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AIR LINE RESPIRATOR FILTER CARTRIDGE HOLDER

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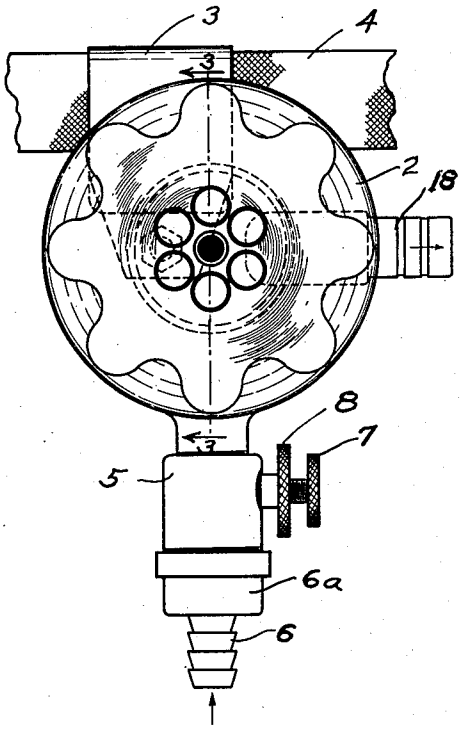


Fig. 1

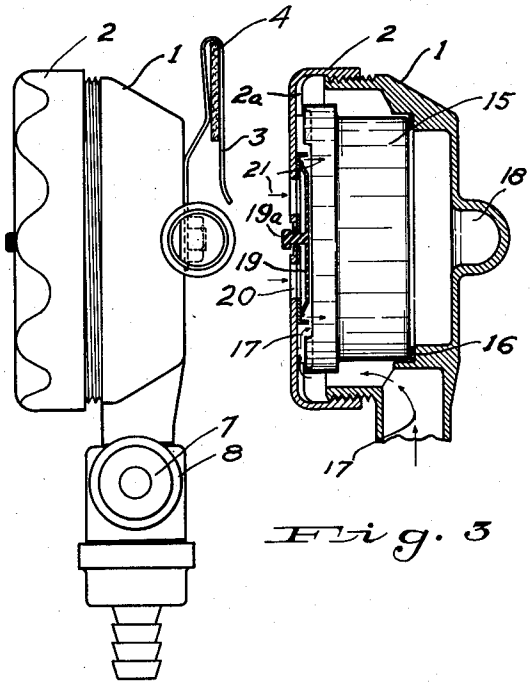


Fig. 3

Fig. 2

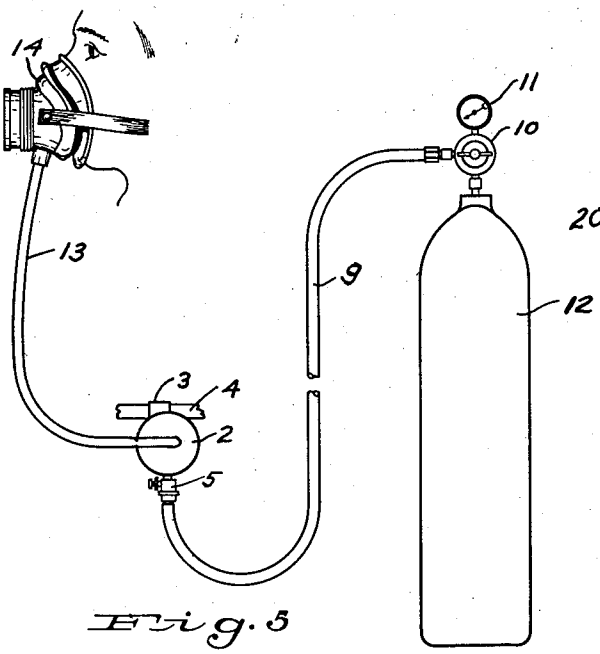


Fig. 5

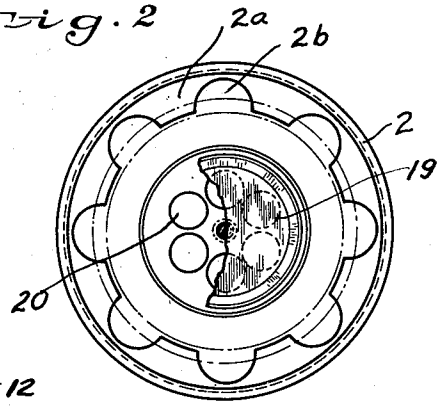


Fig. 4

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AIR LINE RESPIRATOR FILTER CARTRIDGE HOLDER

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3 Claims. (Cl. 128—146)

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The present invention relates to an air line respirator system and, more particularly, to a filter cartridge holder or container therefor designed to enable the inhalation of filtered air with little or no breathing resistance even when the air line has been broken or the air pressure has otherwise been removed.

In industries which have existing compressed air lines, it is advantageous to employ these lines to supply respirator masks worn on the face so that a wearer can breathe filtered air continually with no breathing resistance and thus provide himself with protection against heavy concentrations of dust, fumes, mists, and vapors in occupations such as welding, paint spraying, flame cleaning and metallizing. Air pressure supplied respirators are also useful for protection against respiratory hazards encountered in the manufacture of storage batteries, paints and glazes, asbestos and by-products, in cement and chemical plants, in foundries, granite quarries and many other industries.

As a safety measure, it is desirable to provide the above described air line respirator with means for allowing inhalation of filtered air even at times when by accident or otherwise there is a break in the compressed air line. While small ports and openings are adequate for breathing in air when under pressure, such openings provide considerable breathing resistance to air flow when the air is no longer under pressure. Attempts have been made to enlarge these air ports as much as possible so as to lower such breathing resistance at times when the air is not under pressure, as when there is a rupture of the compressed air line. However, these attempts have not met with success inasmuch as there are definite upper limits in size of these ports or openings, therefore even with maximum enlargement there is considerable breathing resistance when the air pressure is removed.

An object of the present invention is to provide an air line respirator system with a novel means for allowing in-flow of a considerable volume of filtered air even when the air pressure has been removed, such as occurs when the air line is ruptured.

A more specific object of the present invention is to provide a novel filter cartridge holder or container having a supplementary air inlet opening which is operable only when air pressure is removed from the line to enable inhalation of considerable quantities of filtered air without breathing resistance when there is a rupture in the air line or when pressure in the line is for

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any other reason lowered or reduced to atmospheric pressure.

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

Figure 1 is a front elevational view of an air line respirator cartridge holder or container embodying the principles of the present invention;

Figure 2 is a side elevational view of the filter cartridge holder or container shown in Figure 1;

Figure 3 is a vertical cross-sectional view taken through line 3—3 of Figure 1;

Figure 4 is a bottom view of the perforated screw cap or cover 2 shown in Figures 1, 2 and 3, and

Figure 5 is a somewhat schematic view of a complete air line respirator system including the filter cartridge holder or container shown in Figures 1 to 4, inclusive.

Referring more particularly to Figures 1, 2 and 3, numeral 1 denotes a substantially cup-shaped filter cartridge holder or container having screw threaded to the mouth or opening thereof a cap or cover 2. Container 1 has rigidly secured to the rear face thereof a clip 3 which may be supported on a belt 4 worn by the wearer of the respirator. Extending radially outwardly and downwardly from the holder or container 1 is an air regulating valve 5 into which air under pressure will flow from an air inlet connector 6, which connector has a coupling element 6a which can be readily pulled away from the casing of valve 5 by means of a slip fit connection. Within the coupling element 6a there is provided a one-way acting ball element which is actuated by a spring (not shown) for normally closing the outlet of coupling element 6a as shown and described in detail in U. S. Patent No. 1,915,553, issued to Harry F. Shindel, entitled "Pipe Coupling." As described in this patent, the above described ball may be progressively unseated to adjust the valve opening by means of a knurled screw, such as 7, which may be locked in any suitable position by a second knurled screw 8 whose hub portion is forced against the outer surface of the housing of the regulating valve 5. Thus any desired amount of air flow may be obtained by suitably adjusting screw 7. However, if the wearer wishes to leave the place where the air line is located, he may simply pull coupling element 6a away from the housing of valve 5 and in so doing, the compressed air line will be automatically closed by seating of the ball valve within coupling element 6a and at the same time, outside air may

be breathed in through the opening in valve 5. This operation will be more clearly understood by referring to Figure 5 which shows that connector 6 is connected to an air line 9 which in turn is connected through a suitable air relief valve (not shown) and pressure reducing valve 10 and gauge 11 to any suitable source of compressed air, such as a compressed air tank 12. The outlet connector 18 at the rear of the holder or container 1 is connected to an air line 13 which leads to the interior of a respirator face piece 14 of any well known type which is worn about the nose and mouth of the wearer.

In operation, so long as air line 9 contains air under pressure, this air will flow in the path indicated by arrows 17 (see Figure 3). Within container 1 there is provided a shoulder portion having seated thereon a sealing gasket 16 against which is pressed a peripheral edge of the filter unit 15 which may be a chemical cartridge or other suitable type of filter unit. A well known type of chemical cartridge is shown having a hollow cylindrical casing filled with a chemical filtering material and having perforated end walls in the form of wire gauze or other pervious materials to enable air to flow through the cylindrical container parallel to the axis thereof. As will appear more clearly in Figure 4, the cap 2 has integrally formed on its inner surface a plurality of projections 2*a* separated by arcuate cutouts 2*b*. Projections 2*a* are forced against the opposite peripheral edge of the cartridge 15 by screwing of cap 2 as shown more clearly in Figure 3. The arcuate cutouts or openings 2*b* enable air to flow in the direction indicated by arrows 17, that is, first along the outer wall of the cartridge 15, thence through openings 2*b* and into the left side of the cartridge as shown in Figure 3, thence flowing through the cartridge so as to filter the air. Filtered air thus flows through the right side opening of cartridge 15 and into the outlet connector 18 which is connected to the respirator face piece.

On the cover portion of the cap or cover 2, there is mounted a flexible diaphragm 19 of rubber or any other suitable flexible material and which is somewhat disk-shaped, having a central integral portion 19*a* which is mounted in a hole formed centrally of the cap 2. A plurality of apertures 20 are provided in cap 2. However, so long as air is under pressure in line 9, this pressure is sufficient so that at all times it will push the diaphragm 19 to the closed position as shown in Figure 3, that is, so that the periphery thereof will be in sealing engagement with the inner surface of the cap 2.

However, in the event there is a rupture in air line 9, or if for any other reason the pressure is removed from line 9, such as in the case where a worker pulls connector 6*a* away from the valve housing of valve 5, the immediately surrounding air will enter the opening of valve 5 and air will still flow in the direction shown by arrows 17. However, since this air is no longer under pressure, considerable breathing resistance will be offered when attempting to force this air by inhalation of the wearer through cartridge 15, therefore making breathing quite difficult and tiring to the wearer.

This breathing resistance is overcome by an outstanding feature of the present invention which is in the form of a large supplementary air inlet such as provided by the flexible diaphragm 19 and openings 20 because since the air pressure is no longer sufficiently high to keep the diaphragm continually sealed, it will become unseated as the result of inhalations by the wearer. Thus outside air in large quantities will enter the holes 20 and will pass beyond the periphery of the inwardly flexed diaphragm. In other words, it will move in the direction shown by arrows 21 through the filter unit 15 so that the air will be filtered and will finally flow outwardly to connector 18 to the respirator. This in-flow of air will be in addition to that breathed in through the path shown by arrows 17. A considerably greater amount of air will be breathed in through holes 20 than through the path indicated by arrows 17 since a considerable greater area opening is provided in holes 20. Therefore, the wearer will not encounter breathing resistance even when air pressure no longer exists in inlet connector 6.

Of course, other designs of diaphragm or one-way acting valves may be provided instead of that shown on cap 2. Also, other types of filters may be substituted for chemical cartridge 15, such as a hollow filter pad of felt or other suitable filtering material.

Thus it will be seen that I have provided an efficient air line respirator system involving a novel cartridge holder or container which is constructed so as to enable the breathing in, from the surrounding atmosphere, of a copious supply of filtered air without breathing resistance, even when the air pressure in the line has been reduced to atmospheric pressure, therefore overcoming the disadvantages of previous devices in which considerable breathing resistance was provided because of limitations of the openings in the air inlet valve.

While I have illustrated and described a certain specific embodiment of my invention, it will be understood that this is by way of illustration only, and that various changes and modifications may be made within the contemplation of my invention and within the scope of the following claims.

I claim:

1. In an air line respirator system, including a respirator face piece, having an air inlet hose, a filter unit connected to said hose and which is supplied by air under pressure, said filter unit comprising a container and a readily detachable outer cap, said cap having a one-way acting inhalation valve which is normally closed as the result of air pressure in said system and which is opened only as a consequence of removal of said air pressure and inhalation by the wearer of the respirator face piece, said container having passageways for allowing air flow through said filter unit irrespective of the presence or absence of said air pressure.

2. Apparatus as recited in claim 1 wherein said container is of substantially cup-shape and wherein said cover is perforated and is screw threadedly mounted on said container and wherein said one-way acting valve is in the form of a flexible diaphragm disposed opposite air inlet openings formed on the face of said cover and which is centrally supported on said cover so as to permit a supplementary air inlet flow through said openings only when the air pressure in said line has been reduced to substantially atmospheric pressure.

3. In an air line respirator system having a respirator face piece, an air line connected thereto and a source of compressed air for providing air under pressure in said line, a filter unit in said line comprising, in combination, a substantially cup-shaped container enclosing a filter cartridge and having a screw threaded cap for firm-

ly supporting the cartridge in sealing engagement with a bottom portion of said container, said cap being engageable with a peripheral portion of said cartridge in a manner so as to allow air under pressure to flow from said air line along the outer walls of said cartridge, thence through the joint between the cap and cartridge, thence through the cartridge unit so as to become filtered, and finally to the respirator face piece, said cap having a plurality of holes on its face and having mounted thereon a one-way acting diaphragm disposed opposite said plurality of holes by air under pressure in said air line but which upon removal of said air under pressure will become

opened as the result of inhalation of the wearer, thus forcing outside air through said holes in the cap, thence through the filter cartridge to the respirator.

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