

July 14, 1959

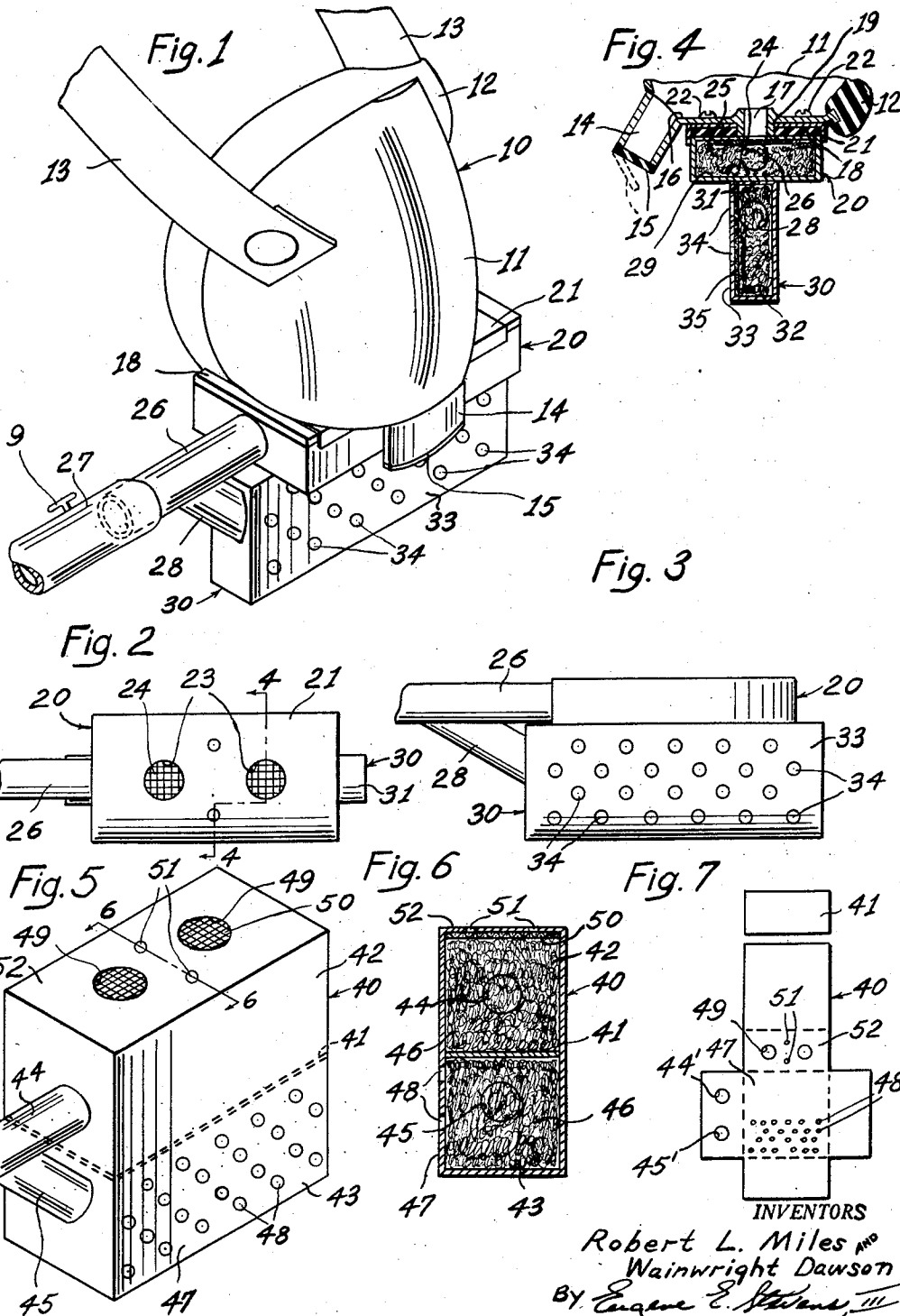
R. L. MILES ET AL

2,894,508

RESPIRATOR

Filed May 18, 1956

2 Sheets-Sheet 1



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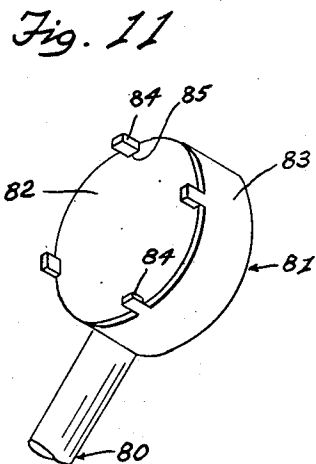
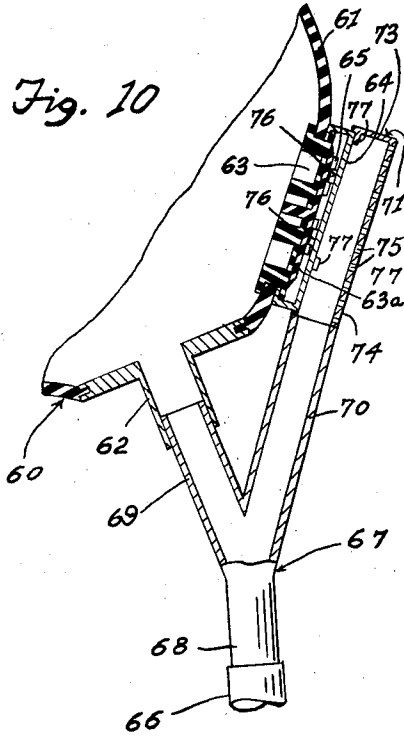
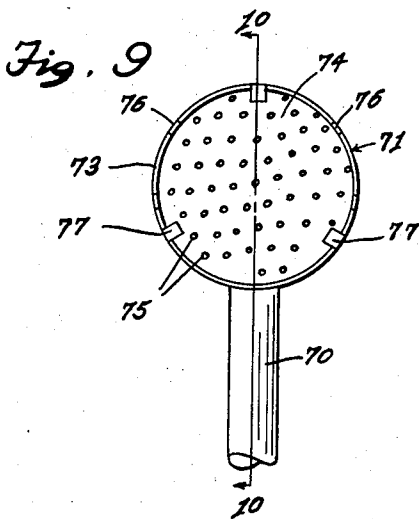
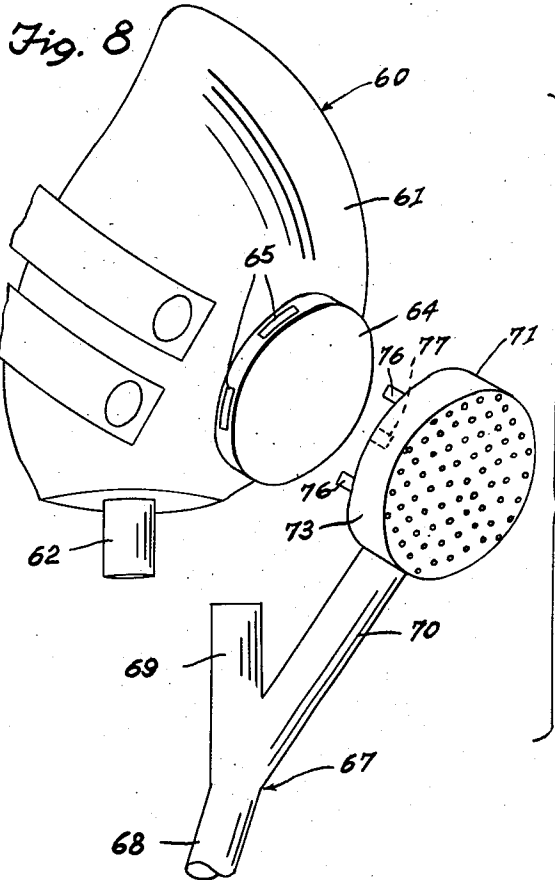
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R. L. MILES ET AL
RESPIRATOR

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2 Sheets-Sheet 2



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1

2,894,508

RESPIRATOR

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Application May 18, 1956, Serial No. 585,762

12 Claims. (Cl. 128—146)

Our invention relates to oronasal respirators of the type wherein air is supplied to the interior thereof under pressure and is exhausted therefrom through an outlet port and exhaust valve. Such respirators are highly efficient within their limits but make no provision for protecting the eyes or the other exposed portions of the face from hot or noxious fumes which are incident to many welding or cutting operations which use a torch or an electric arc. Such operations require the addition of goggles which afford but limited additional protection or the addition of a welder's helmet which offers better protection. However, a welder's helmet is extremely hot to wear and its eye shield usually becomes fogged from heat and humidity. Also as such helmets are spaced from the face on all sides, they do not offer complete protection from fumes.

This application comprises a continuation-in-part of our copending application filed July 13, 1955, Serial Number 521,701, now abandoned.

We are aware that attempts have been made to avoid these last objections by supplying air under pressure to the interior of welder's helmets but such devices fail to give complete protection against noxious fumes and even tend to draw them into the helmet. Also, such helmets require the use of an oronasal respirator and dual connections with the air supply are needed. Thus, the operator is weighted down with two air hoses and needs a special welder's helmet.

With the foregoing in view, it is an object of our invention to provide an improved oronasal respirator which includes means for supplying air to the interior thereof and which simultaneously maintains an atmosphere of fresh air over the wearer's face.

A further object is to provide a novel attachment which is readily attached to a standard oronasal dust mask or the like, which attachment includes means for directing a supply of air under pressure to the interior of the respirator while simultaneously directing a second supply of said under pressure forwardly and laterally of the respirator so as to form and maintain an atmosphere of fresh air over the wearer's face.

A further object is to provide a novel attachment in the form of an adaptor fitting which connects the air supply conduit to the respirator, such fitting including means for supplying air to the respirator interior and also means for forming an air screen in front of the wearer's face, means being provided for readily detachably connecting the fitting to a standard respirator without any modification of the latter.

A further object is to provide in combination with an oronasal respirator, novel air manifold means which simultaneously furnishes a supply of air to the respirator while utilizing a second body of air to form and maintain an atmosphere of fresh air about the face of the wearer.

Other objects and advantages reside in the particular structures of the several species of the invention, in the

2

several elements comprising each, combinations and sub-combinations of such elements, all of which will be readily apparent to those skilled in the art upon reference to the attached drawing in connection with the following specification wherein the invention is shown, described and claimed.

In the drawing:

Figure 1 is a perspective view of one form of the invention, showing the same attached to a conventional mask;

Figure 2 is a plan view of this species of the invention apart from the mask;

Figure 3 is a front elevational view of Figure 2;

Figure 4 is a fragmentary, transverse, vertical sectional view on a smaller scale, taken substantially on the planes of the lines 4—4 of Figure 2, but showing the device attached to the mask;

Figure 5 is a perspective view of a modified species of the invention;

Figure 6 is a transverse, vertical sectional view of the modification taken substantially on the plane of the line 6—6 of Figure 5;

Figure 7 is a plan view of a blank for forming the species of the Figures 5 and 6;

Figure 8 is an exploded perspective view of a further modified form of the invention and a standard oronasal mask to which it is to be applied;

Figure 9 is a rear view of this form of the invention showing the same apart from the respirator;

Figure 10 is a fragmentary vertical sectional view taken substantially on the plane of the line 10—10 of Figure 9, the device being shown applied to the respirator; and

Figure 11 is a fragmentary perspective view taken from the rear and showing a further modification.

Referring specifically to the drawing, wherein like reference characters designate like parts in all views and referring at first to the species of invention of Figures 1—4, inclusive, 10 designates generally any suitable oronasal mask which may be of well known construction. As illustrated, the mask 10 includes a cup portion 11 which encloses the nose and mouth of the wearer and a marginal gasket 12 of soft elastomeric material in the nature of foam rubber for sealing the joint between the cup 11 and the wearer's face. The mask or respirator 10 is secured to the face in any suitable manner as by the elastic head straps 13. The cup 11 is also provided with an air exhaust port 14 which may be provided with any suitable check valve such as the flap valve 15. The shell 10 also includes a floor 16, Figure 4, formed with two laterally spaced inlet ports 17, only one of which is shown. One inlet port 17 is located below each nostril of the wearer. Obviously a single large inlet port would suffice. As so far described the device is conventional and forms no part of the invention except as combined with the elements now to be described.

In the form of the invention of Figures 1—4, there has been provided an upper manifold 20 which preferably is of flat configuration and horizontally disposed. Manifold 20 includes a top wall 21 which is horizontally disposed below the floor 16. The top wall 21 is spaced from the floor 16 by a sealing gasket 18 which is formed with inlet ports 19 only one of which is shown which register with the ports 17 aforesaid. The top wall 21 and gasket 18 are secured to the floor 16 in any suitable manner as by the screws 22 which seat in threaded holes in top wall 21. The top wall 21 is formed with a pair of laterally spaced ports 23 which register with the ports 17 and 19 in the floor 16 and gasket 18 respectively to provide open communication between the manifold 20 and the interior of the cup 11. The ports 23 may be and

3

preferably are screened with fine wire mesh 24. The interior of manifold 20 may be filled with any suitable air filtering media such as the fibrous material shown more or less diagrammatically at 25.

Air under pressure is supplied to the manifold 20 by a conduit 26 which opens into the manifold through an end wall thereof. The conduit 26 is readily detachably connected to an air supply pipe, hose or the like 27 which is connected to any suitable supply of air under pressure, not shown. It is to be understood that the wearer of the respirator has ready access to a suitable air valve for controlling the amount and pressure of the air supplied to the respirator. Such a valve is shown diagrammatically at 9, Figure 1.

A branch conduit 28 of the conduit 26 opens into and supplies air to the interior of a second manifold 30 disposed below the manifold 20. The manifold 30 is of narrow form and is vertically disposed beneath the manifold 20. The top wall 31 of the manifold 30 is fixedly secured to the bottom wall 29 of the upper manifold 20 in any suitable manner as by being soldered, brazed or welded thereto. If desired, the interior of the lower manifold 30 may be filled with any suitable air filtering or diffusing material 32. The lower manifold 30 includes a front wall 33 which is formed with a plurality of relatively small holes or outlet ports 34 through which the air supplied through the branch conduit 28 escapes. Ports 34 may be screened with reticulated fabric 35 if desired.

In operation, air under pressure enters both manifolds 20 and 30 through the pipe 27, conduit 26 and branch conduit 28. The air which enters the upper manifold 20 passes to the respirator interior through the inlet ports 23, 19 and 17 aforesaid to keep the wearer supplied with fresh air and to cool that portion of the wearer's face which is enclosed by the cup 11. Surplus air and exhaled breath escape from the cup 11 through the exhaust port 14 and its check valve 15. The air which enters the lower manifold 30 is diffused by the fibrous material 32 which causes the air to escape uniformly through all of the ports 34. Such escaping air fans out to form an atmosphere of fresh, cool air which lies over and protects the face of the wearer, particularly his eyes, from fumes which are heated, noxious or otherwise undesirable. When the device is worn beneath a welder's helmet it keeps the interior of the helmet filled with fresh air without requiring two air hoses or other special equipment or connections. Thus, if a portion of a job requires a welder's helmet and a portion does not, the wearer of the respirator need do no more than put on the helmet when he needs it and remove it when he does not without any delay or further adjustment of the respirator. At most, the wearer would only have to adjust the air supply by means of the valve 9, which as aforesaid, is always within reach of the user.

The constant supply of air from the manifold 30 prevents fogging of the eyepiece of the helmet and is fanned out laterally and vertically in all directions by the helmet wall. It exhausts around all edges of the helmet wall to prevent the entry of undesirable fumes.

In the species of Figures 5-7, there has been provided a single manifold 40 which is vertically disposed below the floor 16 of the cup 11 and rigidly secured thereto in any suitable manner such as by the screws 22 of the first described form of the invention. A horizontal partition 41 divides the manifold 40 into upper and lower chambers 42 and 43 respectively to which air under pressure is supplied by conduit 44 and branch conduit 45. Both chambers 42 and 43 may be filled with filtering or diffusing media 46. The manifold 40 has a front wall 47 the lower portion of which is formed with a plurality of small outlet ports 48 through which the air escapes which has been supplied through the branch conduit 45 to the lower chamber 43. The ports 48 open only into the lower chamber or compartment 43. The air escaping

4

through the ports 48 forms an atmosphere of fresh air over the wearer's face in the same manner as in the first form of the invention.

The manifold 40 has a top wall 52 which is formed with spaced ports 49 which may be screened with reticulated material 50. Threaded holes 51 are formed in the top wall 52 to receive the screws 22 for securing the manifold 40 to the cup 11. The operation of this form of the invention is the same as that of the species of Figures 1-4.

Obviously the upper and lower chambers or compartments 42 and 43 amount to and correspond to the two manifolds 20 and 30 of the first species. However, the arrangement here is superior in some ways in that it can be stamped from a single blank as is clearly shown in Figure 7. Even the partition 41 can be initially a part of the single blank being cut off later and trimmed to the proper size and shape. It is clear, therefore, that this form of the invention can be readily formed by the use of simple dies, jigs and the like without the use of special tools or special skills. The holes 44' and 45' for the conduits 44 and 45 may be preformed in the blank together with the holes 51 and ports 48 and 49.

The form of invention of Figures 8 to 10, comprises a fitting which is attachable to a standard oronasal respirator with little or no modification of the latter. Thus, 60 designates a standard air line mask having a cup 61, an inlet fitting 62 on the bottom thereof and an outlet valve 63 on the center front of the same. Such outlet valve fitting 63 includes a valve cover 64 on the outside of the cup 61, which cover has a narrow cylindrical side wall formed with exhaust ports 65 therein which form the sole outlets for the fitting. Any suitable exhaust valve, such as the flexible disc flap valve 63a, is contained in the outlet valve fitting 63.

In this form of the invention, the air supply line 66 is connected to the inlet fitting 62 by an adapter fitting 67 which comprises a tubular stem 68 which is readily detachably connected to the line 66 in any suitable manner, not shown. The fitting 67 includes two tubular branch conduits 69 and 70 which are preferably of equal size or capacity and preferably diverge symmetrically from the stem conduit 68 so that equal amounts of air from the line 66 go through each branch conduit.

The branch conduit 69 is operatively connected to the air inlet fitting 62 of the mask 60 in any suitable manner, not shown, to supply air under pressure to the interior thereof. The other branch conduit 70 extends upwardly toward the exhaust fitting 63 and includes means for forming an air screen before the face of the wearer. In the embodiment illustrated, such means comprises a manifold 71 fixed to the upper end of branch conduit 70.

The manifold 71 is cylindrical in form to conform substantially in size and shape to the exhaust fitting cover 64. The manifold 71 is hollow and includes an impervious, cylindrical side wall 73 which is operatively secured to the branch conduit 70 and a front wall 74 which is formed with a suitable number of air-screen forming ports or perforations 75. The side wall 73 of the manifold 71 includes suitable means such as the deformable tabs 76 which are hooked onto the exhaust valve cover 64 through the outlet ports 65 in a manner readily understood.

The side wall 73 of the manifold 71 is sized and shaped to fit closely over the valve fitting cover 64. It is provided also with radially inwardly directed tabs 77 which are located slightly axially inwardly of the free edge of the side wall 73, Figures 8 and 10, so as to provide stops which limit the telescoping of the manifold 71 and valve fitting cover 64. Thus, the branch conduit 70 is readily detachably connected to the cover 64 so that twisting of the line 66 is prevented and the connection between the branch conduit 67 and inlet fitting 62 is relieved of strains. Likewise, of course, this serves to anchor the manifold 71 centrally of the mask 60 which is an ideal

location for the formation of an air screen before the face of the wearer. If desired the side wall 73 of manifold 71 may be formed with perforations to insure radial distribution of some of the screen-forming air.

In the form of the invention of Figure 11, an adapter fitting 80 very like the fitting 67 has been provided. Here, however, the manifold 81 is fitted with an impervious rear wall 82 which is permanently secured to the side wall 83 in any suitable manner as by brazing. Such rear wall bears on the front surface of the exhaust valve cover 64 and the assembly is secured thereto by the deformable tabs 84 which operate like the tabs 76 of the form of invention of Figures 8-10. Notches 85 are formed in the rear wall 82 to permit passage of the tabs 84 past the rear wall.

It is clear from the foregoing that the forms of the invention of Figures 8-10 and 11 are readily attached to the mask 60 without any modification of the latter. It is apparent, likewise, that only a slight modification would be necessary to attach this adapter to the mask of Figure 1 or other forms of standard masks.

Moreover, it is clear that in all species of the invention, an adequate and continuous supply of air is fed to the interior of the respirator cup. At the same time, an atmosphere of fresh air or air screen is formed and maintained about the wearer's face whereby to accomplish the objects of the invention.

While we have shown and described what are now thought to be the preferred embodiments of the invention, it should be understood that the same is susceptible of other forms and expressions. Consequently, we do not limit ourselves to the precise species shown and described hereinabove except as hereinafter claimed.

We claim:

1. In an oronasal respirator including a cup and means for supplying air under pressure to said cup, said means including an air line; the improvement comprising a tubular fitting operatively connected to said air line, said fitting having two tubular branch conduits, one of said branch conduits being operatively connected to said cup to supply air to the interior thereof, a manifold carried by the other branch conduit, means readily detachably connecting said manifold to said cup forwardly thereof, and said manifold being formed with means for forming an air screen forwardly of said cup.

2. In an oronasal respirator including a cup, an air inlet fitting, and an air supply line; the improvement comprising an adapter for connecting said line to said fitting, said adapter comprising a tubular stem operatively connected to said line and two diverging tubular branch conduits, one of said branch conduits being operatively connected to said air inlet fitting for conducting air to the interior of said cup, said cup including an air exhaust fitting having a portion extending exteriorly thereof, means readily detachably connecting said other branch conduit to said portion, and said last named branch conduit including means for forming an air screen forwardly of said cup.

3. A respirator according to claim 2, wherein said last named means comprises a manifold carried by the second branch conduit.

4. In an oronasal air line respirator including a cup, separate air inlet and exhaust fittings, and an air line for supplying air under pressure to said cup; the improvement comprising an adapter having a tubular stem operatively connected to said air line and two tubular branches, one of said branches operatively engaging said inlet fitting, a manifold carried by the other of said branches, said manifold being formed with air discharge ports for forming an air screen forwardly of said cup,

said manifold being of substantially the same size and shape as said exhaust fitting, and means for readily detachably connecting said manifold onto said exhaust fitting.

5. An oronasal respirator according to claim 4, wherein said stem and branches comprise a symmetrical Y, and said branches being of equal diameter and capacity.

6. An oronasal respirator according to claim 4, said exhaust fitting including laterally directed exhaust ports, connecting means on said manifold and insertable into said exhaust ports of said exhaust fitting comprising said means for readily detachably connecting said manifold to said exhaust fitting.

7. An oronasal respirator according to claim 6, wherein said connecting means comprise a plurality of deformable tabs.

8. An oronasal respirator according to claim 7, wherein said manifold includes an impervious rear wall bearing on said exhaust fitting.

9. An oronasal respirator according to claim 4, wherein said manifold comprises a rearwardly opening cup telescopically receiving said exhaust fitting therein, and radially inwardly directed stops on said manifold to limit the entrance of said exhaust fitting therein.

10. In an oronasal respirator including a cup, an air inlet fitting and an air supply line; the improvement comprising an adapter for connecting said line to said air inlet fitting, said adapter comprising a tubular stem operatively connected to said line and two diverging tubular branch conduits, one of said branch conduits being operatively connected to said inlet fitting for supplying air to the interior of said cup, a manifold, means readily detachably connecting said manifold to said cup forwardly and centrally thereof, means operatively connecting the other branch conduit to said manifold for supplying air to the interior thereof, and said manifold being formed with a plurality of forwardly directed discharge ports for forming an air screen forwardly of said cup.

11. In an oronasal respirator including a cup, means for supplying air under pressure to the interior thereof, and an air exhaust fitting having an exterior portion disposed outwardly of said cup and forwardly thereof; the improvement comprising a conduit containing air under pressure, said conduit having a discharge end, means for readily detachably connecting said discharge end to said exterior portion of said discharge fitting, and said discharge end of said conduit including means for forming an air screen forwardly of said cup.

12. In an oronasal respirator including a cup, means for supplying air under pressure to the interior thereof, and an air exhaust fitting having an exterior portion disposed outwardly and forwardly of said cup; the improvement comprising a conduit containing air under pressure, said conduit having a discharge end, a manifold operatively connected to said discharge end of said conduit and receiving air under pressure therefrom, means readily detachably connecting said manifold to said exterior portion of said discharge fitting, and said manifold including means for forming an air screen forwardly of said cup.

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