

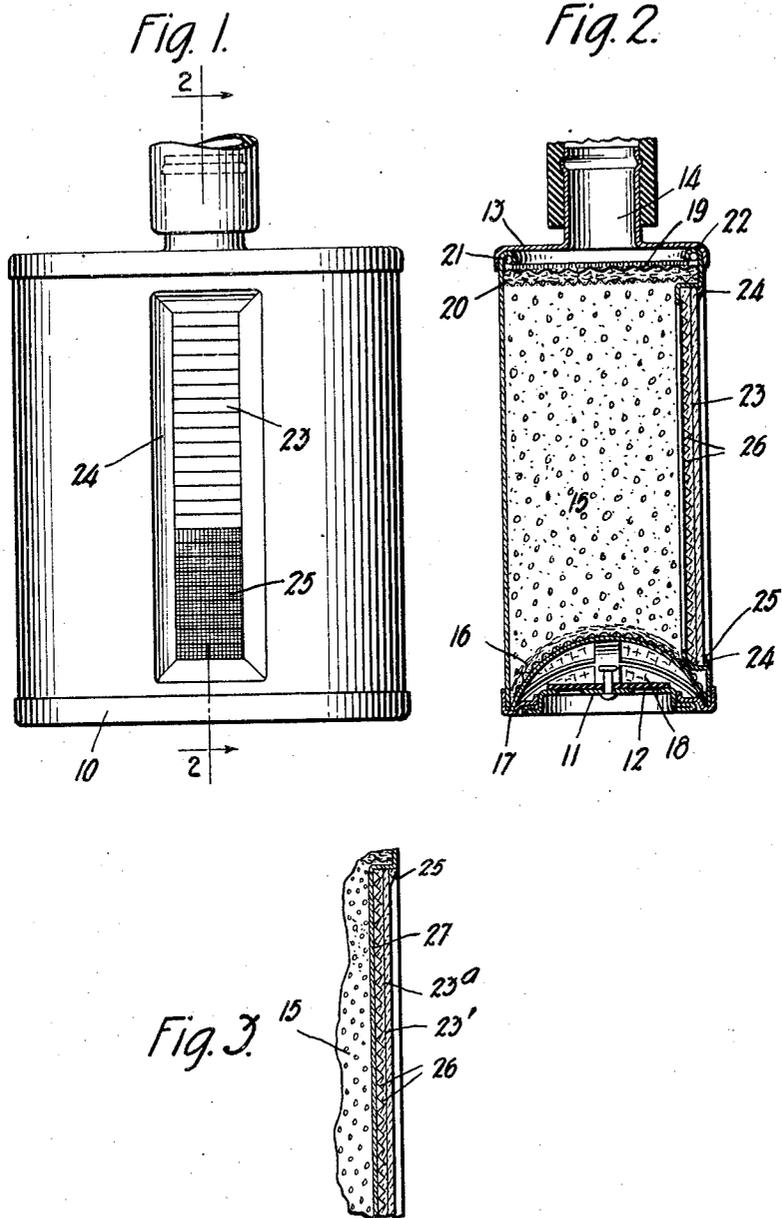
Aug. 27, 1929.

M. YABLICK

1,725,893

INDICATING GAS MASK CANISTER

Original Filed Dec. 5, 1924



INVENTOR

BY *Max Yablick.*

Dean, Fairbank, Obriecht & Hirsch.
ATTORNEYS

UNITED STATES PATENT OFFICE.

MAX YABLICK, OF NEW YORK, N. Y., ASSIGNOR TO MINE SAFETY APPLIANCES COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

INDICATING GAS-MASK CANISTER.

Original application filed December 5, 1924, Serial No. 754,108, now Patent No. 1,537,519, dated May 12, 1925. Divided and this application filed March 25, 1925. Serial No. 18,161.

My present invention relates primarily to respirators and more particularly to the canisters thereof for intercepting or separating out poisonous or obnoxious gases from air, drawn therethrough in the process of inhalation.

Since an ordinary canister comprising a metal casing enclosing the gas absorbing or intercepting composition through which the air is drawn, does not indicate the extent of residual life after use, such canister when reused, may fail at such time as it is most needed, while discarding of a canister after but a single use usually involves waste.

It is accordingly, among the objects of the invention to provide a canister which will indicate while in or out of use, without the need for separate testing appliances or operations, the proportion of residual life therein.

