Nov. 20, 1945. G. A. WIECZOREK, JR., ET AL 2,389,225

CANISTER

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Fig. 2.

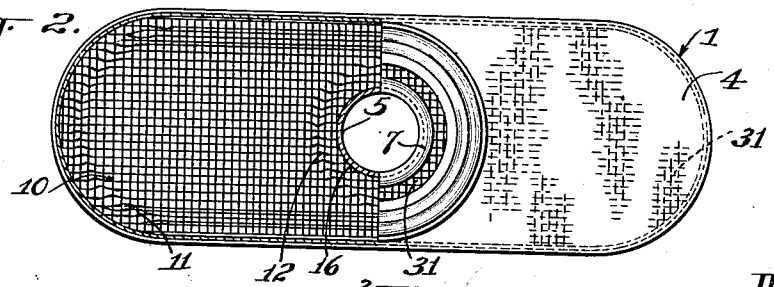


Fig. 1.

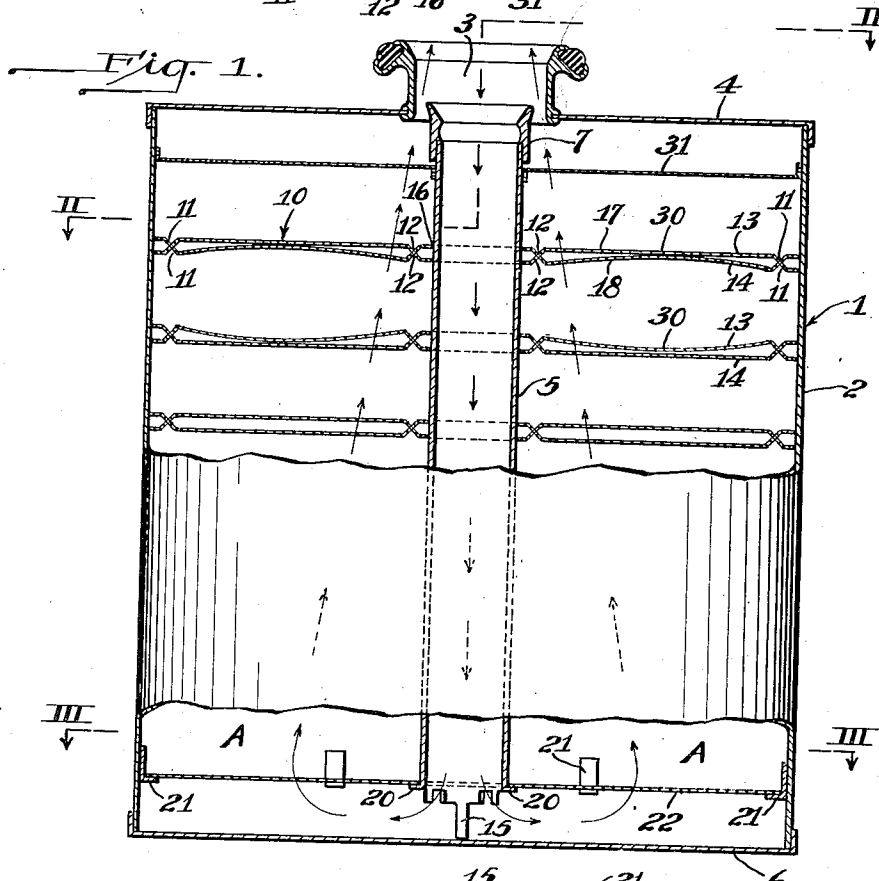
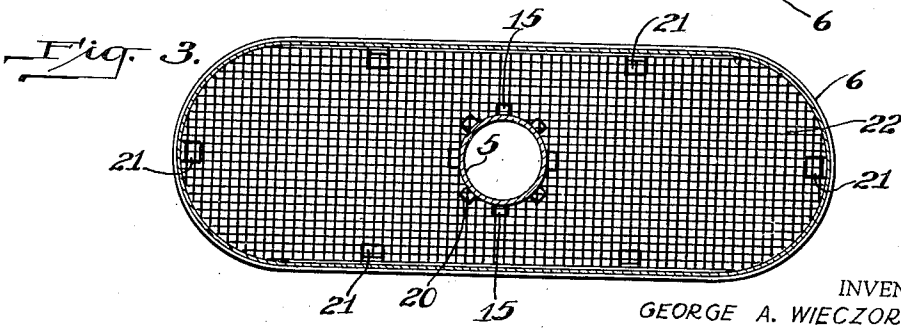


Fig. 3.



