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3,101,709

FACE MASKS

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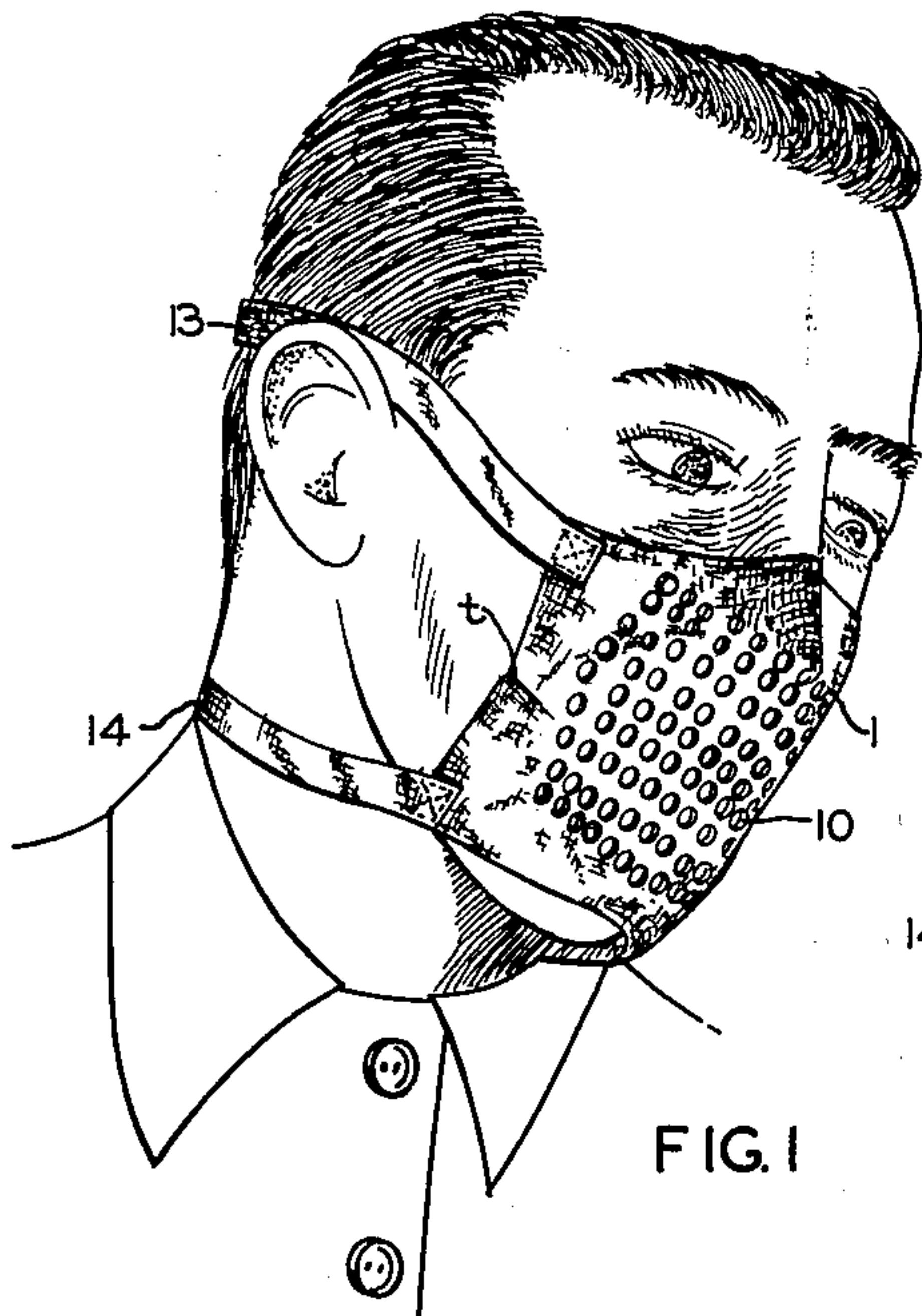