Another object of the invention is to provide indicating means for the purpose mentioned which shall not necessitate any substantial change in the construction or design of canisters in common use, which shall in no way interfere with the efficacy of the canister in the regular performance of its function, nor involve added discomfort or danger in use, which shall operate reliability without possibility of a false registration, which shall involve no delicate mechanical or other appliances likely to become out of order, and which shall not add appreciably to the cost of the canister.

My present invention has a preferred field of application to canisters, the fillers of which preferably of granular material, have a marked avidity for the impurity to be intercepted, absorbed, adsorbed or occluded. In the use of such canisters, the impurity is immediately intercepted by the unused filler as the air is drawn in from the bottom thereof, the purified air passing on through the rest of the filler, so that at any stage of use of the canister, the filler content will be substantially used or spent below a definite level, said level rising as the use of the canister proceeds.

Where, as in the cases in which the filler of absorbent changes color or appearance after it has intercepted the gaseous impurity, the indication can be effected through a window in the canister extending the height

thereof or by providing a transparent canister wall. On the other hand, where the gas does not change the color or appearance of the filler, the latter may be impregnated with an appropriate indicator for the gas, so that the indication can be effected as in the first illustration. Where it is not desired to use an indicating impregnation, an indicator test strip may be used, extending the height of the canister in contact with the filler, and preferably superposed over the inner wall of the canister, and exposed through a transparent or open wall portion, or the container wall itself or a part thereof may be of an absorbent material impregnated with the indicator, and exteriorly covered with a transparent gas resisting coating, such as shellac.

This application is a division of my co-pending application, Serial No. 754,108, filed December 5, 1924, issued May 12th, 1925, as Patent No. 1,537,519 in which the generic claims are presented.

In the accompanying drawings in which is shown one or more of various possible embodiments of the several features of this invention,

Figure 1 is a side view of a preferred canister,

Figure 2 is a view in longitudinal section taken along the line 2—2 of Figure 1, and

Figure 3, is a fragmentary longitudinal sectional view of a modification.

The casing of the canister is substantially conventional, including the usual shape of metal casing or canister with a bottom wall 10 telescoped thereover, said bottom wall having the inlet cap 11 centrally closed by a flap valve 12. A cover cap 13 is telescoped over the casing and has the usual outlet neck 14 to which the hose or tube, only one end of which is shown, leading to the bearer's face is attached.

The filler 15, preferably a granular substance, may be supported upon a layer 16 of absorbent cotton, in turn, upon a curved wire mesh seat 17 above the flap valve 12, affording a space 18 in which the flap valve may operate. At the top of the canister, a similar, preferably flat wire mesh compression member 19 presses upon the filler through an interposed layer of absorbent cotton 20 and is held in place by a clamp 21

of appropriate construction reacting against integral intumed tongue 22 at the top of the casing.

In a preferred embodiment, there is provided a window 23 extending substantially the height of the canister, and preferably comprising a narrow strip of transparent material such as glass held in place in the canister in any of a wide variety of manners. By way of illustration, I have shown the window lodged in an integral rectangular frame 24, pressed outward from the metal of the canister and fixed in position by soldering as at 25. Preferably the window is a thick pane of triplex or non-shatterable glass comprising two thinner panes of glass cemented to an interposed sheet 23' of celluloid or the like. The inner wall of pane 23 may be provided with a series of prisms 26 extending horizontally thereacross in contact with the absorbent filler for a purpose which will appear fully in the operation set forth below.

The filler it will be understood is of composition and physical construction such as to have a particular affinity or avidity for the gas or gases to be abstracted from the air drawn through the canister into the lungs of the user. In certain applications, the canister contents will change color or appearance when the gas has been absorbed thereby, for instance, in the use of a filler of copper sulphate crystals, impregnating granules of pumice stone or the like, the natural green color changes to blue when ammonia has replaced the water of crystallization in whole or in part.

As the ammonia laden air is drawn into the canister, the ammonia will rapidly be absorbed by the bottom layer of the filler and air freed from ammonia is drawn through the rest of the filler, so that the ammonia saturated compound at the bottom of the canister, will appear blue after use, while the rest of the filler above said bottom will remain green. By inspection through the window, therefore, it is instantly ascertained what proportion of the life of the canister has been spent and to what extent therefore, the canister is available for further use.

