

April 11, 1961

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2,978,708

HEAD-PIECES FOR PRESSURIZED CLOTHING

Filed Sept. 5, 1958

2 Sheets-Sheet 1

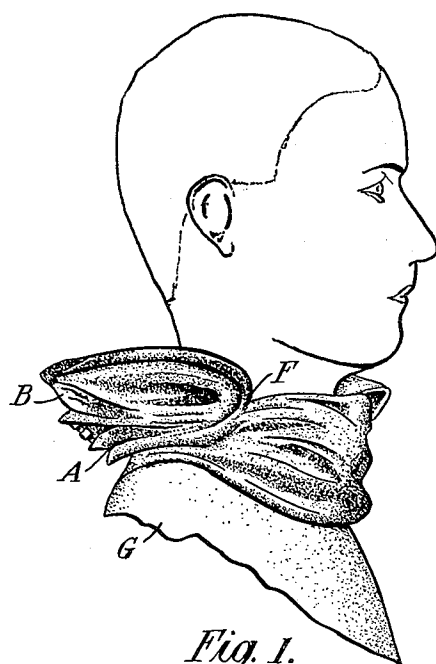


Fig. 1.

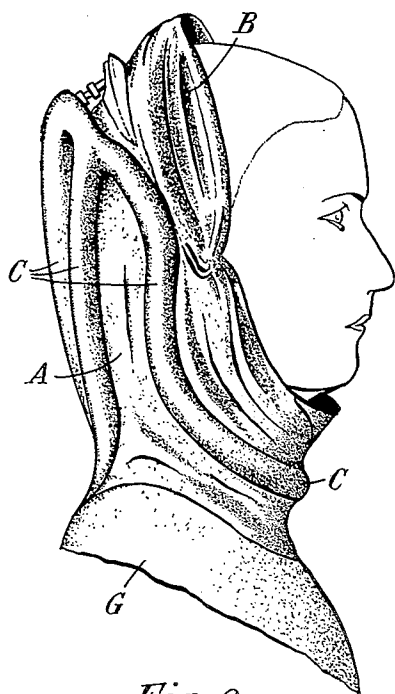


Fig. 2.

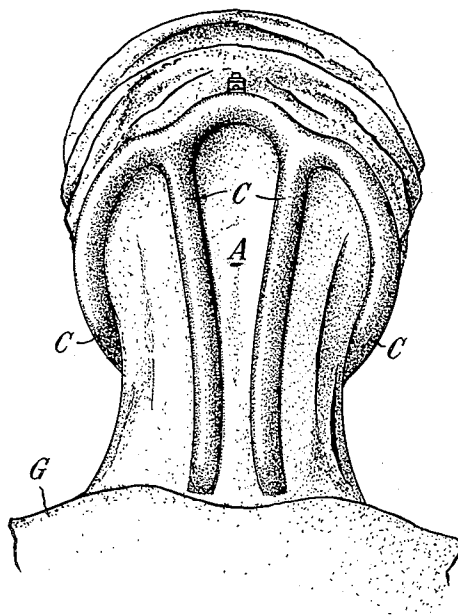


Fig. 4.

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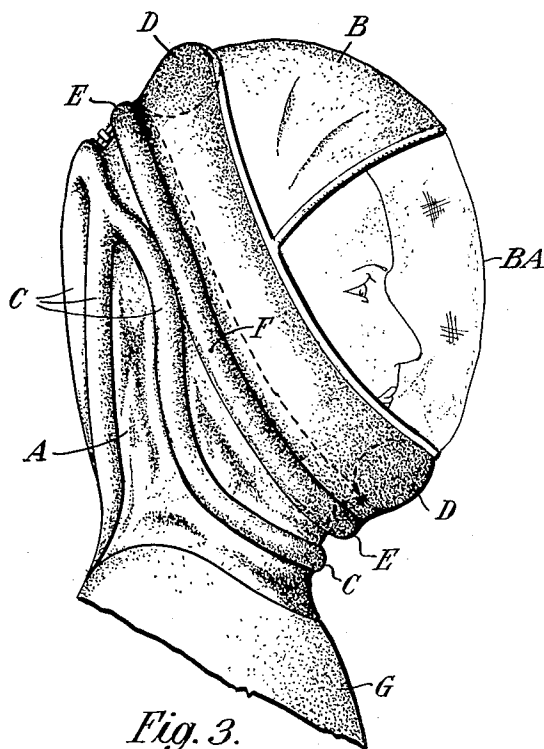


Fig. 3.

