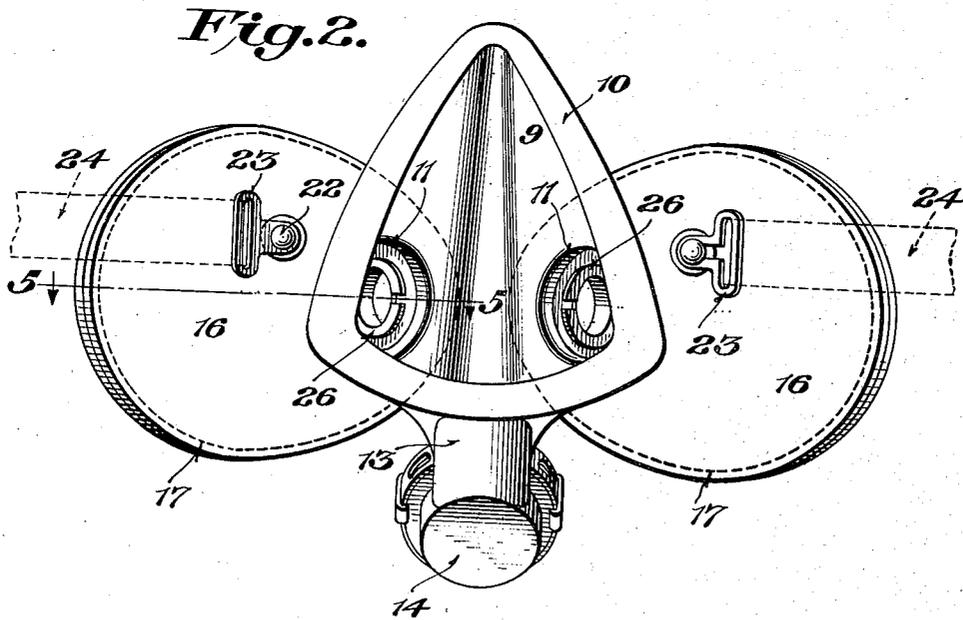
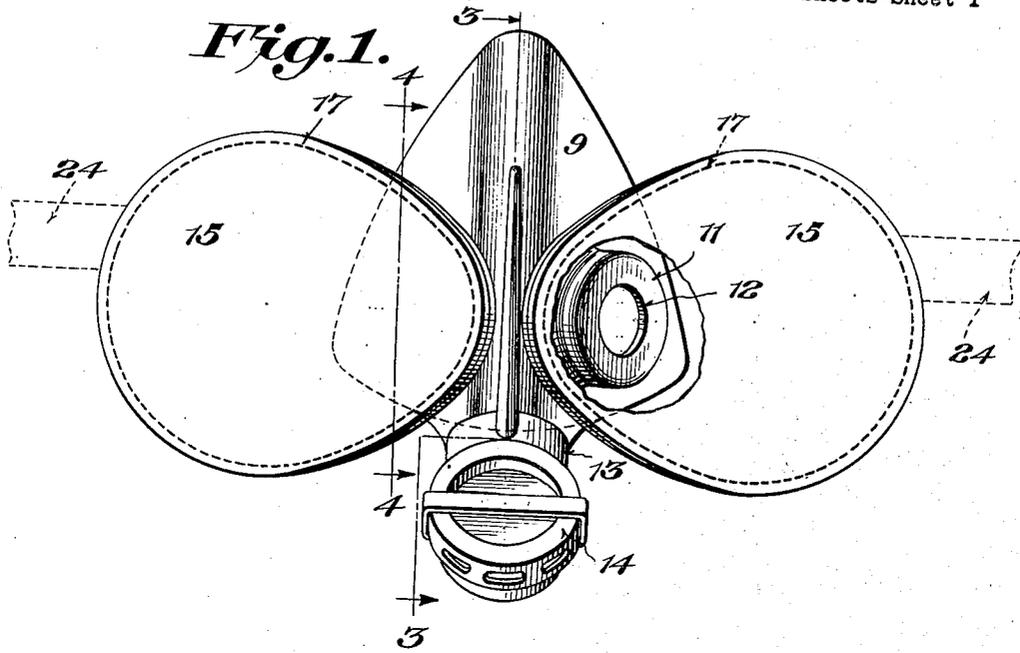


June 18, 1940.

