June 1, 1948. W. E. GROSS 2,442,356

CANISTER

Filed April 19, 1944

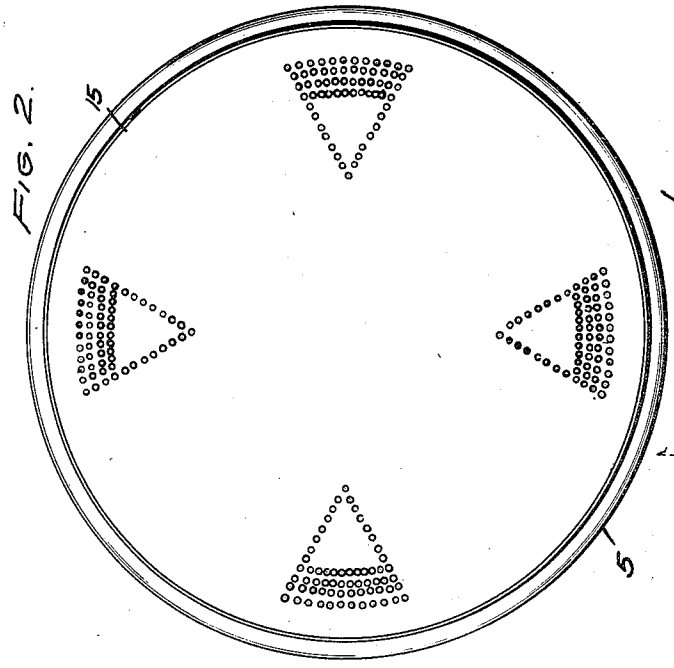


FIG. 2.

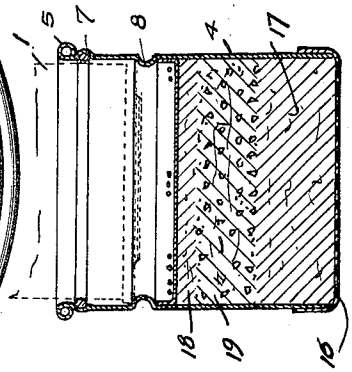


FIG. 4.

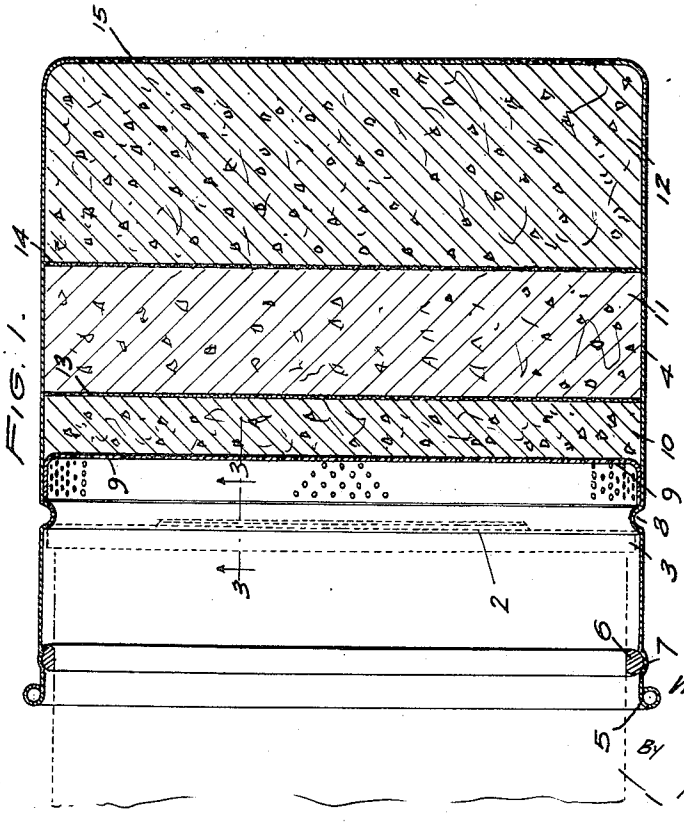


FIG. 1.

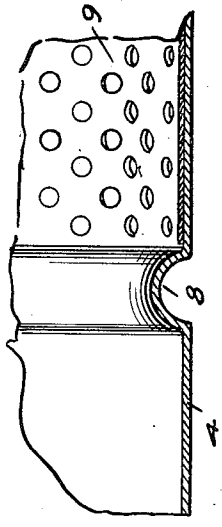


FIG. 3.

