United States Patent

[11] 3,545,436

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[22] Filed **July 21, 1967**
[45] Patented **Dec. 8, 1970**

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a corporation of Ohio. by mesne assignments to

[54] **FACE SEAL**
10 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **128/141,** 128/146.7
[51] **Int. Cl.** **A62b 18/00**
[50] **Field of Search** 128/140-147, 195, 205; 2/7, 8, 21

[56] **References Cited**

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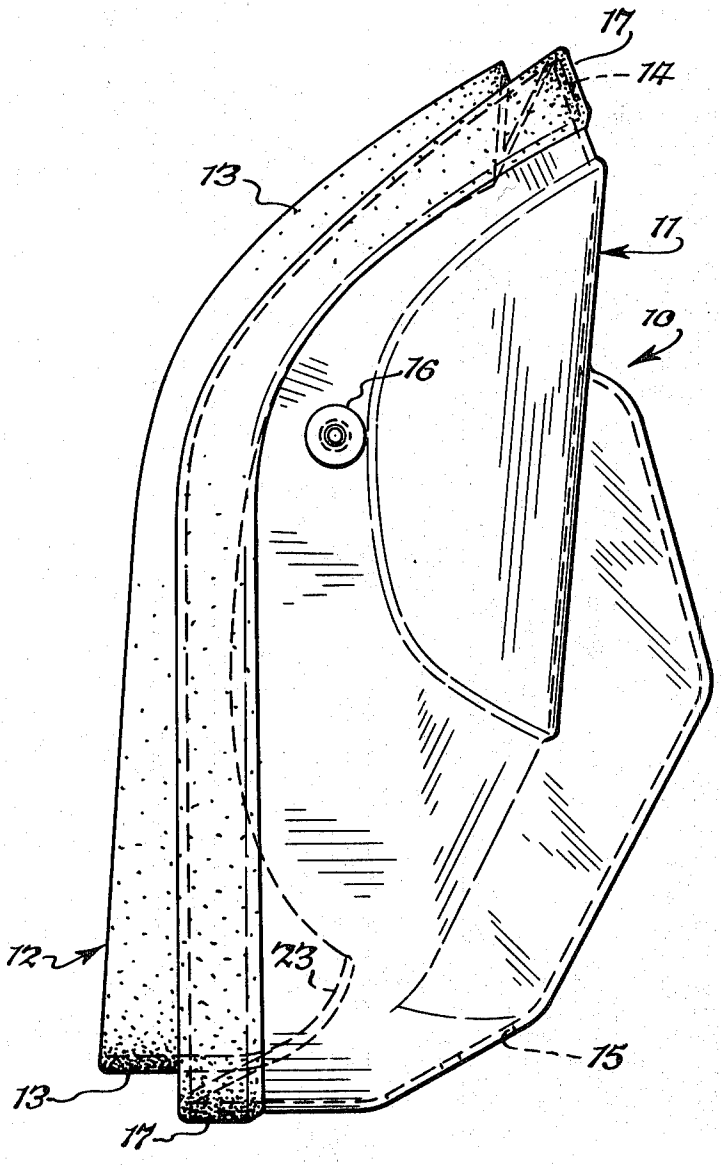
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Primary Examiner—Anton O. Oechsle
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ABSTRACT: A resiliently flexible sealing element conformable to the face of a wearer is supported by and spaced from a mask body by a resiliently flexible web, the sealing element and web extending perimetrically around the open side of the mask body with the hinge web connected at one side to the sealing element and at its other side to a flange secured to the mask body.



