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FLEXIBLE CONSTRUCTION IN RESPIRATOR MASK FACEPIECE

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Fig. 1.

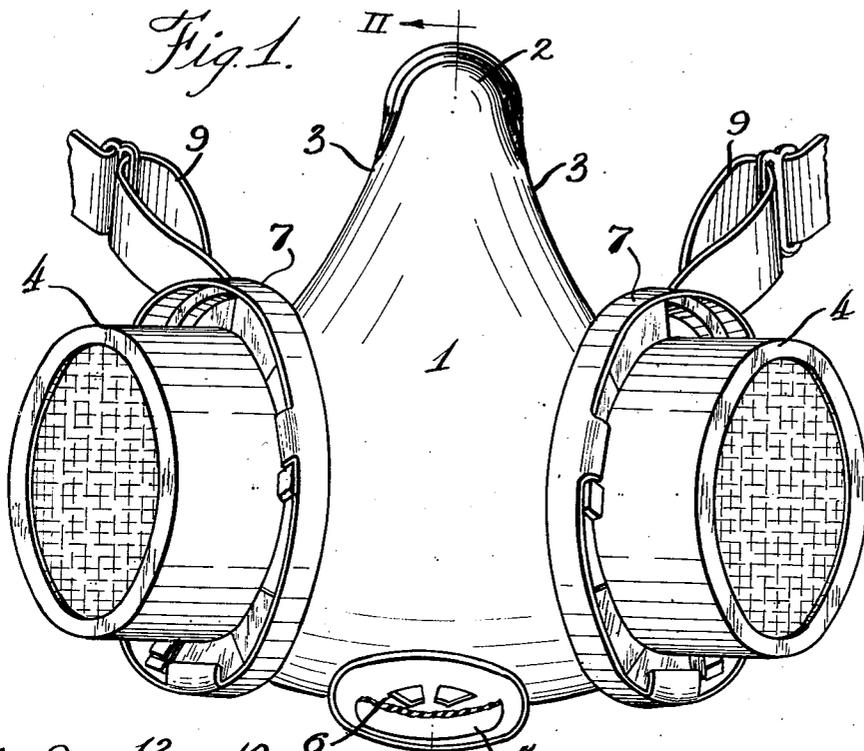


Fig. 2.

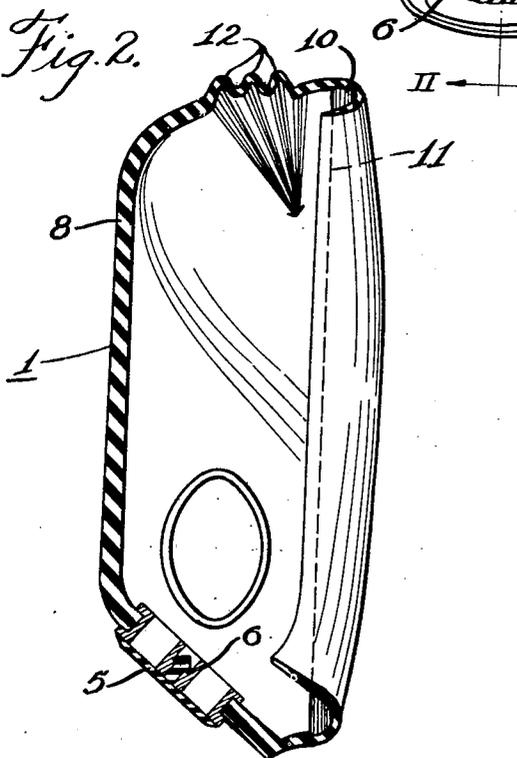
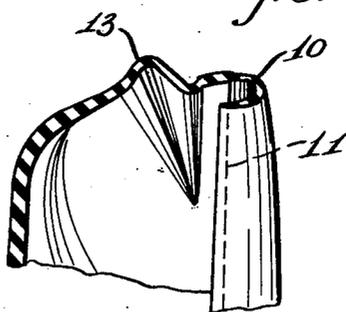


Fig. 3.



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FLEXIBLE CONSTRUCTION IN RESPIRATOR MASK FACEPIECE

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3 Claims. (Cl. 128-146)

The present invention relates to improvements in a respirator of the type which is held in sealing engagement with the face of the wearer along a contour which surrounds the nose, mouth and chin and adapted to give protection against dusts, mists, fumes, gases and vapors of various kinds. An outstanding disadvantage of common designs of the above type of respirator is that they are not comfortable to wear. Therefore, even after they are worn a relatively short time, substantial discomfort results which oftentimes impels the wearer to remove the respirator and thereby expose himself to the deleterious effects of breathing dust and noxious fumes.

A further disadvantage of commonly used types of respirators is that in view of variations in the contours of the nose of the wearer at different levels, the nose bridge portion of the respirator will provide a good fit only when worn at a given level.

A still further disadvantage of commonly used types of respirators is that they are generally complicated in construction, requiring special stiffening material, such as metal wire, bands or straps, and are adaptable to fit a limited number of nose bridge or facial contours, thus requiring the stocking of a number of different sized respirators.

An object of the present invention is to provide a novel respirator which is devoid of the above named disadvantages of common types of respirators.

A further object of the invention is to provide a respirator having a face piece which is extremely comfortable, yet snug fitting, self-adjusting and providing floating, cushioned engagement with the face and a gas-tight seal therewith regardless of whether the face piece is worn high or low, and which is adapted to fit a large variety of facial contours, especially over the critical nose region.

A more specific object of the present invention is to provide, in a face piece of a respirator, a hinged nose bridge portion which is readily yieldable and collapsible and which is adapted to provide at all times cushioned engagement in a gas-tight manner with any selected level of the nose, thereby enabling the face piece to be worn low, in cases wherein goggles are to be worn by the wearer, or high, as desired by the wearer without sacrificing air-tightness.

Other objects and advantages of the present invention will become apparent from a study of the following description, taken with the accompanying drawing wherein:

Figure 1 is a front elevational view of a respirator embodying the principles of the present invention;

Figure 2 is a vertical cross-sectional view taken along line 2-2 of Figure 1 and more clearly showing the pleated nose bridge portion of the respirator embodying the principles of the present invention, and

Figure 3 is a cross-sectional view similar to Figure 2 of a modification of the pleated nose bridge portion, showing a single instead of a triple pleat with a portion broken away.

Referring more particularly to Figure 1 of the drawing, numeral 1 denotes a face piece which is preferably molded of rubber or similar flexible material and which is cup-shaped and somewhat triangular or pear-shaped in contour. Face piece 1 is designed to cover the nose, mouth and chin of the wearer and adapted for air excluding contact between the face-contacting periphery thereof and the face of the wearer. Face piece 1 has a top convex nose bridging portion 2 and two side concave portions 3 which surround the nose. Attached to each of the lower lobes of face piece 1 are a pair of readily

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detachable and replaceable filter or cartridge units denoted generally by the numeral 4. The lowermost portion of the face piece surrounds the chin, and adjacent thereto is an exhalation valve 5 comprising, for example, a rubber diaphragm which is centrally supported on a perforated replaceable wheel-like element 6 of the respirator.

Replaceable cartridge or filter units 4 may be readily attached to or detached from supporting bases 7 of the respirator by wedge-shaped radial extensions at the bases of the filter units which are engageable with radially inwardly extending flanged portions of the base as shown. Other types of units and other modes of connection, such as a screw threaded connection between the base of the replaceable unit and the receptacle or support attached to the respirator may, of course, be substituted. The respirator is held against the face of the wearer by means of straps 9.

An important feature of the invention resides in the specific shaping of the face piece 1 along the face contacting marginal portion thereof and, more particularly, the nose bridge portion, in order to provide amazing improvement in comfort to enable the wearer to wear the respirator for a long period of time before discomfort is apparent as well as to allow automatic, cushioned adjustment of the nose bridge to varying contours of the noses of different wearers or at different nose levels of the same wearer. Face piece 1 has an inwardly curved, face contacting marginal portion 10 which, at the nose bridging portion 2, extends of the order of 3/16 inch outwardly from a parting line 11 denoted by dash lines and progressively increasing to a slightly greater distance along the cheek-contacting edge portions for providing air-excluding contact with the varying facial contours. The marginal edge portion or face contacting portion 10 extends substantially along a flat plane principally at the nose bridging portion in order to make it more adaptable to fit varying nasal contours and in order to permit the respirator to be worn either high or low on the nose with equally efficient face-contacting, air-excluding engagement without discomfort. The inwardly turned, face-contacting edge portion is greatly reduced in thickness beginning from the parting line and extending along its entire curvature, being preferably about 0.024 inch in thickness around the entire nose bridging portion and increasing abruptly in thickness elsewhere to perhaps double or more at the parting line and finally to about 0.125 inch along the front wall portion. Thus, the front wall portion will give sufficient rigidity to the face piece so as to retain a given cup shape without the use of stiffening elements, whereas the abruptly thinner in-turned marginal portion will be extremely yieldable and collapsible so as to form a cushion-like, air excluding contact with the face which will enable it to mold itself to varying facial features encountered with the exertion of very slight pressure, thus giving an air-tight seal without noticeable pressure points that result in discomfort, particularly about the bony nasal region.

In order to provide even greater cushioning and automatic adjustment of the nose bridge portion to varying contours of the nose of the wearer, this portion is molded with a plurality of pleats such as 12. The thickness of the pleated portion is substantially less than that of the front wall portion so that the pleats may be readily collapsible and will readily yield under resistance offered by the nose of the wearer, particularly when the nose piece is moved downwardly in elevation and supported on the lower portion of the nose. Thus, the accordion-like pleats in the nose bridge portion will allow wearing of the mask or face piece equally well either high or low on the varying nose bridge contours. It also provides self-adjustment of the vertical span variation between the under chin and the nose bridge, thus permitting the mask to conform to a far greater variety of facial contours. In addition, the over-all comfort of the respirator is materially improved, particularly since the progressive compression afforded by the pleats in the nose bridge portion greatly reduces the pressure on the nose, which is the part of the face most sensitive to pressure because this is the boniest region of contact between the mask and face of the wearer, thereby offering the wearer amazingly improved com-

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fort in spite of long periods during which the respirator is worn.

The pleats may extend throughout an angle of perhaps 5° to 90° from a vertical plane at right angles to Figure 2, preferably through an angle of about 35° with the vertical. The pleats may extend about an arc of about 85° in the plane of Figure 1 or between 5° and 150°, or perhaps even greater, so as to provide adjustment and cushioning about the entire perimeter of the nose engaging portion. The outermost limit of the pleats in the plane of Figure 2 may be at a level of about $\frac{5}{16}$ inch above the uppermost level of the in-turned marginal portions, and the total height of the pleats may be of the order of 1 inch.

Although three pleats are shown in Figure 2, for purposes of illustration, it will be apparent that other numbers of pleats may be selected, such as two, four, or more, or perhaps a single pleat such as shown in Figure 3.

The single pleat shown in Figure 3 extends through an arc in the plane of the drawing of about 35° from the vertical although it will be apparent that the arcuate movement of the pleat may be anywhere between 5° up to about 90° to allow any desired range of pivotal movement of the nose bridging portion relative to the remainder of marginal portion 10 about a forward arc of the nose bridging portion of the mask or face piece.

Thus, as the respirator is pressed against the face of the wearer or moved downwardly, the nose bridging portion, because of its inclusion of pleats, will readily collapse to allow a forward hinging motion of the nose bridging portion and of the inwardly turned marginal edge portion surrounding the nose and thereby provide a readily yieldable and comfortable fit in a gas-tight manner about any part of the nose or about any nasal contour of the wearer.

Thus it will be seen that we have provided a highly efficient face piece construction for a respirator or similar apparatus, having a face-engaging cushioned and extremely comfortable fit and having a pleated nose bridge portion which is readily collapsible, thereby providing a yieldable fit with the nose of the wearer regardless of whether the respirator is worn high or low on the nose and regardless of varying nasal contours of different wearers and which insures a perfectly gas-tight fit with

amazing comfort of wear irrespective of the fact that the respirator may be worn over long periods of time.

While we have illustrated and described two embodiments of our invention, it will be understood that these are by way of illustration only, and that various changes and modifications may be made within the contemplation of our invention and within the scope of the following claims.

We claim:

1. A respirator comprising a face piece of resilient material of substantially cup shape having a marginal portion adapted to surround the nose, cheeks and chin of the wearer, and having a pleated portion of said marginal portion comprising a plurality of pleats running over the nose piece spaced at the nose axis and terminating at points on either side of the nose piece such as to give an accordion effect and to allow said marginal portion surrounding the nose to pivot forwardly, as the result of collapsing movement of the pleated portion, at an angle with respect to the remainder of said marginal portion, thereby providing a yieldable, cushioned fit between the respirator and the face of the wearer, particularly about the nose.

2. A respirator as recited in claim 1 wherein said pleated portion extends about the nose through an angle of about 150° and extends forwardly of the wearer through an arc of the order of 35° and wherein said pleated portion tapers to hinge points on opposite sides of the nose surrounding portion.

3. A respirator as recited in claim 1 wherein said pleated portion comprises a plurality of pleats extending forwardly of the wearer throughout an arc of between 5° and 90° and having a periphery about the nose of the wearer which extends through an arc of between 5° and 150° and wherein the pleats terminate at hinge points opposite the nose surrounding portion.

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