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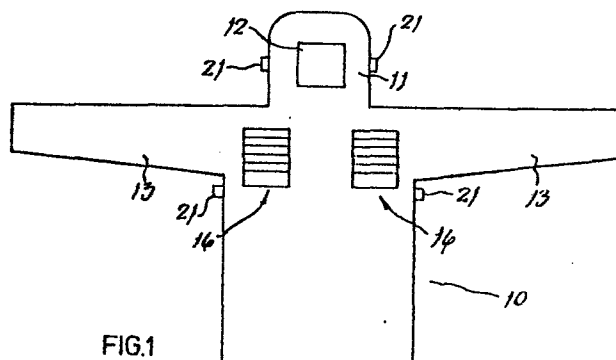
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Protective enclosure.

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There is disclosed a protective enclosure such as a garment, casualty bag or tent for use in a contaminated environment made from an impermeable material and having a vent with an associated decontaminating filter means to admit air into the interior of the enclosure, and a one-way valve for exhaust of air from the interior of the enclosure.



PROTECTIVE ENCLOSURE

5 This invention concerns a protective enclosure
of the kind (hereinafter termed of the kind referred to)
intended to protect an occupant against contaminants
such as chemical warfare agents. It may take the form
of a garment such as a smock or pair of trousers or be
in the form of a bag for transporting a casualty or in
the form of a shelter such as a tent.

10

It is well known that if such a garment for
example is substantially impermeable, as is usually
necessary it will cause discomfort to the wearer,
particularly when engaged in exercise, by increasing his
15 body temperature causing perspiration which is unable to
evaporate.

Similar, though perhaps not so acute, problems
occur with casualty bags, tents and the like.

20

It is an object of the present invention to
provide a protective enclosure of the kind referred to
which overcomes, at least to some extent, the problem
aforesaid.

25

According to the present invention there is
provided a protective enclosure made from an impermeable

material having at least one vent therein through which
the enclosure may breathe and at least one aperture
therein fitted with a one-way valve arranged to pass air
and the occupant's body vapours to atmosphere, there
5 being filter means associated with said vent to
decontaminate air passing through said vent into the
enclosure.

The enclosure may be in the form of a garment
10 such as a smock or pair of trousers or in the form of a
bag for transporting a casualty or in the form of a tent
or the like.

Each said vent may comprise an extended opening
15 covered by a plurality of strips which when the
enclosure is in use extend generally horizontally with
the lower edge of each strip overlapping the upper edge
of the next lower strip to provide a plurality of
gill-like apertures through which the enclosure may
20 breathe.

Each said strip may be cut full so as to be
slightly outwardly bowed to maintain the gill-like
apertures open.

Each one-way valve may be of the flap-valve type.

The invention will be further apparent from the following description, with reference to the several figures of the accompanying drawings, which show, by way of example only, two forms of protective garment, being a smock and pair of trousers, a casualty bag and small tent all embodying the invention.

Of the drawings:-

Figure 1 shows a diagrammatic front view of the smock;

Figure 2 shows a diagrammatic front view of the trousers;

Figure 3 shows a perspective view of one of the vented areas of the smock of Figure 1 and on an enlarged scale;

Figure 4 shows a cross-section through the vented area on the line III-III of Figure 2.

Figure 5 shows a perspective view of the casualty bag;

Figure 6 shows a perspective view of the tent;

Figure 7 shows a fragmentary front view of a
slide fastener arrangement for use with any of
the enclosures of Figures 1 to 5;

and Figure 8 shows a cross-section through the
fastener arrangement on the line VIII-VIII of
Figure 7.

Referring now to Figures 1, 3 and 4 of the
drawings, it will be seen that the smock, generally
indicated at 10, is integrally formed with a hood
portion 11 having a front opening 12 for connection to
respirator means and sleeves 13. The smock is made
from an outer layer 14 bonded to an impermeable inner
layer 15 (see Figure 4).

