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2,578,007

RESPIRATOR

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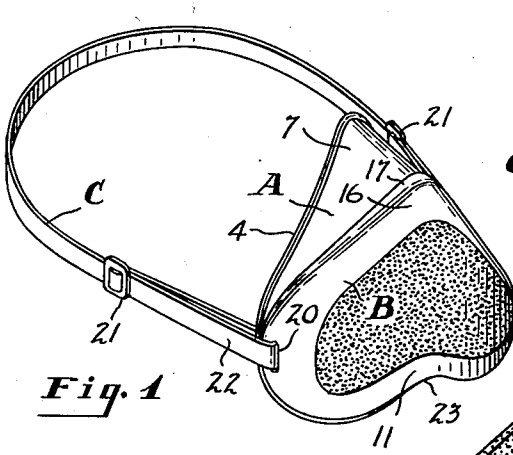


Fig. 1

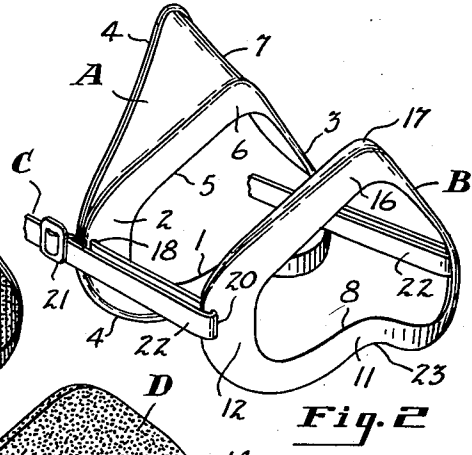


Fig. 2

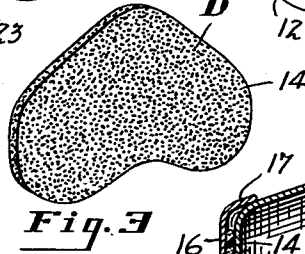


Fig. 3

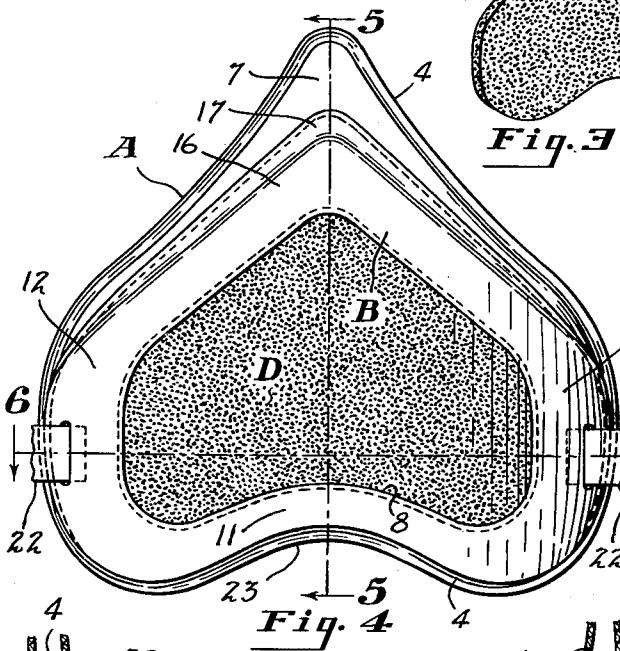


Fig. 4

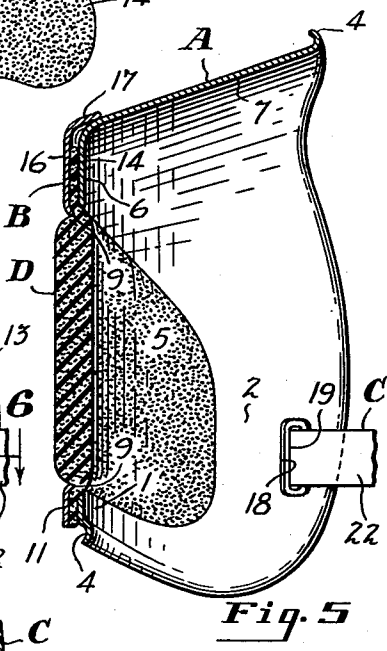


Fig. 5

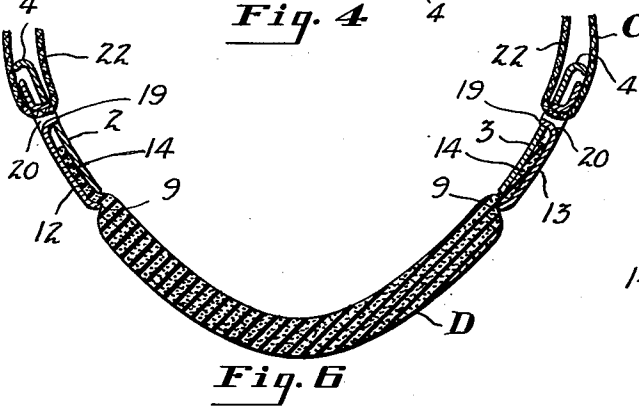


Fig. 6

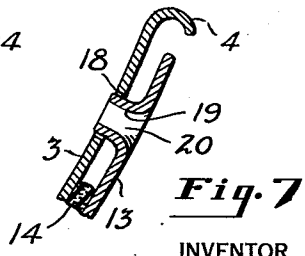


Fig. 7

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RESPIRATOR

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11 Claims. (Cl. 128-146)

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This invention relates to respirators, more particularly to mask type respirators preferably having separable parts or members for marginally clamping a filter element to support such element across central breathing openings in the members.

Mask respirators are extensively used in industries in which work is done in an atmosphere laden with dust or other foreign particles that are objectionable or harmful when breathed. Such respirators are also used by individuals subject to hay fever and other allergies to filter the air they breathe. From time to time it becomes necessary to replace or cleanse the filter element when it is soiled or loaded with dust or other foreign particles. The old filter is cleansed as by washing and replaced between the clamping members for re-use, or the old filter element is discarded and replaced by a new one. In atmospheres having relatively high concentrations of dust, paint or other foreign materials or particles it is desirable to change the filter element at frequent intervals.

One of the principal objects of the present invention is therefore to provide a mask type respirator of simplified construction and few parts, all of which can be instantly disassembled, removed or replaced by hand and in which the removal and replacement of the filter element is facilitated. As a preferential arrangement the separable frame members which clamp the filter element in place include means providing an interlocking connection so that a filter element is retained in clamped relation between the frame members when the mask is removed from the face of the wearer, and so that the separable frame members hold together and retain their clamping grip on the filter element while the mask is being donned and adjusted in place by the wearer.

Another object is to provide a mask type respirator of separable inner and outer members in which one of the members, such as the inner member, is of greater area or extent than the other member and includes a lateral bridge or nasal portion for overlying the nose of the wearer.