FIG. 1

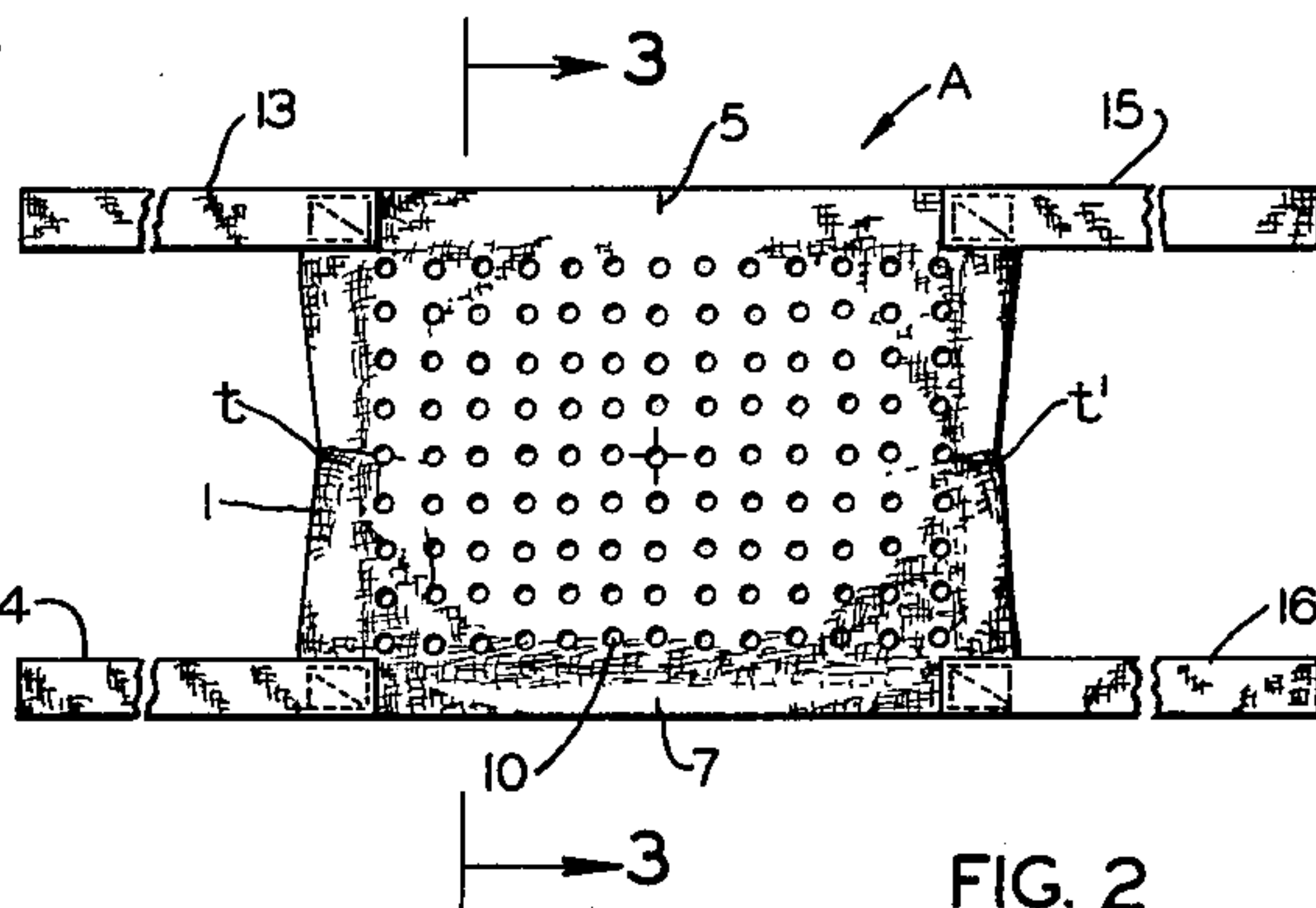


FIG. 2

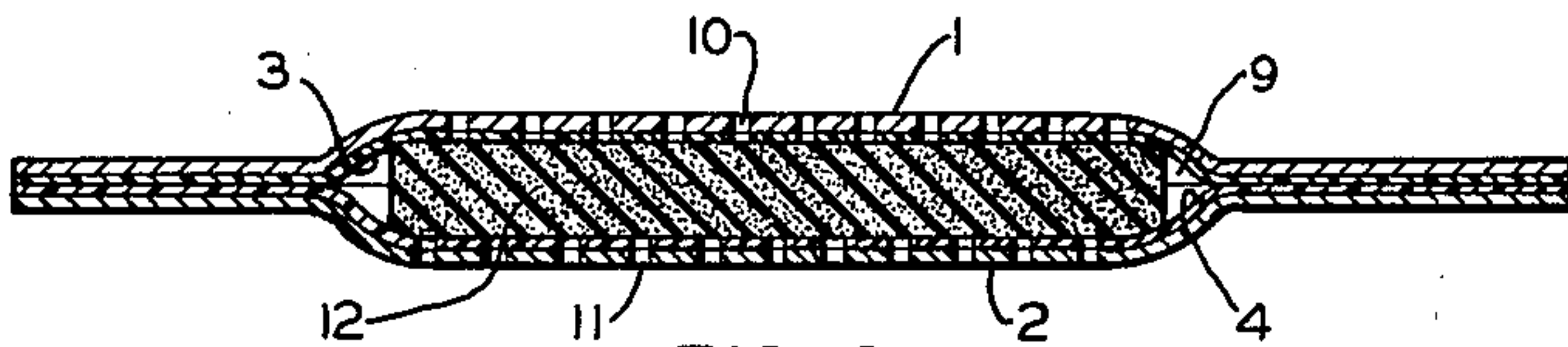


FIG. 3

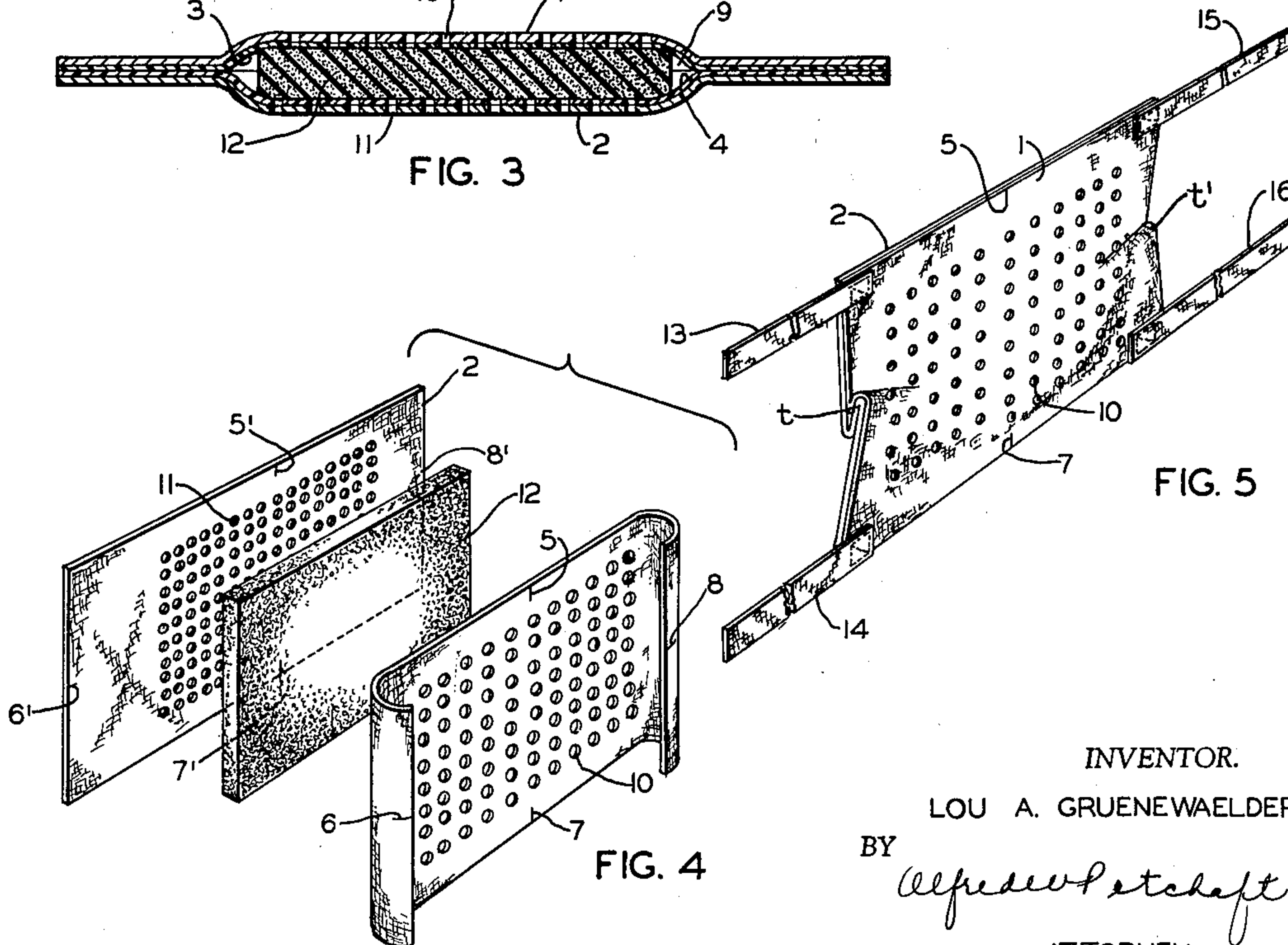


FIG. 4

FIG. 5

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FACE MASKS

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This invention relates to certain new and useful improvements in face masks.

Ordinarily, doctors, nurses, and other hospital personnel, wear face masks when performing their duties in operating rooms, contagious disease wards and the like. These face masks usually consist of nothing more than a woven gauze pad which is strapped over the nose and mouth of the wearer. Unfortunately, however, this type of face mask is frequently too porous to serve effectively as a filter for trapping airborne bacteria or even toxic fumes with the result that under many conditions of hospital use this type of face mask affords little or no protection. Special purpose face masks are available for filtering out highly poisonous or toxic vapors, and these masks are highly effective and useful for certain purposes. However, a mask of this type is ordinarily unsuitable for hospital use or for others who may be attending convalescent patients.

