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3,491,752

BREATHING APPARATUS

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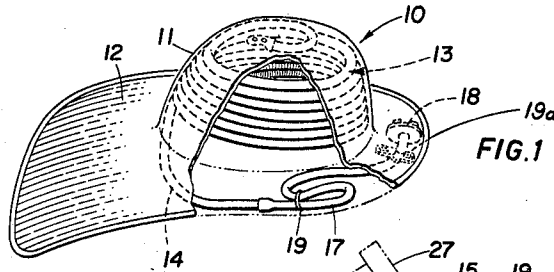


FIG. 1

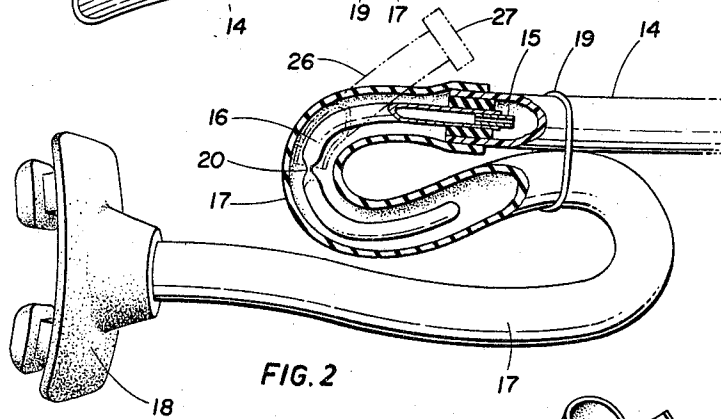


FIG. 2

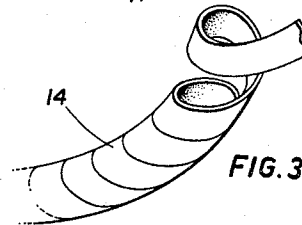


FIG. 3

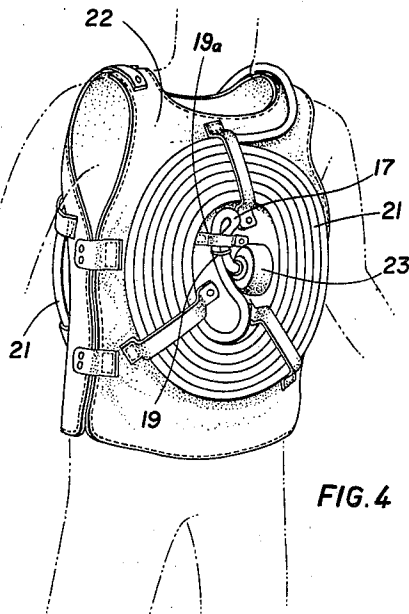


FIG. 4

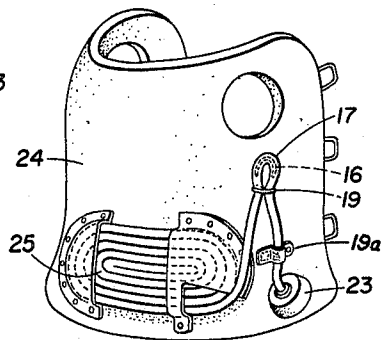


FIG. 5

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BREATHING APPARATUS

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5 Claims

ABSTRACT OF THE DISCLOSURE

A protective helmet for use by firemen and the like incorporating an emergency supply of compressed air or oxygen contained in a spirally wound tubular pressure vessel within the crown of the helmet, and a breakable sealing means contained within a flexible tube which is itself retained in an inoperative position preventing accidental breaking of the sealing means, while supporting the same in a convenient position available for use in an emergency.

This invention relates to an emergency individually portable breathing apparatus for use by firemen, civil defense workers, military personnel and the like.

Various types of emergency breathing apparatus are available such as those used by firemen for escape from burning buildings or other unbreathable atmospheres and also those used for escape from very high altitude aircraft. Such devices have usually centered around a cylindrical oxygen container of substantial size and volume and have incorporated regulator mechanism and a variety of different breathing devices permitting in some cases the inhalation of pure oxygen and in other cases the inhalation of a mixture of oxygen and air or pure air from the cylinder under pressure and in still other cases a mixture of oxygen and atmospheric air if available in a sufficiently breathable form. However, such prior devices were portable only in a restricted sense. Usually they were designed to be carried on a specially designed sling or uniform attachment that is to say on the back or slung from the belt and were generally speaking an addition to the existing uniform or clothing of the individual. It is of the very nature of this type of breathing apparatus that is required for use in unexpected emergencies. In very many cases such emergencies arise at very short notice such that it is impossible for the individuals to foresee the emergency arising. Therefore in many cases the individuals will have neglected to attach the additional piece of equipment to their uniform and will unexpectedly find themselves in a hazardous situation due to an atmosphere which has instantaneously become unbreathable. As a result, while such prior emergency breathing apparatus has been entirely satisfactory, it has in very many cases not been carried or worn on the person at the very moment when it was most required.

Obviously, it would be desirable if such emergency breathing apparatus formed an actual part of the standard uniform of the individual at all times whether he be entering a potentially hazardous situation or not. However, the design of prior art breathing apparatus has rendered such widespread usage difficult if not impossible.

It is therefore an objective of the present invention to provide an emergency breathing apparatus which will be incorporated in the standard uniform of equipment of the individual.

More particularly, it is an objective of the present invention to provide apparatus having the foregoing advantages which is incorporated in the protective helmet or headgear of the individual.

More particularly, it is an objective of the present invention to provide apparatus having the foregoing advantages in which the act of applying the breathing mouth-

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piece also operates to break the seal on the pressure container and commence flow of air or gas to the user.

More particularly, it is an objective of the present invention to provide apparatus having the foregoing advantages to provide emergency breathing apparatus which is adopted for incorporation in various different parts of the uniform such as for example the uniform jacket.

The invention seeks to provide the foregoing and other advantages by the provision of a personally portable emergency air and gas inhalator unit for incorporation in an item of personal apparel and the like and comprising: an elongated tubular pressure vessel wound upon itself in a spiral manner and shaped to conform to a part of the body; high pressure conduit means connected to said vessel for escape of contents therefrom; metering jet means connected to said conduit means restricting the rate of flow of said escaping contents; breakable sealing means closing said conduit means; and, low pressure flexible hose means connected to said conduit means.

A preferred embodiment of the invention will now be described with reference to the following drawing in which like reference devices refer to like parts thereof throughout the various views and diagrams and in which:

FIGURE 1 is a perspective illustration of a fireman's helmet of a typical standard design incorporating the breathing apparatus according to the invention, the helmet being partially cut away to show the incorporation of the breathing apparatus;

FIGURE 2 is a greatly enlarged plan view partially in section showing the breakable sealing device;

FIGURE 3 is an enlarged perspective view of a portion of the tubular container.

FIGURE 4 is a perspective illustration of an alternative embodiment for use in for example, a uniform jacket, and

FIGURE 5 is a perspective illustration of a further embodiment.

From FIGURE 1 it will be noted that this preferred embodiment of the invention comprises a typical standard design of a fireman's helmet 10 having in this case a crown 11 and a brim 12. The construction being either of metal or plastic or of suitable material in known manner.

The breathing apparatus incorporating in the helmet 10 comprises a tubular pressure vessel indicated generally as 13 comprising a length of relatively narrow diameter metallic tube 14 wound upon itself to conform to the interior of the crown 11 of helmet 10. It will be noted that the pressure vessel 13 consists essentially of thin walled tubular construction as distinct from conventional pressure vessel of relatively thick walled cylindrical construction having domed ends. The tubing 14 is preferably formed of helically wound metallic tape (see FIGURE 3) welded or otherwise bonded together to form a continuous sealed tube thereby providing the most advantageous fibre stressed distribution within the walls of the tube 14 for the purposes of use as a pressure vessel, such fibre stress distribution in the thin walled narrow diameter tube being greatly superior to the fibre stressed distribution in the relatively thick walled large diameter cylindrical vessel, conventionally used for the purpose. In this way, a very much lighter more compact pressure vessel is achieved which may be incorporated in a relatively small space such as the interior of the helmet 10 without impairing the use of the helmet 10 for its main purpose or inconveniencing the wearer in any way. In addition, considerably greater pressures can be safely stored inside a tubular pressure vessel such as 13 since in the first place the fibre stress distribution is more advantageous therefore permitting higher bursting pressures to be achieved, and in

the second place, the consequences of a rupture of the walls of the tube 14 are virtually harmless as compared with the typical cylindrical pressure vessel which when ruptured under pressure behaves somewhat in the manner of a grenade.

The pressure vessel 13 is preferably provided with any suitable pressure reducing means, in this case preferably being of the simplest possible construction such as the capillary tube or very fine jet orifice (see FIGURE 2) which in turn communicates to the breakable sealed tube 16. Breakable tube 16 which is preferably a copper coated steel walled tubing bent double upon itself is contained within the flexible low pressure plastic or rubber tube 17 which completely encloses tube 16 and is sealed tightly around the end of tube 14. Low pressure flexible tube 17 is preferably of sufficient length to reach readily around the mouth of the wearer and is provided with a mouthpiece 18 which may be placed inside the lips of the wearer and preferably gripped by the teeth for example, to prevent accidental dislodgement during active use. The flexible tube 17 is preferably retained in the doubled over position as shown in FIGURE 2 against accidental breaking of high pressure tube 16 by means of the clip or retaining thread 19 which may readily be broken or unlocked by the individual. As stated above, tube 16 is preferably readily breakable when flexible tube 17 is pulled straight and may for this purpose be provided with a reduced or weakened neck 20 at about the midpoint of the bend to facilitate breaking at this point. In order to retain the free end of tube 17 and mouthpiece 18 when not in use, a spring clip 19a or other similar retaining member may be located on the brim 12 of helmet 10 thereby supporting tube 17 out of the way of the wearer of the helmet 10 while yet keeping it readily available for immediate use.

In operation, the fireman or other personnel will wear the helmet 10 at all times. In the event that the atmosphere becomes suddenly unbreathable, the wearer of the helmet 10 merely grasps the free-end of the tube 17 and places the mouthpiece 18 in his mouth. The act of grasping and moving the flexible tube 17 will straighten out tube 17 thereby breaking tube 16 and unsealing the pressure vessel 13 permitting the oxygen or compressed air to flow therefrom into tube 17 and into the mouth of the wearer.

Obviously, in some cases the entire pressure vessel 13 and flexible tube 17 may be made removable from helmet 10 for instant replacement on the site of for example, a fire, suitable retaining means being provided on the helmet 10 to secure the pressure vessel 13 therein during use and wearing of the helmet 10. On the other hand, the helmet 10 and pressure vessel 13 may be made integrally and the fireman or other wearer after exhausting one pressure vessel 13 merely exchanges the entire helmet 10 for another helmet.

According to a further embodiment of the invention, it may be desirable to provide for a somewhat greater pressure storage capacity than can be incorporated in the helmet. In this case, resort may be had to a chest pack design for the pressure vessel which may for example be incorporated in the standard tunic worn by the personnel, or which may be slipped on and fastened around the head and shoulders of the wearer on a harness or vest. In this alternative embodiment, the pressure vessel 21 will be seen to be of spirally wound construction arranged in a single plane, and provided with shoulder straps 22 for attachment to the person. Alternatively, the shoulder straps 22 may be dispensed with and the pressure vessel 21 supported in the actual uniform jacket either on the chest or on the back, the flat spirally wound construction of the pressure vessel 21 permitting the same to be incorporated in this way without unduly increasing the bulk of the jacket and without

restricting the movements of the wearer. The other details of construction including the pressure reducing means and the sealing means and seal breaking means are the same as in the previous embodiment and are referred to by the same reference numerals. The mouth piece 18 is preferably replaced by a face mask 23 covering the eyes and nose.

As a further alternative it may be desirable to incorporate the pressure vessel and mouth piece as part of the standard fire and heat resistant vest worn by fireman. Such a further embodiment is shown in FIGURE 5 and will be seen to comprise a fire proof vest 24 of standard construction, a tubular pressure vessel 25 located along the lower edge of vest 24 wound upon itself and formed into a kidney-like shape so as to conform to the waist and hips of a wearer. The flexible tube 17, and mask 23 and retaining member 19 and breakable sealing means are essentially the same as in the other embodiments.

By way of example a helmet 10 can be readily built to incorporate a tubular pressure vessel which comprises a tube of wound copper tape, having an interior diameter of 0.25 inch and a length, when extended, of 5 to 6 feet, giving a storage capacity of about 15 litres of gas, or air, at about 4000 p.s.i. A capillary tube or jet of about 0.004 diameter will permit a flow rate of an average of about 6 to 8 litres per minute, thereby providing an endurance of about 2 minutes. Such an apparatus will weight about one half pound, in addition to the weight of the helmet.

According to a further embodiment, illustrated in phantom form in FIGURE 2, provision may be made to incorporate a certain proportion of atmospheric air together with the oxygen flowing from tubular pressure vessel 14, by means such as the air inlet tube 26, extending through flexible hose 17 around one portion of conduit member 16, whereby to provide a venturi effect, with the flow of high pressure oxygen from conduit 16 continually drawing air inwardly through inlet 26. If desired, air filter means such as 27 may be added.

It will be understood that the invention may incorporate a clip for the nose, or a mask covering the eyes and/or nose, or alternatively a plastic bag attached to the brim of the helmet and fitting over the head, and, in some applications, an expandible gas accumulator bag to avoid wastage of gas during breathing out, such features being omitted from the drawings for the sake of clarity.

Obviously while the invention has been described in relation to a fireman's helmet it is equally applicable to other uniform helmets such as military and civil defence helmets for example and miners' helmets, and in addition to other types of headgear such as a flying helmet or a diver's helmet, for providing additional emergency air in the event of failure of the standard breathing equipment.

The foregoing is a description of a preferred embodiment of the invention which is here given by way of example only. The invention is not to be taken as limited to any of the specific features described but comprehends all such variations as come within the spirit and scope of the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An escape helmet comprising; a helmet adapted for wearing as protection for the human head; an elongated tubular pressure vessel fastened in said helmet for gas storage, wound upon itself in a spiral manner and shaped into a shallow conical shape to fit over the human head and within said helmet; conduit means connected to said vessel for escape of contents therefrom; metering jet means connected to said conduit means restricting the rate of flow of said escaping contents said conduit means being formed with a portion thereof in a predetermined shape and being adapted to be deformed from said shape to break said sealing means; breakable sealing means clos-

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ing said conduit means and extending around said shape portion of said conduit means; low pressure vessel hose means connected to said conduit means and releasable retaining means engaging said low pressure hose means and retaining the same against movement, and being releasable to permit extension of said hose means for breaking of said sealing means.

2. The apparatus as claimed in claim 1 wherein said conduit means at least is formed into a partial U-shape and said flexible hose extends over the same and conforms to the same general shape, movement of said flexible hose to extend the same opening said U-shape and breaking said sealing means.

3. The apparatus as claimed in claim 1 including outlet orifice means at the free end of said conduit means; and, an atmospheric air inlet tube having one end communicating with the atmosphere and another end with the interior of said flexible hose means around said orifice means to constitute a venturi system.

4. The apparatus as claimed in claim 3 including air inlet filter means on the outer end of said inlet tube.

5. The apparatus as claimed in claim 1 including a mouthpiece on said flexible hose means.

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References Cited

UNITED STATES PATENTS

771,801	10/1904	Andrew	128—142.5 XR
882,686	3/1908	Ireland et al.	2—3
932,880	8/1909	Meikle	128—142.7 XR
1,185,392	5/1916	Ganzer	128—142.5 XR
2,380,372	7/1945	Alderfer	128—203 XR
2,432,627	12/1947	Margaria	128—203
2,577,045	12/1951	Stout	222—5
2,733,835	2/1956	Alfery et al.	222—5
2,850,011	9/1958	Schaefer	128—142
3,018,776	1/1962	Saitta et al.	128—203 XR
3,068,865	12/1962	Laszlo	128—142
3,208,449	9/1965	Bartlett	128—145.8

FOREIGN PATENTS

Ad. 13,982 1893 Great Britain.

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2—5; 128—147, 203, 208, 142.3, 145.8; 222—541