Feb. 2, 1932. A. B. DRÄGER 1,843,446

CARTRIDGE FOR INDEPENDENT BREATHING APPARATUS

Original Filed Feb. 19, 1926

Fig. 1.

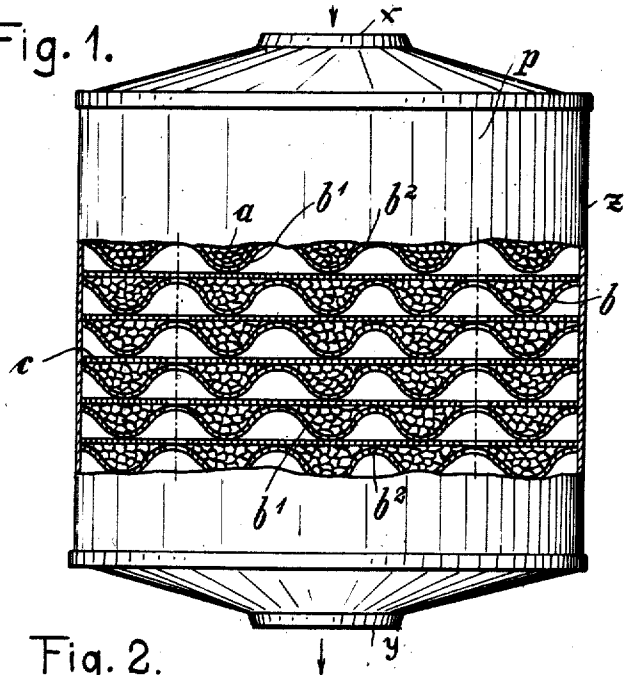

Fig. 2.

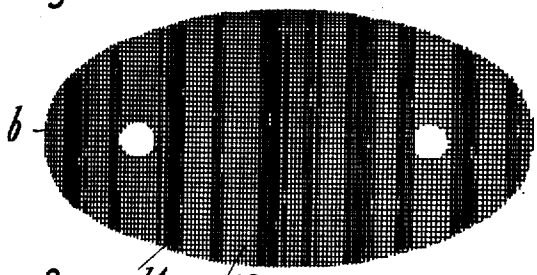

Fig. 3.

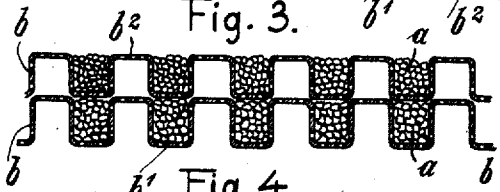

Fig. 4.

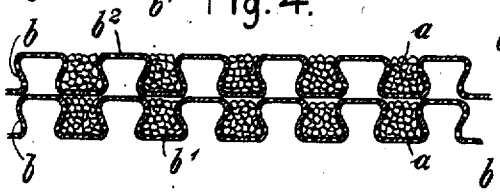

Fig. 5.

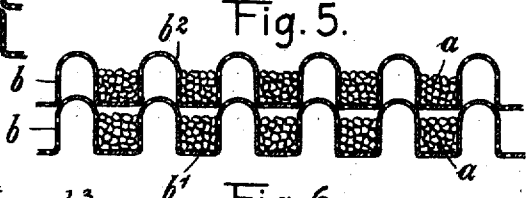

Fig. 6.

Witness.
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UNITED STATES PATENT OFFICE

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CARTRIDGE FOR INDEPENDENT BREATHING APPARATUS

Original application filed February 19, 1926, Serial No. 89,298, and in Germany February 20, 1925. Divided and this application filed July 16, 1930. Serial No. 468,232.

The present invention relates to a new and improved respirator cartridge comprising a plurality of gas absorbing cells of a particular arrangement, to be used in combination with suitable breathing apparatus, and is a modification of the invention disclosed and claimed in applicant's copending application Serial No. 89,298, filed February 19, 1926, Patent No. 1,802,941, issued April 28, 1931, of which this application is a division.

Breathing devices are generally employed under conditions adverse to normal respiration and in the presence of the noxious gases which such devices are designed to eliminate. The wearer is usually in a confined space in which he is subjected to abnormal temperature and pressure. Breathing is naturally difficult under such conditions, and the added fact that the wearer has physical labor to perform which requires rapid respiration makes it apparent that the need for a device which allows a maximum freedom of breathing is as great as the need for a device which will purify the air by removing unrespirable gases.