The outer layer 14 is comprised by a multi-fibre
synthetic flame retardant light weight woven fabric
whilst the inner layer 15 is a polyamide or pvdc
plastics film coated with butyl rubber.

A preferred fabric for the outer layer 14 is a
mixture of 33% polyamide and 67% modacrylic having a
weight of 248 g/m^2 , being of 3/1 twill construction

with 31.9 warp threads/cm and 28.5 weft threads/cm. The material has a breaking load of 1086N in the warp direction and 919N in the weft direction.

5 The two layers may be bonded together using a discontinuous adhesive system, for example low melt polyamide fibre or powder.

10 Vented areas 16 are provided on either side of the front of the smock just below the shoulders.

15 Each vented area 16 comprises an extended rectangular opening 17 through the layers 14 and 15. The opening 17 is covered by a plurality of horizontally extending strips 18 of material similar to that of the layer 14. The upper edge of the uppermost strip 18 is sewn to the skin 14 above the opening 17 and each strip 18 overlaps the strip 18 therebelow to provide a plurality of gill-like apertures 20 through which the garment may breathe. The side edges of the strips 18 are sewn to the layer 14 at the sides of the opening 17 and the strips 18 are cut full so that they bow slightly outwardly to maintain the apertures 20 open.

25 Air entering the smock through the openings 17 is decontaminated by passage through filters 30 secured on the inside of such openings by any suitable means

such as by Velcro (Registered Trade Mark) tapes for example. The filters 30 may be of polyurethane foam impregnated with activated carbon material or of other known kind.

5

Four one-way valves 21 are provided, preferably of the flap-valve type in apertures through the garment in the vicinity of the wearer's two armpits and on opposite sides of the hood portion 11. The valves
10 21 are arranged to allow air and the wearer's body vapours to pass from inside the garment to atmosphere. In use, movement of the wearer's body acts to pump air and body vapours through the valves 21 causing air to be drawn into the garment through the apertures
15 20, thus establishing positive air flow through the garment, greatly enhancing the comfort of the wearer.

All of the sewn seams are rendered waterproof by an impermeable coating or by means of an impermeable
20 tape such as a nylon tape, for example.

Figure 2 shows a pair of trousers of similar construction to the smock of Figure 1 having the vents 16 on the legs and two one-way valves 21 in the vicinity
25 of the groin.

Referring now to Figure 5 it will be seen that the casualty bag 40 is generally in the form of a sack made from the same two layer material as previously described and having side walls 41. Vents 42 similar to the vents 16 of the smock described above are provided at spaced locations around the side walls 41 and decontaminating filters are positioned behind the vents 42 as previously indicated.

One-way valves 43 for the exhaust of air from within the bag are provided at spaced locations in the top of the bag. They are of the flap type. Hand or battery driven pump means (not shown) may be provided to connect with the valves 43 to draw air therethrough from the interior of the bag thus forcing air to enter through the vents 42 thereby establishing circulation of decontaminated air through the bag.

The top of the bag is closed by a slide fastener arrangement 44 which may be opened to enable a casualty to be positioned in or removed from the bag. The slide fastener is preferably as described hereinafter.

Referring now to Figure 6 it will be seen that a small tent 50 having a sewn-in ground sheet 51 is constructed from a two layer material as previously

described. The walls of the tent 50 are equipped with vents 52 and one way valves 53 all as discussed hereinbefore. The tent 50 has a door 54 openable by means of a slide fastener 55 designed when closed to prevent passage of contaminated air and again preferably constructed as described hereinafter. Again motor or manually operable (from within the tent) means may be provided to ensure air circulation through the tent by way of vents 52 and valves 53.

10

The preferred slide fastener is shown at 100 in Figures 7 and 8 and is adapted to releasably connect a first enclosure part 110 with a second enclosure part 120. The fastener parts 100a and 100b are sewn to the parts 110 and 120 such that the part 110 provides a flap 130 of substantial width overlying the fastener 10 and an edge region of the part 120.

