

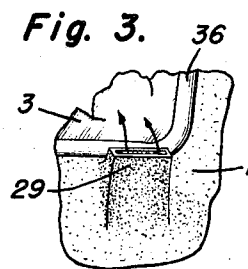
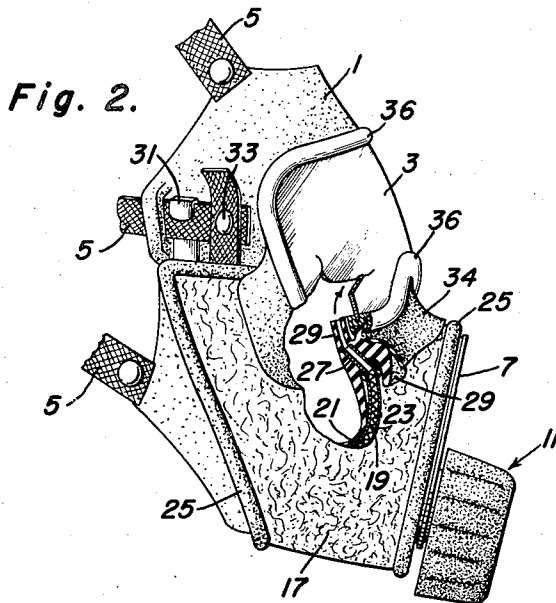
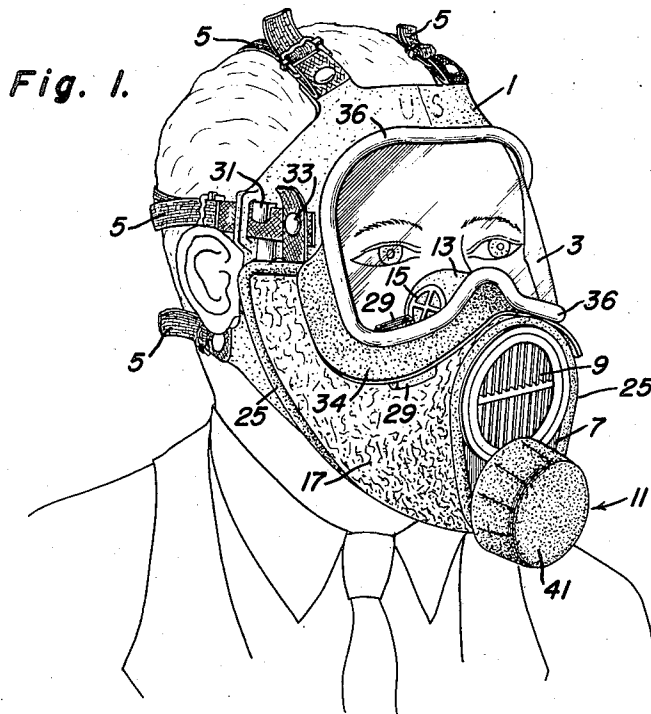
Aug. 11, 1959

