It is also known that the lower panel of a three-panel panel respirator may adopt a concaved position causing the wearer difficulty in reorienting the panel. The main cause of the lower panel collapsing in this way is its compliant structure.

However, in order for the product to provide adequate comfort and fit to the user, all the web layers of the lower panel must conform to the face without areas of heightened pressure or irritation, that is to say must have a degree of compliancy. Thus there is a conflicting set of design requirements; the material must be sufficiently compliant to comfort and fit, and yet sufficiently rigid to prevent the lower panel from collapsing.

Embodiments of the present invention seek to at least mitigate the above problems by providing a personal respiratory protection device which can open effectively and may be easier to open and don.

Summary

According to an aspect of the present invention, there is provided a personal respiratory protection device comprising:

an upper panel,

a central panel, and

a lower panel,

the central panel being separated from each of the upper and lower panels by a first and second fold, seam, weld or bond, respectively, such that the device is folded flat for storage along the first and second fold, seam, weld or bond and opened to form a cup-shaped air chamber over the nose and mouth of the wearer when in use,

wherein the lower panel includes a stiffening sheet which has a longitudinal crease line and a lateral crease line,

wherein the stiffening sheet is folded about the longitudinal crease line when the device is in use, and

wherein the stiffening sheet is folded about the lateral crease line when the device is in is flat folded configuration.

Advantageously, the stiffening sheet can provide an area of localised increased stiffness whilst leaving the rigidity of the surrounding lower panel largely unaffected. In this way the stiffening sheet may be able to mitigate the risk of the lower panel collapsing whilst not unduly impairing the comfort and fit performance of the respirator. The provision of a stiffening sheet with a longitudinal crease allows the concaved root of the crease to be congruent with the concaved shape formed by the lower panel in use about an imagery center line of the respirator.

Claims

1. A personal respiratory protection device comprising:

an upper panel,

a central panel, and

a lower panel,

the central panel being separated from each of the upper and lower panels by a first and second fold, seam, weld or bond, respectively, such that the device is folded flat for storage along the first and second fold, seam, weld or bond and opened to form a cup-shaped air chamber over the nose and mouth of the wearer when in use,

wherein the lower panel includes a stiffening sheet which has a longitudinal crease line and a lateral crease line,

wherein the stiffening sheet is folded about the longitudinal crease line when the device is in use, and

wherein the stiffening sheet is folded about the lateral crease line when the device is in is flat folded configuration.

2. The personal respiratory protection device of claim 1 wherein the lateral crease line and longitudinal crease line are perpendicular to one another.

3. The personal respiratory protection device of any one of claim 1 or 2 wherein the longitudinal crease line is coexistent with a longitudinal centerline of the device.

4. The personal respiratory protection device of claim 3 wherein the opening of the device by a user causes the unfolding of the stiffening sheet about the lateral crease line.

5. The personal respiratory protection device of any preceding claim wherein the opening of the device by a user causes the stiffening sheet to be moved into an overcentre position about the longitudinal crease line.

6. The personal respiratory protection device of claim 5 wherein the stiffening sheet forms a semi-rigid V-shape when the device is open and the stiffening sheet is in an overcentre position about the longitudinal crease line.

7. The personal respiratory protection device of any preceding claim wherein the device has a multi-layered structure that comprises a first inner cover web, a filtration layer that comprises a web that contains electrically-charged microfibers, and a second outer cover web, the first and second cover webs being disposed on first and second opposing sides of the filtration layer, respectively, wherein a nose conforming element is attached to the second cover web.

8. The personal respiratory protection device of any preceding claim further comprising a headband that comprises an elastomeric material, the headband being secured to the central mouth panel.

9. The personal respiratory protection device of any preceding claim further comprising an exhalation valve that is disposed on the central panel.

10. The personal respiratory protection device of any preceding claim wherein the lower panel has a graspable tab attached to the lower panel proximate the longitudinal crease line, the tab being graspable in use to open the device.

11. The personal respiratory protection device of claim 10 wherein the tab is attached to the lower panel proximate the lateral crease line.