United States Patent [19]

Guy

[11] **3,822,698**

[45] **July 9, 1974**

[54] **POWERED AIR-PURIFYING RESPIRATOR HELMET**

[76] Inventor: **Richard E. Guy,** 450 S. Burnett Dr., Baytown, Tex. 77520

[22] Filed: **Jan. 22, 1973**

[21] Appl. No.: **310,724**

[52] **U.S. Cl.** ..... **128/142.7,** 2/3 R

[51] **Int. Cl.** **A61f 9/06**

[58] **Field of Search**..... 128/142.7, 142.6, 142.4, 128/142, 145, 146.3; 2/3 R, 5, 171.3, 171.4, 183

[56] **References Cited**

UNITED STATES PATENTS

1,000,721	8/1911	Cypra	128/142.7
1,774,074	8/1930	Wittcoff	2/171.3
2,029,566	2/1936	Herzer	128/142.6
3,258,010	6/1966	Austin et al.	128/142.7
3,413,972	12/1968	Depping	128/142.7
3,649,964	3/1972	Schoelz	128/142.7

FOREIGN PATENTS OR APPLICATIONS

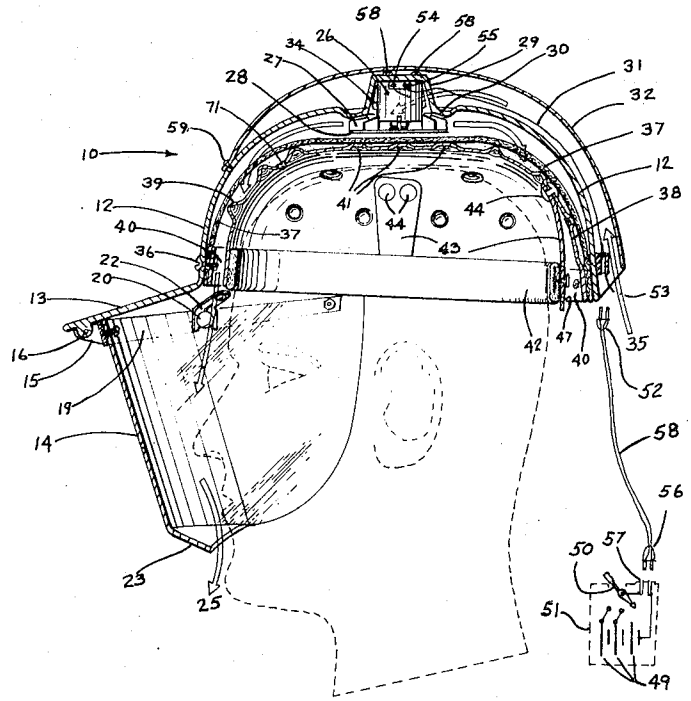
74,773	5/1954	Netherlands	128/142.6

Primary Examiner—Richard A. Gaudet
Assistant Examiner—Henry J. Recla

[57] **ABSTRACT**

A helmet or hat equipped with a built-in powered air blower and air filtering system which removes contaminants from the surrounding air and continuously delivers the purified air under positive pressure to an area between the wearers face and a fitted transparent face shield supported from the visor, and from this area the wearer breathes normally while the excess filtered air and exhaled breath escapes through a slightly restricted opening between the bottom of the mask and the wearer's chin.