In the breathing apparatus art two general types of absorbtion cartridges are employed. These are known as the filter type and the surface contact type. In the first mentioned type there are no free passages through the cartridge, but the absorbtion cells are so disposed that the contaminated air is passed through the cartridge in intimate contact with the chemicals. As can be seen, such an arrangement makes possible a complete absorbtion but this is accompanied by a relatively large resistance to the passage of the air. Breathing, therefore, involves the making of an unusual effort. The surface contact type of cartridge has the advantage of offering a lower resistance due to the fact that in this construction the air passes through channels unrestricted by the absorbing element, but as it provides less intimate contact of the air with the absorbent, the length of the channels through which the air passes in the cartridge is proportionally increased to increase the probability that a comparatively large proportion of the air will contact with the absorbent. Consequently, the resistance even in this type of cartridge is relatively high. To obtain this long passageway, the surface contact cartridge is generally divided into several compartments containing absorbing cells which extend across the cartridge. Each compartment is separated, except at alternate ends, from the adjoining compartment by baffle plates through which the air cannot pass. The desired contact is effected by passing the air longitudinally through the entrance compartment along the sides of the absorbtion cells and into the opposite end of the adjoining compartment, through which the air passes longitudinally in the opposite direction, and so on through the cartridge. It will be seen that such a path is long, and the current of air unbroken.

The present invention relates to an improvement of the surface contact type of cartridge which eliminates the disadvantages incident to the use of such type.

The invention is illustrated by the devices shown in the annexed drawings in which:

Fig. 1 is an elevation of a cartridge, partly in section, showing the arrangement of the absorbtion cells within the cartridge.

Fig. 2 illustrates a wire net container for absorbment material adapted to be used in connection with the modification shown in Fig. 1.

Figs. 3, 4, 5 and 6 illustrate sectional views of various modifications of the wire net which may be used to contain the absorbent.

The cartridge shown in Fig. 1 comprises a containing vessel a, having any convenient shape, with air inlet opening x and air outlet opening y, the air traveling in the direction indicated by the arrows. Within the container are arranged a number of foraminated sheets b in superposed relation, each of which consists of a piece of corrugated wire netting shaped, as indicated in Fig. 2, to fit the inside of the container. The wire screen sheet b is preferably of such construction that it will securely retain the particles of absorbent and at the same time expose them as much as possible to the passing air. When the depressions b' in the corrugated wire net are filled with absorbent material a, each

sheet is made up of alternating gas absorbent cells formed by the filled depressions, and air spaces defined by the crests b^2, of the corrugations. The sheets are of like structure, and are arranged within the container in superposed relation so that the alternate depressions b' and crests b^2 of each sheet are in vertical alignment with the corresponding depressions and crests of the adjoining upper and lower sheets. The particular arrangement of the corrugations of the sheets may vary so long as it is substantially the same in each sheet. Thus, as shown in Fig. 2 the depressions b' may run in parallel lines perpendicular to the longitudinal axis of the sheet or, as shown in Figs. 4, 7 and 2, of the drawings of said application Serial No. 89,298, they may take the form of circular or elliptic rings disposed around a point centrally located in the sheet, or may extend radially toward the edges of the sheet.

In the modification shown in Fig. 1, a foraminated covering plate c is placed between pairs of adjacent sheets. This serves the purpose of maintaining the sheets in proper relation and also to form a cover for the depressions of the lower sheet, thus preventing displacement of the gas absorbing chemicals within the depressions. In the modifications shown in Figs. 3, 4, 5, and 6, the depressions of the sheets b are so formed that when the sheets are placed in superposed vertical relation within the container the bottoms of the filled depressions b' of each sheet form a cover for the filled depressions of the sheet immediately below the same, thus performing the covering function performed by the separating sheet c shown in Fig. 1. In Fig. 3, the foraminated sheets b are provided with depressions which have substantially parallel sides. When the sheets are superposed so that the bottom b' of each depression is seated on the top of the corresponding depression of the next sheet, the chemicals a are securely held within the lower depression. Fig. 4 shows the bottoms of the depressions b' of the foraminated sheets b wider than the openings of such depressions. Thus, such bottoms rest on the tops of the foraminated sheet immediately below the same, and do not extend into the depressions a short distance as in Fig. 3, and the air passages extending between the depressions, filled with chemicals, are of constantly varying cross-section, thereby increasing irregularity of air flow.

In Fig. 5, the crests b^2 are bulged upwardly, thus permitting the bottoms of depressions b' to extend into the depressions below them, thus guarding against lateral displacement of the sheets. As shown in Fig. 6, displacement may be prevented by bulging out the crest at certain portions only, i. e. at spaced intervals, thus forming small humps b^3 which project into the air spaces of the sheets immediately above them.

When the cartridge is loaded with the purifying layers it presents a series of stacked chemical cells in a substantially vertical line, each vertical series being separated from the adjoining vertical series by spaces defined by the crests between the cells of each layer, these spaces also being in superposed vertical relation. As the layers are stacked perpendicular to the direction of the flow of air through the container, the superposed air spaces between the absorbtion cells form channels extending in the direction of the air flow and unrestricted by the absorbent material.

Air introduced into the cartridge at the inlet x is free to pass through the channels between the stacks of absorbent cells. In passing through such channels substantially all portions of the air are caused to contact the chemicals, because the air when passing through the wire screen is set in whirling motion. Consequently, there is a thorough absorption in the relative short passageway of the air through the container. As the amount of resistance produced by the screens is very small, free breathing is possible with negligible effort.

While he has shown and described desirable embodiments of his invention, it is to be understood that he does not limit himself to the precise construction disclosed herein.

He claims:

1. A gas purifying cartridge, comprising a container having a gas inlet opening and a gas outlet opening, a plurality of foraminated sheets of corrugated structure adapted to retain gas purifying material in the depressions of the corrugations, said sheets being mounted in superposed relation within the container transversely to the direction of the flow of air through the container and being supported in spaced relation to one another independently of the material in said depressions; the material retaining depressions of each corrugated sheet being in substantially vertical alignment with the material retaining depressions of the adjacent corrugated sheets.

2. A gas purifying cartridge, comprising a container having a gas inlet opening and a gas outlet opening, a plurality of foraminated sheets of corrugated structure adapted to retain gas purifying material in the depressions of the corrugations mounted in superposed relation within the container transversely to the direction of the flow of gas through the container, the bottoms of said depressions being wider than the openings of said material retaining depressions and positioned on the top of the corresponding material retaining depression of the adjacent lower sheet, thereby spacing the sheets and holding the purifying material in place.

3. A gas purifying cartridge, comprising a container having a gas inlet opening and a gas outlet opening, a plurality of foraminated sheets of corrugated structure adapted to retain gas purifying material in the depressions of the corrugations, the depressions and the crests of the corrugations arranged in superposed rows extending transversely to said sheets, the bottoms of the material retaining depressions of each sheet being in closing or covering position with relation to the openings of the material retaining depressions of the adjacent lower sheet.

4. A gas purifying cartridge, comprising a container having a gas inlet opening and a gas outlet opening, a plurality of foraminated sheets of corrugated structure adapted to retain gas purifying material in the depressions of the corrugations, said sheets being mounted in superposed relation within the container transversely to the direction of the flow of air through the container and being supported in spaced relation to one another independently of the material in said depressions, the material retaining depressions of each corrugated sheet being in substantially vertical alignment with the material retaining depressions of the adjacent corrugated sheets, the material retaining depressions being closed to prevent spreading of the purifying material.

ELFRIEDE DRÄGER,
Executrix of the Estate of Alexander Bernhard Dräger, Deceased.

3. A gas purifying cartridge, comprising a container having a gas inlet opening and a gas outlet opening, a plurality of foraminated sheets of corrugated structure adapted to retain gas purifying material in the depressions of the corrugations, the depressions and the crests of the corrugations arranged in superposed rows extending transversely to said sheets, the bottoms of the material retaining depressions of each sheet being in closing or covering position with relation to the openings of the material retaining depressions of the adjacent lower sheet.

4. A gas purifying cartridge, comprising a container having a gas inlet opening and a gas outlet opening, a plurality of foraminated sheets of corrugated structure adapted to retain gas purifying material in the depressions of the corrugations, said sheets being mounted in superposed relation within the container transversely to the direction of the flow of air through the container and being supported in spaced relation to one another independently of the material in said depressions, the material retaining depressions of each corrugated sheet being in substantially vertical alignment with the material retaining depressions of the adjacent corrugated sheets, the material retaining depressions being closed to prevent spreading of the purifying material.

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CERTIFICATE OF CORRECTION.

Patent No. 1,843,446. **Granted February 2, 1932, to**

ELFRIEDE DRÄGER, Executrix of ALEXANDER BERNHARD DRÄGER, deceased.

It is hereby certified that the above numbered patent was erroneously issued to the Executrix, of said inventor, whereas said patent should have been issued to Heinrich Otto Dräger, of Lübeck, Germany, as assignee of the entire interest in said invention, as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 12th day of April, A. D. 1932.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)

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