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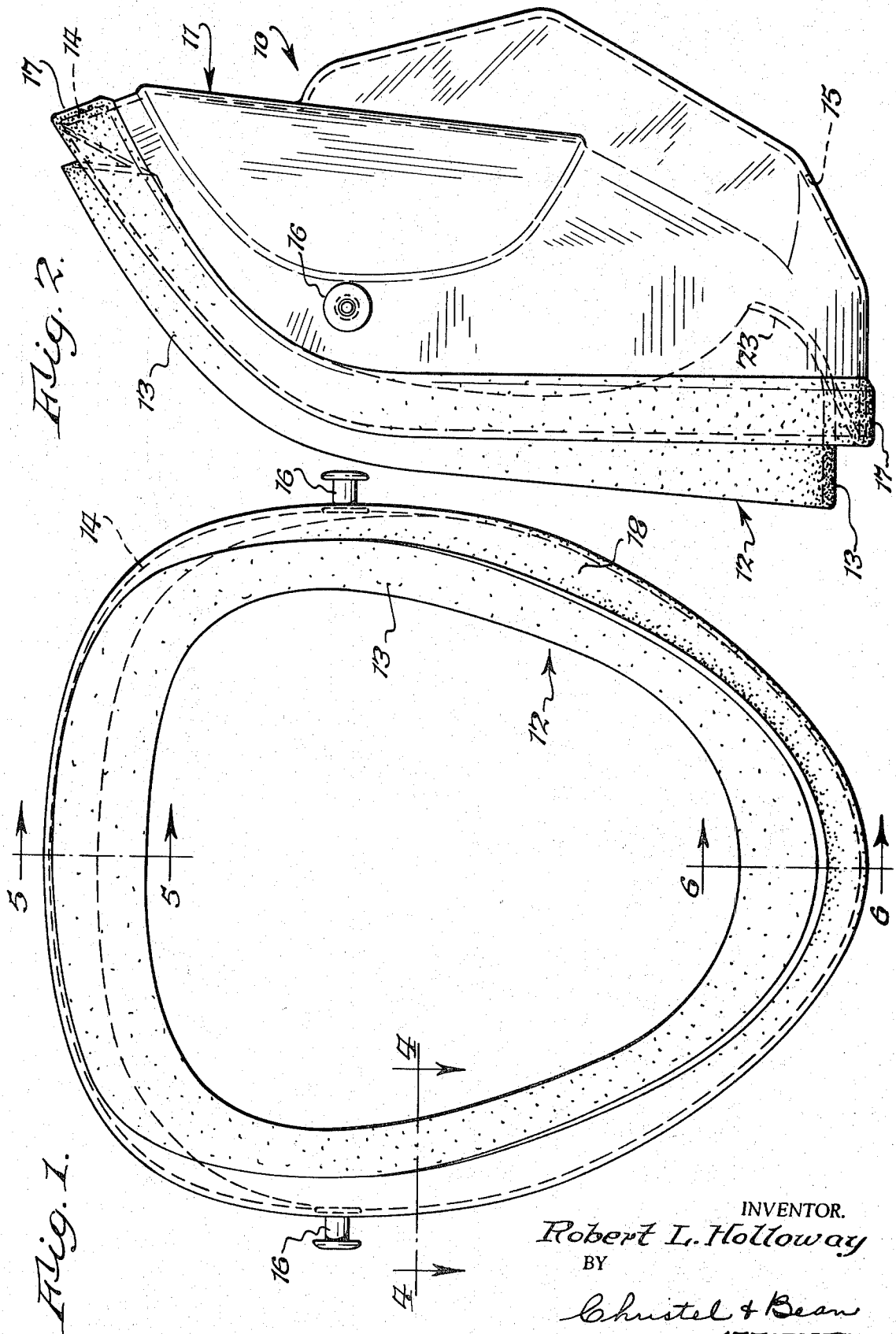


Fig. 2.

Fig. 1.

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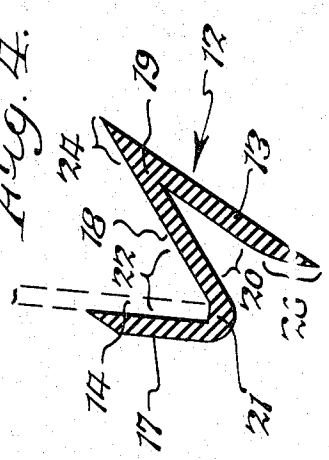


Fig. 4.