The edge of the flap 130 can be releasably secured to the part 120 by means of a Velcro (Registered Trade Mark) tape fastener whose tapes 140a and 140b are sewn to the inside of flap 130 and outside of part 120 respectively to define a pocket 150 extending over the length of the fastener 100 and containing a filter pad 160 also extending over the length of the fastener 100.

The pad 160 may be of polyurethane foam impregnated with active carbon material for example.

Additional Velcro tape fasteners may be provided
5 to secure the pad 160 in position if desired.

Any air entering the enclosure through interstices or the like in the slide fastener necessarily first passes through the filter 160 and is
10 thus decontaminated.

It will be appreciated that it is not intended to limit the invention to the above examples only, many variations, such as might readily occur to one skilled
15 in the art, being possible, without departing from the scope thereof as defined in the appended claims.

Thus, for example, the slide fasteners of Figures 7 and 8 may be incorporated in garments such as
20 those of Figures 1 and 2 if desired.

CLAIMS

1. A protective enclosure made from an impermeable material having at least one vent therein through which the enclosure may breathe and at least one aperture
5 therein fitted with a one-way valve arranged to pass air and the occupant's body vapours to atmosphere, there being filter means associated with said vent to decontaminate air passing through said vent into the
10 enclosure.
2. A protective enclosure according to claim 1 wherein each vent comprises an extended opening covered by a plurality of strips which when the enclosure is in
15 use extend generally horizontally with the lower edge of each strip overlapping the upper edge of the next lower strip to provide a plurality of gill-like apertures.
3. A protective enclosure according to claim 2
20 wherein each said strip is cut full so as to be outwardly bowed to maintain the gill-like apertures open.
4. A protective enclosure according to any one of claims 1 to 3 wherein each one-way valve is of the
25 flap-valve type.

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5. A protective enclosure according to any one of claims 1 to 4 wherein said impermeable material comprises an outer layer of multi-fibre synthetic flame retardent lightweight woven fabric and an inner layer of plastics film coated with butyl rubber.

6. A protective enclosure according to any one of claims 1 to 5 wherein each said filter means comprises a pad of polyurethane foam impregnated with activated carbon material and located with the enclosure behind the vent.

7. A protective enclosure according to any one of claims 1 to 6 being a garment.

8. A protective enclosure according to claim 7 being in the form of a smock with a head enclosing hood portion, at least one of said one-way valves being located in said hood portion.

9. A protective enclosure according to claim 8 having further one-way valves in the vicinity of the armpits.

10. A protective enclosure according to claim 7 in the form of a pair of trousers, there being at least one

of said one-way valves in the vicinity of the groin.

11. A protective enclosure according to any one of claims 1 to 6 being a casualty bag.

5

12. A protective enclosure according to any one of claims 1 to 6 being a tent.

10

13. A protective enclosure according to any one of claims 7 to 12 having an opening between two parts thereof closed by a slide fastener arrangement wherein a flap extends from one of the parts connectable by the slide fastener to overlies the fastener and an edge region of the other part, said flap being releasably securable to the other part to define a pocket extending over the length of the fastener, a filter pad to decontaminate any air passing into the garment through the slide fastener being located in said pocket.

15

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14. A protective enclosure according to either claim 11 or claim 12 including pump means to force air through the enclosure by way of said vents and one-way valves.