E. SOVINSKY
FIELD PROTECTIVE MASK

2,898,908

Filed April 6, 1954

2 Sheets-Sheet 1



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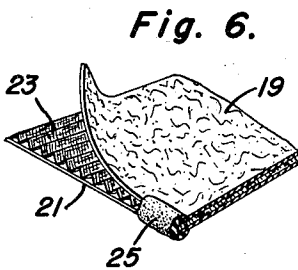
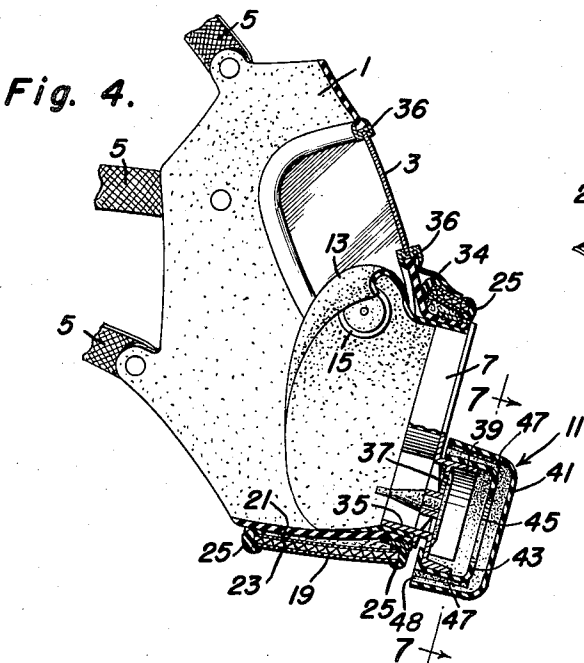
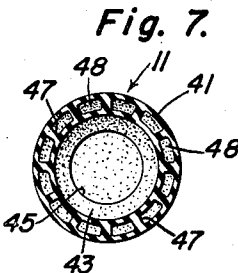
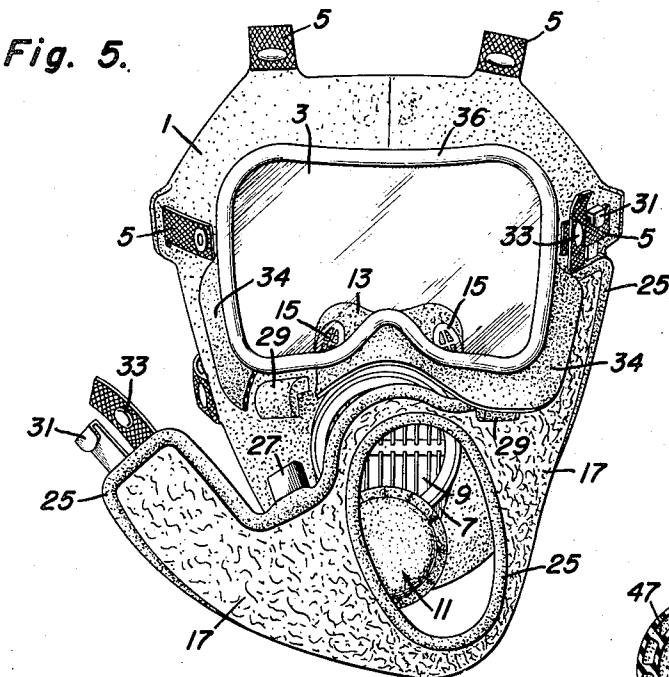
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FIELD PROTECTIVE MASK

Filed April 6, 1954

2 Sheets-Sheet 2



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2,898,908

FIELD PROTECTIVE MASK

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9 Claims. (Cl. 128—141)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment to me of any royalty thereon.

This invention relates to a protective mask of the type commonly known as a "gas mask." This term will be used in this specification although it will be understood that the mask is designed to be effective against all types of air-borne contaminants, whether solid, liquid, or gaseous, and is particularly designed to effectively prevent the passage of aerosols, bacteria, and radioactive particles as well as the usual war gases.

An object of this invention is to provide a gas mask which gives complete protection and is compact, light in weight, and flexible.

A further object of my invention is to provide a gas mask having a large filtering area and giving a minimum breathing resistance.

To attain these objects, I have devised a gas mask characterized by a new type filtering element which gives maximum filtering and adsorbent action with minimum weight and bulk and which fits the face of the wearer. I have also provided a new type outlet valve cover which prevents leakage of contaminated air through the outlet valve and is of such a structure as to permit massaging of the outlet valve, to overcome sticking or freezing, without removing the cover.

In the drawings, Figure 1 is a perspective view of the mask as a whole mounted on the head of the wearer. Figure 2 is a side elevation of the mask with a portion broken away to show an air inlet. Figure 3 is a fragmentary view taken from the inside of the mask showing an air inlet. Figure 4 is a longitudinal section. Figure 5 is a front view showing the filter partially removed from the face piece. Figure 6 is a fragmentary view showing the structure of the filter. Figure 7 is a section on line 7—7 of Figure 4.