W. A. WHIPPLE
RESPIRATOR

2,205,368

Original Filed Oct. 30, 1937 2 Sheets-Sheet 1



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Fig. 3.

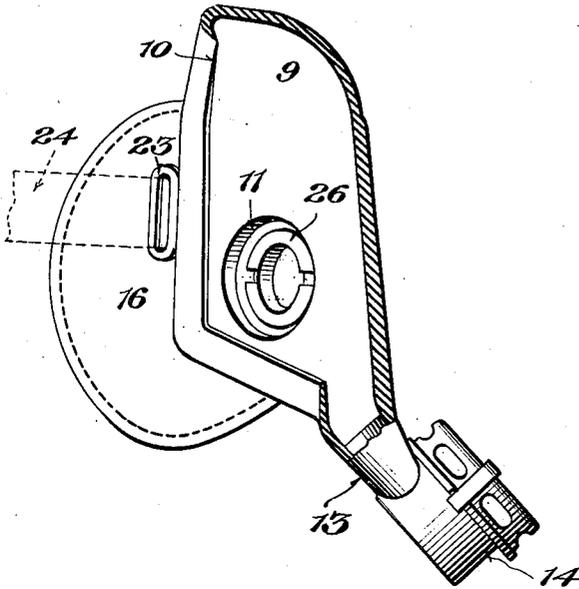


Fig. 4.

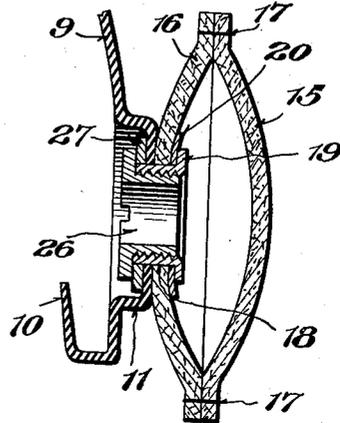


Fig. 5.

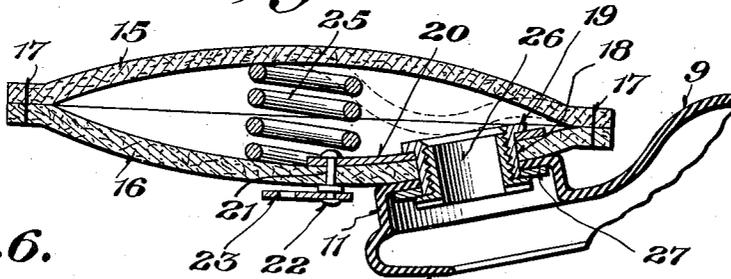


Fig. 6.

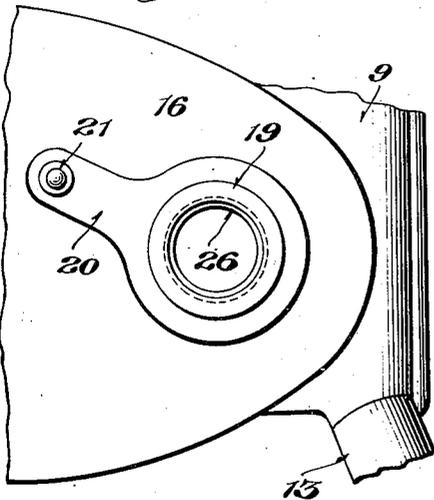


Fig. 7.

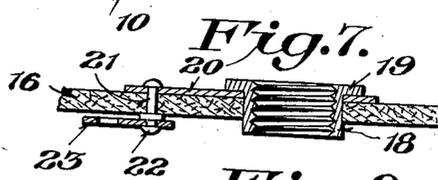
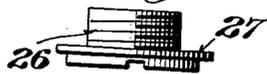


Fig. 8.



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UNITED STATES PATENT OFFICE

2,205,368

RESPIRATOR

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Application October 30, 1937, Serial No. 171,969
Renewed December 1, 1939

4 Claims. (Cl. 128—146)

This invention relates to respirators for filtering flying particles, dust, smoke, and other injurious solid matter from air to be breathed.