11 Claims, 6 Drawing Figures



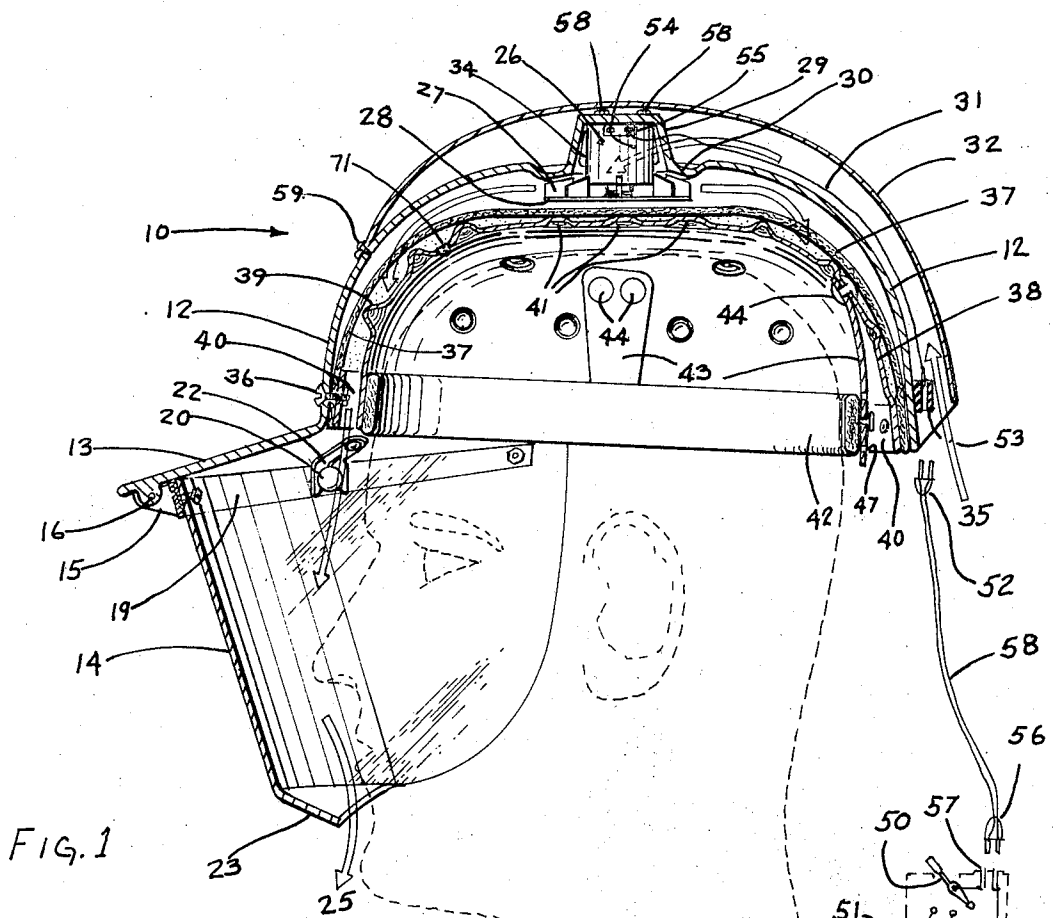


FIG. 1

FIG. 2

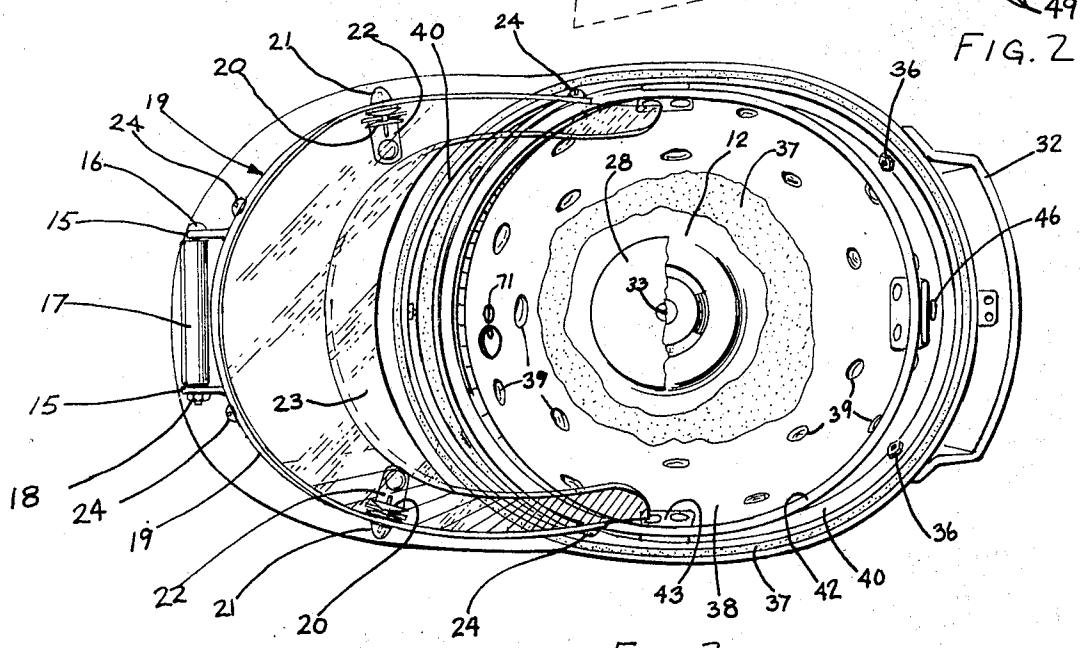


FIG. 3

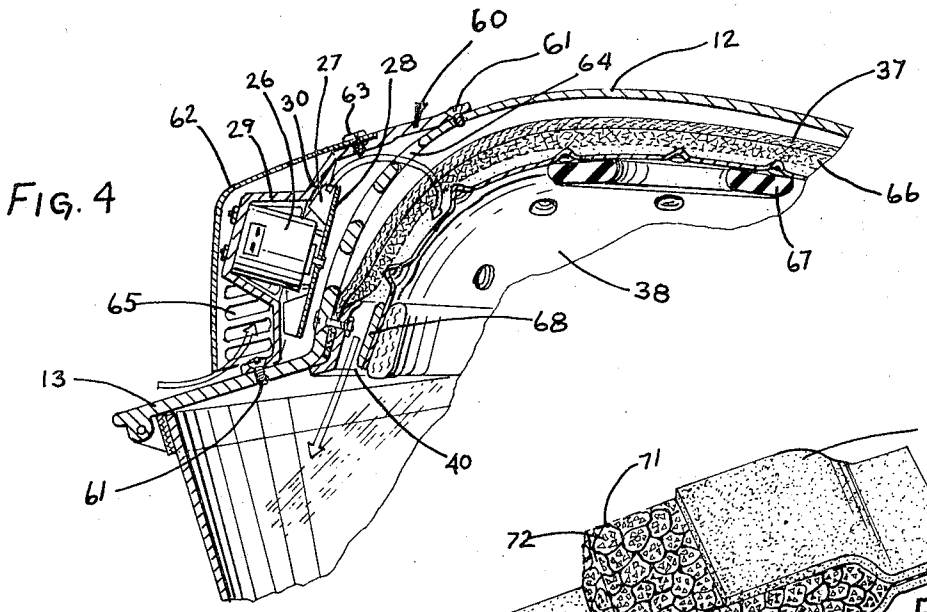


FIG. 4

FIG. 5

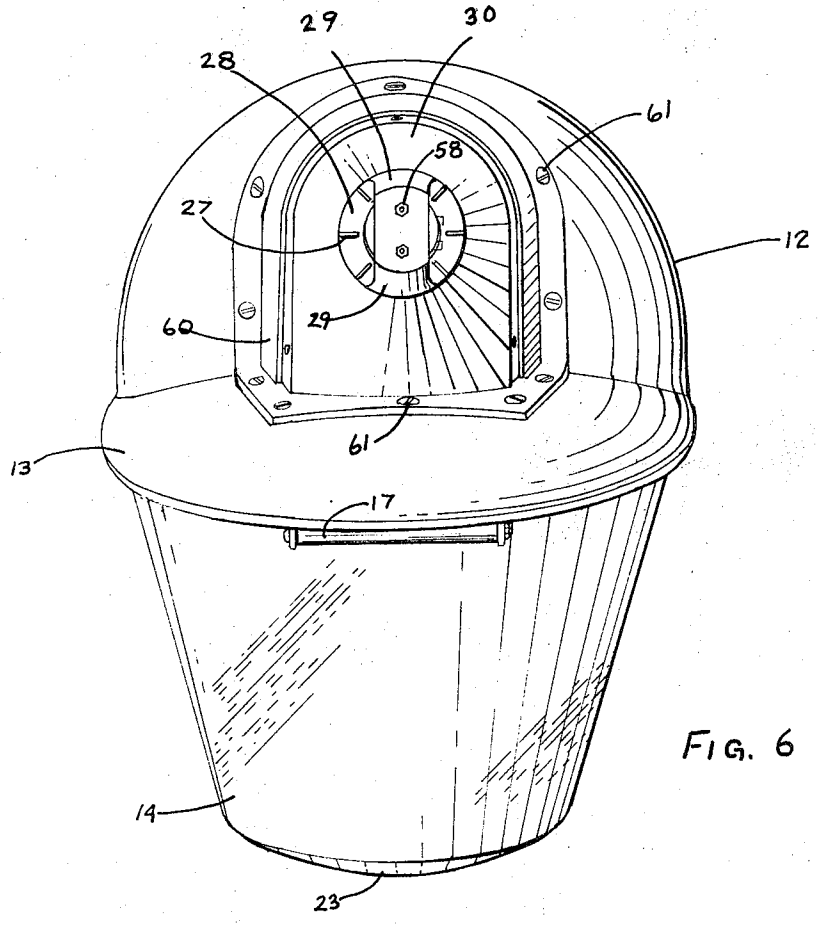


FIG. 6

POWERED AIR-PURIFYING RESPIRATOR HELMET

BACKGROUND OF THE INVENTION

The air we breath contains varying amounts of dust, dirt, pollen, smog and noxious fumes. Workers in some mining operations contract crippling Silicosis, Black Lung Disease, and other respiratory ailments or lung disease after prolonged exposure to the various dusts associated with mining. Workers in certain industrial or agricultural operations are exposed to toxic dusts, mists and fumes which can cause illness or death if inhaled in relatively small quantities.

Some persons are allergic to certain pollens or dust occurring naturally in the air and manifest this by an allergic reaction known as Hay Fever. Quite often, if uncontrolled, this allergic reaction progresses to a serious sinus condition or asthma. It is estimated by medical authorities that one out of every ten persons suffers from an allergy of one sort or another. The loss of wages and medical costs resulting from allergic based respiratory illnesses are estimated at well over one billion dollars annually in the United States alone. The individual misery and discomfort suffered by these allergic persons is beyond calculation.

Many persons, because of their jobs or life style, must expose themselves to airborn particulate matter or fumes that they are allergic to, or, which can be injurious to their health. Antihistamine drugs help and some people are helped by desensitization treatments; but many are not aided by this approach. They must somehow avoid their allergens or suffer.

If people exposed to airborn dusts and pollen or fumes wear one of the many good lung powered respiratory filter masks that are available on the market they can avoid inhaling these harmful substances. However, wearing one of these face mask filters is very uncomfortable with necessarily tight fitting head straps and face mask seals. In addition the wearer of one of these masks must forcefully inhale against the pressure drop of the air passing through the filter media and the intake valve, and, when exhaling he must force the air out through the exhaust valve. After a short time this can become annoying to normal people and exhausting to many with respiratory problems. Many such face masks leave the eyes uncovered and open to the irritating dust and pollen or fumes. Full face coverage filter masks that do cover the eyes in addition to nose and mouth are often prone to fogging of the transparent face shield and are even more uncomfortable to wear. Speech and sight are greatly impaired and bulky hoses and filter cartridge are cumbersome and unsightly to wear. In fact regular face mask filter respirators are so cumbersome and uncomfortable that many workers and allergy sufferers risk the health hazards involved rather than wear this kind of protection.

The invention disclosed and claimed herein is directed to solving the above and other problems associated with the personal respiratory equipment of the prior art.

SUMMARY OF THE INVENTION

A positive pressure filtered air respirator, comprising a helmet or hat, an electric blower integral with the hat, air filters and/or chemical adsorbants incorporated within the air passages to or from the blower, and a face shield surrounding the wearer's face and closing off the escape of the purified air provided by said blower except at the chin where the air is permitted to escape under a slight restriction so as to maintain a higher air pressure inside the mask than outside.

It is the general object of this invention to provide a self-contained powered air-purifying respirator helmet which supplies filtered breathing air to the wearer's face and excludes all outside unpurified air.

Another objective of this invention is to provide a very portable, lightweight, low cost, absolutely free-breathing, air-purifying respirator that protects the eyes as well as the respiratory system from injurious substances in the air.

A further objective of this invention is to limit the area of the face protected by the face shield to only the eyes, nose, and mouth so as to leave hearing unimpaired.

Another objective of this invention is to provide for purified and exhaled air, a definite air escape passage at the chin and essentially no other areas in order to minimize air, blower, and power requirements and allow the wearer to speak and be heard essentially normally through this exit.

Another objective of this invention is to use the space between the hat inner liner and hat interior to install a relatively large area high efficiency filter without significantly increasing the hat exterior size or weight.

Other more specific objectives and advantages of the invention will become apparent when reference is made to the following detailed description, considered in conjunction with the drawings.

DESCRIPTION OF THE DRAWINGS

In the drawings, wherein certain details may be omitted from one or more views for the purposes of clarity:

FIG. **1** is a side view of a vertical section through the center of the helmet from front to back showing construction in accordance with the teachings of this invention. The blower motor and impeller is not shown in section but as a side elevation. A phantom view of the helmet wearers head is shown as a dashed outline.

FIG. **2** is a schematic diagram of the electrical circuitry employable by the invention.

FIG. **3** is a bottom plan view of the helmet with portions of the inner liner, filter and blower impeller broken away to show underneath.

FIG. **4** is a side view of a vertical section of the top front portion of a helmet which shows an alternate construction for use as a "hard hat" protective helmet. The blower motor is not shown in section but in vertical elevation.

FIG. **5** is an enlarged and cut away perspective view of a section of a portion of the chemical adsorbant filter holding the activated carbon granuals within its porous surfaces.

FIG. **6** is a frontal elevational view of the alternate construction respirator helmet shown partially in FIG. **4** but without the protective cover over the motor.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now in greater detail to the drawings, FIGS. **1** and **3** illustrate a helmet assembly **10**, which is constructed in accordance with the teachings of this in-

vention and comprises a basic helmet, cap or hat **12**, which has a brim or visor **13**, in front of helmet **12**, although a brim could be extended as far as desired around the hat. Attached to the Visor **13**, is a transparent face shield **14**, which is pivotally engaged by a hinge **15**, to the front of the visor **13**, in such a manner that the face shield can be swung on hinge **15**, out and upward from the wearer's face to allow access to the face and make it easier to place or remove the hat. Although the method of hinging **15**, shown is suitable, there are other methods of hinging or swinging the face shield and accordingly it is not deemed necessary to show all the precise details as these are well known to persons proficient in the arts. In some instances it may not be necessary or desireable to be able to move the face shield **14**, in relation to the hat and in this case the shield would be removeably bolted or suitably fastened directly to the hat brim or a bracket thereon.

In the particular arrangement shown in FIGS. **1** and **2**, the two hinge arms **15**, are pivoted from the ends of hinge pin **16**, which in turn is held in a bracket **17**, suitably fastened to the visor **13**, or by a projecting bracket which is integral with the visor. By tightening the lock nut **18**, on the hinge bolt pin **16**, sufficient friction between hinge arms **15** and bracket **17** can be developed to retain the visor in any position desired, within limits of its swing, when it is pushed out away, from the normal operating position shown. This allows the wearer to adjust eye glasses or gain access to his face for any reason.

Hinge arms **15**, are suitably fastened to, or are integral with face shield frame **19**, which is "U" shaped as shown and generally made of metal or other material that will allow it to be bent to fit the wearer's face. When in normal position as shown in FIG. **1** the face shield frame **19** is held by at least two releasable detent fasteners **20**, which in FIGS. **1** and **2** consist of double headed through bolts holding the plastic shield to the frame **19** with the heads shaped as shown, to move easily and guide the fasteners into the spring clips, **22**. The spring clips are bolted or otherwise adjustably fastened to the brim **13** and are split as shown in FIGS. **1** and **2** to allow bolt heads **20** to enter the "V" shaped opening of the spring clips, force the clip "legs" apart and snap into small rounded notches in the clip legs which releaseably retain the face shield frame **19** in the sealed operating position shown. Rounded nuts **21**, in addition to holding the bolts **20**, are used as finger grips to force the shield open or closed.

The face shield frame **19** is fitted against the underside of the brim **13** reasonably tight to exclude outside air drafts. A resilient gasket (not shown) may be used to aid in attaining this seal in the closed operating position shown in FIG. **1**. It also reduces filtered air loss.

The transparent face shield **14**, is generally, but not necessarily, made of a thin, flexible plastic sheet, generally U-shaped and is removably bolted to the face shield frame **19** by bolts **20** and **24** and forms a relatively tight seal with the frame **19** to prevent significant passage of air through the common joint. The face shield **14** is fitted to the wearers head, by bending in at the sides so that the rounded edges gently touch the sides of the face to seal off outside air drafts from entering the face area. Fitting the shield side edge to the face is aided by bending the face shield frame as required, inward or outward to the adjoining facial configuration down to near the chin. The bottom of the face shield **14** has a small molded, bent over, or attached lower shield closure **23**, which approaches but does not touch the chin. This closure **23**, is preferrably a transparent flexible or resilient plastic that can be trimmed to fit individual facial shapes and provides the slightly restricted exit **25**, where excess purified air and exhaled breath escapes. When this helmet is used in relatively non-toxic, and non-turbulent atmosphere, the lower closure **23** may be minimized or omitted if it is deemed that a possible occasional exposure to unfiltered outside air will not be harmful. The more hazardous that the outside air is to the wearer and the more turbulent or "windy" this outside air is then the higher the positive pressure of the filtered air should be behind the face shield **14** in order to prevent possible infiltration of the outside air. The positive pressure can be regulated, in part, by adjusting the area of the discharge opening **25**, to more or less restrict the air flow and thereby increase or decrease the positive pressure inside the face shield. The effect of blower speed in regards to air flow and positive pressure will be discussed later on in this description.

A small electric motor **26**, with its shaft **33**, extended downward is suitably fastened to motor bracket **29**, with bolts or machine screws **58**. The centrifugal blower impeller is formed of a thin circular disc **28**, with a thicker center hub that contains a hole that will fit on, and rotate with, the motor shaft **33** and be suitably fixed firmly in place on the shaft by friction or adhesive or any of the many common methods known by those experienced in the art. Fastened to or integral with the blower circular disc **28**, are a plurality of impeller blades **27**, designed, together with the motor, to affect the shortest overall assembly practical. To this end the blades **27**, extend up past the motor (see. FIG. **1**) and the disc **28**, is mounted as close to the motor end bell as practical. The blower blades are designed in accordance with well known fan or blower design practices to match the motor speed and air flow and discharge head requirements of the helmet filtering system. It has been determined that purified air flows of between 3 and 6 standard cubic feet per minute are generally adequate to carry out the practice of this invention; however, occasions may arise where higher or even lower air flows may be more desireable or necessary. Motor power requirements will vary considerably with filter and air flow requirements but satisfactory operation has been obtained with 0.30 watts in some tests.

The blower impeller blades **27**, are shrouded on one side by the impeller disc **28** and closely approach the adjacent stationary helmet surface **30**, on the other side. Thus when the blower impeller (assembly **27** and **28**) is revolved by the motor, any air within the impeller blades is thrown out radially by centrifugal force in the manner of all centrifugal blowers and more air is forced in through the openings **34** in the motor mounting bracket **29**. The incoming air can come directly from the surroundings or may, as shown on FIG. **1**, be drawn from an intake ducts formed between the protective and decorative crest **32**, and the adjoining helmet **12**, surface. The crest is removeably fastened to the helmet **12** by screws **59**. The lower back end of this intake duct is open to the outside air at air flow arrow **35**. The shape of crest **32** may take many forms and, assuming an adequate air flow capacity, all would be suitable so long as they afforded physical protection to the

motor mount area, kept rain and other falling matter out of the air intake openings **34**, and minimized and utilized the effect of the outside wind velocity so as not to adversely affect blower air delivery.

The air discharged from the blower impeller **27, 28**, collects in the space between the helmet **12** inside surface and hat shaped filter **37** which is sealed against the helmet surface all around it's lower periphery. The discharged air builds up sufficient pressure in this space to push itself through the filter media of filter **37**, (see air flow arrows) and in doing so, any particulate matter, i.e. dust, pollen, etc. in the air is retained on or in the filter media, at least down to the particle size limitation of the filter media used. The filter media used is generally that with maximum porosity and yet retains a sufficient percentage of the minimum size of the offending particles the wearer wishes to avoid. In this way the filter has the least resistance to air flow and therefore requires the least blower and power requirements and thereby the least size and weight overall.

The large area hat shaped filter **37**, is either molded or pressed to shape in one piece, or sewn or cemented together from a plurality of shaped pieces of filter media. An alternate filter could be used wherein it is made of a non-porous material in the general shape of filter **37**, and circular or other shaped holes would be cut in the non-porous material and similarly shaped patches of porous filter media would be cemented over these holes so that all air must pass through the filter media patches. The lower edge of the hat shaped non-porous filter patch support of course is sealed to the inside of hat **12** as noted before.

The filter media can be made from just about any of the many standard filter clothes, felts, papers etc. that are available on the market and which will remove the size particulate matter described. Obviously the media must not contain material that would be or could be harmful to the wearer in normal usage. However, this should not prohibit the use of any filter or adsorband or absorbant materials that are properly prepared or contained to prevent their harming the wearer in normal usage. The filter may be folded or pleated or waffled so as to increase filtering area and reduce blower power requirements and further to hold more filtered material before clogging.

The hat shaped filter **37** is supported by and is installed over the hat liner **38**, and is held away from the outer liner **38** surface by small rounded projections **38** and **41**, on the surface in order to form a continuous and unblocked purified air collection - passage area between filter **37** and hat liner **38**. The filter is generally fastened down to the several flat topped projections **41** on liner **38** by means of adhesives or any other suitable means to insure that filter **37** does not move up and drag on the revolving blower impeller disc **28** above it. The lower edge of the hat shaped filter **37** should be about flush with the lower edge of sealing ring **40**. The circumference of the filter **37** inside surface and sealing ring **40** outside surface are essentially the same. As seen on FIG. **3**, the tapered sealing ring **40** fits and nests with the heat or helmet **12**, inside surface at the lower rim where the sides of the hat are also tapered. The lower edge of the head shaped hat liner **38**, and the sealing ring **40** are one and the same in approximately the back two-thirds of the hat. However in the front one-third of the hat the liner **38** is made slightly smaller to leave an opening between the inside of the seal ring **40** and the outside of the hat liner **38**, through which opening filtered air is discharged to the face area of the mask. When the tapered sealing ring **40**, with the edge of filter **37** placed over it, is pushed into the taper of the inside of hat **12**, the filter media **37** becomes compressed between the two tapered surfaces and is sealed all around its lower periphery to the hat **12** inside surface. The seal band **40**, and the attached hat liner **38**, and filter **37** are all held in the sealed-off position by removable bolts **36**, which pass through the seal ring, the filter media and the hat to hold the assembly together.

A head engaging band **42**, can be constructed of a similar material and in similar manner as is found in the head engaging bands of many common protective hard hat helmets. Accordingly no great detail of its construction will be given since those experienced in this art are well familiar with this general construction. The hat band **42**, should preferrably faced with a soft sweat resistant material for comfort and non-slip service on the wearers head. The band **42** can be made adjustable in the back to fit various head sizes by any one of many well known arrangements. Many such adjustable head band arrangements are well known to those proficient in the arts and accordingly no details are deemed necessary.

The head engaging band **42** is removably fastened and sealed to the somewhat flexible lower rim of approximately the front third of head liner **36** to prevent significant loss of purified air. Outside the face mask area, the head band is free to flex and shape itself to the wearers head and is supported by at least two relatively stiff but laterally flexible support tabs **43** which are riveted by rivets **44**, or bolted to or otherwise suitably fastened to the head liner as shown in FIG. 1. The support tabs **43** are each connected to the head band **42** by being releasable pushed over the head of a short stud **46** fastened to the core of the head band at each support tab location. Each support tab has more than one stud hole **47**, to allow the wearer to adjust the tilt of the hat up or down in the back or sides. Thus the wearer can adjust the air exit opening between face shield **14**, **23**, and the wearers face and chin by connecting the head band studs **46**, to higher or lower support tab holes **47**.

Blower motor **26** is provided with electrical energy from one or more common direct current batteries **49**, in FIG. **2** which can be carried in a battery pack **51** in the wearers pocket or fastened to his belt or some other convenient place by a clip. In some instances the batteries **49** may be carried in or on the helmet itself if the wearer desires. FIG. **1** and FIG. **2** illustrates an electrical circuit suitable for supplying electrical energy to the blower motor **26**. The three batteries are connected in series with each other and with an on-off and **2** speed selector switch **50** which allows the wearer to connect either one or more batteries to the motor to vary the blower speed to suit battery or outside wind conditions. Other common means for controlling motor speed such as by inserting a variable resistance in the circuit are also useable for this purpose. Electrical Motor **26**, electrical connections **54** and **55**, are connected by two wires **31** to a standard two wire receptacle **53**. A two wire mating plug, **52** is removably plugged into and connects with the battery receptacle **57** which through the on-off and speed control switch **50** is connected to the batteries. By means of a simple adapter plug not

shown here with a built-in resistance to reduce voltage, the wearer can obtain an alternate source of electrical power from other sources such as an automobile cigar lighter receptacle where in he can use electrical energy from the automobile battery and save his portable batteries.

FIGS. 4 and 6 illustrate further embodiments and modifications of the invention as shown in FIGS. 1, 2 and 3. All elements in such figures which are like or similar to the elements in FIGS. 1, 2, 3 are identified with like reference numbers. Further, since these various embodiments and modifications are primarily concerned with a different or alternate motor and blower position on the helmet only such fragmentary portions of the total helmet are shown as are necessary to illustrate these differences or modifications.

In this modification, the motor 26 with blower impeller 27, 28, attached is mounted in a separate motor-blower housing 60 which is sealed all around its periphery to helmet 12 and visor 13. This housing is removably fastened by screws 61 and serves the same purpose as the portion of the helmet 12 in FIG. 1, numbered 29 and 30, that is to support the motor 26 and provide a blower casing 30 which shrouds the open side of the impeller and traps and directs the air discharged from the impeller so that it must pass through helment holes 64 and into the space between helmet 14 and filter 37. From here the air is forced through the filter 37, and optional chemical adsorbant pad 66, and then is directed into the face mask area. Outside air being drawn into the blower pases through holes or slots 65, in or under protective cover 62, and then passes between motor support legs 29 and into the eye of the impeller 27, 28.

The construction of the helmet illustrated in FIGS. 4 and 6 is made stronger in general to also serve for duty as a protective hard-hat helmet for protection of the wearer's head against bumps and falling objects. Because of this, the the head suspension system is made stronger. Sealing band 40 is made with a flange on the lower edge to prevent it being driven up into the helmet if the wearer experienced a hard blow on top of the helmet. Also helmet liner 38 is strengthened across the front lower edge with reinforcing bar 68 as required to withstand the force of the helmet being driven downward onto the wearer's head.

As further head protection, a soft light weight, doughnut shaped resilient material such as foamed rubber is cemented to the inside of the top of liner. Further protection is afforded the wearer by the filter media 37, and the optional chemical adsorbant pad 66, being interposed between the wearer's head and the top and sides of the helmet 12.

The chemical adsorbant pad 66 is used to remove certain noxious fumes, vapors or gases which a filter cannot. The science of adsorption of various gases into substances such as activated charcoal or carbon is well known and established. This invention teaches a method of holding this loose activated carbon in a relilient pad that can be curved or bent as required and still maintain an adsorbant pad of even porosity and thickness and which will not allow the carbon or other chemicals shift by gravity or movement or change of position. FIG. 5 shows a perspective view of an enlarged cut away section of chemical adsorbant pad 66. Layer 73 is a thin pre-shaped layer of resilient open and even cell or mesh structured material with all openings smaller than the chemical granuals 72, to be retained in layer 71. One example of a suitable material would be an open cell urethane elastomer foam. Cemented to layer 73 is the pre-shaped resilient core layer 71 which is a similar large open and even cell stucture material whose cells are significantly larger than the chemical granuals 72 to be held within its cell structure. Chemical adsorbant granuals 72, such as activated carbon, are graded to size all grains larger than the cells openings in layer 71. These granuals 72, are sifted onto and packed down into all the cells of layer 71 by vibration or other means until all cells of layer 71 are full of granuals of the absorbant. Then layer 70, which can be essentially the same as layer 73, is cemented to the top of layer 71 to prevent the escape of the granuals. The cementing is not sufficient to significantly close up the cell openings to air passage. At the outer edges of the whole assembly 66 the edge of layer 71 must be sealed to prevent loss of the adsorbant granuals at the open edge. One method of sealing shown in FIG. 5 is to let top and bottom layers 70 and 73 to extend beyond core layer 71 a sufficient amount to allow cementing these layers together and thereby seal the edges of layer 71 and provide a sealing lip to be held between sealing strip 40 and the helmet or filter 37 as shown in FIG. 4. The relatively large surface area of this chemical adsorbant pad 66 with suitable adsorbant granual sizes will offer the least resistance drop possible to the air flowing through it while exposing the greatest practical amount of adsorbant to the air flowing through the pad.

The chemical adsorbant pad 66 can be used in the helmet 10 alone without filter media 37, or, can be used in series with the filter 37 depending on the type of service the wearer expects to be exposed to. It can be seen that this kind of adsorbant pad construction can be used in standard respirators, air conditioners or other services where an adsorbant is used for odor or toxic fume removal.

Although only a selected number of embodiments of the invention have been disclosed and described it should be apparant that other embodiments and modifications of the invention are possible.

I claim:

1. A positive pressure filtered air respirator device comprising:

a dome shaped element having a visor;

a face shield having its upper edge attached and sealed to said visor, said face shield including means for engaging the side edges thereof to a wearer's face to form seals therewith and means for permitting a slightly restrictive air passage from the lower edge thereof whereby the shield is sealed around its periphery except for a small opening adjacent the wearer's chin;

a generally dome shaped air filter element fitted adjacently to, but slightly spaced from, the inside surface of the helmet and generally co-extensive therewith;

means for securing and substantially sealing the filter element to the helmet adjacent the periphery thereof to form a first generally dome shaped space therebetween;

a dome shaped impermeable member fitted adjacent to, but slightly spaced from, the underside surface of the filter element and generally co-extensive therewith;

means for securing the impermeable member to the filter element and the helmet to form a second generally dome shaped space between the impermeable member and the filter element;

means for providing fluid communication between the second generally dome shaped space and the interior of said shield;

an electrically driven air blower secured to the helmet;

means providing an inlet air passage for fluid communication between the ambient and the blower; and

means providing an outlet air passage for fluid communication between the blower and the first generally dome shaped space, whereby ambient air passes through the inlet passage to the blower, through the outlet passage to the first generally dome shaped space, through the filter element to the second generally dome shaped space, to the interior of the face shield and out through the slightly restrictive air passage at the bottom of the face shield, thereby causing a slightly higher air pressure in the interior of the face shield than the ambient.

2. A positive pressure filtered air helment according to claim **1,** wherein the helmet includes a matching tapered ring integral with the peripheral edge of said impermeable liner, whereby the filtering element is secured and sealed to the helmet by positioning the impermeable liner integral with the tapered sealing ring into the helmets lower tapered edge so that the tapered sealing ring is wedged into the said tapered helmet edge with the peripheral edge of the said filter element compressed, secured and sealed between the sealing ring and the tapered helmet edge.

3. A positive pressure filtered air helmet according to claim **1** including a permeable chemical adsorption pad, wherein this permeable chemical adsorption pad is nested with and fitted just below said filter and coextensive therewith and further has its peripheral edges sealed and secured to said helmet lower inside periphery so as to maintain a generally dome shaped space between the chemical adsorption pad and said impermeable liner.

4. A positive pressure filtered air helmet according to claim **1** wherein the impermeable liner includes protrusions spaced about on the convex side of said impermeable liner so as to maintain a generally dome shaped space between liner and said filter element.

5. A positive pressure filtered air helmet or the like according to claim **4** wherein the chemical adsorption pad is constructed from a three layer pliable and very open and even celled foamed urethane or the like, wherein the outer two of the said layers have cell openings smaller than the granules of the adsorption media such as activated carbon, which is packed into the middle layer which has cell openings larger than the adsorption granules and these cells walls are completely open so that only the thin intercell ligamentry bonds remain and the granules can be readily packed evenly throughout the middle layer, and this absorption media is held within the said middle layer by cementing the afore mentioned small cell layers so as to completely cover each side of the middle layer, and with the edges of the middle layer being sealed by lapping and cementing the smaller cell outer layers to each other all around the periphery.

6. A positive pressure filtered air helmet or the like according to claim **1** wherein the face shield is adjustable thereby allowing the wearer to swing the shield away from his face and means for releasably holding said face shield in any position within the arc of said face shield swing.

7. A positive pressure filtered air helmet or the like according to claim **1** wherein the top of the helmet crown has the electric motor mounting bracket, air intake opening, and blower housing integrally moulded as a part of the helmet.

8. A positive pressure filtered air helmet or the like according to claim **7** including a protective and decorative hollow crest with an inverted U shaped cross section removably and sealingly fastened over the blower motor mounting and blower air intake opening with said hollow crest and adjoining outer helmet surface forming an intake air passage which opens to the outside in the lower back of the helmet with the opening generally facing downward.

9. A positive pressure filtered air helment or the like according to claim **1** where in the electric motor mounting bracket and air blower housing are by themselves an integral unit which is removably sealed to and attached to said helmet.

10. A positive pressure filtered air helment of the like according to claim **1** wherein the helment is constructed and strengthened in the manner of a protective "hard hat" commonly used for worker head protection in the construction industry and wherein the electric motor and blower assembly is removably and sealingly mounted on the exterior of the helmet crown above the visor and includes means for conveying the said blower discharge air to the filter element inside the crown.

11. A positive pressure filtered air helmet or the like according to claim **10** including a relatively rigid protective cover with a plurality of air intake holes or louvers in the sides of said protective cover essentially below the level of the blower motor and said protective cover is removably and sealingly fastened over the motor-blower assembly.

* * * * *