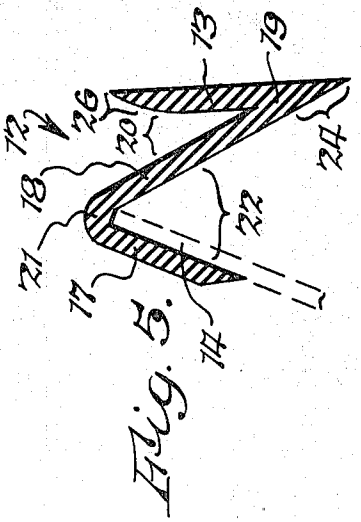


Fig. 5.

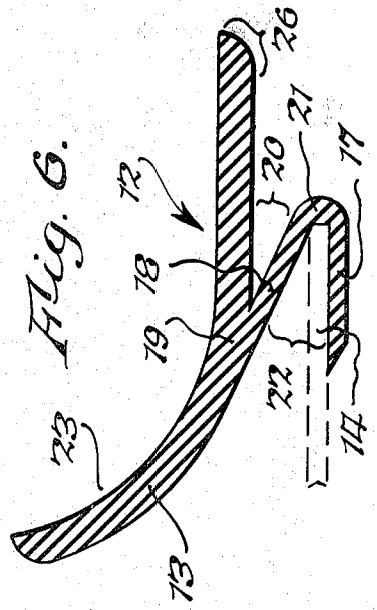


Fig. 6.