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UNITED STATES PATENT OFFICE

2,442,356

CANISTER

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Application April 19, 1944, Serial No. 531,775

4 Claims. (Cl. 23—288)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government, for governmental purposes, without the payment to me of any royalty thereon.

This invention is concerned with means for diversifying and amplifying the protective action of gas mask canisters and the like. More particularly, it has the object of providing for use in combination with standard gas mask canisters a type of auxiliary canister or filter having a construction which affords a quick and secure attachment.

The canister of the military-type gas mask, whether for service, training or non-combatant use, is essentially designed for protection against toxic war gases. It is required to have a long service life and yet be suitably light in weight and small to not hamper the wearer or give excessive breathing resistance. For these reasons the military gas mask canister does not have adequate filling to adapt it for protection against high concentrations of war gas, e. g., concentrations above 1%, or against certain toxic gases which are less frequently expected to be encountered, such as carbon monoxide.

Although there are all-purpose canisters designed to provide protection against a large variety of toxic gases, these have the limitation of breaking down in a short time on account of the limited amounts of specific fillings they contain for absorbing the different gases.

Accordingly, it is an object of this invention to provide an auxiliary canister adapted to be readily attached to a standard canister in an emergency for increasing protective action and means for effecting a quick and efficient seal.

In a more specific sense, a further object of this invention is to provide an auxiliary canister designed to give a quick-acting, air-tight seal that permits attachment or detachment in the field without the use of adhesives, tapes, tools, etc., and which can be manipulated promptly into a proper position.

A further object is to provide a multi-purpose canister made up of sections which are readily put together to form a purification train suited for the air purification required; also, to provide auxiliary sections constructed in a simplified form so that they are light in weight, give low air resistance, are readily assembled and easily renewed. Still other objects will be apparent in the following description.

One important feature of construction for accomplishing the objects of this invention resides in a proper shaping of an auxiliary or sectional

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canister so that it telescopes readily over an inlet end portion of another canister or section and securely wedges a sealing member of rubber or similar rubbery or compressible material, such as synthetic rubber or elastomers.

For a more detailed description, reference is made to the accompanying drawings, wherein:

Figure 1 shows a sectioned side view of one type of auxiliary canister assembled in combination with a standard type cylindrical canister;

Figure 2 shows an inlet end view of the auxiliary canister illustrated in Figure 1;

Figure 3 is an enlarged fragmentary cross-section view of the auxiliary canister, along line 3—3 in Figure 1; and

Figure 4 shows a sectioned side view of a second type of auxiliary or sectional canister, the view being reduced in scale.

Referring to the drawings and particularly to Figures 1, 2 and 3, 1 represents the bottom part of a standard military-type canister having a common kind of filling, such as activated charcoal, whetlerite, or soda lime mixed with charcoal, for removing war gas contaminants from air which enters the canister through a valved inlet 2 in a double-seamed bottom 3.

The auxiliary canister body or casing 4 has an open end extension telescoped over the bottom portion of the canister 1, as shown in Figure 1, with the curled rim or lip 5 flexed a short distance from the outer side wall of canister 1. A rubber sealing ring 6 is wedged and held firmly between the outer side wall of canister 1 and the outwardly beaded groove or indentation 7 in the auxiliary canister body 4 near rim 5. The double seam 3 of canister 1 rests against an inwardly indented circumferential bead 8 in canister body 4.

The circumferential groove at the back of the inwardly indented bead 8 is spaced a further distance away from the rim 5 than is the outward bead 7 and is located so that a perforated retaining plate 9 is held firmly against the filling within the auxiliary canister body 4 and away from the bottom inlet valve 2 of canister 1. The inward bead 8, accordingly, may be considered to have several functions. It fixes the distance of insertion and acts as a support for the perforated retaining plate 9.

The perforated retaining plate 9 is preferably dished inwardly to press firmly against the filling material within the auxiliary canister.

For the purpose of illustration, the filling shown in the auxiliary canister is intended for eliminating carbon monoxide from air. Carbon

monoxide is not removed by the ordinary or standard military-type gas mask canister. It is a very insidious toxic gas which has no odor. It is present in automobile exhaust gases, in mine-explosion gases, in burning buildings, and in gases from burning smokeless powder.

