

[54] **METHOD OF MAKING ALUMINIZED PAPER**

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[51] Int. Cl. **D21h 3/66**

[58] Field of Search..... 162/4, 181 R, 13.8, 140; 23/253 TP; 264/115, 116, 122

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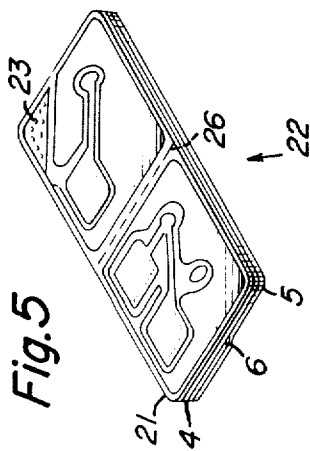
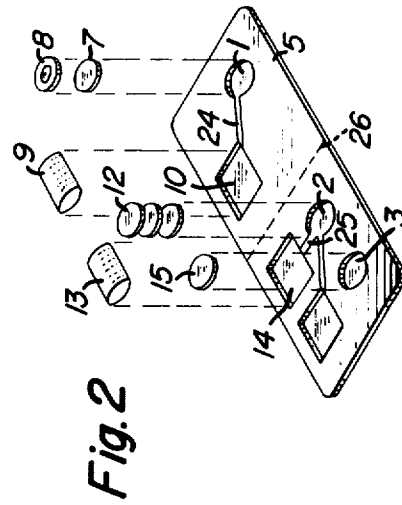
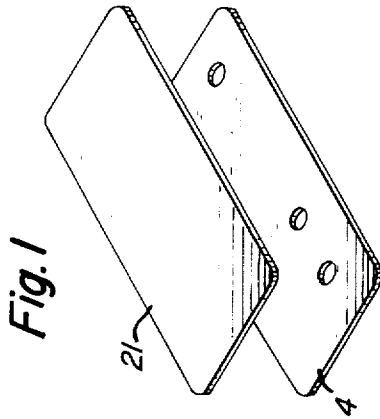
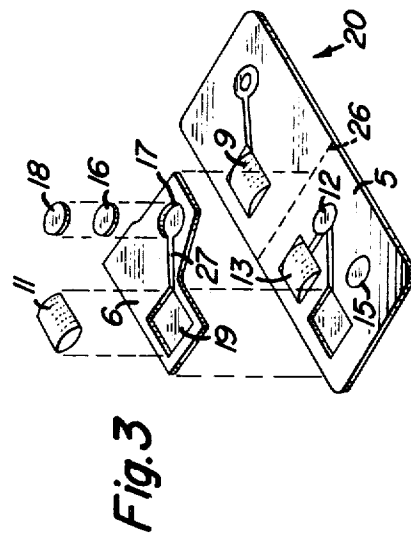
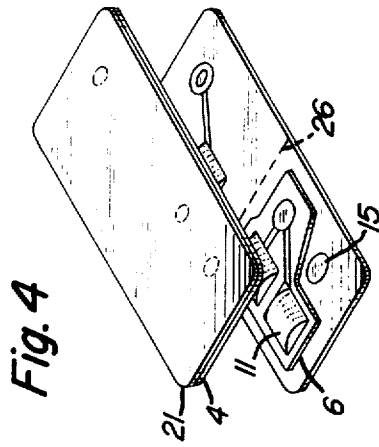
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[57] ABSTRACT

A method of forming an aluminized test paper is disclosed where blotting paper and aluminum powder are slurried together and then molded to form the test paper which is subsequently dried.

2 Claims, 5 Drawing Figures



METHOD OF MAKING ALUMINIZED PAPER

This is a division of application Ser. No. 129,360, filed Mar. 30, 1971, now U.S. Pat. No. 3,740,196.

DEDICATORY CLAUSE

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

My invention relates to a new apparatus, material, and method of producing the material for chemical spot test systems containing multiple spot tests enclosed in a container which can be carried in a jacket or shirt pocket; my invention being an improvement of apparatus such as disclosed and claimed in U.S. Pat. application Ser. No. 52,499 filed 6 July 1970 now U.S. Pat. No. 3,726,645.