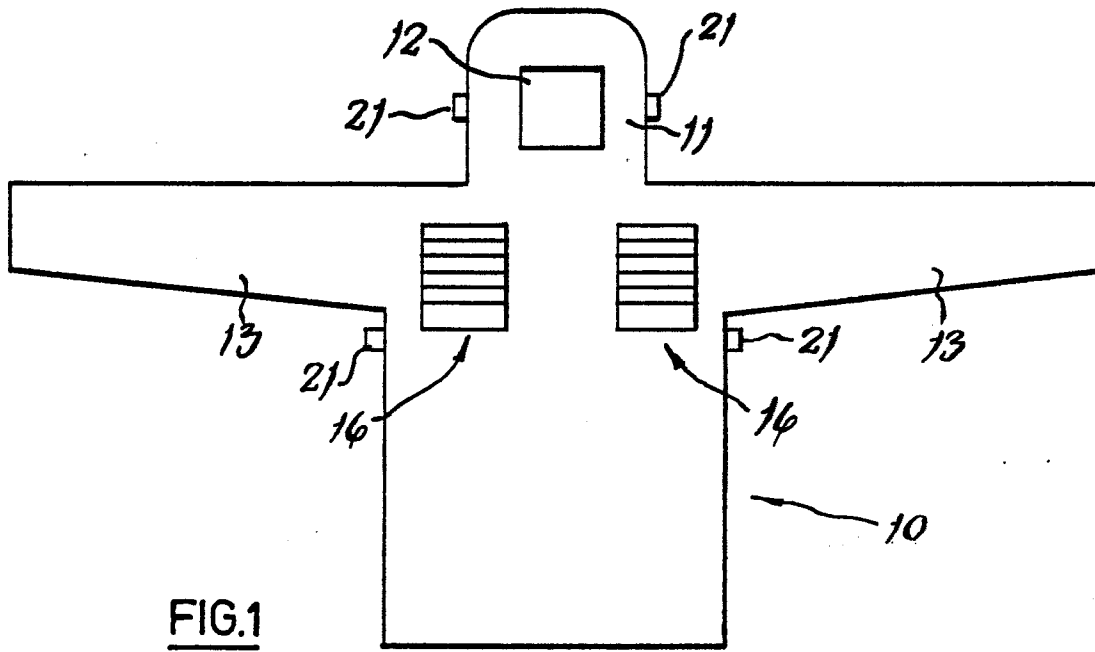


FIG. 1

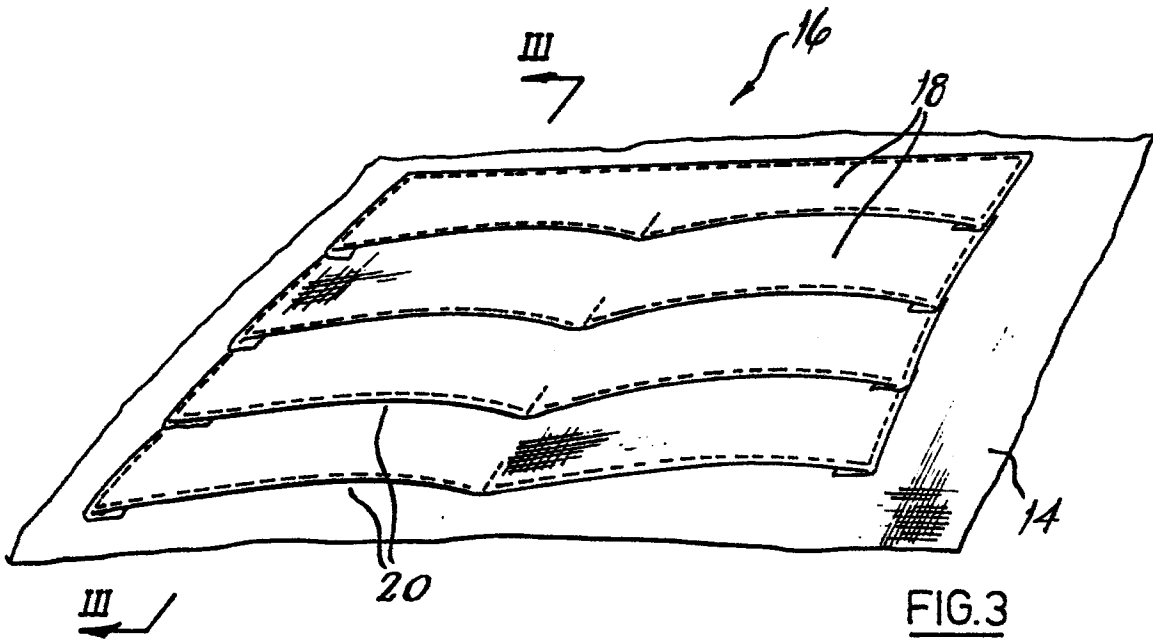


FIG. 3

