

May 3, 1966

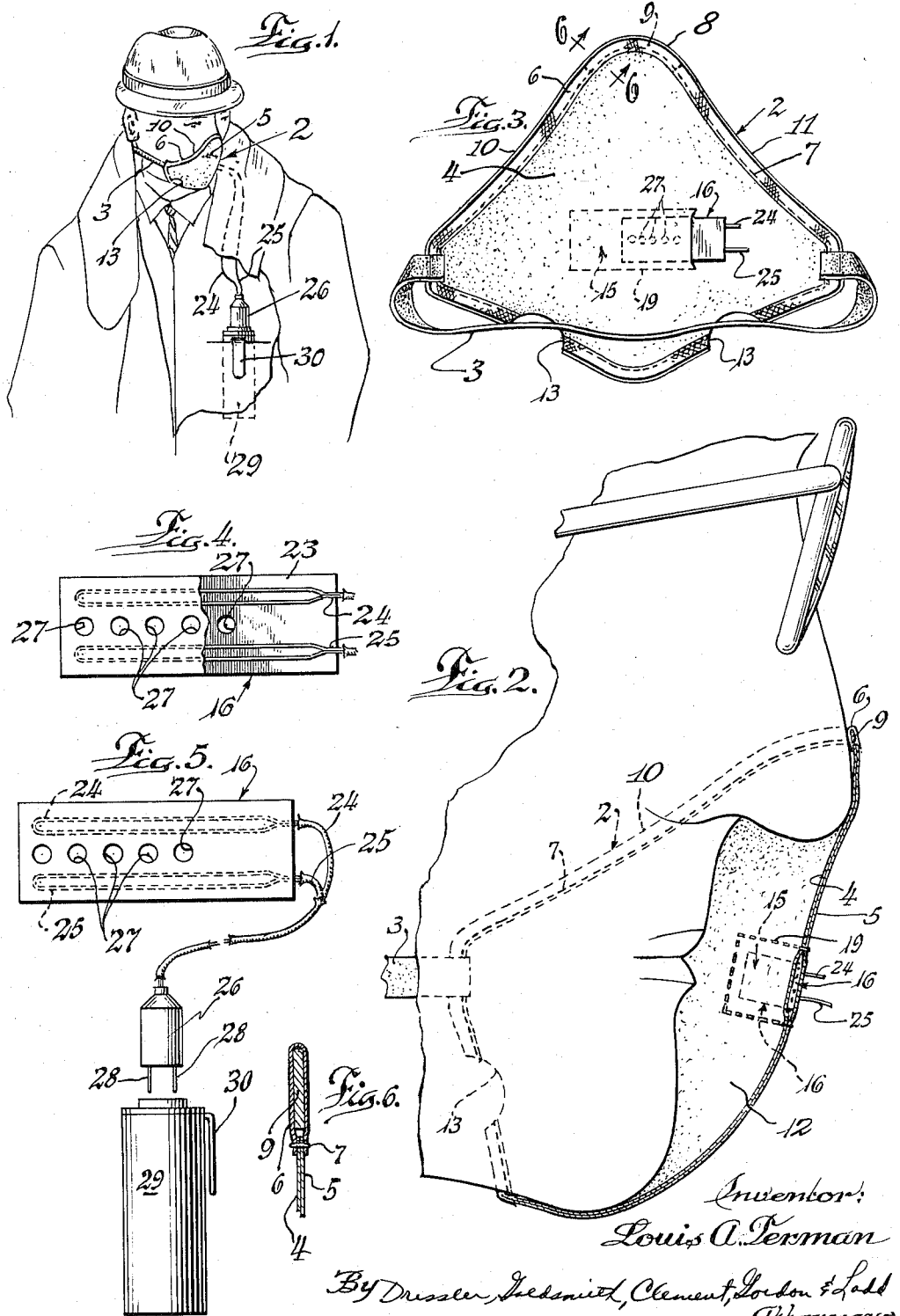
L. A. TERMAN

3,249,108

MASK FOR PROTECTING RESPIRATORY TRACT

Filed Dec. 16, 1963

2 Sheets-Sheet 1



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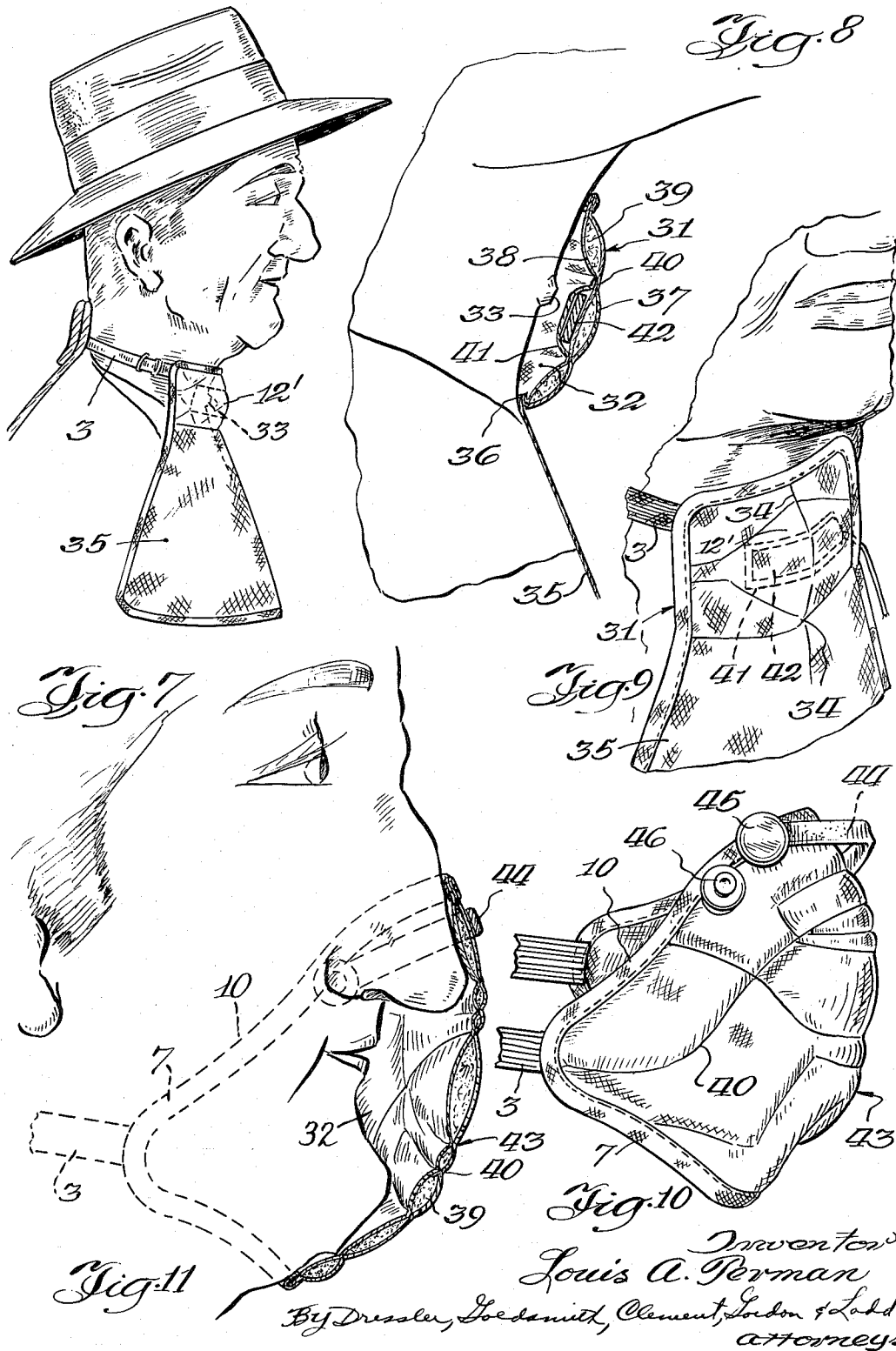
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MASK FOR PROTECTING RESPIRATORY TRACT

Louis A. Terman, 110 Beach Road, Glencoe, Ill.

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9 Claims. (Cl. 128-146)

This application is a continuation-in-part of my prior copending application Serial No. 250,429, filed January 9, 1963, and now abandoned which is in turn a continuation-in-part of my prior copending application Serial No. 192,910, filed May 7, 1962 and now abandoned.