The spot tests in the aforementioned systems are designed to detect chemical speices down to 0.02 part per million in water and air and are contained in packaging and support means made of weldable and impermeable plastic film.

The prior art apparatus, such as the exemplary apparatus described in the aforementioned patent application, employed a mustard agent spot test means wherein CuCl_2 solution contacted aluminum discs, such as discs 12 in the aforementioned patent application, to generate sufficient heat to achieve adequate sensitivity for the mustard agent spot test. The use of the aforementioned aluminum discs presented a problem of assembly in that the discs were thin and had a small size, about $\frac{1}{4}$ inch in diameter, which made handling of the discs difficult. Moreover, the aluminum discs were difficult to wet with the CuCl_2 solution which caused a delay in heat generation and adversely affected the sensitivity of the mustard agent spot test. Further, excess CuCl_2 in the prior art device would often leak from the apparatus. My invention was conceived and reduced to practice to overcome the aforementioned aluminum disc problem and to satisfy the long felt need for a heat generating means for a mustard agent spot test in a chemical spot test system.

My invention has utility in any chemical system wherein an aluminum and CuCl_2 exothermic reaction is required.

A principal object of my invention is to provide a reliable, effective, and sensitive means and material, for detecting the presence of mustard agent by a chemical spot test system.

A further object of my invention is to provide an easily assembled means and material to detect mustard agent which employs a CuCl_2 and aluminum exothermic reaction wherein excess CuCl_2 will not leak from the assembled means.

Another object of my invention is to provide an inexpensive and easy method for manufacturing an aluminum means for use in a means to detect mustard agent.

Other objects of my invention will be obvious or will appear from the specification hereinafter set forth.

FIG. 1 is a view showing an aluminum protective shield and a cover, made of plastic film, for the plastic film container means shown in FIG. 2; the view being prior to lamination.

FIG. 2 is an exploded view showing a container means made of plastic film and components to be assembled within the container means.

FIG. 3 is an exploded view showing the structure shown in FIG. 2 after assembly of the components therein with a module means, made of plastic film, above the FIG. 2 structure and also showing components to be assembled within the module means.

FIG. 4 is an exploded view showing the structure shown in FIG. 1, after lamination, located above the structures shown in FIG. 3 preparatory to lamination of the entire system.

FIG. 5 is a view showing the entire assembly of structures shown in FIGS. 1 to 4 after lamination.

My invention, as shown in FIGS. 1 to 5, will now be described in detail as follows.

The plastic film to produce cover 4, package 11, and module 6, shown in FIGS. 1 and 3, was produced by subjecting a commercially available chlorofluorocarbon film of the general formula $(\text{CF}_2 - \text{CFC1})_x$ to a vacuum of approximately 1 millimeter of mercury at 195°F until the volatile content of the film was reduced to no greater than 0.05 parts per million when measured at 150°F under a vacuum of approximately 1 inch of mercury; the measurement at 150°F being made in the conventional manner. The resulting vacuum treated film remained pliable, weldable, and impermeable. While any part configuration for any desired chemical system application can be stamped from the above described plastic film by conventional machine shop stamping technique, exemplary configurations are demonstrated by aforementioned structures 4, 11, and 6. Also, while the above described plastic film is suitable for any applicable chemical system, an exemplary system for detection of nerve agent presence in air or water is provided by inserting sintered glass disc 7 in recess 1 and superimposing an enzyme spot disc 8 on disc 7, the enzyme spot being any conventional composition such as that impregnated in the enzyme paper described in U.S. Pat. Ser. No. 3,049,411; inserting a buffer in a plastic film package 9, the buffer being a composition as described in the aforementioned U.S. Pat., in recess 10; inserting aluminized paper 12, the manufacture thereof described in the example below, in recess 2; inserting CuCl_2 in a plastic film package 13 in recess 14; and inserting, in recess 3, a substrate 15 of composition such as described in U.S. Pat. Ser. No. 3,515,644. A system for detecting mustard agent in air or water can be provided in combination with the above described nerve agent detection system by inserting a plastic film disc 16, made of plastic film, in recess 17 of module 6 and superimposing on disc 16 a mustard agent spot test 18 of composition 4-nitro-benzyl pyridine impregnated in a conventional substrate; inserting package 11, made of plastic film, containing K_2CO_3 within recess 19; and superimposing module 6 on section 5 of the container shown at 20 in FIG. 3. The plastic film used in the apparatus has particular utility regarding the mustard agent detection system, because this system is very sensitive to contamination by volatile matter within commercially available plastic film. After assembly of the nerve agent system components and mustard agent system components as described above; container 20 with module 6 superimposed thereon, cover 4 superimposed on container 20 and module 6, and aluminum shield 21 superimposed on cover 4 are laminated together utilizing conventional laminating technique to form the integral chemical system unit shown at 22 in FIG. 5. The operation of the above described exemplary nerve agent and mustard

