said halves being joined together by seams along the respective upper side edges of said upper portion; said convex section of said upper portion lower edge and said convex upper edge of said lower portion being joined at their respective apogees to provide an excess of material at the front of said trouser in the area of the knee thereof over the material at the back of said knee, thereby causing said garment, in the relaxed condition, to assume the attitude of a slightly flexed knee.

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