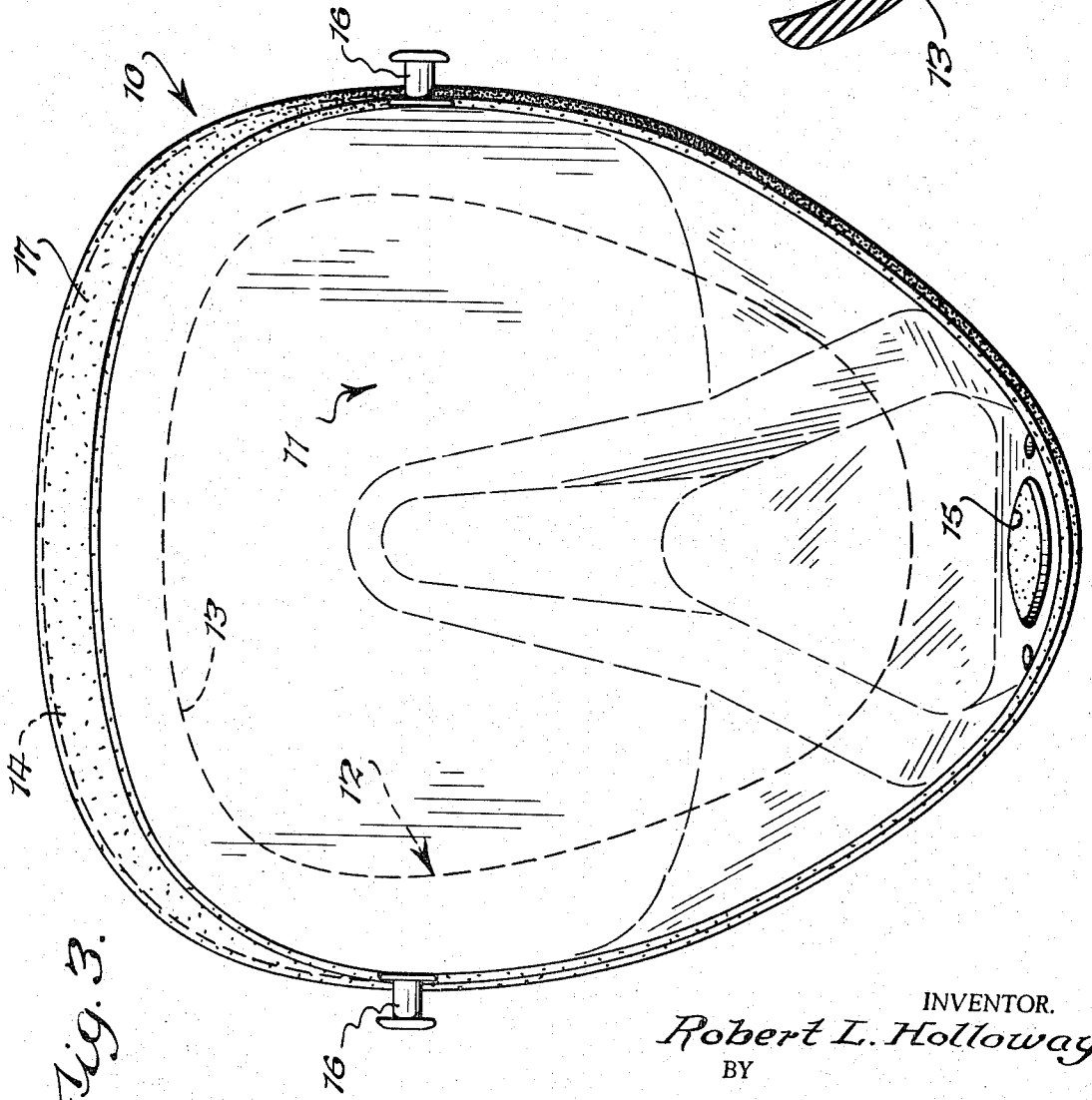


Fig. 3.

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FACE SEAL

BACKGROUND OF THE INVENTION

This invention related to face masks and in particular to breathing face masks which seal against the face of a user and exclude the ambient environment from those portions of the face which are confined by the face mask.

It is important that a face mask properly fit the face of the wearer. The need for a good seal is self-evident. Not so obvious, however, is the importance of comfort in the fit of the mast to the face. If the mask is not comfortable to wear, it will bother the user and may create a feeling of uneasiness, all of which is distracting and undesirable.

This poses a problem because, as a practical matter, face masks are not custom made but are designed for use by anyone. The wide range in shape and size of the human face makes it difficult to provide a mask which will comfortably fit a variety of users, and this is particularly so with masks designed to provide wide angle vision.

While users have, of necessity, generally accepted several mask designs, so far as I am aware such prior art efforts have not provided a completely satisfactory solution to these problems.

SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the present invention to provide a face seal which adapts the mask to fit an extremely wide variety of facial configurations.

It is another primary object of this invention to accomplish the foregoing in a face mask and seal combination providing a comfortable fit.

It is another object of the present invention to provide a face mask having a mask body and suspended therefrom a floating seal conformable in sealing relation to the face of a user independently of the mask body.

It is a further object of the present invention to provide a face mask having the foregoing characteristics together with full vision transparent face piece.

Various other novel features of construction and advantages inherent in the face mask construction of the present invention are pointed out in detail in conjunction with the following description and drawing of an illustrative embodiment of the invention.

DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 is a rear elevational view of a face mask seal made in accordance with the principles of the present invention;

FIG. 2 is a side elevational view thereof shown secured to a face mask body;

FIG. 3 is a front elevational view of the face mask shown in FIG. 2;

FIG. 4 is a cross-sectional view of the seal taken about on line 4–4 of FIG. 1, with portions of the mask body shown in phantom;

FIG. 5 is a similar cross-sectional view taken about on line 5–5 of FIG. 1; and

FIG. 6 is a similar cross-sectional view taken about on line 6–6 of FIG. 1.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

Referring now in detail to the accompanying drawings, there is shown a face mask of general application, generally designated 10, comprising a mask body 11 and a seal therefor generally designated 12. Seal 12 includes a conformable sealing element 13, adapted to seal the mask body to the face of a user thereof. In the illustrated form, mask body 11 has a perimetrical edge 14 defining an opening for receiving portions of the face of a user, the edge 14 being adapted to seat in sealing relation against seal 12. The sides of mask body 11 adjacent and below eye level together with a lower portion thereof extend about and enclose respective side and chin portions of the face of the user with edge 14 curving upwardly and outwardly above eye level to wrap around the forehead. Thus the facial features of the user, including the eyes, nose and mouth, are fully enclosed within mask body 11 and within the confines of edge 14. However, the seal of my invention is not limited to use with full face mask, or to use with mask bodies having the illustrated configurations.