Another object is to provide such a respirator in which the separable frame members are formed of thin shape-retaining sheet material, the inner member having an outwardly rolled guard or edge flange which extends outwardly beyond the plane of the outer member to prevent the cheeks of the wearer from coming in contact with the edges of the outer member.

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A further object of the invention is to provide a separable frame type respirator in which alined openings are provided in the side portions of the frames and a head band is laced or threaded through the alined openings to hold the separable frame parts in assembled relation. As a preferential arrangement, loops of the head band are threaded through the alined side openings or apertures of the frame members, the frame members remaining threaded on the loops when separated from one another for filter replacement, and the head band loops serving to guide the frame members as the latter are moved together into predetermined clamping relation.

Still further objects and advantages relate to certain details of construction and arrangements of parts which will become apparent as the following description of a preferred embodiment of the invention is set forth. This description is made in connection with the accompanying drawings forming a part of this specification. Like parts throughout the several views of the drawings are indicated by the same letters and numerals of reference.

In the drawings:

Figure 1 is a perspective view of a mask type respirator having separable frame parts and a filter clamped therebetween, and including a band for holding the device in place on the head of the wearer;

Fig. 2 is a perspective view of the respirator with parts broken away and without the filter element, the frame members being drawn apart or separated from one another while remaining threaded on the loops of the head band;

Fig. 3 is a perspective view of a suitable filter element;

Fig. 4 is a front elevational view of the respirator mask with parts of the head band broken away and removed, this view being enlarged with respect to the preceding figures;

Fig. 5 is a vertical sectional view with parts broken away and removed taken substantially on the line indicated at 5-5 of Fig. 4;

Fig. 6 is a sectional view with parts broken away and removed, taken substantially on the line indicated at 6-6 of Fig. 4; and

Fig. 7 is a sectional detail through the frame members at one side of the respirator showing the interlocking snap fit connection between the parts and also showing one of the pairs of alined frame openings for receiving a loop of the attaching head band.