It is therefore, the primary object of the present invention to provide a face mask which effectively filters out dust, vapors, fumes, airborne bacteria, and the like, thus preventing such elements from entering the nose, mouth, or respiratory system.

It is also an object of the present invention to provide a face mask of the type stated which is comfortable to wear and does not materially restrict normal breathing.

It is an additional object of the present invention to provide a face mask of the type stated which is easy to clean and sterilize.

It is a further object of the present invention to provide a face mask of the type stated which is light in weight and relatively inexpensive to manufacture.

It is another and more specific object of the present invention to provide a face mask which includes a porous filtering element having a fungicide dispersed therein so that airborne bacteria can be removed and rendered harmless.

With the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawing (one sheet)—

FIG. 1 is a perspective view of a face mask constructed in accordance with and embodying the present invention and showing the face mask in position on the face of the wearer;

FIG. 2 is a top plan view of the face mask;

FIG. 3 is a sectional view taken along line 3-3 of FIG. 2;

FIG. 4 is an exploded perspective view of the face mask; and

FIG. 5 is a perspective view of the face mask.

Referring now in more detail and by reference characters to the drawing, which illustrates a preferred embodiment of the present invention, A designates a face mask comprising a pair of rectangular plies 1, 2, of woven fabric and being provided on their inner faces 3, 4, with a thermoplastic synthetic resin. The plies 1, 2, are each provided with bench marks 5, 6, 7, 8, 5', 6', 7', 8', and faces 3, 4, are facewise heat-sealed together with the bench marks 5, 6, 7, 8, 5', 6', 7', 8', respectively, in registration, so as to form a pocket 9 between the plies 1, 2. Each of the plies 1, 2, is also provided with perforations 10, 11, which are so arranged that they will be offset or staggered from each other when the plies 1, 2, are heat-sealed together.

