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Description

The invention relates to protective clothing such as is worn in hazardous environments to protect the wearer from dangerous fumes and/or liquids.

Such protective clothing may comprise a suit which must be worn with gloves, boots and a breathing mask. To obtain a required degree of protection, effective seals must be established between these clothing components and the invention is concerned with the provision of sealing arrangements which are inexpensive to produce and simple to use whilst affording seals of appropriate integrity.

US Patent 2994089 describes a protective garment in which a sleeve is received in the gauntlet portion of a mitten which is covered by a dummy cuff attached to the sleeve. The sleeve and cuff have respective elastic bands which grip the user's arm and the unsupported gauntlet portion. The seal afforded by this arrangement is unreliable and the presence of the dummy cuff on the outside of the sleeve is an encumbrance to the user.

The present invention aims to overcome these disadvantages and to provide a reliable glove-to-sleeve seal in protective clothing which is convenient and comfortable in use. Glove-to-sleeve seals according to the invention can be provided simply and cheaply, using components which are easily handled by the user.

In accordance with the invention, there is provided protective clothing comprising a glove having a gauntlet portion received in the free end portion of a sleeve and an annular sealing member sealing an annular space between the sleeve end portion and the gauntlet portion, in which the annular sealing member is secured to only one of the said portions and forms a seal at its interface with the other portion, at least the one of the surfaces of the sealing member and the said other portion in contact at the interface which is a surface of the member to which the sealing member is not attached being inwardly tapered in the direction outwardly of the sleeve end portion, characterised in that the gauntlet portion is sufficiently stiff for the sealing member to be sealingly compressed in the annular space when the glove is urged outwardly of the sleeve end portion is use.

The annular sealing member is advantageously secured to the sleeve end portion.

Conveniently, the other one of the surfaces of the sealing member and the said other portion in contact at the interface is inwardly tapered in the direction outwardly of the sleeve end portion.

Preferably, the sealing member comprises an annulus of closed cell material and, advantageously, has an inner stiffening annulus covered by the closed cell material.

In some embodiments, the protective clothing includes an inner sleeve extending inwardly of the sleeve from the annular sealing member to the inner end of the gauntlet portion of the glove,

an end portion of the inner sleeve being capable of being turned over to extend within the gauntlet portion.

Advantageously, the protective clothing includes an inner glove with a gauntlet portion arranged to secure the or each end portion within the gauntlet portion of the outer glove. Preferably, the gauntlet portion of the inner glove comprises a further annular reinforcement member which tapers inwardly in the direction outwardly of the sleeve end portion.

Conveniently, the or each reinforcement member can be readily collapsed to allow it to be moved outwardly of the sleeve through the sealing member.

The invention is further described below by way of example with reference to embodiments thereof schematically shown in the accompanying schematic drawings, in which:

Figure 1 is a partial sectional view of the free end of a sleeve of a suit of protective clothing sealed to a gauntlet portion of a glove received therein; and

Figure 2 is a like view of a modified means for sealing a sleeve of the suit to a gauntlet portion of a glove received therein, the component parts being shown spaced apart in a position prior to completion of the seal.

The protective clothing suit and the related clothing components yet to be described can be made of any suitable liquid and gas impervious sheet material, for example PVC, neoprene or natural rubber, depending on the environment from which protection is required. It is assembled from appropriately cut panels by bonded seams, which can be reinforced by stitching, and over which sealing strips can be secured by adhesive.

Figure 1 shows in cross-section the free end portion 21 of a sleeve of the suit. The sleeve portion 21 is constructed so as to taper inwardly towards its free end. The suit is worn with gloves 22 and a seal has to be maintained in use between each of these gloves and the associated sleeve of the suit. In accordance with the invention, such a seal is effected by means of a ring 24 the material of which can be a resiliently stretchable flexible closed cell foam material, for example neoprene or rubber, so as to be impervious to liquid and gases. Because of the compressed condition of the ring 24 between the sleeve 21 and glove 22, a seal is obtained against entry of fluids through the join between the sleeve and glove. Instead, the ring 24 can be of relatively rigid material, for example plastics material, lined over at least its internal face with the resilient material mentioned above, or with other material capable of making a seal. The ring 24 is of circular cylindrical or frusto-conical shape.

The glove 22 is provided with a gauntlet portion 25 having secured therein as by adhesive and/or stitching (not shown) a frusto-conical reinforcement member 26 of stiff but resiliently deformable material. The gauntlet portion 25 can but need not be extended beyond the larger diameter end of the member 26 as shown at 28, to be

turned inwardly in use and form an elasticated restriction around the wrist of the wearer. The ring 24 is secured either to the gauntlet portion 25 or to the sleeve portion 21 so as to be received by them adjacent the opening of the sleeve portion.

The glove 22 can be readily assembled with and disassembled from the sleeve 21 by inward deformation of the member 26 along an axial life so that its effective cross sectional area is less than that of the opening of the sleeve portion 21. In use, outward urging of the glove 22 by the user's hand and arm will tend to compress the ring 24 and so enhance the seal it provides.

An effective seal is provided in an economical way in components of protective clothing which are conveniently handled by the user.

Figure 2 shows a modified arrangement for effecting a seal between the glove 22 and the sleeve 21. The sleeve 21 is again provided with the ring 24, and the glove 22 again includes within its gauntlet portion 25 the frusto-conical reinforcement member 26. An internal inner sleeve 29, suitably of the same material as the sleeve 21, however now extends into this sleeve from the inner end of the ring 24. The free end of the inner sleeve 29 extends beyond the larger diameter end of the member 26, so that its end portion 30 can be turned inwardly as shown, in the same way as the end portion 28 of the gauntlet portion 25.

In the arrangement of Figure 2, the seal is effected as before between the glove 22 and the inner face of the ring 24, but the sealing assembly is locked in place by means of a second hollow frusto-conical member 31, suitably of the same material as the member 26. The member 31 is shaped to be received within the member 26, with the end portions 28 and 30 between the two members.

The member 31 is preferably secured within the gauntlet portion 32 of a secondary inner glove 33 for example of thin rubber sheet material, which is received in use within the glove 22, to provide additional protection.

It will be evident that the Figure 2 arrangement enhances the security of the seal, which can be gas-tight and is consequently suitable for use in a gas-tight suit, fitted with a gas-tight zip fastener. If desired, a further member of the same general form as the member 31 can be received within the member 31, in the same way as the member 31 is received within the member 26, the gauntlet portion 32 of the secondary inner glove 33 being then extended beyond the inner end of the member 31 to be folded up to provide an end portion corresponding to the portion 28 of the glove 22. The end portion may be engaged by a further frusto-conical member corresponding to the member 31. This further frusto-conical member can be secured within a tertiary glove if required.

It will be appreciated that the sealing arrangements described provide seals which are entirely adequate for a range of conditions under which protective clothing has to be worn, and which are extremely simple and inexpensive to provide.

The invention can of course be embodied in a variety of different ways from those specifically illustrated and described.

Claims

1. Protective clothing comprising a glove (22) having a gauntlet portion (25, 36) received in the free end portion of a sleeve (21) and an annular sealing member (24) sealing an annular space between the sleeve end portion and the gauntlet portion, in which the annular sealing member is secured to only one of the said portions and forms a seal at its interface with the other portion, at least the one of the surfaces of the sealing member and the said other portion in contact at the interface which is a surface of the member to which the sealing member is not attached being inwardly tapered in the direction outwardly of the sleeve end portion, characterised in that the gauntlet portion is sufficiently stiff for the sealing member to be sealingly compressed in the annular space when the glove is urged outwardly of the sleeve end portion in use.

2. Protective clothing according to claim 1, characterised in that the other one (21; 25, 26) of the surfaces of the sealing member and the said other portion in contact at the interface is inwardly tapered in the direction outwardly of the sleeve end portion.

3. Protective clothing according to claim 1 or 2, characterised in that the annular sealing member (24) is secured to the sleeve end portion (21).

4. Protective clothing according to any one of claims 1 to 3, characterised in that the sealing member (24) comprises an annulus of closed cell material.

5. Protective clothing according to claim 4, characterised in that the sealing member (24) has an inner stiffening annulus covered by the closed cell material.

6. Protective clothing according to any preceding claim, characterised in that the gauntlet portion of the glove comprises an annular reinforcement member (26) reinforcing an annular flexible portion (25).

7. Protective clothing according to claim 6, characterised in that the reinforcement member (26) is within the flexible portion (25).

8. Protective clothing according to claim 6 or 7, characterised in that an end portion (28) of the flexible portion (25) extends beyond the reinforcement member (26) in the inward direction of the sleeve and can be turned over to extend within the remainder of the gauntlet portion of the glove.

9. Protective clothing according to any preceding claim, characterised in that the sealing member (24) is in direct contact with the inner surface of the sleeve (21) and with the outer surface of the gauntlet portion (25, 26).

10. Protective clothing according to any one of claims 1 to 8, characterised by an inner sleeve (29) extending inwardly of the sleeve (21) from the annular sealing member (24) to the inner end of the gauntlet portion (25, 26) of the glove (22), an

end portion (30) of the inner sleeve being capable of being turned over to extend within the gauntlet portion.

11. Protective clothing according to claim 8 or claim 10, characterised by an inner glove (33) with a gauntlet portion (32) arranged to secure the or each end portion (28, 30) within the gauntlet portion (25, 26) of the outer glove (22).

12. Protective clothing according to claim 11, characterised in that the gauntlet portion (32) of the inner glove (30) comprises a further annular reinforcement member (31) which tapers inwardly in the direction outwardly of the sleeve end portion.

13. Protective clothing according to claim 12, characterised in that the annular reinforcement member (31) is within the gauntlet portion (32) of the inner glove (30).

14. Protective clothing according to any preceding claim, characterised in that the or each reinforcement member (26, 31) can be readily collapsed to allow it to be moved outwardly of the sleeve (21) through the sealing member (24).

Revendications

1. Equipement vestimentaire de protection comprenant un gant (22) qui comporte une manchette de prolongement (25, 26) reçue dans la partie d'extrémité libre d'un manchon (21) et un élément d'étanchéité annulaire (24) fermant un espace annulaire entre la partie d'extrémité du manchon et la manchette de prolongement du gant, dans lequel l'élément d'étanchéité annulaire est fixé à une seule des dites parties et constitue une étanchéité à son interface avec l'autre des dites parties, au moins la première des surfaces de l'élément d'étanchéité et la dite autre partie en contact à l'interface, qui est une surface de l'organe auquel l'élément d'étanchéité n'est pas fixé, convergeant vers l'intérieur en direction de l'extérieur de la partie d'extrémité du manchon, caractérisé en ce que la manchette est suffisamment rigide pour que l'élément d'étanchéité soit comprimé, de façon étanche, dans l'espace annulaire lorsqu'on pousse le gant vers l'extérieur de la partie d'extrémité du manchon, en utilisation.

2. Equipement vestimentaire de protection suivant la revendication 1, caractérisé en ce que ladite autre (21; 25, 26) des surfaces de l'élément d'étanchéité et ladite autre partie en contact à l'interface convergent vers l'intérieur en direction de l'extérieur de la partie d'extrémité du manchon.

3. Equipement vestimentaire de protection suivant la revendication 1 ou 2, caractérisé en ce que l'élément d'étanchéité annulaire (24) est fixé à la partie d'extrémité du manchon (21).

4. Equipement vestimentaire de protection suivant l'une quelconque des revendications 1 à 3, caractérisé en ce que l'élément d'étanchéité (24) est constitué d'un anneau de matière à cellules fermées.

5. Equipement vestimentaire de protection suivant la revendication 4, caractérisé en ce que

l'élément d'étanchéité (24) comporte un anneau raidisseur intérieur recouvert par la matière à cellules fermées.

6. Equipement vestimentaire de protection suivant l'une quelconque des revendications précédentes, caractérisé en ce que la manchette de prolongement du gant comprend un élément de renforcement annulaire (26) qui renforce une partie flexible annulaire (25).

7. Equipement vestimentaire de protection suivant la revendication 6, caractérisé en ce que l'élément de renforcement (26) est à l'intérieur de la partie flexible (25).

8. Equipement vestimentaire de protection suivant la revendication 6 ou 7, caractérisé en ce qu'une partie d'extrémité (28) de la partie flexible (25) s'étend au-delà de l'élément de renforcement (26) en direction de l'intérieur du manchon et peut être rabattue de manière à s'étendre à l'intérieur du restant de la manchette du gant.

9. Equipement vestimentaire de protection suivant l'une quelconque des revendications précédentes, caractérisé en ce que l'élément d'étanchéité (24) est en contact direct avec la surface intérieure du manchon (21) et avec la surface extérieure de la manchette (25, 26).

10. Equipement vestimentaire de protection suivant l'une quelconque des revendications 1 à 8, caractérisé en ce qu'un manchon intérieur (29) s'étend vers l'intérieur du manchon (21), de l'élément d'étanchéité annulaire (24) à l'extrémité intérieure de la manchette (25, 26) du gant (22), une partie d'extrémité (30) du manchon intérieur pouvant être rabattue de manière à s'étendre à l'intérieur de la manchette.

11. Equipement vestimentaire de protection suivant la revendication 8 ou la revendication 10, caractérisé en ce qu'il comprend un gant intérieur (33) comportant une manchette de prolongement (32) disposée de manière à fixer la ou chaque partie d'extrémité (28, 30) à l'intérieur de la manchette (25, 26) du gant extérieur (22).

12. Equipement vestimentaire de protection suivant la revendication 11, caractérisé en ce que la manchette (32) du gant intérieur (30) comporte un autre élément de renforcement annulaire (31) qui converge vers l'intérieur en direction de l'extérieur de la partie d'extrémité du manchon.

13. Equipement vestimentaire de protection suivant la revendication 12, caractérisé en ce que l'élément de renforcement annulaire (31) est situé à l'intérieur de la manchette (32) du gant intérieur (30).

14. Equipement vestimentaire de protection suivant l'une quelconque des revendications précédentes, caractérisé en ce que le ou chaque élément de renforcement (26, 31) peut être facilement aplati pour permettre de le déplacer vers l'extérieur du manchon (21) à travers l'élément d'étanchéité (24).

Patentansprüche

1. Schutzbekleidung bestehend aus einem Handschuh (22) mit einem überziehteil (25, 26),

das in dem offenen Ende eines Ärmels (21) aufgenommen wird und mit einem ringförmigen Dichtungsteil (24), das einen ringförmigen Raum zwischen dem offenen Ende des Ärmels (21) und dem Überziehteil (25, 26) abdichtet, wobei das ringförmige Dichtungsteil (24) nur entweder am Überziehteil oder am offenen Ende des Ärmels befestigt ist und mit seiner nicht befestigten Fläche dann entsprechend das Überziehteil oder das offene Ende des Ärmels abdichtet und wobei wenigstens eine Fläche des Dichtungsteils und des Überziehteils oder des offenen Endes des Ärmels, die miteinander in Kontakt stehen und nicht am Dichtungsteil befestigt sind, sondern nur durch dieses abgedichtet werden, sich in Richtung des offenen Endes des Ärmels verjüngen, dadurch gekennzeichnet,

daß das Überziehteil (25, 26) ausreichend steif in bezug auf das Dichtungsteil (24) ist, um dichtend in den ringförmigen Raum eingepreßt zu werden, wenn der Handschuh sich aus dem Arme bewege.

2. Schutzbekleidung nach Anspruch 1, dadurch gekennzeichnet,

daß die andere Fläche des Dichtungsteils (24), die innenseitigen Kontakt hat, sich nach innen in Richtung des offenen Endes des Ärmels verjüngt.

3. Schutzbekleidung nach Anspruch 1 und 2, dadurch gekennzeichnet,

daß das ringförmige Dichtungsteil (24) am offenen Ende des Ärmels (21) befestigt ist.

4. Schutzbekleidung nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet,

daß das Dichtungsteil (24) einen Ringraum aus Schaumstoff mit geschlossenen Zellen hat.

5. Schutzbekleidung nach Anspruch 4, dadurch gekennzeichnet,

daß das Dichtungsteil (24) einen inneren Versteifungsringraum hat, der von dem Schaumstoff mit geschlossenen Zellen bedeckt ist.

6. Schutzbekleidung nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet,

daß das Überziehteil des Handschuhs (22) ein ringförmiges Verstärkungsteil (26) hat, das einen ringförmigen, elastischen Teil (25) verstärkt.

7. Schutzbekleidung nach Anspruch 6, dadurch gekennzeichnet,

daß das Verstärkungsteil (26) innerhalb des elastischen Teils (25) angeordnet ist.