The respirator comprises inner and outer frame members A and B, respectively, and an attaching

head band C. The frame members are formed of shape-retaining material, preferably being relatively thin and somewhat resilient so as to conform to varying facial contours of different persons. Although the frame members may be stampings of thin metal, such as aluminum sheet, it is preferred to use a thermosetting or thermoplastic material such as a phenol formaldehyde resin of methyl methacrylate. The frame members can be formed as by injection molding of a suitable plastic material, or, if a thermoplastic is used, the frames may be formed of sheet material cut and shaped in presses.

The inner frame member is cupped to receive the nose and mouth of the wearer and has a bottom portion 1 which extends across and rests against the chin of the wearer. Side portions 2 and 3 are curved rearwardly away from the plane of the chin or bottom portion 1, the side portions having inwardly directed confronting faces which are normally disposed flatwise against the cheeks of the wearer. The inner frame member is formed with outwardly curved or rolled edges providing integral beads 4 which prevent the frame from cutting into the wearer's cheeks, thus providing a more comfortable fit. The rolled bead edge also strengthens the inner frame member to resist breaking and collapsing of the same.

In the front of the mask the inner frame A is formed with a heart or V-shaped breathing opening 5 across which is disposed filter element D which may be formed of sponge rubber, fibrous glass, or cotton gauze. Above the breathing opening the inner frame member A includes a front portion 6 disposed approximately in the same plane as the chin portion 1 and having a rearwardly extending angularly disposed flange 7. This flange, integral with the inner frame member, also extends along the top edges of the side portions 2 and 3 providing an enclosing bridge for the wearer's nose. As shown in Fig. 4 the bridge flange 7 is generally of inverted V shape and tapers in width down the sides of the mask. The rolled edge 4, continuous across the bottom edge of the inner frame member A including the front portion 1, is also extended upwardly along the rear edges of the nasal bridge 7 so that a continuous outwardly rolled edge is provided about the entire peripheral extent of the inner frame member A.

The outer frame member B is complementally shaped with respect to the inner frame member but is of less area or extent than the latter. Breathing opening 8 in the outer frame member B corresponds in shape to the breathing opening 5 of the inner frame member but is slightly less in area, the edge of the outer frame member about the breathing opening being curved or flanged inwardly as indicated at 9 to bite into the material of the filter element D and to displace the filter element inwardly into the breathing opening 5 of the inner frame member.

The filter element may be any suitable porous material such as a woven gauze, fibrous glass, or sponge rubber, mentioned above, or terry cloth or natural or artificial sponge. Displacing the filter element inwardly by the pressure of the inturned edge 9 of the outer frame member causes the filter element to imbed or cover the edges of the inner frame member about the breathing opening 5. Thus the inner frame edges are cushioned by the material of the filter element and objectionable pressure against the face of the wearer by such edges is avoided.

The outer frame member includes side and front portions 11, 12, 13 and 16 corresponding respectively to the portions 1, 2, 3 and 6 of the inner frame member A. These corresponding portions of the inner and outer frame members are shaped complementally to the same contours, providing confronting faces which clamp marginal portions 14 of the filter element D around the entire periphery of the latter. The clamping area is relatively large around the entire extent of the breathing opening so that withdrawal of the edges of the filter element from between the frame members is avoided. Slight lateral displacement of the filter element is permitted, however. Additionally, the assembly of new or fresh filter elements between the frame members and across the breathing opening is readily effected in the present respirator since the wide marginal gripping area provided makes it unnecessary to locate the filter element precisely with respect to the breathing opening.

Along the upper edge of the front portion 16 of the outer frame member is formed an integral angularly disposed flange 17 which is arranged to overlie an arch portion of the nasal bridge 7 of the inner frame member to locate the two frame members in predetermined relative positions and to support the outer frame member on the inner. Piloting or guiding of the frame members to locate them in predetermined relation with respect to one another is provided by the lateral flange 17 which has sliding engagement on the upper surface of the nasal bridge 7 as the frame members are moved together in assembling the respirator.

At each side of the mask respirator the side portions 2 and 3 of the inner frame member are formed with vertically elongated openings 18 which receive matching tubular extensions 19 formed integrally on the adjacent side portions 12 and 13 of the outer frame member. Each of the tubular extensions 19 is received in the associated socketlike aperture 18 of the inner frame member A with a snap fit. Thus the tubular extensions constitute interlocking means for retaining the frame members in assembled relation.

The head band C is in the form of a flexible strap or tape formed of woven fabric material, leather or plastic. Preferably the head band is elastic to retain the respirator frame snugly against the wearer's face and may be of molded rubber for frictionally engaging the wearer's head to resist slipping. Suitable elasticity is also present in conventional elastic tape made of woven fabric material, incorporating elastic or rubber strands. In assembling the respirator the ends of a suitable length of band or tape are threaded through openings 20 in the tubular extensions 19, the ends of the tape or band also passing through the openings 18 of the inner frame member. These ends of the band are then secured to slide buckles 21 on the body of the band, thus providing loops 22 in the ends of the band or tape which are threaded through the aligned openings 18 and 20 of the frame members. By sliding the buckles 21 along the main portion of the head band the size of the band and the loops 22 may be adjusted.

As shown in Fig. 2 the inner and outer frame members A and B may be separated from one another for renewal and replacement of the filter D while the frame members remain threaded on the band loops 22.

To change or replace the filter element D while

the respirator is being worn, the user, after drawing outwardly on the side portions 12 and 13 of the outer frame member to release the snap fit interlock of the tubular extensions 19 in the apertures 18, merely draws the outer frame member B forwardly and away from the inner frame member A, allowing the latter to remain in position over the nose and mouth. The elasticity of the head band C permits the frame members to be separated from one another, the band loops 22 sliding through the side openings 18 of the inner frame member. With the frame members thus separated the filter element D is released from clamped position between the confronting faces of the frame members, permitting it to be removed or withdrawn from the breathing opening in the front of the mask. With the outer frame member still withdrawn a new or replacement filter is then disposed across the breathing opening 5 of the inner frame member and the outer frame member returned to clamping position.

Should the respirator be first removed by the wearer for replacement or renewal of the filter element, the frames may be separated by springing apart the side portions 12 and 13 of the outer frame member to withdraw the tubular extensions 19 from the apertures 18 of the inner frame member, thus releasing the frame members from their clamping engagement on the filter element. The loops 22 of the head band C remain threaded through the aligned openings of the frame members and serve as piloting means, guiding the parts together when the frame members are clamped about the new filter element.

In addition to providing an interlocking connection between the frame members, the tubular formations 19, in cooperation with the locating flange 17, serve as locating indexes which correctly align the frame members so as to position the breathing opening 5 of the inner frame member in precise relation to the breathing opening 8 of the outer frame member. This correct positioning of the parts is effective in maintaining the proper relationship between the inturred edge flange 9 formed on the outer frame member B about the breathing opening.

While the breathing opening may be of any suitable size or shape it has been found advantageous to make it of generally inverted V shape as shown in Fig. 4, the front portions I and II of the frame members across the bottom of the mask being curved or recessed upwardly as indicated at 23 to correspond to chin anatomy.

In accordance with the provisions of the patent statutes, the principles of the present invention may be utilized in various ways, numerous modifications and alterations being contemplated, substitution of parts and changes in construction being resorted to as desired, it being understood that the embodiment shown in the drawing and illustrated above is given merely for purposes of explanation and illustration without intending to limit the scope of the claims to the specific details disclosed.

What I claim is:

1. A mask type respirator comprising an inner frame member receivable against the face of a wearer and having a central breathing opening, an outer frame member receivable over the inner frame member, a filter element interposed between the members and extending across said opening, and a retaining band for holding the members in place, the frame members having aligned apertures and the band having at least

one loop extending through the aligned apertures in the frame members and serving to hold the frame members together when the band is tensioned about the head of the wearer.

2. A mask type respirator comprising inner and outer frame members receivable together in nesting relation, at least one of the members being formed of thin shape retaining sheet material having angularly disposed edge flange portions located laterally beyond the corresponding edges of the other frame member, a filter element receivable between the frame members, the latter defining a breathing opening and having complementary surfaces around the opening for clamping the filter element, side portions of one of the members having band receiving openings, corresponding side portions of the other member having matching openings defined at least in part by integral flanges which extend into the band receiving openings of said one member to retain the frame members together, and a head band having portions threaded through the matching openings of the frame members for holding the latter in place on the face of the wearer.

3. A mask type respirator comprising separable shape retaining frame members and a filter element receivable therebetween, the frame members having complementally formed portions extending around a breathing opening for clamping the edges of the filter element and supporting the latter across the opening, and one only of the frame members including an integral laterally extending portion angularly disposed with respect to the clamping portion of said one member for overlying and enclosing the wearer's nose, such extension portion being at an angle to the plane of the breathing opening and the other frame member being of substantially less area than said one frame member.

4. A mask type respirator comprising separable shape retaining inner and outer frame members and a filter element receivable therebetween, the frame members having complementally formed portions extending around a breathing opening for clamping the edges of the filter element and supporting the latter across the opening, and the inner frame member only including an integral laterally extending portion angularly disposed with respect to the clamping portion on the inner frame member for overlying and enclosing the wearer's nose, such extension portion being at an angle to the plane of the breathing opening and the outer frame member being of substantially less area than the inner frame member.

5. A mask type respirator comprising separable shape retaining frame members, a filter element receivable therebetween, the frame members having complementally formed portions extending around a breathing opening for clamping the edges of the filter element and supporting the latter across the opening, side portions of the frame members having aligned band receiving openings, projections on one of the frame members receivable within the band openings of the other frame member to lock the frame members together, and band means extending through the band openings.

6. A mask type respirator comprising inner and outer open center frame members receivable in nested relation over the nose and mouth of a wearer, a filter element disposed between the frame members and across the open centers thereof, means for holding the frame members on the head of the wearer and means interlock-

ing the frame members for holding the latter together, said interlocking means including a through aperture in one member and a raised element on the other member receivable in the aperture of said one member.

7. A mask type respirator comprising inner and outer open center frame members receivable over the nose and mouth of a wearer, a filter element, a head band for holding the frame members in place, the frame members being nested one within the other and having complementary surfaces for receiving and clamping the filter element therebetween, the inner frame member having opposite side portions formed with cheek contacting faces disposed in generally confronting relation to one another, the head band having ends attached to corresponding points of the frame members, and interfitting snap fit formations on the frame members in pairs for holding the latter together with the filter element clamped therebetween, the snap fit formations being located one pair on each side of the nose receiving portions of the frame members at said band attaching points.

8. A mask type respirator comprising a frame receivable against the face of a wearer and having a central breathing opening, a filter element disposed across said opening, said frame including inner and outer members disposed in nested relation and clamped upon the edges of the filter element, and a head band for retaining the frame in place, the inner and outer frame members having aligned apertures and the head band extending through said aligned apertures to hold the frame members together when the band is tensioned about the head of the wearer.

9. A mask type respirator comprising a generally heart shaped frame receivable against the face of a wearer and having a central breathing opening, a filter element disposed across said opening, said frame including inner and outer members disposed in nested relation and clamped upon the edges of the filter element, the frame having a lower edge portion recessed upwardly to receive the chin of the wearer, and a head band for retaining the frame in place, the inner and outer frame members having aligned aper-

tures and the head band extending through said aligned apertures to hold the frame members together when the band is tensioned about the head of the wearer.

10. A mask type respirator comprising a generally heart shaped frame receivable against the face of a wearer and having a central substantially heart shaped breathing opening, a filter element disposed across said opening, said frame including inner and outer members disposed in nested relation and clamped upon the edges of the filter element, and a head band for retaining the frame in place, the inner and outer frame members having aligned apertures and the head band extending through said aligned apertures to hold the frame members together when the band is tensioned about the head of the wearer.

11. A mask type respirator comprising a frame receivable against the face of a wearer and having a center filter opening, a filter element disposed against said opening, said frame having inner and outer members disposed in nested relation, interlocking means for holding the frame members together, said interlocking means including a through aperture on one member and a raised element on the other member receivable in the aperture of said one member, and a head band for holding the frame members on the head of the wearer, said head band extending through said aperture.

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