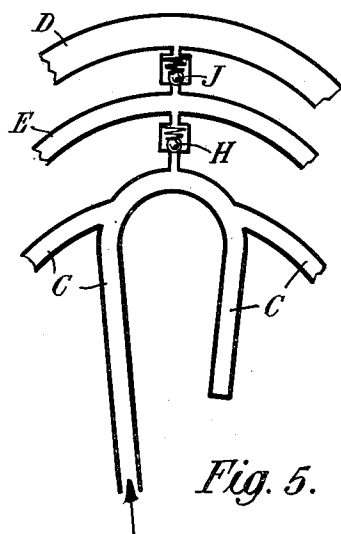


Fig. 5.

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HEAD-PIECES FOR PRESSURIZED CLOTHING

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9 Claims. (Cl. 2—3)

The object of this invention is to provide an improved constructional form of head-piece for use in conjunction with a pressurised suit or other protective garment, such as is worn by persons subjected to abnormally low atmospheric pressures and temperatures, the desiderata being that the head-piece shall be capable of being worn over a conventional respirator mask, harness and crash-helmet, that it shall be transparent and flexible, that it shall be capable of being worn open in normal conditions, and of being closed and sealed in case of necessity.

According to the invention, a head-piece for this purpose comprises two complementary components which together form a substantially spherical hollow casing and which are attached to or integral with the collar of the garment, said members being hinged together to permit one or both of them to be moved between an open position and a closed position, and separate means for (a) moving said open member to the closed position, and (b) thereafter for sealing the peripheral edges of the two members.

A further feature of the invention consists in the provision on the respective peripheral edges of the two components of the head-piece of two inflatable tubular annulae, one being of larger radius than the other, together with means for admitting pressurised gas to said annulae at the times desired. When the head-piece is open, the open member is stowed within the neck of the garment and the annulus thereof is folded about a transverse line; the arrangement is such that in the predetermined conditions referred to the said folded annulus is first inflated, causing it to straighten about the folding line and thereby to move the open member until the annulus thereof has passed outside or through the annulus of the other member. In this position the second annulus is inflated so that it forms a joint with the first annulus, and the parts are locked in closed relationship by the tension in the skins of the two members due to the pressurisation of the suit.

An embodiment of the invention is illustrated in and hereinafter described with reference to the accompanying drawings, in which Fig. 1 is a side view showing the head-piece fully opened, Figs. 2 and 3 are similar views respectively showing the head-piece partly and fully closed, Fig. 4 is a rear view of the head-piece in the partly closed position, and Fig. 5 is a diagram illustrating the manner of operation. The head-piece depicted in the drawings is shown in its application to a pressure suit suitable for use by aircrews in high altitude flight, or in analogous circumstances, where it is required that the head-piece shall be capable of closing automatically in the event of the aircraft cabin pressure being lost at an altitude exceeding 40,000 feet.

The head-piece assumes a substantially spherical form when closed in the position ready for use shown in Fig. 3, and its two components, which are approximately hemi-spherical, combine to form a hollow spherical casing when brought together, affording ample space to accommodate the wearer's head, even when wearing a

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protective helmet, a respirator mask and any necessary harness.

One component of the head-piece, indicated generally by the reference numeral A, is made entirely of flexible gas-tight woven fabric. The other component B is partly of the same fabric and partly of a transparent flexible polyvinyl chloride or other light-weight material having similar properties. The transparent portion BA constitutes a visor which encloses the face in the position of use (Fig. 3); at other times it is collapsed with the fabric part B.

The component A includes a network of tubes C, C, of flexible gas tight woven fabric which are connected the one to the other and which, when inflated, are self-erecting into the position shown in Fig. 3, in which the component A encloses the back of the head and the underside of the chin. The component A also includes a further annular tube D, the purpose of which is hereinafter described.

The component B includes an annular tube E which, when the head-piece is open in the positions of Figs. 1 and 2, is folded upon itself at each side of the head at a point indicated at F. The upper part of the tube E is incorporated in the fabric of the component B at a position such that when said tube E is inflated it will lie behind the upper part of the annular tube D which is incorporated in the fabric of the component A. As will be understood, the effect of inflating the tube E is to cause it to straighten about the folding points F, an operation which is necessarily attended by the opening out of the fabric B and visor BA, until the component B assumes the position of Fig. 3.

The operation just described takes place whilst the annular tube D remains uninflated, and as the tube E is made of slightly larger radius than the tube D, when the tube E reaches the position of Fig. 3 it passes over and outside the lower part of the tube D. In consequence, when the tube D is next inflated, it will expand within the peripheral margin of the component B so that by hoop pressure it is forced to bear against the inner surface of the tube E.

