

July 2, 1946.

A. H. BULBULIAN

2,403,046

MASK CONSTRUCTION

Filed July 19, 1943

2 Sheets-Sheet 1

FIG. 1.

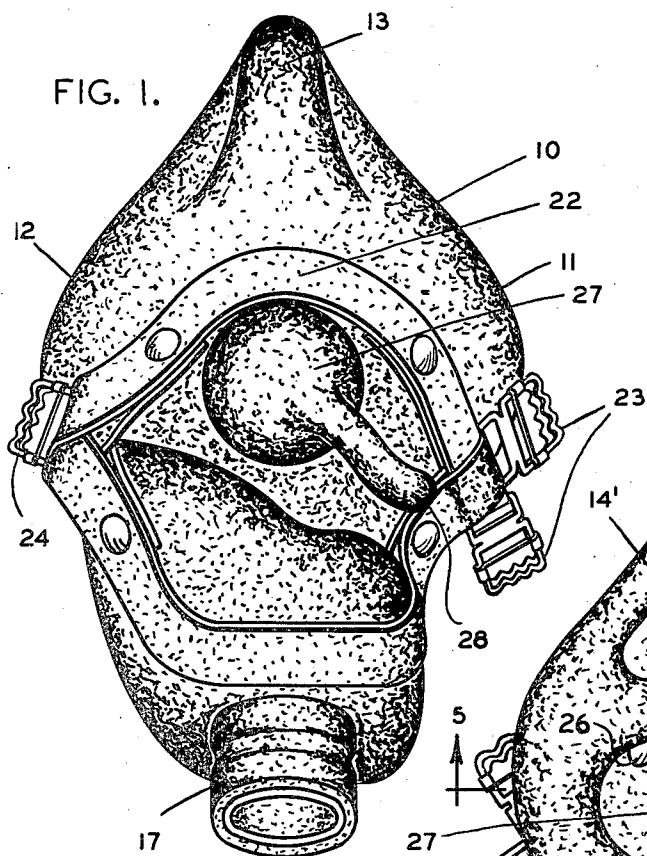
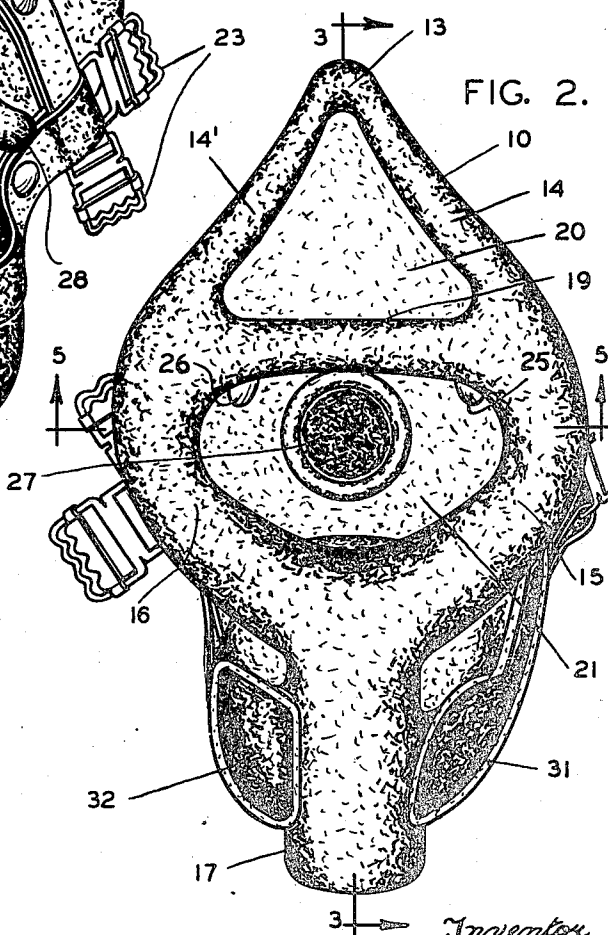


FIG. 2.



ARTHUR H BULBULIAN

By P. A. Whiteley
Attorney

July 2, 1946.