The presence of the multiplicity of transverse ribs on the window against which the granular contents in the canister is firmly pressed, obstructs any possible relatively free path for the air along the minute gap, which might otherwise exist between the window and the contents, and thereby avoids the possibility of the impurity in the air when drawn through the canister, rapidly changing the color of the entire length of filler exposed through the window, and giving a false indication where the body of the filler is not spent. By the rib construction, it is seen that the air is not readily drawn through the path of greatly increased re-

sistance immediately adjacent the window. Moreover, the ribs aid in rendering sharper the line of demarcation between the used and the unused filler and also acts as graduations by which the proportion of unused filler can be more accurately determined.

My invention is broadly applicable to canisters for respirators regardless what impurity is to be removed, the filler in each case being used according to common practice for the purpose desired.

In some cases, however, the filler will not change in color or physical appearance after it has absorbed the impurity on which it is to act, sufficiently to afford a line of demarcation between the saturated and the fresh part. In such case, it is desirable to combine with the filler an appropriate indicator which will change color by the action of the impurity, the indicator, of course, in each case being such as not to impair the efficacy of normal operation. For instance, the usual filler of soda lime employed as an absorbent for hydrogen sulphide does not appreciably change color after it has been saturated by the gas, so that the residual life of the canister could not readily be ascertained by inspection through the window. In this case, I preferably spray the soda lime with a solution of lead salt, such as lead acetate. The lead salt, as will be understood, is converted into the black lead sulphide, when acted on by the hydrogen sulphide, so that it serves as an indicator, the filler now appearing black to the level to which the free hydrogen sulphide gas has passed. Instead of spraying, the absorbent can, of course, be immersed in a solution of the salt.

Where it is undesired or unfeasible to impregnate the absorbent with an indicator, a separate test or indicator strip 27 may be used, applied immediately back of the window 23', as shown in Figure 3. This test strip may either be of a type which changes color when acted on by the gaseous impurity itself or when acted on by the product resulting from the absorption of the gaseous impurity by, or other action upon the filler. In the case of a canister for removing ammonia gas, embodying a filler of material that does not inherently change color after it has been used, such, for instance, as silica gel, ordinary red litmus paper may be used, for instance, which will turn blue up to the level to which the ammonia gas has passed. In an alternative arrangement, part or all of the wall of the canister may be made of an appropriate porous molded material, such as fibre, impregnated with the indicating solution, and protected at its exterior from the action of the gas, by a transparent outer coating, such as shellac, water glass, or any suitable transparent enamel. In operation, the canister wall will change color

to the level to which its contents has been spent.

During the actual use, in industry, of a canister, as for the protection from ammonia, chlorine, sulphur dioxide, hydrocyanic or hydrochloric acid, a faint odor of these gases will apprise the user to change canisters, even if he should not look at the indicator, which in that case would appear to show that the canister has been spent. In the case of a canister used for protection against carbon monoxide, however, or other poisonous gas that is odorless and tasteless, the canister should be looked at by the user from time to time during service, only the indicator in that case and neither the sense of smell, taste, or any other sense or sensation, apprising of the need for changing canisters. Without my indicating means in the use of a canister operating in a carbon monoxide atmosphere, the user might be seriously poisoned before he became aware of the fact that the canister is not functioning. Inasmuch as in the use of a carbon monoxide abstracting canister, the availability for further use should be almost constantly ascertained during actual service, it might be desirable to extend the indicator, not throughout the height of the canister, but only near the top thereof, the change in color or appearance during service, of such indicator, apprising of the need for changing canisters. A small mirror (not shown) is, therefore, advantageous, set at the proper angle to reflect the image of the indicator, so that it can be constantly seen, while the mask is in use.

My indicator always apprises of the need for replacing the canister, even though the latter may not be entirely spent, but by reason of rapid breathing, for instance, the impurity might only have acted on the surface of the granules throughout the height of the canister and thereby have caused a change in color throughout the height of the window.

When the canister thus used, is laid aside for a period of hours or days, the granules which have only absorbed the gas at their surface, resume substantially the color or appearance of the unspent granules, by reason of the impurity spreading throughout the volume of the granules, while those granules that have been saturated maintain the color or appearance of spent filler. Accordingly, the filler after having been allowed to regenerate, presents a line of demarcation between the spent and unspent part thereof, visible through the window. The user, accordingly, knows that it is still serviceable, where, in the absence of my indicating means, or separate testing appliances or operations, he would not feel safe in re-using a canister that had once apparently failed.

I have thus provided a reliable registering means for indicating the residual life of the

canister, and its availability of any instant for further use, which means is simple and easy to apply, which involves no delicate mechanism of any character, which avoids the use of special testing appliances or the need for disassembly of the apparatus, which does not depend for its operation on temporarily inflicting discomfort or pain upon the user and which does not impair the life of the canister. Should the canister drop and the glass window crack, the celluloid pane therein remains intact and prevents the entry of air or gas through the crack, so that false reading is avoided.

Where a special chemical is used, near the top of the canister to produce a special noticeable physiological effect, such as to excite the lachrymal glands, as a signal that the canister is no longer fit for use, it is apparent that there is no means available for indicating to the user the extent to which the canister is still available, when he is about to commence its use, so that after use but for a fraction of a minute the signal may be given and the user is compelled to leave the gas-charged space and obtain a new canister. Moreover, the efficiency of the worker is impaired, by the anticipation of the pain and discomfort to be inflicted and by the actual damage done when the alarm is given.

Where, on the other hand, two or more canisters are carried on the person with an inter-connecting valve for placing a used canister out of service and changing to a supposedly unused canister, not only is the apparatus more bulky and of greater weight, impairing the freedom of movement of the user, but, unless the connecting valve is particularly well made at substantial expense, it is likely to leak, so that as a matter of fact, the two canisters will to an extent be used concurrently and the supposedly fresh reserve canister may actually be spent or nearly spent, when the valve is set to bring it into use.

In the foregoing, I have described two specific applications or embodiments of the invention suitable for ammonia and one for hydrogen sulphide gas masks. For abstracting sulphur dioxide, soda lime may be used as with hydrogen sulphide, with a separate indicating test paper, however, impregnated with potassium iodate starch and applied substantially as in the embodiment of Fig. 3. For abstracting hydrochloric acid fumes, soda lime is also suitable, but as in its use for removing sulphur dioxide or hydrogen sulphide, it does not change color. For this use, it is preferable to impregnate the soda lime with a Congo red solution which turns blue when acted on by hydrochloric acid fumes. For removing carbon monoxide gas, a suitable absorbent may be used with Palladium chloride test paper, serving as an indicator and turning dark under the action

of carbon monoxide. Another suitable indicator for carbon monoxide is iodine pentoxide, sulphuric acid. The foregoing are illustrative examples merely of noxious gases and the indicators therefor with which my invention is concerned.

My invention is not limited in its application to industrial uses, but is suitable also in chemical warfare. In military operations, thus, when the window or other indicating area shows no more change, the soldier knows it is safe to remove the mask, and thus the dangers of premature removal, as well as the discomfort of continued use of the mask when no longer necessary, are obviated.

It will thus be seen that there is herein described apparatus in which the several features of this invention are embodied, and which apparatus in its action attains the various objects of the invention and is well suited to meet the requirements of practical use.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative, and not in a limiting sense.

I claim:

1. A respirator canister, a filler therein having a strong avidity for a definite gase-

ous impurity and an indicator strip extending substantially the height of the canister and permanently changed in appearance by contact with the gaseous impurity, whereby the residual life of the canister can be ascertained by inspection of said indicator strip.

2. A respirator canister for abstracting a gaseous impurity from inhaled air, said canister including a substance having a strong affinity for said gaseous impurity, a window extending the height of said canister, and an indicator strip extending substantially the length of said window and changed in color or appearance by contact with the impurity.

3. A respirator for removing an impurity from air, comprising a canister, a filler therein having an affinity for said impurity, and an indicator visible from the exterior of the canister associated with but not incorporated in said filler, said indicator by change of color showing a line of demarcation between the spent and unspent filler.

4. A respirator comprising a canister and a window therein, said canister including a filler for removing carbon monoxide from air passed therethrough and a Palladium chloride indicator strip associated with said filler and visible through said window, said strip apprising the user by change of color of the level to which said filler is spent.

Signed at New York city in the county of New York and State of New York this 23rd day of March A. D. 1925.

MAX YABLICK.