This invention relates to a mask, and is particularly concerned with means for protecting the respiratory tract of the wearer from cold air or from wind.

The apparatus of the present invention is particularly designed for use by patients with a cardiac condition, particularly in case of coronary insufficiency, when they are exposed to cold air. It is well known that cold air often causes angina attacks in patients having a cardiac condition. The apparatus may also help some asthmatic patients susceptible to asthmatic attacks triggered by cold air, and persons having respiratory ailments who may have difficulty in breathing in windy weather even when the temperature is above freezing. Another advantage of the apparatus is the added comfort it gives to healthy people, such as sportsmen, mailmen, policemen, and other people exerting themselves outdoors in cold air.

In accordance with the present invention, a mask made of any suitable air pervious material, preferably fabric, such as, for example, nylon tricot or gauze, which may be plain or insulated, and is shaped to fit over the lower portion of a person's face or over the tracheostomy orifice of persons who have had a tracheotomy. The mask may be provided with a pocket for holding a removable heating element. The mask without a heating element, or with the heating element removed from the pocket, is washable and will dry quickly even if it has an insulating filler.

The upper edge portion of the mask is cut along the lines of the naso-labial fold, and the section of the upper edge portion crossing the nose is preferably provided with a strip or band of flexible material, such as soft metal, for example, that can be shaped to conform to the anatomy of the face without compressing the nostrils. The strip of flexible material for shaping the upper edge portion crossing the nose may be imbedded therein, or may be detachably secured to the mask, as by snap fasteners. This shaping of the upper edge of the mask prevents the warm exhaled air from flowing upwardly and fogging the glasses, if the wearer of the mask is wearing glasses. The mask is provided with an air vent on each edge at a level below the level of the mouth to permit the escape of exhaled air without interfering with the entrance of fresh air and to help maintain a normal carbon dioxide and oxygen balance that is necessary for normal health.

The shape of the mask forms an air pocket in front of the oral orifice and just below the nasal orifices of the wearer, or in front of the tracheostomy orifice if one is present. The air pocket is of sufficient size to insure an adequate supply of fresh air and to permit the exhaled air to pass out to the atmosphere without interfering with the intake of fresh air. The pervious nature of the material of which the mask is made and of the filler, when an insulating filler is used, permits a free flow and exchange of air, thus helping to maintain a normal carbon dioxide and oxygen balance.

A pocket for holding a heating element may be centrally located below the nasal orifices and in front of the oral orifice, or in front of the tracheostomy orifice if one is present. The air pervious material of which the mask is made is usually too thin to form a pocket in a single

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thickness of the material. Accordingly, the pocket may be made by sewing an extra strip of the material to the mask along three sides of the strip, thereby leaving one end of the pocket open for reception of a heating element.

The above described method of forming a pocket for a heater is suitable for either insulated or non-insulated masks. In non-insulated masks, the mask is preferably made of two superimposed sheets of air pervious material, and the pocket can be formed by sewing both sheets together along the sides of a rectangle, in the position desired for the pocket. One sheet of the material may then be slit within the rectangle near one end thereof to form an opening through which the heating element may be inserted.

The heating element may comprise any conventional non-flaming, low-temperature heater, including the presently commercially available heating elements containing internal chemical heat generating means. However, it is preferred to use a heating element comprising a few turns of wire adapted to be heated by passage of an electrical current therethrough. The wire is encapsulated in a suitable insulator, such as a strip of plastic, for example, that is flexible enough to be bent to conform to the contour of the mask and is self-sustaining as to any shape into which it is bent. The strip of material in which the heating element is embedded is apertured to allow the free passage of air, both inhaled and exhaled.

Although any suitable heating means may be used, a battery operated electrical heating elements is preferred because a heating element of this type permits the wearer to maintain a uniform temperature within the desired range of temperature. The electrical heating element may have control means, such as a thermostat, for example, by means of which the maximum heat is limited. The size and location of the heating element, when the mask is being worn with the heating element in the pocket of the mask, insure that all air entering the respiratory tract of the wearer is warmed. Part of the air passes through the apertures in the heating element, and the rest of the air passes close enough to the heating element to be warmed thereby. The air is warmed enough to prevent the shock incidental to the inhalation of cold air, but not enough to burn, dry out the mucous membranes, or cause discomfort.

The wires of the heating element are connected to a plug that is adapted to be connected to a battery carried in any convenient place, such as, for example, a jacket pocket or purse of the person wearing the mask. The battery is preferably rechargeable. The lead from the battery to the heating element may be provided with a switch. The switch may be a simple on-off switch or may have means for limiting the maximum temperature of the heating pad. When a non-battery-operated heating element is used the battery and switch are eliminated.

The structure by means of which the above mentioned and other advantages of the invention are attained is described in the following specification, taken in conjunction with the accompanying drawings showing a few preferred embodiments of the invention in which:

FIGURE 1 is a perspective view of the upper portion of a man wearing a face mask embodying one form of the invention;

FIG. 2 is an enlarged fragmentary perspective view showing the mask of FIG. 1 in place on the face of the wearer;

FIG. 3 is a front elevational view of the mask of FIG. 1;

FIG. 4 is a top plan view of the heating element with a portion broken away to show the interior structure;

FIG. 5 is a view, partly in plan and partly in elevation, showing the heating element and the battery to which it is adapted to be connected;

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FIG. 6 is a cross sectional view, taken along the line 6—6 of FIG. 3;

FIG. 7 is a perspective view showing a mask in position over a tracheostomy orifice;

FIG. 8 is a view similar to FIG. 7, but showing the mask in cross section;

FIG. 9 is a fragmentary perspective view of the mask of FIGS. 7 and 8, showing the pocket and a heater in the pocket;

FIG. 10 is a perspective view of a mask having the detachable strip for shaping the upper edge of the mask; and

FIG. 11 is a perspective view showing the mask of FIG. 10 in its position of use.

Referring to FIGS. 1 to 6 of the drawings, a mask 2 is provided with an elastic strap 3 for securing the mask in place against the face of the wearer. If desired, tapes may be substituted for strap 3. The tapes may be made of any suitable material, and may be tied together or may be provided with snap fasteners.

The mask may be made of any suitable air pervious material, preferably a fabric such as nylon tricot or gauze, for example. Although the mask may be made of a single thickness of material it is preferred to make it of two sheets 4 and 5 of material bound together at the perimeter by a folded binding strip 6 stitched to the edges of the mask, as indicated at 7.

The upper edge of the mask has a section 8 that extends across the nose of the wearer when the mask is in place. A flexible strip 9 is inserted within the fold of binding strip 6 along the length of section 8. Strip 9 may be of soft metal or of any other suitable material, such as, for example, plastic, that can be shaped by hand and is capable of maintaining any shape into which it is bent. If desired, strip 9 may be secured transversely of the mask anywhere within the region where the mask extends across the nose. Strip 9 permits the upper edge of the mask to be shaped to fit against the sides of the wearer's nose without compressing the nostrils. The absence of compression against the nostrils permits the wearer to breathe normally while wearing the mask.

The upper edge of the mask on each side of section 8 is cut along the naso-labial fold, as indicated at 10 and 11, respectively, so that the upper edge of the mask conforms to the contour of the face and prevents the warm exhaled air from passing upwardly through a space between the upper edge of the mask and the face of the wearer. The escape of warm exhaled air through a space between the upper edge of the mask and the face of the wearer is undesirable because if the wearer is wearing glasses they will be fogged by said escaping air.

The mask is so shaped that when it is fitted against the face of a wearer it is spaced outwardly from the lower front portion of the wearer's face to form an air pocket 12 directly in front of the oral orifice and just below the nasal orifices, as shown in FIG. 2. The size of the air pocket is sufficient to insure the presence of an adequate supply of fresh air and to permit the exhaled air to pass to the atmosphere without being rebreathed, thus helping to maintain a normal carbon dioxide and oxygen balance. The porosity of the material of the mask, which permits the free passage therethrough of both fresh air and exhaled air, also helps to maintain the normal carbon dioxide and oxygen balance.

The lower edge portions of binding strip 6 are cut away on each side of the wearer's chin to provide air vents 13 that facilitate the escape of the exhaled air.

A pocket 15, for housing a heating element 16, is formed in the mask directly in front of the oral orifice and below the nasal orifices. The pocket is preferably formed by stitching the two sheets of mask material together along the edges of a rectangle 19. Then one sheet of the mask material, preferably the inner sheet 4, is slit parallel to one edge of the rectangle to form an open end for the pocket, as shown in FIG. 3. The opening is dimensioned to permit easy insertion of the heating

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element. Pocket 15 is dimensioned to receive and envelop the heating element.

Heating element 16 comprises a strip 23 of suitable insulating material having wires 24 and 25 encapsulated therein, with the ends of the wires extending from one end thereof and connected to an electrical plug 26. Strip 23 is provided with a plurality of apertures 27 between wires 24 and 25 so that some of the fresh air can flow through the heating element. All of the fresh air flowing into the oral and nasal orifices of the wearer of the mask must flow either through apertures 27 or so close to the edges of the heating element that it will be warmed to a comfortable temperature before it reaches said orifices.

Plug 26 has prongs 28 adapted to fit into a rechargeable battery 29 that may be carried in a jacket pocket or in any other suitable place. The battery is preferably provided with a clip 30 to hold it against accidental displacement from the pocket in which it is held. The battery is designed to heat the heating element 16 to a temperature ranging from about 98.6° F., which is normal body temperature, to about 110° F. The air breathed in by a person having a cardiac condition and wearing the mask will be warmed sufficiently to protect the wearer against an angina attack that might otherwise be triggered by the entrance of cold air into the respiratory tract.

As previously mentioned, the mask is preferably made of washable material. However, if desired, the heating element may also be used with disposable masks that are discarded after a single use. The essential requirements of the mask are that the material of which it is made must be pervious, to allow air to flow freely therethrough, and it must be strong enough to hold the heating element. It is also possible, if desired, to have the heating element permanently secured to the face mask. The wires from the battery may be detachably secured to the ends of the heating element at one end of strip 23.

The mask shown in FIGS. 7 to 9 is designed to protect the tracheostomy orifice of persons who have had a tracheotomy in the same manner as the mask of FIGS. 1 to 6 protects the nasal and oral orifices. In this embodiment, the mask 31 is shaped to fit the neck of the wearer and is sewed in such a manner as to form an air pocket 32 in front of the tracheostomy orifice 33. The air pocket 32 serves the same purpose as the air pocket 12 in the embodiment of FIGS 1 to 6. The air pocket may be formed by shaping members placed in the mask, but preferably is formed by taking a dart 34 in the upper edge of the mask, and another dart 34 in the lower edge of the mask. The darts 34 from the opposite edges of the mask extend toward each other, but their inner ends are spaced from each other to form an air pocket 32' of proper size.

The mask 31 is provided with an elastic band or tapes 3 to secure it in place around the neck of the wearer. An apron 35 is preferably secured to the lower edge of the mask in any suitable manner, such as, for example, by stitching, as indicated at 36. The apron slopes outwardly toward its lower edge and is adapted to extend under the wearer's coat to help hold the mask in place. When the outer edges of the apron are under the wearer's coat, the lower edge of the mask cannot be lifted away from the wearer's neck by wind.

The mask 31 is shown as being made of insulating material, but it will be understood that either embodiment of the mask may be made from a single or double sheet of nylon or gauze, or may be made of the insulating material. The insulating material comprises two outer covers 37, 38, of a pervious fabric, such as, for example, nylon tricot, and a heat retaining, non-allergic air pervious fibrous filler 39 held between said covers. The insulating filler may comprise a layer of acrylic fiber such as the copolymer of vinyl-chloride and acrylonitrile, for example. The outer covers may be stitched together, as indicated at 40, to form a plurality of small compartments to maintain even distribution of the fibers of the insulating filler. The mask may be provided with a pocket 41 to

hold a heating element 42 as in the embodiment of FIGS. 1 to 6.

In FIGS. 10 and 11 I have disclosed a face mask 43 similar to that of FIGS. 1 to 6 except that it is made of the insulating material mentioned above in the description of the embodiment of FIGS. 7 to 9. The mask may be provided with a pocket, such as the pocket 41 in FIG. 8, to hold a heating element for heating the mask. This mask is provided with a detachable strip 44 of plastic or soft metal that can be shaped by hand and is capable of maintaining any shape into which it is bent.

The strip 44 is provided at each end with snap fastener parts 45 adapted to engage complementary snap fastener parts 46 on the upper edge portion of the mask 43. The strip 44 may be detachably secured to the mask and then shaped by hand to fit the transverse configuration of the upper portion of the wearer's nose without compressing the wearer's nostrils. Although the strip 44 is shown as having snap fastener parts secured to the ends, it will be understood that it may be secured to the mask in any suitable manner.

Although I have described a preferred embodiment of the invention in considerable detail, it will be understood that the description thereof is intended to be illustrative, rather than restrictive, as many details of structure may be modified or changed without departing from the spirit or scope of the invention. Accordingly, I do not desire to be restricted to the exact structure disclosed.

I claim:

1. A mask for protecting the oral and nasal air passages of a wearer from direct contact with cold air and wind, said mask comprising air-pervious fabric tapered toward the ends thereof and thereby configured to cover the nose and mouth of the wearer with the upper portion of the mask being shaped to follow the naso-labial fold of the wearer's face, said mask being formed of cup shape so that, when worn, a central portion thereof is spaced outwardly from the lower front portion of the wearer's face to form an air pocket directly in front of the mouth and just below the nose, said mask being imperforate over the area covering the mouth and nose, and heating means carried by said air-pervious fabric within said air pocket to heat the air drawn into said pocket by the inhalation of the wearer to warm the air before it can contact said air passages.

2. A mask for protecting the oral and nasal air passages of a wearer from direct contact with cold air and wind, said mask comprising air-pervious fabric tapered toward the ends thereof and thereby configured to cover the nose and mouth of the wearer with the upper portion of the mask being shaped to follow the naso-labial fold of the wearer's face and the lower portion of the mask being shaped to underlie the chin, said mask being formed of cup shape so that, when worn, a central portion thereof is spaced outwardly from the lower front portion of the wearer's face to form an air pocket directly in front of the mouth and just below the nose, said mask being imperforate over the area covering the mouth and nose, and air-pervious pocket means carried by said central portion of said air-pervious fabric, said pocket means being

adapted to position heating means within said air pocket to heat the air drawn through said mask by the inhalation of the wearer to warm the air before it can contact said air passages and heating means positioned in said pocket means.

3. A mask for protecting the oral and nasal air passages of a wearer from direct contact with cold air and wind, said mask comprising air-pervious fabric configured to cover the nose and mouth of the wearer with the upper portion of the mask being shaped to follow the naso-labial fold of the wearer's face and the lower portion of the mask being shaped to underlie the chin, said mask being formed of cup shape so that, when worn, a central portion thereof is spaced outwardly from the lower front portion of the wearer's face to form an air pocket directly in front of the mouth and just below the nose, said mask being imperforate over the area covering the mouth and nose, and air-pervious pocket means carried by said central portion of said air-pervious fabric, said pocket means containing heating means to heat the air drawn through said mask by the inhalation of the wearer to warm the air before it can contact said air passages.

4. A mask as recited in claim 3 in which said air-pervious pocket means extends horizontally across the central portion of said air-pervious fabric directly opposite the mouth of the wearer and said heating means is slidable within said air-pervious pocket.

5. A mask as recited in claim 3 in which said heating means is formed with openings therein for passage of air therethrough.

6. A mask as recited in claim 1 in which said air-pervious fabric is constituted by outer covers of air-pervious fabric confining insulating fibers therebetween.

7. A mask as recited in claim 6 in which said outer covers are stitched together to form a plurality of small compartments to maintain said insulating fibers uniformly distributed.

8. A mask as recited in claim 2 in which said air-pervious fabric is held to the face of the wearer by means of a single band secured to said tapered ends of said fabric.

9. A mask as recited in claim 2 in which a strip of soft bendable material is secured to the central upper edge portion of said mask whereby said strip shapes the upper edge portion of said mask to fit across the wearer's nose.

References Cited by the Examiner

UNITED STATES PATENTS

1,292,096	1/1919	Schwartz	128—146
1,633,705	6/1927	McKesson	3—1.3
2,410,903	11/1946	Rogge	128—212
2,922,418	1/1960	Heffernan et al.	128—141

FOREIGN PATENTS

1,257,220	2/1961	France.
1,268,021	6/1961	France.
627,215	8/1936	Germany.

RICHARD A. GAUDET, *Primary Examiner*.

W. E. KAMM, *Assistant Examiner*.