Referring to Figure 1, the mask comprises an impermeable face piece 1 provided with a window 3. While we have shown a single window, it is obvious that, if desired, a separate lens may be provided for each eye. The face piece is held in place by the usual straps 5. Mounted in the face piece is an angle piece 7 which comprises a voice transmitter 9 and an air outlet 11. The voice transmitter forms no part of my invention and may be of any known type. Moreover, it may be omitted, if desired. The air outlet will be described in more detail later in this specification.

Within the face piece is a nose cup 13 provided with the usual air inlet valves 15. Mounted on the face piece is a filter 17 which forms one of the major features of my invention. This filter, as shown in Figures 1, 2, and 5, covers a large part of the face piece, particularly the cheek portions thereof.

Referring to Figure 6, this filter is made up of two sheets 19 and 21 formed of fibrous material impregnated with activated carbon. These sheets are held apart by

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spacer 23. This spacer should be of a character to permit the free passage of air in any direction. We have found a suitable material to be an open-mesh fabric of relatively stiff thermoplastic material molded to a corrugated form. The edges of the filter are suitably sealed as shown at 25. Mounted on the filter are two tubes 27 which form air conduits communicating with the space between layers 19 and 21 of the filter. Mounted on the face piece are air inlet members 29 which are provided with openings of such size as to form a snug fit with tubes 27. The air inlet members, as shown in Figures 2 and 3, preferably terminate immediately adjacent the window so as to produce a flow of fresh air thereacross thus preventing fogging. The filter is removably mounted on the face piece in any suitable manner. Merely as an example, we have shown it as provided with hooks 31 and snap fasteners 33.

In order to assist in shedding rain, I provide a rain flap 34. This rain flap is a narrow sheet of flexible resilient rubber. The upper edge is shown as secured beneath rim 36 of window 3. This flap covers the upper edge portion of filter 17.

The air outlet is best shown in Figures 4 and 7. It comprises an outlet tube 35 in which is mounted a conventional type outlet valve comprising a flexible rubber disk 37 which makes contact with the outer end of tube 35. A holder 39 likewise of conventional construction is formed integrally with tube 35. Mounted on holder 39 is my improved outlet valve cover. This cover comprises an outer cup-shaped member 41 and an inner cup-shaped member 43. As will be seen, the outer member 41 is imperforate. The inner member 43 has imperforate side walls but is provided with one or more openings 45 in its base. Separating the two cup-shaped members are a plurality of radial wall members 47 which divide the space between the cup-shaped members into, say, twelve channels, 48.

The flow of the air in this mask is as follows:

When the wearer inhales, air is drawn inwardly through sheets 19 and 21 of the filter, the filter being desirably hung rather loosely on the face so that air may enter on both sides. It then flows along the air space, provided by spacer 23, to tubes 27. It then flows inwardly through inlets 29 and valve 15 of the nose piece and finally to the lungs of the wearer. When the wearer exhales, air flows past outlet valve 37 into inner cup 43 thence through opening 45 into outer cup 41 and out through the channels 48.

Returning to the inhaling phase, it will be understood that while the outlet valve should, ideally, completely prevent inward flow of air therethrough, in practice there will be a small leakage, say $\frac{1}{10}$ ml., during each breath. My outlet valve cover is so designed as to give protection to the wearer at this stage. It will be noted that the two cups form a cavity having an appreciable volume which is selected so as to be much greater than the volume of air that may leak past the outlet valve. The arrangement of the cups and radial walls moreover forces any air that might be drawn in from the exterior to flow through a tortuous path before reaching the valve. This effectively prevents bypassing. Hence, a small amount of outside air drawn into the passages 48 will not reach the outlet valve. It will, of course, be completely expelled during the exhaling phase.

Due to the moisture in the breath, there is a tendency at times for the outlet valve to stick or freeze, particularly in very cold weather. It is necessary for the wearer to massage the valve to loosen it. My valve cover is formed of flexible resilient rubber and because of its form and the material of which it is made it permits the wearer to massage the valve without the necessity of re-

moving the cover as would be necessary if the cover were of, say, metal.