8. Schutzbekleidung nach Anspruch 6 oder 7, dadurch gekennzeichnet,

daß ein Endteil (28) des elastischen Teils (25) sich unterhalb des Verstärkungsteils (26) in Richtung des abgeschlossenen Endes des Ärmels erstreckt und umgestülpt werden kann, um sich innerhalb des verbleibenden Reststückes des Überziehteils des Handschuhs zu erstrecken.

9. Schutzbekleidung nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet,

daß das Dichtungsteil (24) in direktem Kontakt mit der Innenfläche des Ärmels (21) und mit der Außenfläche des Überziehteils (25, 26) steht.

10. Schutzbekleidung nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet,

daß sich ein innerer Ärmel (29) inwandig des Ärmels (21) vom ringförmigen Dichtungsteil (24) zum inneren Ende des Überziehteils (25, 26) des Handschuhs (22) hin erstreckt, wobei ein Endteil (30) des inneren Ärmels umgestülpt werden kann, um sich innerhalb des Überziehteils erstrecken zu können.

11. Schutzbekleidung nach Anspruch 8 oder 10, gekennzeichnet durch

einen inneren Handschuh (33) mit einem Überziehteil (32) der so angeordnet ist, daß er jedes Endteil (28, 30) innerhalb des Überziehteils (25, 26) des Handschuhs (22) befestigt.

12. Schutzbekleidung nach Anspruch 11, dadurch gekennzeichnet,

daß das Überziehteil (32) des inneren Handschuhs (33) ein weiteres ringförmiges Verstärkungsteil (310) hat, das sich in Richtung auf das offene Ende des Ärmels hin verjüngt.

13. Schutzbekleidung nach Anspruch 12, dadurch gekennzeichnet,

daß das ringförmige Verstärkungsteil (31) innerhalb des Überziehteils (32) des inneren Handschuhs (33) angeordnet ist.

14. Schutzbekleidung nach einem der Ansprüche 1 bis 13, dadurch gekennzeichnet,

daß wenigstens ein Verstärkungsteil (26, 31) vollständig umgeklappt werden kann, um es aus dem Ärmel (21) durch das Dichtungsteil (24) zu bewegen.

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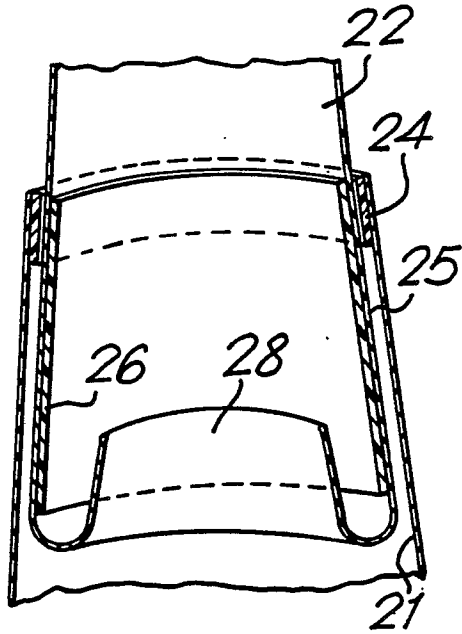


FIG. 1.

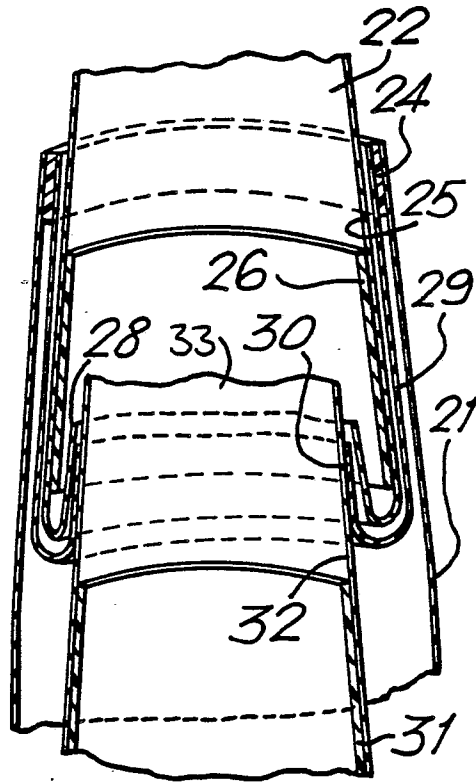


FIG. 2.