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Snugly disposed in the pocket 9 in overlying relation to said perforations 10, 11, is a thin, porous, wafer-like filtering element 12 made of foamed polyurethane sponge. Preferably the vertical side margins of the mask A are provided with short tucks *t*, *t'*, thereby imparting a desirable degree of concavity to the mask A, so that it will more easily conform to and fit over the mouth and nose of the user. This material is capable of being formed into sponges having extremely small pores and is, therefore, highly effective as a filtering medium. However, it should be understood that other porous cellular materials may be used in fabricating the filtering element 12. In preparing the filtering element 12, the polyurethane is foamed and cured in the conventional manner. However, in compounding the polyurethane plastisol prior to foaming, a small amount, preferably 2% to 5% by weight, of a quaternary ammonium compound is added to the plastisol. Quaternary ammonium compounds are highly active fungicides and have the property of destroying macro and micro-organisms, such as airborne bacteria. Among the quaternary ammonium compounds which can be used in the present invention are dodecyl dimethyl benzyl ammonium naphthenate, cetyl dimethyl benzyl ammonium naphthenates, 9-octadecenyl dimethyl ethyl ammonium naphthenate, tetraethyl ammonium naphthenate, dimethyl ethyl propyl ammonium naphthenate, N-(lauric acid ester of colamino-formyl methyl) dimethyl ammonium naphthenate, and N-alkylbenzyl trimethyl ammonium naphthenates, such as N-dodecylbenzyl trimethyl ammonium naphthenate. One of the most useful and practical quaternary ammonium compounds and the one found preferable for the present invention is di-isobutyl phenoxy ethyl dimethyl benzyl ammonium chloride monohydrate, together with a dimethyl silicone oil to impart heat resistance to the cells of the foam. For instance, when polyurethane foam is laundered, the hot water tends to collapse the cells of the foam. The addition from 0.2% to 1% by weight of a silicone will overcome this difficulty. Of course, the silicone can be omitted if the mask is to be used only a few times and thrown away without laundering. Consequently, when the polyurethane is cured, the quaternary ammonium naphthenate will be completely and homogeneously dispersed therein and the cells of the filtering element 12 will be provided on their surfaces with an active, nontoxic fungicide and bactericide.

It has also been found that other types of nontoxic, active bactericides may be used. For example, less than 1% by weight of phenyl mercuric acetate may be compounded with the polyurethane to provide an effective filtering element 12.

Stitched, heat-sealed, or otherwise secured at the four corners of one of the plies 1, 2, are narrow tying straps 13, 14, 15, 16, which are of a sufficient length to extend around the head of the wearer as shown in FIG. 1.

In use, the face mask is placed over the face, as shown in FIG. 1, with the filtering element 12 disposed over the nose and mouth. Since the plies 1, 2, and filtering element 12 are flexible, they will substantially conform to the contour of the face. Moreover, the areas of the plies 1, 2, which are heat-sealed together form an air impervious barrier as well as prevent any tearing or accidental separation of the plies 1, 2, and, therefore, effectively prevent air from entering the nose and mouth except through the filtering element 12. Moreover, since the perforations 10, 11, are staggered or offset from each other, the path through which the air flows in the filtering element 12 is greater than would be the case if the perforations were in alignment. Consequently, it is possible to filter out a larger amount of foreign matter from the air. Furthermore, all the air passage through the filtering element will be exposed to the active bactericide with



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the result that many types of airborne bacteria will be rendered harmless before entering the mouth and nose of the person wearing the mask. In the care and feeding of newly born babies, as well as in surgical operating rooms where sterile conditions must be maintained, face masks of the present invention prevent contamination of the sterile field by destroying bacteria exhaled by the wearer.

It will be apparent that filtering elements of the type used in the face mask A can be formed of many sizes and shapes and can be utilized as filters in air conditioning systems in hospitals and the like.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the face masks may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A face mask comprising a flexible sheet-like portion consisting of two substantially rectangular plies, each of which is provided with a layer of thermoplastic synthetic resin on its inner face, said sheet-like portion being provided with a plurality of perforations, and a porous filtering element containing less than 1% by weight of phenyl mercuric acetate and being secured to said body portion and covering said perforations, said body portion being substantially air impervious except at said perforations so that air passing through said body portion will travel through said perforations and filtering element.

2. A face mask comprising a flexible sheet-like body portion consisting of two substantially rectangular plies, each of which is provided with a layer of thermoplastic synthetic resin on its inner face, said sheet-like portion being provided with a plurality of perforations, and a foamed-sponge filtering element containing a quaternary ammonium naphthenate and secured to said body portion over said perforations, said body portion being substantially air impervious except at said perforations so that air passing through said body portion will travel through said perforations and filtering element.

3. A face mask comprising a flexible sheet-like body portion consisting of two substantially rectangular plies, each of which is provided with a layer of thermoplastic synthetic resin on its inner face, said sheet-like portion being provided with a plurality of perforations, and a polyurethane sponge filtering element containing 2% to 5% by weight of a quaternary ammonium naphthenate, said filtering element being secured to said body portion over said perforations, said body portion being substantially air impervious except at said perforations so that air passing through said body portion will travel through said perforations and filtering element.

4. A face mask comprising a plurality of substantially rectangular plies, each of which is provided with a plurality of perforations, the inner face of said plies each being provided with a layer of thermoplastic synthetic resin, each of said plies having a short tuck at its vertical side margin to impart a degree of concavity, and a porous filtering element confined between the two plies, said filtering element containing a quaternary ammonium naphthenate, said plies being substantially air impervious except at said perforations so that air passing through said plies will travel through said perforations and filtering element.

5. A face mask comprising a plurality of substantially rectangular plies, each of which is provided with a plurality of perforations, the inner face of said plies each being provided with a layer of thermoplastic synthetic resin, each of said plies having a short tuck at its vertical side margin to impart a degree of concavity, and a polyurethane sponge filtering element confined between the two plies and covering the perforations therein, said filter-

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ing element containing 2% to 5% by weight of a quaternary ammonium naphthenate, said plies being substantially air impervious except at said perforations so that air passing through said plies will travel through said perforations and filtering element.

6. A face mask comprising a pair of rectangular plies of woven fabric and being provided on its inner face with a thermoplastic synthetic resin, each of said plies having perforations so arranged to be offset and staggered from each other, and a foamed polyurethane sponge filtering element interposed between said two plies and covering the perforations therein, said filtering element containing 2% to 5% by weight of quaternary ammonium naphthenate, said plies being substantially air impervious except at said perforations so that air passing through said plies will travel through said perforations and filtering element.

7. A face mask comprising a pair of rectangular plies of woven fabric and being provided on its inner face with a thermoplastic synthetic resin, each of said plies having perforations so arranged to be offset and staggered from each other, and a foamed polyurethane sponge filtering element interposed between said two plies and covering the perforations therein, said filtering element containing 2% to 5% by weight of di-isobutyl phenoxy ethyl dimethyl benzyl ammonium chloride monohydrate, said plies being substantially air impervious except at said perforations so that air passing through said plies will travel through said perforations and filtering element.

8. A face mask comprising a pair of rectangular plies of woven fabric and being provided on its inner face with a thermoplastic synthetic resin, each of said plies having perforations so arranged to be offset and staggered from each other, and a foamed polyurethane sponge filtering element interposed between said two plies and covering the perforations therein, said filtering element containing 2% to 5% by weight of di-isobutyl phenoxy ethyl dimethyl benzyl ammonium chloride monohydrate, and 0.2% to 1% of a dimethyl silicone oil for imparting heat resistance to the sponge cells, said plies being substantially air impervious except at said perforations so that air passing through said plies will travel through said perforations and filtering element.

9. A face mask comprising a pair of rectangular plies of woven fabric and being provided on its inner face with a thermoplastic synthetic resin, each of said plies having perforations so arranged to be offset and staggered from each other, and a foamed polyurethane sponge filtering element interposed between said two plies and covering the perforations therein, said filtering element containing a compound of the class consisting of dodecyl dimethyl benzyl ammonium naphthenate, cetyl dimethyl benzyl ammonium naphthenates, 9-octadecenyl dimethyl ethyl ammonium naphthenate, tetraethyl ammonium naphthenate, dimethyl ethyl propyl ammonium naphthenate, N (lauric acid ester of colaminoformyl methyl) dimethyl ammonium naphthenate, N-dodecylbenzyl trimethyl ammonium naphthenate, and di-isobutyl phenoxy ethyl dimethyl benzyl ammonium chloride monohydrate.

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