Returning again to the filter 17, the sheets 19 and 21 are, as has been mentioned, formed of fibrous material impregnated with activated carbon. The detail structure of these filter sheets may vary. For example, they might be made of a plurality of sheets of filter paper into which activated carbon has been brushed. I have found a desirable type filter sheet to comprise a bat type fibrous mat of approximately 4.5 millimeter thickness impregnated with approximately 30 percent by weight activated carbon held to the fibres by a suitable adhesive. The filter sheets should be sufficiently flexible to permit folding of the mask. I have employed a filter having a total filtering area of about 600 sq. centimeters and including about 90 grams of activated charcoal having a very fine particle size ranging from 50 mesh downwardly. This filter material has a very low resistance to the flow of air and is effective both as a mechanical filter and as an adsorbent, giving protection against many types of bacteriological and toxic agents. The weight of the filter is very small as compared to the usual cannister and because of its shape it is well balanced on the face. Since the edges of the filter are sealed there is no possibility of leakage of air at any point. It is a simple matter to replace the filter by a fresh one when needed.

While I have described my invention in some detail, it will be appreciated that various modifications are possible. I, therefore, do not desire to be limited except by the scope of the appended claims.

I claim:

1. A gas mask comprising an impermeable facepiece, at least on air outlet in said facepiece, air inlet means in said facepiece, a filter comprising two sheets of filter material disposed substantially parallel to the outer surface of said facepiece and comprising portions substantially covering the cheek portions of the facepiece, spacing means holding said sheets apart to form an air space therebetween, sealing means sealing the edges of said sheets so as to prevent entrance of outside air into said air space except through said filter material, and conduit means connecting said air space with said air inlet means.

2. A gas mask as defined in claim 1, wherein each of said sheet comprises fibrous filtering material impregnated with activated carbon.

3. A gas mask as defined in claim 2 wherein said activated carbon is present in the amount of about 30 percent by weight of the filtering material.

4. A gas mask as defined in claim 1 wherein said filter is loosely hung on said face piece, whereby air may flow through each of said sheets to said air space.

5. A gas mask as defined in claim 1 wherein said filter is so mounted as to be readily removable from said facepiece.

6. A gas mask as defined in claim 1 wherein said air inlet comprises means defining at least one opening in said face piece and said conduit means comprises a tube fitting within each said opening.

7. A gas mask comprising an impermeable face piece, transparent window means in said face piece, an outlet tube mounted in said face piece, an outlet valve in said outlet tube, a nose cup within said face piece, at least

one inlet valve in said nose cup, air inlet means in said face piece adjacent said window means and so located as to direct incoming air across said window, a filter comprising two sheets of flexible fibrous filtering material impregnated with activated carbon, spacing means holding said sheets apart to form an air space therebetween, said sheets of filtering material being disposed substantially parallel to the outer surface of said facepiece and comprising portions substantially coextensive with and shaped to conform to the sides of said facepiece, means sealing the edges of said sheets together in such a manner as to prevent entrance of outside air into said air space except through said filter material, conduit means secured to said filter and communicating with said air space, said conduit means removably engaging said air inlet means, and means removably securing said filter to said face piece.

8. A gas mask as defined in claim 7 and further comprising a rain flap comprising a strip of flexible resilient material secured at its upper edge to said face piece and having its lower edge free, said rain flap being so positioned as to cover the upper edge of said filter.

9. A gas mask comprising a face piece; air inlet means connected to said face piece, said air inlet means including means for purifying the incoming air; air outlet means connected to said face piece, said air outlet means including an outlet tube, an outlet valve comprising a flexible, resilient disk making contact with the outer end of said outlet tube, and an outlet valve cover mounted on the end of said outlet tube, said outlet valve cover comprising an imperforate outer cup-shaped member, an inner cup-shaped member having imperforate side walls but a perforate base, said inner cup-shaped member being mounted within said outer cup-shaped member, the bases of the two cup-shaped members being adjacent but spaced from each other, and a plurality of radial walls separating said inner and outer cup-shaped members, said cover being formed entirely of flexible resilient material, said inner cup-shaped member being joined to said outlet tube and covering said outlet valve.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,898,908

August 11, 1959

Eugene Sovinsky

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 33, for "on air outlet" read -- one air outlet --.

Signed and sealed this 26th day of January 1960.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents