Aug. 31, 1943. A. H. BULBULIAN 2,327,995

MASK ADAPTED FOR USE AT HIGH ALTITUDES

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Fig-1

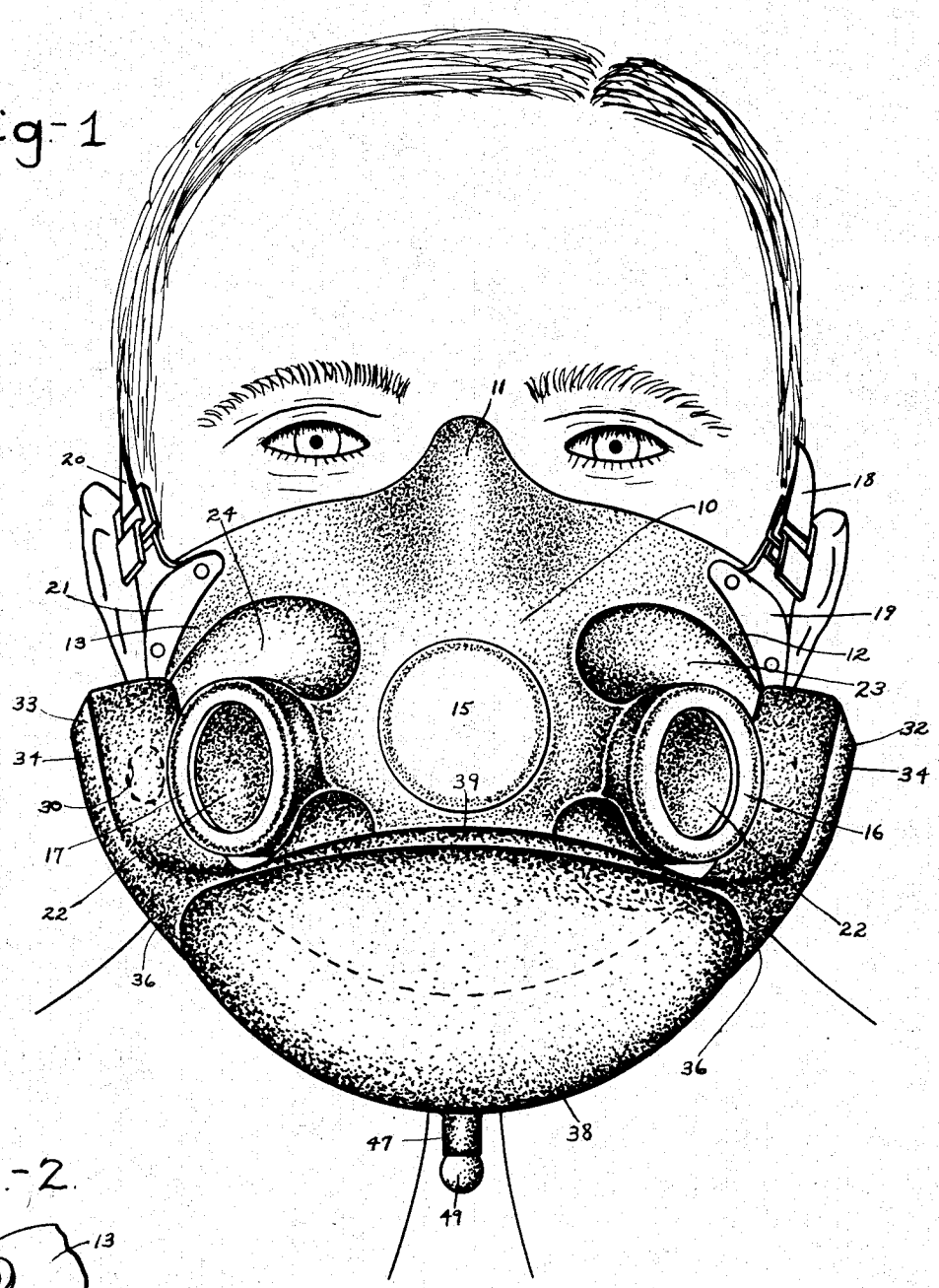
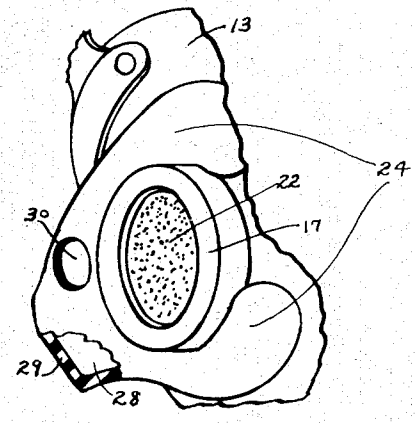


Fig-2.



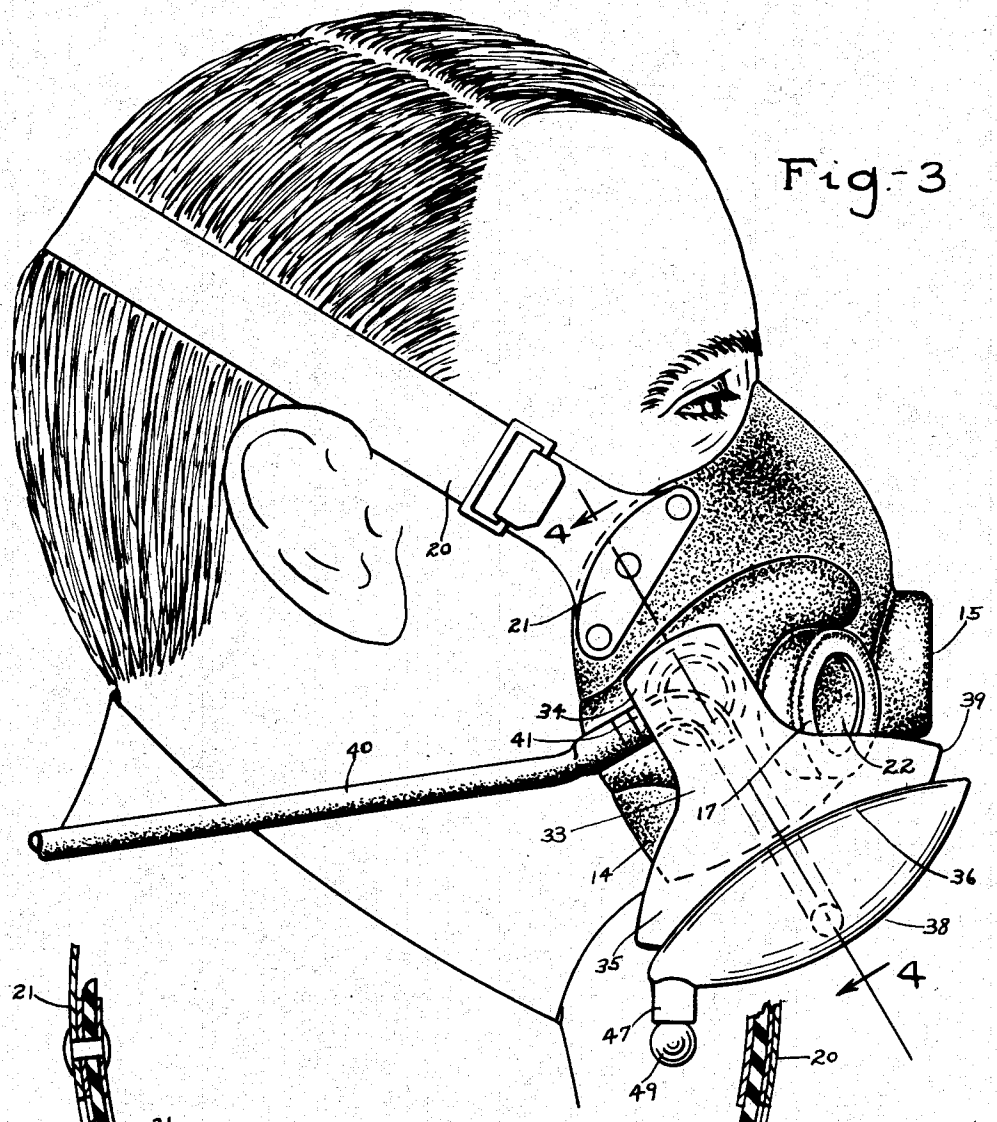
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Fig. 3



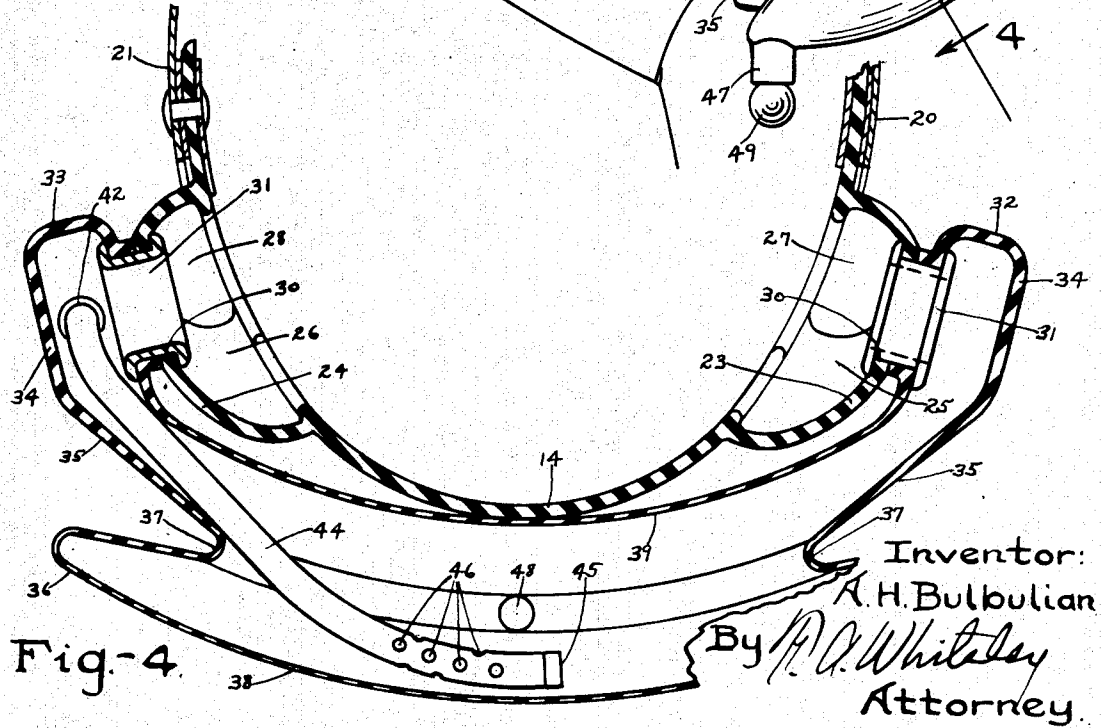


Fig. 4.

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UNITED STATES PATENT OFFICE

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MASK ADAPTED FOR USE AT HIGH ALTITUDES

Arthur H. Bulbulian, Rochester, Minn.

Application September 22, 1941, Serial No. 411,871

5 Claims. (Cl. 128—205)

My invention relates to masks adapted for use at high altitudes and has for its object to provide a mask structure adapted to cover the face of the aviator wherein oxygen is fed to a rebreathing bag so formed and placed as to make the rebreathing bag substantially a part of the mask itself.

In such mask structures employed for flying to very high altitudes the marginal contour of the mask itself may be so arranged as to engage the sides and top of the nose, the upper and side parts of the cheeks and under the chin, completely enclosing the face and providing a breathing chamber between the mask body and the face enclosing both the nose and the mouth. To this breathing chamber is delivered the inhalation gases and from the breathing chamber is expelled the gases of exhalation. Suitable valve mechanism admits and permits expulsion to atmosphere of these inhalation and exhalation gases in desired amounts. The oxygen is normally supplied directly to a rebreathing bag and the exhalation gases go to this rebreathing bag until it is filled with a mixture of oxygen and exhalation gases and thereafter the last part of each exhalation which is most heavily charged with carbon dioxide is expelled through the valve mechanism to atmosphere. On inhalation the rebreathing bag is first emptied and then through the valve mechanism atmospheric air is drawn into the breathing chamber to be mixed with the oxygen.

A difficulty with aviators has been encountered because heretofore it has been regarded as necessary to have the rebreathing bag and the oxygen supply tube depending from the mask structure, where it may interfere with the aviator's actions, particularly in military aviation, for which this type of mask structure is particularly designed. Under certain conditions violent movements on the part of the aviator due to conditions of combat in military aviation or to other causes might catch the bag or the tube and displace or rupture one or both of them with serious results where the flying is at very high elevations. For if elevations of from 30,000 to 35,000 feet are attained, which is now within the flying range of military aviators, interruption of oxygen supply would quickly bring unconsciousness and resulting disaster.

It is a principal object of my invention to provide a rebreathing bag construction which will make the rebreathing bag practically a part of the mask itself and to introduce the oxygen into the rebreathing bag from a tube which comes from behind the aviator and is entirely out of the way of the aviator.

This arrangement is particularly adapted for use in a mask structure corresponding to that disclosed in the application of Walter M. Boothby and myself, Serial Number 388,482. It is an object of my invention, therefore, to adapt the aforesaid mask structure to the holding of a rebreathing bag directly at or adjacent the chin of the wearer and the opening from said rebreathing bag into the breathing chamber at each side of said chamber.

It is a further object of my invention to introduce the oxygen delivering tube at one side of said mask supporting structure and to carry said tube to points adjacent the center bottom of the rebreathing bag so that oxygen will always be delivered uniformly to all parts of the rebreathing bag.

The full objects and the advantages in use of my mask structure are recited in detail in the specification hereinafter given, and the novel features by which the advantageous results desired are attained are particularly pointed out in the claims.

In the drawings illustrating an application of my invention in one form—

Fig. 1 is a front perspective view showing the mask in position as worn.

Fig. 2 is a fragmentary detail view of one of the valve casings showing the manner of opening for inhalation thereinto.

Fig. 3 is a side elevation perspective view of the entire mask structure as worn.

Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 3.

As shown, the mask structure comprises a main body portion 10 which is formed with a nose enclosing portion 11, side parts 12, 13 for engaging the cheeks of the wearer and a bottom part 14 for passing under the chin of the wearer, as clearly shown in Fig. 3. A central microphone turret 15 is provided which will normally be in front of the mouth of the wearer and two valve turrets 16 and 17 are disposed symmetrically in a lateral position at each side of the microphone turret. The entire apparatus will be held on the face of the wearer by suitable strapping means 18, 19 and 20, 21, Fig. 1. Within the valve turrets 16 and 17 are positioned valve discs 22, which may be formed of sponge rubber, or may house any desired type of valve mechanism for permitting inlet of air and outlet of exhalation gases during breathing. Partially surrounding the valve turrets 16 and 17 are outwardly bulged por-

tions of the mask body **23** and **24** which form passageways **25** and **26**. These passageways in the mask of the aforesaid copending application were continued at **27** and **28** to tubular extension members which ultimately united and went to the rebreathing bag. In this invention, however, the parts **27** and **28** are closed, as indicated at **29**, Fig. 2. In other respects the mask structure itself as above detailed may be the same as that of the aforesaid copending application.

An opening **30**, Figs. 2 and 4, extends through the wall of each of the bulged portions **23** and **24**. To this opening on each side is secured by means of a connector member **31**, Fig. 4, a pair of wing-like hollow members **32** and **33**. These members as shown in Figs. 1 and 3 each comprises a base portion **34** by which the connection through opening **30** is made and an inwardly-curved spreader portion **35** of the shape in plan shown in Fig. 3. The rebreathing bag **36** is connected with or actually a continuation of the spreader members **35**, being connected therewith by the loop **37**, which with the base member **38** provides the expansion part of the rebreathing bag. The members **32**, **33** are really a part of the rebreathing bag, being extended at the back in the web **39**, which also, as clearly shown in Fig. 4, has the connector button **31** passing through an aperture therein.

Oxygen from a source of supply not shown is delivered through tube **40** to a connector member **41** through the side of extension **33**, as best indicated at **42** in Fig. 4. A continuation **44** of tube **40** is carried to a point **45** at or just past the center of the bottom of the rebreathing bag as shown in Fig. 4. A series of openings **46** balances the discharge of oxygen to the rebreathing bag.

From the bottom of the bag as indicated in Figs. 1, 3 and 4 extends a drainage tube **47** which opens through a hole **48**, Fig. 4, and is normally closed by a stopper **49**. By withdrawing the stopper from time to time any condensation which may accumulate in the rebreathing bag may be permitted to escape.

The advantages of my invention have been substantially indicated in the foregoing specification. Of particular value and use is the organization of a compact highly protective mask structure to which the rebreathing bag is attached in such a way as to make it in effect a part of the mask itself. As inspection of Fig. 1 illustrating the mask as worn clearly shows, the organization in its entirety is little more bulky and cumbersome than the mask without the rebreathing bag would be, and yet all parts of the entire assemblage are so positioned that they cannot in any way impede or interfere with the movements of the hands and arms of the aviator. The oxygen supply tube coming from behind over the shoulder of the aviator also is positioned so as to be entirely away from any of the aviator's movements.

Another highly important advantage resides in the short passageways between the breathing chamber within the mask body and the rebreathing bag. The breathing chamber being relatively large and over a considerable part of the face of the wearer is heated to some degree by radiation from the face of the wearer but principally by the exhalation gases from the lungs. These gases will first go to the rebreathing bag and because of the short passage thereto will tend to heat the rebreathing bag and the incoming oxygen (which may be very cold), and, further, the rebreathing bag being directly in contact with a portion of the mask there will be less radiation and more constant tempering of the gases of inhalation. The manner in which the oxygen is delivered to the rebreathing bag thoroughly distributes it to the warm exhaled gases, and the short passages from the rebreathing bag into the breathing chamber at each side thereof and from each side of the rebreathing bag, give a uniformly mixed oxygen and rebreathed gases. Further the passages to and from the rebreathing bag facilitate quick filling and emptying of the rebreathing bag, which makes possible exceptionally easy and natural breathing.

I claim:

1. In a mask adapted for use in high altitudes, a mask body having marginal portions for contacting the face so as to enclose and form a breathing chamber extending over the nose and mouth, a rebreathing bag having longer and shorter dimensions secured at the ends of the longer dimension to the mask body so as to be held transversely against it and under the chin of the wearer, passages extending from the mask and into the rebreathing bag at each end thereof for establishing communication with said breathing chamber, and an oxygen supply tube adapted to extend over the shoulder and from behind the wearer, said supply tube being carried into the bag and along it to a point adjacent the center of its longer dimension.

2. In a mask adapted for use in high altitudes, a mask body having marginal portions for contacting the face so as to form a breathing chamber extending over the nose, mouth and chin, a rebreathing bag having longer and shorter dimensions and having substantially T-shaped extensions toward the ends of the longer dimension, the shanks of said extensions being secured to the sides of the mask body so as to hold the rebreathing bag transversely against the chin-enclosing part of the mask body and under the chin of the wearer, openings passing through said extensions from each end of the rebreathing bag and into the breathing chamber, and means for introducing oxygen directly into the rebreathing bag as so held and positioned.

3. In a mask adapted for use in high altitudes, a mask body having marginal portions for contacting the face so as to form a breathing chamber extending over the nose, mouth and chin, a rebreathing bag having longer and shorter dimensions and having substantially T-shaped extensions toward the ends of the longer dimension, the shanks of said extensions being secured to the sides of the mask body so as to hold the rebreathing bag transversely against the chin-enclosing part of the mask body and under the chin of the wearer, openings passing through said extensions from each end of the rebreathing bag and into the breathing chamber, and an oxygen supply tube adapted to extend over the shoulder and from behind the wearer, said supply tube being carried into the bag and along it to a point adjacent the center of its longer dimension.

4. A mask adapted for use in high altitudes comprising a mask body having marginal portions for contacting the face so as to enclose and form the breathing chamber extending over the nose and mouth, inlet openings spaced apart at opposite sides of the mask body, connectors having passageways extending from said inlet openings, an elongated rebreathing bag supported at its ends by said connectors and held thereby close under the chin of the wearer and communicat-

ing with the breathing chamber through the passageways through the connectors, and an oxygen supply tube extending into and to a point substantially midway between said connectors.

5. A mask body adapted for use in high altitudes comprising a mask body having marginal portions for contacting the face so as to enclose and form the breathing chamber extending over the nose and mouth, inlet openings spaced apart at opposite sides of the mask body, T-shaped connectors forming passageways extending from said inlet openings, an elongated rebreathing bag formed integral with and supported at its ends by said connectors and held thereby closed under the chin of the wearer, and communicating at its ends with the breathing chamber through said passageways, and an oxygen supply tube extending into and to a point substantially midway between said connectors.

ARTHUR H. BULBULIAN.