agent detection system will be described as follows to render the application complete in all respects. To test the environment for nerve agent presence, shield 21 is peeled off by means of serrulated corner 23, as shown in FIG. 5, and the shield discarded; package 9 is ruptured by squeezing to cause the buffer solution content to flow through channel 24 to thoroughly wet disc 8; unit 22 is exposed to the environment containing suspected nerve agent and/or mustard agent for approximately six minutes; package 13 is ruptured and the CuCl_2 solution squeezed along channel 25 to contact aluminum paper 12 to generate sufficient heat to achieve adequate sensitivity for the mustard agent spot test, completion of the mustard agent test being subsequently described; unit 22 is folded along line 26 and spot disc 8 held against substrate 15 for approximately two minutes; upon folding unit 22 back to the position shown in FIG. 5, no color on spot disc 8 indicates presence of nerve agent which has inhibited the enzyme action, and, if no agent is present, a blue color results in disc 8 as a result of the substrate-enzyme reaction. To complete the test of the environment for mustard agent presence, after all of the steps described above regarding nerve agent detection have been performed, package 11 is ruptured and the K_2CO_3 solution squeezed along channel 27 to wet spot 18; no color change in spot 18 after wetting by K_2CO_3 indicates no mustard agent is present, and a change to a purple color, after spot 18 is wetted by K_2CO_3 , indicates the presence of mustard agent.

The use of aluminized paper in my apparatus overcomes the prior art aluminum disc leakage problem, because CuCl_2 is absorbed by the paper and excess CuCl_2 is thereby held within the apparatus. By dispersing aluminum particles through paper, a larger surface area is presented to be contacted by and reacted with the CuCl_2 solution to produce instant heat and overcome the prior art problem of difficult wetting of the aluminum discs by the CuCl_2 solution. Lastly, the aluminized paper is more easily handled than the prior art aluminum discs. A typical procedure for preparing the

aluminized paper for my apparatus is described in the following example.

Example

5 Approximately 3.0 grams of conventional blotting paper, approximately 9.0 grams of 325 mesh aluminum powder, and 2,000 ml of water are mixed at high speed for approximately 3 minutes in a conventional blender, such as a Waring blender, to separate the individual fibers. The resulting slurry is emptied into a conventional paper mold, and the water is allowed to drain completely out. The resulting aluminum paper mat is removed from the paper mold screen, placed in an oven and dried at approximately 90°C for approximately 2 hours, and cut to sizes suitable for assembly into my apparatus.

The thickness, weight, ratio of paper pulp to aluminum, and paper characteristics are adjustable within the skill of the art to meet the requirements for any given application.

It is obvious that other modifications can be made of my invention, and I desire to be limited only by the scope of the appended claims.

I claim;

25 1. A method of producing aluminized paper for use in an apparatus to detect environment toxic agent contamination comprising the steps of: mixing the following ingredients in the approximate ratio of 3.0 grams blotting paper, 9.0 grams aluminum powder, and 2,000 ml of water at high speed in a blender for approximately 3 minutes to separate the fibers and produce a slurry; pouring the slurry into a paper mold; draining the water from the slurry within the paper mold to produce an aluminum paper mat; removing the aluminum paper mat from the paper mold; drying the paper mat in an oven at approximately 90°C for approximately 2 hours; and cutting the paper mat into predetermined sizes to use in the apparatus.

35 2. The method of claim 1 wherein the aluminum powder is 325 mesh.

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