Mask body 11, in the preferred embodiment, is formed entirely of a relatively rigid, shape-sustaining, transparent plastic material thereby providing wide angle vision. An opening 15 is provided in the lower portion of mask body 11 for receiving air hoses or other equipment associated with a breathing apparatus, now shown. Fastener projections 16 are provided on opposite sides of body 11 for connection with head straps, not shown, adapted to pass around the user's head to secure the face mask thereto.

Seal 12 is a one-piece construction formed of a resilient and flexible material, such as natural or synthetic rubber, and is shaped to generally conform to the perimetrical outline of edge 14. Seal 12 comprises three integrally formed perimetrical sections, forming a sealing element 13, a sealing flange 17, and a connecting web 18, the latter hingedly joining flange 17 and sealing element 13 in a manner providing a free-floating action therebetween completely around the cavity opening of mask body 11. Each section is of continuous strip form, with inner and outer perimetrical edges. Element 13 hingedly connects with the inner edge of web 18 and 19, adjacent the inner edge portion of element 13, and the opposed faces thereof forming an acute angle or V opening radially outwardly, as shown at 20. The outer edge of web 18 hingedly connects at 21 with the outer edge of flange 17 with the opposed faces thereof forming an acute angle or V opening radially inwardly as shown at 22. In other words, the cross-sectional configuration of seal 12 at any point therealong forms, at least, two oppositely directed V's having a common side in web 18, thereby providing a generally Z-shaped cross-sectional configuration. At the lowermost portion of the mask sealing element 13 extends inwardly and upwardly and forms a socket 23 for receiving the chin of a user. Thus, there is provided a pair of sealing edges completely around the mask body, one within the cavity and the other externally thereof.

Seal 12 provides a comfortable, fluid-tight seal between mask body 11 and the face of a user, as will now be described. Edge 14 of mask body 11 is received in the angle 22 between flange 17 and web 18 and the outer margin of body 11 is bonded to the inner face of flange 17 by a suitable adhesive or otherwise attached and sealed to body 11 in a manner providing a fluid-tight seal therebetween. Facial sealing element 13 comprises a double edged seal. An inner perimetrical chevron seal 24 is formed at an inward extension of the juncture 19 between connecting web 18 and sealing element 13. An outer perimetrical chevron seal 26 is formed along the outside perimeter of sealing element 13. Chevron seals 24, 26 taper inwardly and outwardly, respectively and terminate the respective inner and outer edges of sealing element 13 forming respective inner and outer chevron seals therealong.

In use, the face mask is placed over the face of the user with the straps, not shown, drawn around the head to press the mask against the face. Sealing element 13 resiliently yields in conformance with the facial contours of the user and bears thereagainst with both inner and outer chevron seals in fluid-tight engagement therewith. Pressure developed within the cavity of mask body 11, caused by exhalation or by the external breathing apparatus, not shown, bears against the inner seal 24 in a manner causing the same to seal tightly against the face. Likewise, ambient pressure bears against outer seal 26 in a manner causing it to seal tightly against the face. The chevron seals thus form a double sealing edge about the face. Note that the perimetrical edge 14 of mask body 11 does not bear against the face of the user but is maintained spaced therefrom by seal 12 in a manner which provides free-floating action between a sealing element 13 and mask 11.

The rigid mask body 11 hingedly suspends sealing element 13 therefrom through web 18 disposed therebetween. Sealing

element 13 is free to hinge about the hinge line formed at the juncture 19 of sealing element 13 and web 18 and about a second hinge line formed at the juncture 21 of web 18 and flange 16. At no time does edge 14 and the outer edge of the web and flange juncture at 21 bear directly against either the face of the user or the outside face of element 13. Sealing element 13 is thus free to float relative to the rigid mask body.

