March 20, 1945. W. T. VAN ORMAN 2,371,776

STRUCTURE

Filed Feb. 9, 1943

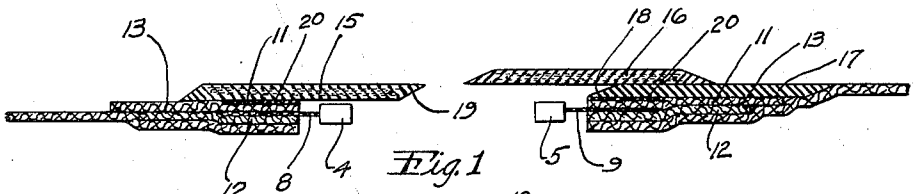


Fig. 1

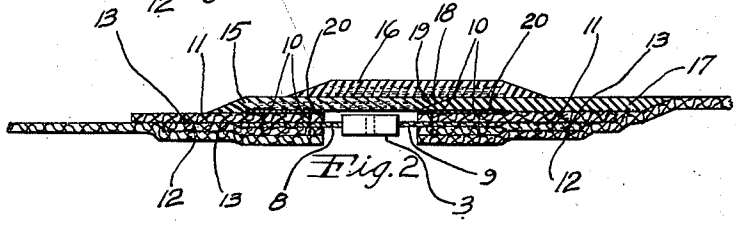


Fig. 2

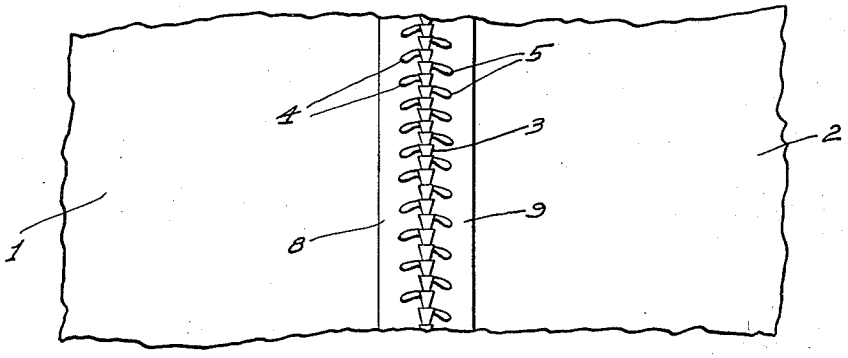


Fig. 3

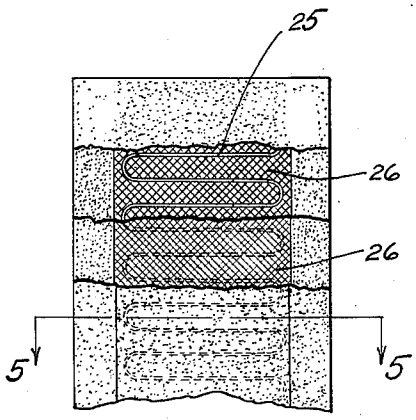


Fig 4

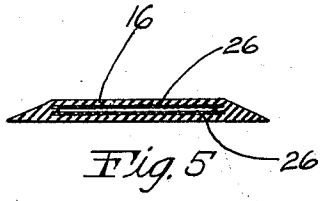


Fig. 5

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UNITED STATES PATENT OFFICE

2,371,776

STRUCTURE

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Application February 9, 1943, Serial No. 475,309

3 Claims. (Cl. 2—96)

This invention relates to a zipper closure designed for use on an inflated suit, such as that which might be used by a diver or by an aviator in high altitudes. The opening in the suit runs perpendicularly down the front of the body, preferably from the neck approximately to the waist. The closure is so designed that although made with a zipper, it is airtight, and the airtightness is insured by providing a flap which is highly flexible in the direction in which the zipper slides but is stiffened in the direction perpendicular thereto. The stiffening permits the wearer to bend forward or backward without being hampered by the stiffening element although the transverse stiffening prevents the closure flap from buckling and opening as the wearer bends forward or backward. The invention will be further described in connection with the accompanying drawing which illustrates the invention although the structure claimed is not specifically limited thereto.

Figs. 1 and 2 illustrates sections through the zipper-closing member which are blown up vertically so that relatively the vertical dimensions are several times the horizontal dimensions. Fig. 1 shows the zipper opened, and Fig. 2 shows the zipper closed. Fig. 3 is a plan view. Fig. 4 is a detail showing a plan view partly in section of the stiffening flap to make clear the structure of the stiffening element. Fig. 5 is a section of the stiffening flap taken on the line 5—5 of Fig. 4.