Among the objects of the invention are to provide a respirator having filter units of large area, of long useful life, and low breathing resistance; to dispose the filter units on the facepiece of a respirator so that they will not interfere with the vision of the user and so that they do not protrude forwardly from the facepiece and constitute cumbersome parts that are in the way of the user in performance of his work; to provide means whereby the filter units are adjustable with respect to the facepiece to conform to the shape of the user's head; and to provide filter units that easily are attachable, removable, and replaceable bodily as complete preformed entities.

Still another object of the invention is so to form and arrange parts of the respirator that a part of the facepiece easily may be swung from the wearer's face when he wishes to utter audible speech.

When considered with the description herein, characteristics of the invention are apparent in the accompanying drawings, forming part hereof, wherein an embodiment of the invention is disclosed for purposes of illustration.

Like reference-characters refer to corresponding parts in the views of the drawings, of which—

Fig. 1 is a front view of the respirator, a part of the filter fabric being broken away;

Fig. 2 is a rear view thereof;

Fig. 3 is a section on the line 3—3, Fig. 1;

Fig. 4 is a section on the line 4—4, Fig. 1;

Fig. 5 is a section on the line 5—5, Fig. 2;

Fig. 6 is a fragmentary side view, the outer sheet of filter fabric being omitted;

Fig. 7 is a section of a filter-bushing and its associated headband-anchor;

Fig. 8 is a side view of a clamping-ferrule and its washer.

The respirator includes a facepiece 9 formed to cover the nose and mouth of the user. It is sufficiently firm to retain its general shape and to hold parts secured to it, and preferably it is molded of soft rubber so that its face-contacting edge will conform to the contour of the face and rest snugly against the skin. The facepiece, in the embodiment shown, has an intumed face-contacting lip 10 that comfortably rests against the face and affords a tight seal therewith, so that unfiltered air is prevented from being drawn in there during inhalations of the user.

The wall of the facepiece, on each side at about where it covers a portion of the cheek, is offset

as a circular protuberance 11, which houses certain parts later referred to, and its outer wall has a circular intake-opening 12.

The material of the facepiece, below the lower portion of the lip 10, is formed as a neck 13, which contains an exhalation-passage, and which extends forwardly and downwardly. A casing 14, on the end of the neck and in communication with its passage, contains a valve, of any suitable form, arranged to open during exhalation, and to close during inhalation and prevent entrance of unfiltered air.

Air to be breathed enters the facepiece during inhalation through the intake-openings 12. In order that injurious air-suspended solid matter may be prevented from entering the facepiece, the invention provides filter units that are attached to the facepiece at those openings.

Each filter unit comprises outer and inner sheets 15 and 16, respectively, of flexible, rather thick, self form sustaining, filter fabric, such as felt for example. The sheets are of somewhat ovate form, and they constitute the filtering walls of the unit. The sheets are connected together at their peripheral edges in any suitable manner, as by adhesive, or by stitching 17.

Before the two sheets of filter fabric are edge connected together, certain parts are associated with the inner sheet 16. One of these parts is an interiorly-threaded bushing 18, having an annular flange or head 19. The bushing extends through an opening near one end of a headband-anchor 20, which abuts the head 19 and there is held on the bushing by friction. The bushing is pressed through an opening near one end of the inner sheet 16 until the anchor 20 rests against the inside surface of the fabric. The anchor 20 around the bushing acts as a washer under the bushing-head when it is drawn down against the fabric as later described. The anchor is somewhat elongated and extends laterally from the bushing along the filter fabric, and its extended portion terminates above the horizontal diameter of the bushing and above the axis of the filter unit. At or near its extended end it is connected to the fabric by a rivet 21 or other suitable fastener. The fastener has a head 22 on the outside of the sheet 16, the head retaining a holder 23 of a headband 24. This connection of the headband to the filter unit is above the longitudinal axis of the latter. The anchor and the bushing are permanently connected in the filter unit.

Prior to completion of the edge connection of the two sheets of filter fabric, an expanding coil

spring 25 is inserted between them and positioned at or about at the center, and the fastening together of the two sheets then is completed. The spring operates to keep the two sheets separated, except at their peripheries, and thus restrains collapse of the filter fabric.

The filter thus formed is complete in itself as a unitary structure, and is ready for association with a facepiece.

Each of the two filter units for a facepiece is mounted on the latter by pushing the bushing 18 through the opening 12, and an exteriorly-threaded clamping-ferrule 26, having a washer 27 under its head, is screwed from the inside of the facepiece into the bushing until the washer is brought down against the inside of the protuberance 11. During this operation, the bushing may be held in the opening of the inner sheet 16 by pressing the outer sheet 15 against its head, as indicated by dotted lines in Fig. 5. The ferrule-head and its washer are housed in the protuberance and thus spaced from the face, and accordingly they do not have uncomfortable contact with the skin. With such a holding means, the filter-wall and the facepiece-wall are securely clamped between the bushing-washer and the ferrule-washer, and the filter unit thus firmly held on the facepiece.

When a respirator equipped with filter units as described is on the face of a user, those units extend backwardly and are disposed close to the sides of the face, where they are held by the headband and where they do not interfere with any normal activities of the user.

Although the size of the filters in proportion to the facepiece as shown is sufficient to afford filtering areas adequate for reasonably long use before it is necessary to clean them or replace them with others, it is apparent that they may be increased materially in size, within practical limitations, to give greater filtering area to meet extraordinary requirements; and for that purpose, if necessary, they may be enlarged to extend beyond the back of the head without discomfort or encumbrance to the wearer.

Ordinarily, when the filter units are assembled with the facepiece, the units are held in the positions desirable for the average users by tightening the ferrules 26. However, if a user wishes to have the units assume other positions, all that is necessary is to loosen the ferrules and swing the units on their pivots (at the openings 12) to desired positions and then tighten the ferrules. The desired positions of the units may be determined, for example, by placing the respirator on the face, with the ferrules slightly loosened, and connecting the headband around the back of the head, when the units are free to assume positions in response to the urge of the headband. As the headband is attached to the filter units above their longitudinal axes—that is relatively near their upper edges—the natural pull of the headband will not cause the units to turn upwardly enough to cover the ears and interfere with the user's hearing. When such adjustment is made, the ferrules are retightened and the adjustment thus maintained.

When it is desired to remove a filter unit from the facepiece for cleaning, replacement by an-

other, or otherwise, all that is necessary is to turn out the ferrule and thus release the unit. The removed unit may be put back or another unit put on in the manner described for first assembly of the parts.

This invention also is directed to provision of a respirator so formed that its lower part may be swung outwardly and opened from the face when the user wishes to speak audibly in circumstances when it is not dangerous to break the seal of the facepiece with the face, and the particular noninterfering positions of the filter units makes this practicable.

With this in view, the neck 13, which extends forwardly and downwardly below where the facepiece-lip 10 contacts under the lower lip of the user, is somewhat elongated, and the valve-casing 14 may be considered as an extension of the neck for this use.

When the user wishes to speak, he may grasp the neck (or casing) and swing it outwardly and upwardly. This will result in the lip 10 being swung outwardly from under the lip of the user and permit his speech to be heard by those near him. This easily may be done without moving the respirator as a whole from its normal place on the face, and it is not at all interfered with by the rearwardly-extending filter units. When the neck is released, the lower part of the rubber facepiece will of itself resume its normal sealing position.

I claim:

1. A respirator comprising a facepiece having an intake-opening in each side, a filter unit in communication with each of said openings near one end and therein pivotally connected to the facepiece, said units extending rearwardly from their places of connection, and a headband-holder on each of said units to the rear of its pivotal connection and above the center of its connection.

2. A walled filter unit for respirators having an orifice near one end in one of its walls, a washer inside of said unit, a bushing held in said washer, disposed in said orifice, and constituting a member for retaining said unit on a facepiece, and a fastener holding said washer against said orificed wall.

3. A walled filter unit for respirators having an orifice near one end in one of its walls, a washer inside of said unit, a bushing held in said washer, disposed in said orifice, and constituting a member for retaining said unit on a facepiece, and a fastener holding said washer against said orificed wall, said fastener extending through said wall and its outer end being adapted for connection with a headband.

4. A walled filter unit for respirators having an orifice near one end in one of its walls, a washer having a lateral extension inside of said unit, a bushing held in said washer, disposed in said orifice, and constituting a member for retaining said unit on a facepiece, and a fastener extending through said washer extension and orificed wall holding said washer and bushing in place, and the outer end of said fastener being adapted for connection with a headband.

WILLIS A. WHIPPLE.