The component A is conveniently attached to or made integral with the collar of the pressurised garment of which the shoulder-portion is shown at G, and the inflatable parts of the head-piece may be arranged to be pressurised from the same supply of compressed gas as that used for the garment, and although it is not shown in the drawings, it will be understood that the head-piece tubes are inflated from a separate high pressure source controlled by a pressure-sensitive valve.

The arrangements for pressurising the tubes C, D and E of the head-piece are illustrated schematically in Fig. 5. When it is required to close the head-piece on the wearer becoming subject to the atmospheric conditions in which the protection of the head-piece is desirable, the first gas tubes to be inflated are the tubes C, C, raising the rear part of the head-piece to the position of Fig. 2. The tubes C are connected to the tube E by a valve H which either will open automatically when the pressure in the tubes C reaches a predetermined value or which has an orifice of suitable area; the inflation of the tube E performs the first stage in the closing of the component B. The next and final stage, viz. that of pressurising the tube D to seal the component B in the closed position shown in Fig. 3 is effected by the opening of the valve J, by which gas is admitted to the tube D when the pressure in the tube E has attained a predetermined value.

When the suit is fully pressurised the pressure within the head-piece exerts tension forces in the skins of the respective members thereof, tending to urge them apart and intensifying to a high degree the pressure between the faces of the jointed annulae.

In an alternative embodiment the tube E of the component B may be of less radius than the tube D of the component A so that on closing the annulus of the former passes within the annulus of the latter.

In the illustrated embodiment hereinbefore described, the component A is initially in a fully collapsed condition resting upon the wearer's shoulders. It will, however, be understood that if desired the component A may be made from some form of semi-rigid material such that in the open position the head-piece of component A occupies a position similar to that in which it is shown in Fig. 2 is the accompanying drawings. In this alternative embodiment, the tubular network C may be omitted, the first tube to be inflated being the annulus E.

What we claim as our invention and desire to secure by Letters Patent is:

1. For use in conjunction with a protective garment having a neck portion, a head piece, comprising, two complementary component members which together form a substantially spherical hollow casing and which are adapted to be connected to the neck portion of said garment, said members being hinged together and including separable peripheral edges arranged to permit the edges to be moved between an open position with the edges separated and a closed position with the edges in contact, and separate means (A) for moving said members from an open edge separated position to a closed edge contacting position, and (B) for sealing the peripheral edges of said two members when in a closed position.

2. A head-piece as claimed in claim 1, whereof the components are respectively provided at their peripheral edges with inflatable tubular annulae, one having a larger radius than the other, and wherein said separate means includes means for admitting pressurised gas to said annulae.

3. A head-piece as claimed in claim 2, wherein when the parts thereof are in said opened position, the tubular annulus of one component is folded upon itself and wherein the arrangement is such that the effect of inflation is to straighten the annulus about its fold line into a position in which it has passed beyond the annulus of the other member and comprising means for subsequently inflating the annulus of said other member so that it expands into contact with the adjacent faces of the annulus of the first member, thereby forming a seal between said annulae.

4. A head-piece as claimed in claim 2, wherein the one

component incorporates a tubular network capable, on inflation, of automatically erecting said component into the position from which the closing operation of the other component may take place.

5. A head-piece as claimed in claim 3 comprising means for inflating the annulus of the second-mentioned component after the unfolding operation of the annulus of the first mentioned component.

6. A head-piece as claimed in claim 4, wherein said tubular annulus of the first-mentioned component is connected by a pressure operated valve with said tubular annulus of the other component.

7. A head-piece as claimed in claim 5, wherein the annulus of the first mentioned component is connected by a pressure operated valve with the tubular annulus of the other component.

8. A head-piece for use in conjunction with a protective garment having a neck portion, said head-piece comprising complementary component members which together form a substantially spherical hollow casing and which are adapted to be connected to the neck portion of the garment, said component members being hinged together to permit them to be moved between an open separated position and to a closed contacting position, said component members including inflatable tubular portions and means for inflating at least one of said portions to cause said members to move from an open position with the tubular portions separated to a closed position with said tubular portions in contact.

9. A head-piece according to claim 1, comprising a component made of a flexible gas-tight fabric which, in the position of use, will enclose the rear of the wearer's head and surround the underside of the chin and a second component, attached to the first, and made partially of the same fabric and partially of a transparent flexible material in the form of a visor.

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