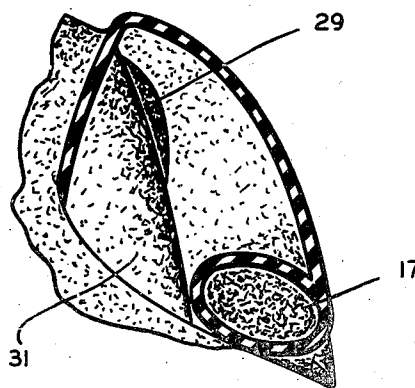
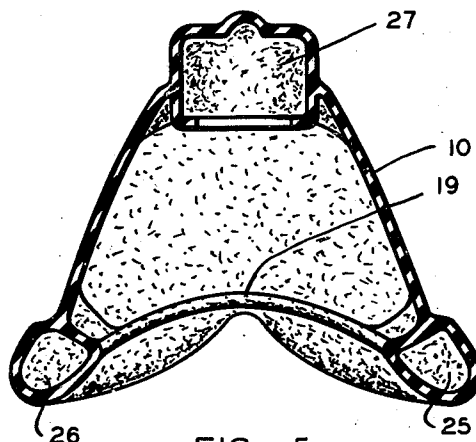
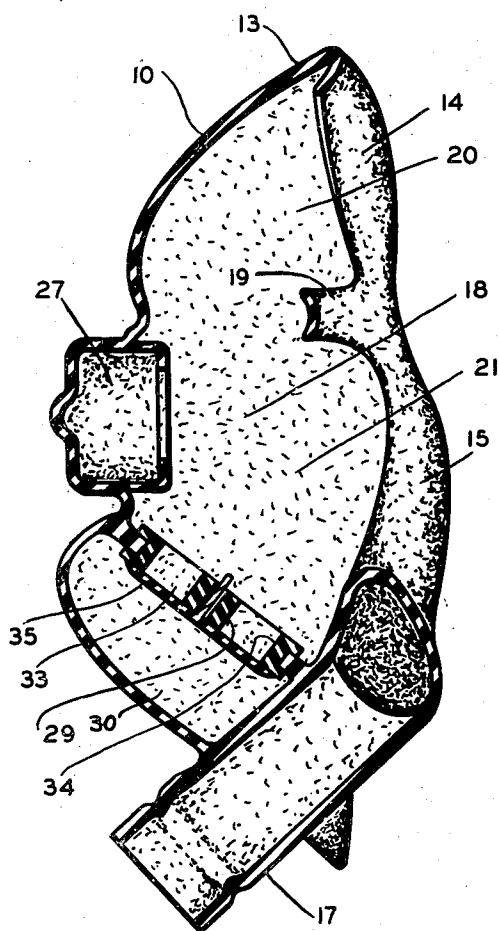
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Inventor
ARTHUR H. BULBULIAN

By *P. A. Whiteley*
Attorney

UNITED STATES PATENT OFFICE

2,403,046

MASK CONSTRUCTION

Arthur H. Bulbullan, Rochester, Minn.

Application July 19, 1943, Serial No. 495,374

5 Claims. (Cl. 128-142)

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My invention relates to a mask construction particularly for the use of aviators at high elevations, and has for its principal object to provide such a mask construction wherein the portions of the body of the mask contacting the face of the wearer are effectively held to make a perfect contact therewith and wherein simple and effective means are provided for holding the mask upon the face of the aviator and wherein novel means are provided for introducing, positioning, and holding the exhalation valve. Essential factors in the production of masks for aviators are efficient sealing on the face of the aviator effected jointly by the contour of the face-contacting surface and parts thereof and by the strapping arrangement applied to the body of the mask itself as related to the means for securing it either to the helmet or to head straps of the aviator in conjunction with the air passages for inhalation and exhalation, the exhalation valve and means of applying it within the mask body.

I have discovered that a very effective sealing means is obtainable by providing a member extending transversely across the breathing chamber which lies upon and is tensioned by contact with the upper lip of the wearer, in conjunction with strapping means which applies pressure across the mask substantially above said lip-contacting member and toward the lower part of the mask, all positioned relative to the mask body itself and to the air outlet and inlet openings to the mask body and to the size of at least one of the air outlet openings so as to hold the mask body itself to make sealing contact with the engaged contours of the face and at the same time to permit ready access of the fingers to the exhaling valve chamber and passageways and to the exhaling valve.

It is an object of my invention, therefore, to provide a mask formed with a body portion having inwardly rolled edges adapted to contact the face and the sides of the nose of the wearer, and having a strip of said mask body extending across the breathing chamber so as to be engaged by the upper lip of the wearer, in conjunction with strapping means secured to the outside of the mask body in such manner that when drawn tight the aforesaid strip will be pressed upon the upper lip of the wearer and will cause the sides of the mask body to be drawn inwardly to effect a good sealing contact with the nose and cheeks of any type of face, even where the bony contours are in certain respects abnormal.

It is a further object of my invention to provide a mask body having a bottom central inhala-

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tion tube branching laterally within the rolled-over edges of the mask body and discharging into the breathing chamber at points just below the outlet of the nostrils and at either side of the mouth, so that when the aforesaid strip is drawn tight upon the upper lip of the wearer, the inlet openings will be conveniently positioned relative to said strip for promoting easy passage of inhalation gas to the breathing passages.

It is a further object of my invention to provide at the point adjacent the bottom of the breathing chamber an exhaling chamber having therein an exhaling valve which opens at each side about the inhaling passageway through short downwardly turned discharge passageways, one of which is made of such a size as to permit both introduction of fingers into the valve chamber and opening up for inspection of the valve.

The full objects and advantages of my invention will appear in connection with the detailed description thereof, and the novel features by which the advantages above outlined are obtained will be particularly pointed out in the claims.

In the drawings illustrating an application of my invention in one of its forms:

Fig. 1 is a top plan view of a mask embodying features of my invention.

Fig. 2 is a bottom plan view of the mask.

Fig. 3 is a sectional view taken on line 3-3 of Fig. 2.

Fig. 4 is a sectional view taken obliquely through the enlarged side openings leading to the valve chamber and showing the extent of said side opening as adapting the mask for insertion of the exhalation valve, and for inspection of the mask chamber.

Fig. 5 is a sectional view taken on the line 5-5 of Fig. 2, viewed in the direction of the arrows.

As shown, the mask body 10 is provided with laterally extending cheek portions 11 and 12 and a forward nose-receiving portion 13, rolled over edge portions 14 and 14' on either side of the nose portion 13 running into tubular edge portions 15 and 16, which in turn extend into a central tube member 17 that leads to the rebreathing bag and to the oxygen supply, either continuous flow or demand-type. There is thus formed in the mask body 10 a breathing chamber 18. Extending across the breathing chamber 18 of mask body 10, as shown in Fig. 5, is a strip 19. This divides the face of the breathing chamber into a nose-receiving portion 20, and a mouth-receiving portion 21. As clearly shown in Fig. 2, the strap or band 19 is curved in such a way that it engages

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the upper lip of an individual when worn and after the same has been strapped by the means hereinafter described, such engagement will tend to draw the face-contacting portions 14 and 14', 15, and 16 into fitting engagement with the contacted portions of the face of the wearer.

These means comprise a strap 22, Fig. 1, which overlies the top front of the mask and is provided at its ends with buckles 23 and 24. These buckles are adapted to be secured to straps, not shown, on a helmet or head harness so that the mask is pulled tight against the face of the wearer. The mask strip 19, shown in Fig. 5, is curved so that the strapping above defined pulls said strip upon the lip of the wearer and tends to draw in the respective sides 11 and 12 of the mask body so as to cause all of the face-contacting margins to fit themselves to the face of the wearer.

As worn, the nose of the wearer will come into the breathing chamber through the opening 20 above the band 19 and the mouth will be exposed to the breathing chamber through the opening 21. The branch tubes 15 and 16 from the central inlet tube 17 open into the breathing chamber at 25 and 26, as clearly shown in Figs. 2 and 5. In this position these inlet openings come below and in substantial close proximity to the openings to the nostrils and at each side of the mouth, so that whether breathing takes place through the nose or the mouth, the inlet gases will be received in a balanced manner. A microphone chamber 27 is positioned in the front of the mask directly in front of the mouth of the wearer and is provided with a sealed tubular extension 28 which may have sealed therein the microphone wire, not shown.

The exhalation valve 29 is located at the bottom of the lower breathing chamber 21 as best shown in Fig. 3. This valve leads to an exhalation chamber 30 located immediately below the microphone chamber 27. From the exhalation chamber 30 extend a pair of exhalation tubes 31 and 32. It will be noted that the exhalation valve is in line with the nostrils behind the band 19 and also substantially in line with the wearer's mouth so that the exhalation gases travel over a short path to the valve and through it into the exhalation chamber and from thence through outlets 31 and 32, straddling and largely surrounding the inhalation tube 17.

The exhalation valve 29 embodies a valve body 33 including a multiplicity of openings 34 therethrough and a dished-type valve flap 35 on the outer face thereof. The form of this valve member makes it only practical to insert the valve from the valve chamber toward the front of the mask. For making practically easy such insertion, I have formed exhalation outlet 31 of a wide cross-section such as to permit the insertion of two fingers into the valve chamber and back of the valve whereby it may be forced into operative position, as indicated in Figs. 3 and 4. The shape of the opening 31 is shown in Fig. 4 as being amply large enough to permit insertion of the first two fingers back of the valve and to get the valve body in place and also to allow opening sufficient for inspecting the chamber back of the valve body, thus enabling a wearer under certain conditions to determine whether ice is being formed back of the exhalation valve and to break up and remove such ice if it is formed.