In the drawing the two pieces 1 and 2 of the front of the suit are closed by the zipper arrangement 3, which is composed of the two interlocking halves 4 and 5. In Fig. 1 these halves are shown separated. They are interlocked in Figs. 2 and 3. The interlocking arrangement is of the usual type. The halves of the zipper are mounted on the cloth members 8 and 9 in the usual way. These cloth members are stitched by the stitches 10 between two plies of airtight fabric. This fabric, for example, may be a rubber-impregnated and rubber-coated material. Instead of rubber, other suitable flexible, airtight plastics may be used, such as suitable polyvinyl compositions, etc. The plastics may be plasticized if necessary. Such plastics are now rather widely employed in the treatment of fabrics to make them water tight and airtight for a multitude of war materials. The two plies 11 and 12 of such impregnated fabric on each side of the zipper may be cemented together where they unite beyond the fabric strips 8 and 9. Cement for this purpose is indicated by the numeral 13. The two portions of the zipper thus held in the treated fabric may be united to the fabric 1 and 2 of the suit by cement. Cement is preferred to stitching where an airtight union is desired.

The zipper closure is made airtight by means of a plurality of thin flaps 15 and 16 which are drawn to a feathered edge. In the drawing the vertical heights are relatively several times the horizontal distances. As shown to scale actual size, the flaps 15 and 16 would actually be about $\frac{1}{16}$ inch thick and 2 inches in width. In order to provide a tight fit for the inner end of the flap 15 a cushioning material 17 is incorporated into the suit. The feathered edge 18 of this cushion 17 forms with the flap 16 a tapered opening in which the feathered point 19 of the flap 15 forms a snug fit. The cushion 17 may be cemented to the coated fabric 11 and the suit material 2, and the flap 16 may be cemented to this cushion 17. The flap 15 may likewise be cemented to the cushion material 11. In practice, it has been found advantageous to insert a tape of rubberized fabric 20 along each edge of the opening to prevent the stitches from distorting the flaps and especially the seating flap 18.

The cushion 17 may be made of rubber stock or other plastic material. The flap 15 may be made of similar material and is preferably reinforced as, for example, by two plies of fabric.

The stiffening element is embedded in the flap 16. It comprises a serpentine wire 25, which is, for example, piano wire .025 inch in diameter. This wire, as illustrated most clearly in Fig. 4, is looped back and forth to give a transverse stiffening without appreciably stiffening the longitudinal dimension of the closure. The diameter of the arc at each end of each of the bends of the wire-reinforcing element 25 may, for example, be $\frac{3}{16}$ inch.

To strengthen the reinforced flap and to prevent the wire from working through the reinforcing plastic, each side of the wire is advantageously covered with a sheet or two of fabric 26, which is most clearly illustrated in the section shown in Fig. 5.

Although one form of the invention has been shown in detail, it is to be understood that various modifications are permissible within the scope of the claims. For example, it is not necessary to use wire as the stiffening element. The zipper need not be mounted in exactly the manner shown herewith. Various other modifications in the arrangement shown are possible.

What I claim is:

1. In an inflated suit a zipper closure, each half of the zipper being joined to a separate portion of the suit; a flap joined to one of said portions of the suit which is flexible longitudinally of the zipper and stiff in a direction transverse thereto; and attached to the other portion of the suit a flap which fits snugly between the first-mentioned flap and the portion of the suit to which said first-mentioned flap is attached.

2. In an inflated suit an airtight closure down the front of the suit which comprises a zipper, each half of which is attached to a different portion of the suit; a flexible flap with a feathered edge attached to one of said portions of the suit, which flap fits against one side of the zipper when closed and the feathered edge of which fits snugly between the other portion of the suit and another flap which fits over the first-mentioned flap, said second-mentioned flap being stiffened transversely and being highly flexible in the longitudinal direction.

3. In an inflated suit an airtight closure down the front of the suit which comprises a zipper, each half of which is attached to a different portion of the suit; a flexible flap with a feathered edge attached to one of said portions of the suit, which flap fits against one side of the zipper when closed and the feathered edge of which fits snugly between the other portion of the suit and another flap which fits over the first-mentioned flap, said second-mentioned flap comprising a serpentine wire reinforcement which runs lengthwise of the flap and stiffens the flap transversely while leaving it highly flexible in the longitudinal direction.

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