The filling shown for eliminating carbon monoxide includes a layer 10 of caustic pumice, an intermediate layer 11 of a low-temperature carbon monoxide catalyst, such as hopcalite, and another layer 12 of caustic pumice. The caustic pumice is a granular preparation of caustic soda and pumice capable of retaining a number of acid gases and absorbing water vapor which tends to inhibit the action of the hopcalite. Hopcalite is a known specially prepared mixture of manganese dioxide and copper oxide in granular form which converts carbon monoxide into innocuous carbon dioxide. Wire screen separators 13 and 14 are placed between the layers of caustic pumice and the granular catalyst layer 11.

The bottom 15 of the auxiliary canister is perforated as shown in Figure 2 to act as an air inlet. After passing through the perforations, the air flows axially first through layer 12 of caustic pumice, then through layer 11 of carbon monoxide catalyst, then through layer 10 and, with carbon monoxide eliminated, into the inlet of the military-type canister, whence it is inhaled into the gas mask directly or through a hose.

To attach the auxiliary canister to the gas mask canister, the following procedure is followed: (*a*) the rubber ring 6 is placed on the gas mask canister body 1 at one point and held against the double seam with the left thumb, the rest of the ring is then laid (without twisting) over the double seam and onto the canister much in the same way as an automobile tire is placed on its rim, taking care to have the ring in contact with the double seam 3 when finished; (*b*) with the auxiliary canister 4 resting against a solid flat surface, the angle of which is immaterial, or with the canister 1 and the auxliary canister 4 held in each hand, the gas mask canister 1 is pushed into the open end of the auxiliary canister 4 until the rubber ring 6 on the gas mask canister contacts the rim 5, then rolls between body 1 and the inner wall of canister 4 and snaps into the groove made by outward bead 7. The rubber ring 6 thus becomes wedged in place, and the canister 1 may be pushed up against the inward bead 8 which serves as a stop.

The modified form of auxiliary or sectional canister shown in Figure 4 has a construction which is similar to that of the auxiliary canister illustrated in Figure 1 but has a detachable inlet cover 16 which can be readily removed from the canister body 4 so that the filling can be put in place after the canister body is formed and can be removed for renewal. The cover 16 may be secured to the canister body by a friction fit, threaded engagement, bead and groove engagement, or a similar manner, and is preferably dished inwardly to press against the filling. Another feature of this modified form of auxiliary canister is in the use of layers 17 and 18 of resilient, fibrous, inorganic material on both sides of granular adsorptive or absorptive material 19.

A resilient fibrous, inorganic material, such as rock wool, advantageously serves to compress and hold the granular material in place, thus preventing channeling, even when the canister is subjected to rough handling. Preferably, the pads of fibrous filter material are cut oversize. If proper binding agents are used, the resilient fibrous material of siliceous or inorganic nature is resistant to water and gives protection against water penetration. Resilient fibrous rock wool also serves to filter out smoke and dust particles and to retain fine droplets of oil.

The granular material used in the auxiliary canister depends upon the purpose of protection. For protection against ammonia, the granular material in the auxiliary canister may be made up of a first layer of silica gel and a second layer of "kupramite," which is a hydrated copper sulfate impregnated into pumice granules. For equipping the auxiliary canister to protect against high concentrations of hydrocyanic acid, the intermediate granular material in the auxiliary canister may be made up of a first layer of charcoal impregnated with hexamethylenetetramine followed by a layer of caustic pumice and another layer of charcoal impregnated with hexamethylenetetramine. These layers may be held in place by means of fibrous rock wool. Thus, any type of adsorptive and/or absorptive material may be placed in the auxiliary canister for protection against one or more specific toxic gases. Also, in the event a new toxic agent is developed, a new counteracting agent may be provided in auxiliary canisters for quick distribution and use in the field.

The simplified auxiliary canister requires a minimum use of machinery, of critical material such as steel, and of skilled labor for its production. It readily lends itself to manufacture from non-metallic material, such as plastics; and even if made from metal, a relatively small amount of metal is used.