The advantages of my invention have been quite fully pointed out in the specification heretofore given. These advantages are unusual compactness and simplicity of construction, and par-

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ticularly the means comprising the strip 19 extending across the breathing chamber and contacted by the lip of the wearer which in conjunction with the pressure brought upon it by the strapping means, causes the parts of the construction at the sides of the nose to grip the nose of the wearer at its sides, thus insuring a sealing contact for differing types of nose and cheek contours.

A further great advantage resides in the arrangement of opening of the breathing passages into the breathing chamber so as to have these openings disposed in immediate proximity to both the nasal and oral breathing passageways.

A further advantage resides in the arrangement whereby in the small and compact mask structure disclosed, there are both large air exhalation passages for ready discharge of the gases of exhalation, and at the same time in connection with one of these passages a sufficiently extensible opening to permit positioning and adjustment of the exhalation valve and inspection of the condition of the exhalation chamber back of the valve.

All of these advantages combine to give a construction of exceptionally symmetrical and compact size with very short exhalation passages turned down so that they will readily drain, and one in which the very act of strapping the same firmly upon the face of the wearer has the effect of causing the face-contacting margins to adapt themselves to the contacted contours of cheeks and nose where such contours may, as will frequently be the case, differ very considerably.

I claim:

1. A mask comprising a body portion, face-contacting inhalation tubes about the lower part of the margins of the mask as worn, inwardly turned flap portions about the upper part of the mask as worn, said portions at the apex being engageable by the nose of the wearer, and a strap-like member connected with the tubular portions and the flap portions and positioned to engage the upper lip of the wearer as the mask is worn, thus forming a unitary breathing chamber with two openings thereinto, the upper opening receiving the nose and the lower opening the mouth of the wearer, the strap member being formed and positioned to engage the upper lip under stress so as to cause the contacting portions of the inhalation tubes and the flap members to be drawn inwardly upon the contacted portions of the face of the wearer to seal the breathing chamber about the mouth and the nose.

2. A mask comprising a body portion having margins adapted to contact the face of the wearer and to form a breathing chamber, a strip of material of the body extending across the opening into the breathing chamber and dividing said opening into an upper portion for receiving the nose and a lower portion for surrounding the mouth as the mask is worn, said strip adapted to be positioned beneath the nose and against the lip of the wearer whereby tension on the strip by said lip will cause the contacting margins of the mask to be drawn inwardly upon the contacted portions of the face of the wearer to seal the breathing chamber over the mouth and nose, and an inhalation tube having branches opening into the breathing chamber adjacent the ends of said strip at points below the nostrils and at the sides of the mouth as the mask is worn.

3. A mask comprising a body portion having margins adapted to contact the face of the wearer and to form a breathing chamber, a strip of material of the body extending across the opening

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into the breathing chamber, said strip adapted to be positioned beneath the nose and against the lip of the wearer, an inhalation tube having branches opening into the breathing chamber adjacent the ends of said strip at points below the nostrils and at the sides of the mouth as the mask is worn, a valved exhalation chamber at the bottom of the breathing chamber directly below the nostrils and adjacent the mouth as the mask is worn, and a pair of exhalation tubes leading from said exhalation chamber and straddling the inhalation tube.

4. A mask comprising a body portion having margins adapted to contact the face of the wearer and to form a breathing chamber, a strip of material of the body extending across the opening into the breathing chamber, said strip adapted to be positioned beneath the nose and against the lip of the wearer, an inhalation tube having branches opening into the breathing chamber adjacent the ends of said strip at points below the nostrils and at the sides of the mouth as the mask is worn, a valved exhalation chamber at the bottom of the breathing chamber directly below the nostrils and adjacent the mouth as the

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mask is worn, and a wide exhalation tube leading from said exhalation chamber at one side of the inhalation tube and permitting introduction of the fingers into the exhalation chamber and opening of the same for inspection thereof.

5. A mask comprising a body portion outwardly extending and open at the front so as to enclose a compact unitary breathing chamber as the mask is worn which receives the mouth and nose of the wearer, an inwardly turned wall at the bottom of said breathing chamber immediately below the mouth of the wearer when the mask is worn, means forming an exhalation chamber below the breathing chamber and separated therefrom by said wall, an exhalation valve mounted in the wall and opening outwardly into the exhalation chamber, and an exhalation tube leading from said exhalation chamber, said tube being made wide and flat and extending a short distance so as to permit introduction of the fingers in the tube to open it to enable the exhalation chamber, the separating wall, and the valve opening there-through to be inspected and cleaned.

ARTHUR H. BULBULIAN.