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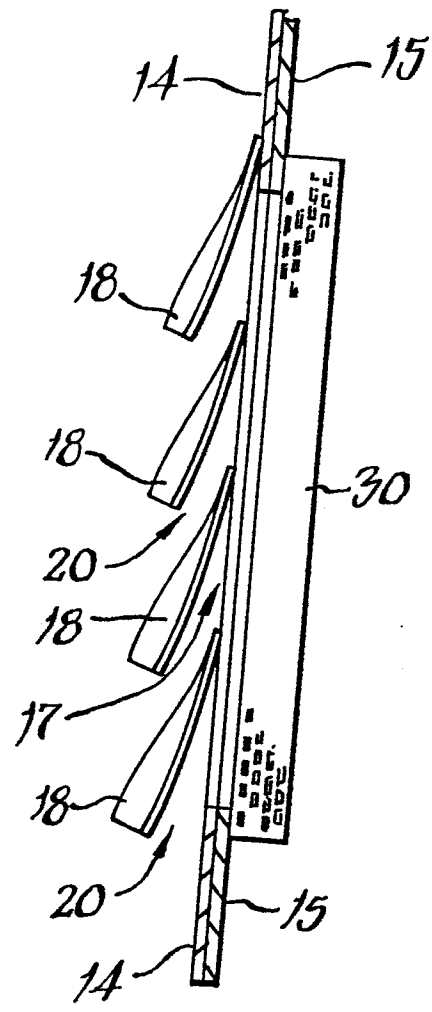


FIG. 4

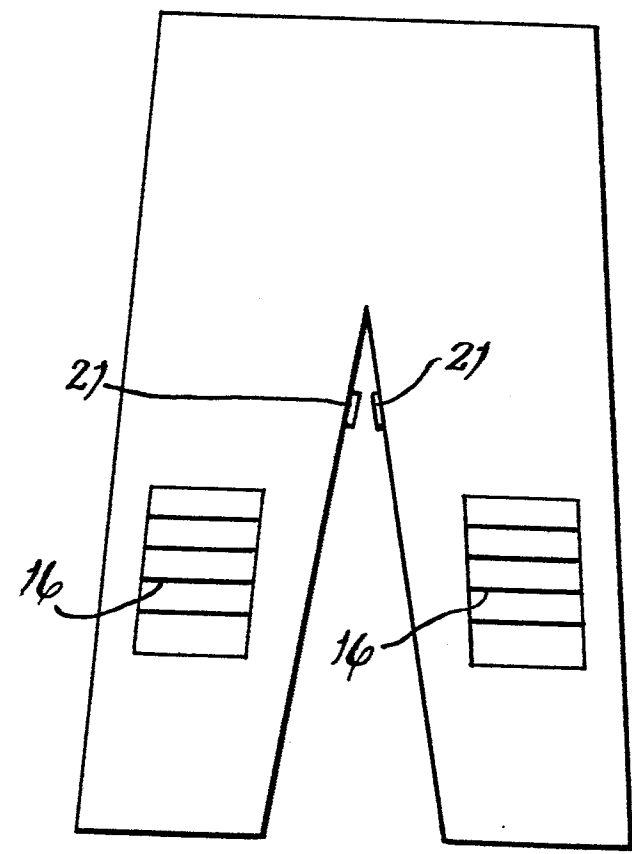


FIG. 2