By virtue of the tough resilient nature of the filtering medium made of a siliceous or inorganic material, such as rock wool, the auxiliary canister containing such a filtering medium does not require the use of separators; thus, the amount of metal is substantially reduced. The cushioning effect of the resilient filtering medium permits chemical absorbents of low hardness value and high efficiency to be used without fining during rough usage. Also, with the detachable perforated inlet cover, the canister can be readily assembled, repaired and renewed by unskilled personnel without the need for special vibrating and compacting apparatus. The resilient filter medium gives the air flow an even distribution over the cross-sectional area of the granular layer and thus dispenses with the use of baffles or other internal structure which offers resistance to air flow.

With the construction shown, the auxiliary canister can be quickly and securely attached to another canister of approximately the same cross-sectional dimensions, and an air-tight seal is effected regardless of any small irregularities of the surfaces sealed and regardless of the presence of a double seam at the bottom of the canister telescoped by the auxiliary canister. The attachment can be manipulated promptly and securely by use of the procedure described.

With the type of canister having a detachable bottom inlet and resilient fibrous material to compress the filling, the canister may be salvaged and packed in the field with air-purifying agents shipped in bulk, thus making a saving in shipping space and in the preservation of the agents during storage and shipment.

Complete engineering tests on canisters constructed in accordance with the present invention proved the canisters to be satisfactory in every way.

The auxiliary canister can be made of convenient size for packing in an hermetically-sealed container which is not opened until the need for protection against a toxic gas like carbon monoxide is judged to be imminent. Thus, the protective value of the canister can be preserved, for otherwise the protective value may tend to be destroyed by exposure to moisture, particularly if proper functioning of the chemical adsorbents depends upon low moisture content. A satisfactory container for storing the canister is constructed like a coffee can, having a circumferential tear strip and provided with a key for opening.

With the hopcalite catalyst, which is inhibited by water vapor, it is also desirable to have a layer of about 75 cc. of silica gel and a layer of about 100 cc. of charcalite (activated charcoal impregnated with about 30–45% calcium chloride) precede the catalyst, 110 cc., with screen separators between the layers and to have a rock wool pad next to the catalyst in the order named. This type of canister, after preservation in an hermetically-sealed container, is very effective for restraining carbon monoxide.

In my co-pending application, Serial No. 519,597, filed January 25, 1944, I have described and claimed the use of resilient rock wool in air-purifying canisters more generally.

It is to be understood that the invention is not limited to the details of construction herewith shown by way of illustration, since modifications come within the spirit and scope of the invention.

I claim:

1. In an auxiliary air-purifying canister a body having an air inlet and outlet, an air-purifying filling disposed in an axial path of air flow from the inlet to the outlet in said body, a perforated detachable inlet cover fixed to the body at the inlet, a side wall of said body surrounding said filling, an inwardly indented bead in said wall, and a perforated retaining plate dished inwardly and held by said bead firmly against the filling.

2. In an auxiliary air-purifying canister a cylindrical side wall, an outlet opening substantially in registration with the inner surface of the cylindrical side wall, an inwardly indented bead in the periphery of said side wall, a perforated retaining plate resting against said bead and pressing against a filling comprising a granular air-purifying material and pad of fibrous rock wool.

3. In an auxiliary gas mask canister adapted for quick and secure attachment to a standard air-purifying canister connected to a gas mask, a canister body shaped to be partly telescoped at one end over a bottom inlet portion of a standard canister, a curled rim at the telescoping end of said body, a perforated inlet cover at an inlet end of said body, an outwardly projecting bead

in a telescoping portion of said body near the curled rim, an inwardly projecting bead in the wall of said body located further from the curled rim than said outwardly projecting bead, a perforated retainer plate resting against said inwardly projecting bead, and interposed between said retainer plate and the perforated inlet cover a granular air-purifying material sandwiched between pads of resilient rock wool filtering medium.

4. An auxiliary air-purifying canister comprising a body having an air inlet side and an opposite outlet side, an air purifying filling disposed in the axial path of air flow from the inlet to the outlet in said body, the inlet side of the body having an opening substantialliy co-extensive with the cross-sectional area of the body occupied by said air purifying filling, a perforated removable cover attached to the body over the inlet side opening, said cover pressing against the filling material on the inlet side of said body, a perforated retaining plate pressing against the filling material on the outlet side of said body, an inwardly projecting bead in the wall of said body to serve as a support for said perforated retaining plate, and an outwardly beaded groove in the wall of said body intermediate the outlet end and said inwardly projecting bead.

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