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Fig. 4.

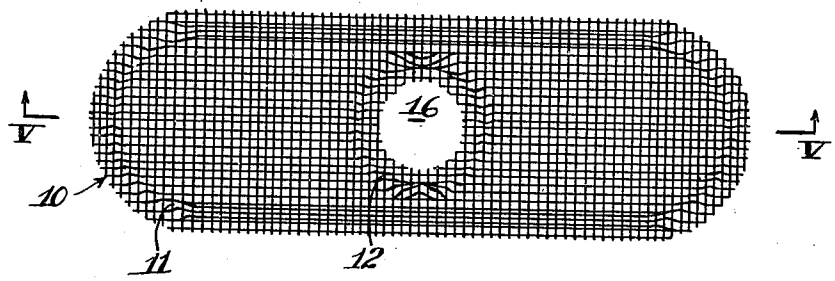


Fig. 5.

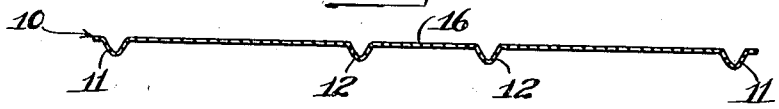


Fig. 6.

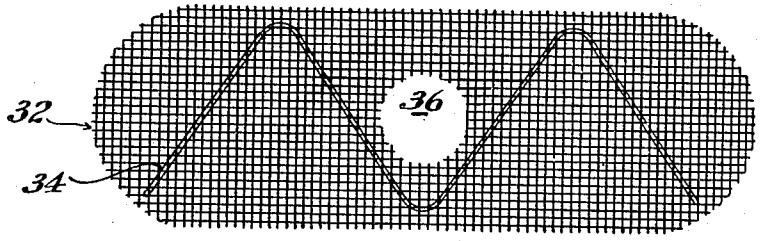
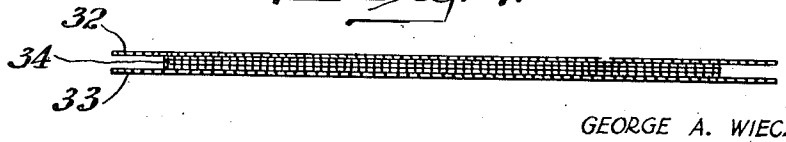


Fig. 7.



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UNITED STATES PATENT OFFICE

2,389,225

CANISTER

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Application November 24, 1939, Serial No. 305,872

6 Claims. (Cl. 183—49)

This invention relates to an improvement in canister construction for use in connection with oxygen breathing apparatus and other personal respiratory protective devices for use in atmospheres deficient in oxygen or contaminated with harmful substances.

It is a principal object of this invention to provide a canister construction with means to support and separate layers of filter materials therein.

It is a further object of this invention to provide spacing and supporting means in a canister to contain filler materials to generate oxygen for breathing and to absorb carbon dioxide in exhaled air.

A further and more specific object of this invention is to provide a supporting and spacing means for each layer of material in a canister housing and which yield upon expansion of the material supported or engaged thereby and which also distribute evenly air passing through the canister over the entering surface of each of the layers of material.

In self-contained breathing apparatus comprising generally a canister connected to a breathing means attached to the face of the wearer, the canister may contain material such as the metallic peroxides, for example, sodium or potassium peroxide, which are reactive to moisture to liberate oxygen for breathing purpose. The physical properly or characteristic of this type of material is that upon being subjected to moisture, or conditions under which oxygen is liberated, the material reacts with the moisture to liberate oxygen and also it expands and fuses. Unless a layer of such material is free to expand, the mass fuses and bonds together and prevents the passage of air therethrough. This condition limits materially the reactive capacity of the material, and in many instances this limit occurs within a very short time, especially when the user is under exertion.

Accordingly, it is among the objects of this invention to provide a support means associated with a housing to contain oxygen evolving materials which means is of such a nature that the materials can expand freely during reaction and which provides an even distribution of air passing through the canister over the entering surface of the layer of material supported thereby. A further object is to provide an inexpensive, easily assembled and adaptable support for material in a canister.

Further objects of this invention will become apparent in the specification of the drawings, in which—

Fig. 1 is a sectional view of a preferred embodiment of our invention.

Fig. 2 is a plan view partly in section taken along the line 2—2 of Fig. 1.

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 1.

Fig. 4 is a plan view of a preferred embodiment of a supporting element.

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 4.

Fig. 6 is another embodiment of a supporting means for the chemical materials.

Fig. 7 is a plan view of the embodiment as illustrated in Fig. 6.

In Figures 1, 2 and 3 the canister 1 is illustrated as comprising a housing 2 made of thin sheet material which is formed in an oblong shape, illustrated in Fig. 2, and with its ends closed except for an opening 3 contained in the entering end 4 of the canister. It is to be understood that the illustrations and detailed description made of a canister construction is not to be considered as a limitation of this invention since it is recognized that the invention has application to many types of canister construction. In this type of canister, an opening 3 receives exhaled air from a respiratory means, not shown, and discharges oxygen evolved within the canister. For separating exhaled air and air to be breathed, a duct 5 is disposed centrally of the housing 2 and supported by end portion 6 of the housing to receive the exhaled air from a breathing tube, not shown, which is connected to the duct 5 by engagement with a fitting 7. The end of the duct is supported in spaced relation to the end portion 6 by a spacer 15 which may be a separable or integral part of the duct. The entering exhaled air passes down through the central duct 5 and is then discharged in an operative space A between the housing 2 and the tube 5, as illustrated in Fig. 1. Passing up through the operative space A the air to be breathed is discharged from the canister through the opening 3, as illustrated.

Exhaled air passing through the operative space A passes through a series of layers of chemical materials interposed in its path of travel. These materials are reactive with the constituents of the exhaled air to provide air suitable for breathing purposes, as by removing noxious and poisonous fluids and for generating oxygen. For supplying oxygen, it is the practice to use the metallic peroxides, usually sodium or potassium peroxide which react with moisture in the ex-

haled air to liberate oxygen. It is a physical characteristic of this material to expand when reacting with moisture to liberate oxygen and also to change during reaction from a crystalline or granular state to a semi-fluid or fusible state so that particles of the material unite or bond to each other and form a mass devoid of air spaces therebetween. Before use, these materials must be sufficiently granular in structure or of such shape to provide adequate air passages therethrough so that there is a minimum of resistance to breathing. Furthermore, it is necessary that the particles of material be sufficiently small so that air passing through a layer of the material contacts a maximum of surface of the material; but, on the other hand, they are to be large enough to provide adequate air passages for limiting as much as possible resistance to breathing.

It is to be understood that the use of the term air herein is to be construed broadly to include exhaled air and air contaminated with poisonous and noxious gases, fumes, dust, mists and vapors which may be passed through such a construction to react with or be absorbed by chemicals disposed in the path of air flow to supply respirable air.

A preferred embodiment of our invention is illustrated in Figures 4 and 5, and comprises an element 10 made of a flat sheet of wire material of a mesh depending upon the size of particles of chemical material to be supported thereon and having sufficient flexibility to yield to the expansion of materials, such as, the oxygen evolving materials described above. The element is disposed in the operative space A flatwise across the direction of flow of air through the housing, Fig. 1. Struck from the plane of the flat sheet are shoulders 11 disposed adjacent the outer periphery of the sheet and shoulders 12 disposed adjacent the inner periphery defining an opening 16 for the central inlet tube 5. Each support 30, Fig. 1, is made up of a pair of such perforated elements, as 13 and 14, and the shoulders 11 and 12 of element 13 coact with shoulders of a like element 14, Fig. 1, and yieldable supporting surfaces 17 and 18 are provided within the shoulder portions 11 and 12 of element 13 and 14 respectively.

The lower end of the inlet tube 5 has outwardly projecting flanges 20 and the inner side of the housing has a corresponding and cooperating inwardly projecting flange 21. A base support 22, which is illustrated as a single wire sheet, is positioned on flanges 20 and 21 and defines a space for receiving air discharged from the inlet tube 5 and before passing up through the operative space A. This space distributes uniformly the air over the entering surface of the chemical material in the initial layer in the direction of flow of air travel. Layers of material which may vary in depth depending upon the purpose of the canister and the physical and chemical properties of the filler material are supported from this base support 22.

Fig. 1 illustrates a canister containing a plurality of layers of chemical material and each layer, except the lowermost layer, is spaced from and supported by an adjacent layer of material by means of a yieldable support such as heretofore described and as illustrated in Figures 1, 4 and 5. Fig. 1 illustrates what is thought to be the effect and function of this type of support, that is, before and during reaction, the coacting shoulders on each element provide a space between adjacent layers of material, and during reaction, the individual elements 13 and 14 of each support 30 yield freely and allow the material, such as the metallic peroxides, supported thereby to expand in the direction of and opposite to the general direction of flow of air therethrough and thus prevent the fusion or bonding of the material which destroys the air passage through the layer. By this expansion, low resistance to air flow and substantially uniform reaction continue throughout the life of the material. It is to be observed that this support provides a yielding means for the upper or supporting surface of each layer, such as the surface engaging the element 14 of each support 30, and also the lower or supported surface, such as the surface engaging the element 13.

A further and useful function of the support is that by spacing each layer from the other, the air having passed through a lower layer is distributed evenly over the entering surface of the upper layer, and thus a uniform reaction with the material occurs throughout the layer. This function of the support is effective in eliminating channeling of air through the layers of the material, since if a channel occurs in a layer, air passing through the layer and entering the space provided between this layer and a succeeding layer is distributed uniformly over the entire entering surface of the succeeding layer. Other arrangements and means may be used for providing the yieldable and spaced supporting elements for the material to be included in a canister. For confining the uppermost layer of material, a screen 31 engaging the housing 2 and inlet tube 5 may be used.

One manner of increasing the amount of yield for one layer can be made by adding yielding elements to the support and, in some instances, an increase in yield will result if some layers of material in the canister do not expand during reaction, thus allowing the available yield at these supports for a layer which may expand beyond the yield limit of its support.

A further embodiment of our invention is illustrated in Figures 6 and 7 in which two flat screen elements 32 and 33 having the necessary porosity for supporting particles of chemical material, are supported in spaced relation by a spacer element 34, which may be of a contour such as illustrated in Fig. 4, and may be made of screen material as used for elements 32 and 33. The contour must be such as to provide the necessary yieldable surface between the supports, and so as not to interfere with the opening 36 in each screen element to accommodate the duct 5.

It is to be understood that the manner of arrangement of the supports for chemical material within the canister housing and the type of canister are not to be considered as a limitation of this invention, since it is recognized that our invention is adaptable for all types of canisters so long as the type of construction does not interfere with the action of yieldable surfaces which are provided by our support construction. It is to be further understood that no limitations are to be inferred from the detailed description of our invention and that it is to be limited only by the scope of the appended claims.

We claim:

1. In a canister having a passage therethrough and in which layers of purifying material are disposed, a yieldable support between the layers of purifying material comprising a pair of flat strips of yieldable perforated material and a separable spacing means between the flat strips shaped and arranged over the surface of each

sheet so that each of the strips is operative to yield to the expansion of the layers of purifying material engaged.

2. In a cansiter having a passage therethrough and in which purifying material is disposed in layers, a support between layers of material comprising two sheets of perforated yieldable material, each of the sheets having a distended portion and the sheets being positioned relative to each other so that the distended portions engage each other to space the sheets from each other to render the sheets operative to yield to the expansion of purifying material.

3. In a canister including a body and a tube extending centrally of the body and defining a chamber between the body and the tube and in which layers of purifying material are placed, a support between layers of the material comprising a pair of sheets of yieldable perforated material, each sheet extending across the chamber and having an opening to accommodate the tube and a separable spacing means between the sheets of material shaped and arranged over the surface of each sheet to position the sheets in spaced relation to define an air entering space for the succeeding layer and to render each sheet operative to yield to the expansion of the engaged layers of purifying material.

4. In a canister including a body and a tube extending centrally of the body and defining a chamber between the body and the tube in which purifying material is placed in layers a support positioned between layers of material and comprising a pair of flat strips of yieldable perforated material, each strip extending across the chamber and having an opening to accommodate the tube, each strip having portions upstruck from the plane surface of the strip and adjacent to the inner and outer peripheries of the strip, and each strip being oppositely positioned in relation to the other so that each upstruck portion contacts its respective portion of the other strip to space each strip from the other and render each strip operative to yield to the expansion of the layer of purifying material engaged.

5. In a canister having a passage therethrough and in which purifying material is disposed, a support for the material comprising two sheets of perforated yieldable material, one of the sheets having a portion upstruck from the surface of the sheet and cooperative with the other sheet to space the sheets from each other to render them operative to yield to the expansion of purifying material while adequately supporting the purifying material in position.

6. In a canister having a passage therethrough in which purifying material is disposed, a support for the material comprising two strips of perforated yieldable material, each of the strips having a plurality of portions upstruck from the surface of the sheet and the strips being positioned relative to each other so that the shaped portions of each strip engage shaped portions of the other strips to space the strips from each other to render them operative to yield to the expansion of purifying material.

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