The edge 14 of mask body 11 is formed slightly larger than the largest front facial outline to be accommodated since sealing element 13 floats relative thereto about the hinge lines and spaces itself to a greater or lesser extent therefrom in accordance with a particular facial configuration. The web 18 also flexes to accommodate the seal to a particular face. Thus, the particular shape of the rigid edge 14 has been practically eliminated as a critical factor in adapting a face mask to various facial configurations. The hinged free-floating connection between the sealing element and the mask body provides a face mask which is thus conformable in sealing relation to an unusually wide variety of facial sizes and contours independently of the mask body. Moreover, the fit of the mask to the face of a user is extremely comfortable due to such hinged floating action.

Having thus described and illustrated a preferred embodiment of my invention, it will be understood that such description and illustration is by way of example only and that such modifications and changes as may suggest themselves to those skilled in the art are intended to fall within the scope of the present invention which is otherwise limited only by the scope of the appended claims.

I claim:

1. A face seal comprising, in combination with a body having an open side adapted to fit about facial portions of a user, said body defining a facial-portion receiving cavity and having a marginal edge portion around said open side thereof, sealing means adapted to form a seal between said body and the face of a user thereof, said sealing means having a generally z-shaped cross-sectional configuration throughout and comprising a resiliently flexible perimetrical sealing element conformable in sealing relation with a face, and a resiliently flexible perimetrical connecting web joining said sealing element to said body in spaced relation thereto, said sealing element normally being suspended from said body by said web in inwardly spaced relation to said marginal edge portion completely therearound whereby said face mask is conformable in sealing relation to the face of a user independently of said body, said sealing element being partially confined within said body cavity and having a portion projecting axially outwardly of said body cavity along the entire marginal edge thereof, said web being joined along one edge thereof to said body adjacent said marginal edge portion thereof and extending therefrom at an acute angle thereto inwardly of said cavity, said sealing element being joined to said web adjacent the opposite edge thereof and extending therefrom at an acute angle thereto outwardly of said cavity, said sealing element and said body edge portion defining with said web a pair of oppositely facing generally V-shaped openings having a common side in said web and thereby providing said generally Z-shaped cross-sectional configuration.

2. A face seal according to claim 1 wherein said sealing element comprises a perimetrical strip having spaced inner and outer perimetrical sealing portions.

3. A face seal according to claim 1 wherein said web is inclined relative to said element and is hingedly joined to said body and to said sealing element adjacent respective opposite perimetrical edge portions thereof.

4. A face seal according to claim 1 wherein said web extends radially outwardly at an acute angle relative to said sealing element and wherein said sealing means includes a perimetrical sealing flange extending inwardly from the outer edge of said web at an acute angle thereto, said mask body being secured to said flange and being hingedly connected to said sealing element at the junctures of said web with said flange and with said sealing element.

5. A face mask according to claim 4, wherein said mask body is relatively rigid, shape-sustaining and transparent throughout.

6. A face mask according to claim 1 wherein said mask body is formed of transparent material, said mask body having marginal portions at said open side secured to said sealing means and enclosing portions of the face of a user providing full wide angle vision therethrough.

7. A face seal according to claim 1 wherein said sealing element comprises an inner perimetrical seal within said cavity and an outer perimetrical seal without said cavity.

8. A face mask according to claim 7 wherein said web joins said sealing element intermediate said inner and outer seals whereby said inner and outer seals are subjected to a sealing pressure within said cavity and ambient pressure without said face mask respectively.

9. A face mask according to claim 7 wherein said web joins said sealing element intermediate said inner and outer seals and extends outwardly at an acute angle relative to said sealing element.

10. A face seal as set forth in claim 1, said sealing element having a portion extending inwardly of said cavity forming a socket for receiving the chin of a user.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,545,436 Dated December 8, 1970

Inventor(s) Robert L. Holloway

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading under item (73) Automatic Sprinkler Corporation of America should read "Automatic" Sprinkler Corporation of America

SIGNED AND SEALED MAR 29 1971

MAR. 9,1971

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents