Aug. 4, 1959 H. A. MAUCH 2,897,741

VENTILATOR COVER

Filed March 19, 1957

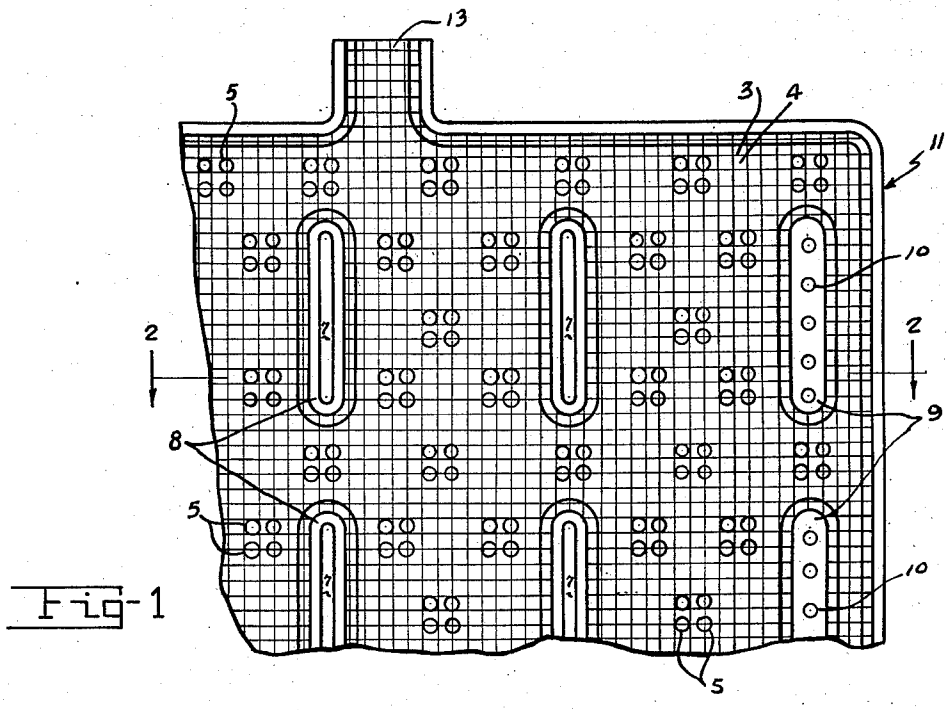


Fig-1

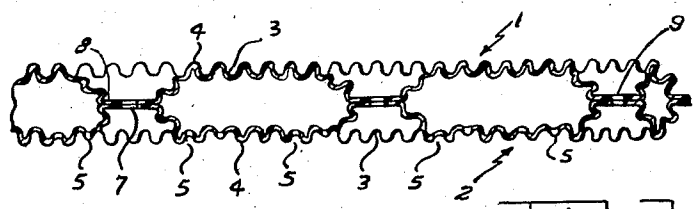


Fig-2

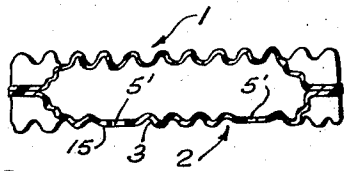
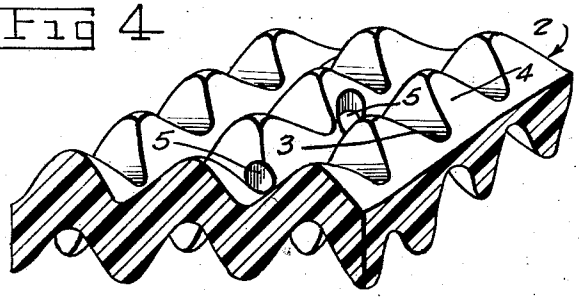


Fig-3

Fig 4



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VENTILATOR COVER

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14 Claims. (Cl. 98—1)

This invention relates to a new and improved air ventilating cover structure applicable for use in fabricating protective apparel, enclosures, or similar articles. It enables improved control of temperature and humidity conditions in areas adjacent to and about the body or object covered thereby.

Ventilating covers of various nature have been proposed in the prior art but certain functional difficulties continue to be present which restrict their application. The major problem is to provide a ventilating cover which will insure uniformity of temperature and humidity control adjacent a body at a minimum cost.

The present invention provides a bag-like enclosure having low air flow resistance along its inside and outside surfaces and produces uniform air flow over the entire surface of the body to be ventilated at a minimum cost. Moreover, embodiments of the subject invention may be produced which have minimum weight and minimum bulk.

A primary object of the invention is to provide an improved ventilating cover structure which can be fabricated as a garment or other cover means for controlling the temperature and the humidity adjacent a body to be ventilated whereby such apparatus may not only be more economically manufactured, but will be more efficient and satisfactory in use, adaptable to a greater variety of applications and have a longer useful life with minimum maintenance and replacement requirements.

Invention embodiment is provided by the ventilating cover structure being fabricated of at least two flexible layers of impermeable material such as plastic film joined along their outer edges to effect a bag-like enclosure having an air inlet integral therewith. The surfaces of the flexible sheets employed are required to be uneven in a manner to provide substantially continuous interconnecting channels or passages for air flow therein. These connecting channels insure a substantially complete and uniform circulation of air within the bag-like enclosure and over the outer surface of the bag-like enclosure irrespective of local pressure loads thereon. In the preferred embodiment of the invention this effect is produced by cross-corrugation of the plastic sheet material to provide small surface elevations spaced by grooves of an inter-connecting nature.

A second aspect of the invention is to dispose air exit openings in the layer of the bag-like enclosure which is to be placed adjacent the body to be ventilated in such fashion that air exiting from the enclosure will enter continuous small channels or passages for air flow within and over its entire surface adjacent the body to be ventilated. The elevation portions of the surface insure maintenance of the passages and substantially uniform air flow in the process. A third concept of the invention is provided by effecting joined slotted portions in the sheets forming the bag-like enclosure. This not only prevents billowing on introduction of air but also affords a means for stretching of the ventilating cover. The slots further serve to scavenge air from adjacent the body being ventilated. Further connecting means are provided in certain areas of the ventilating cover where it is not desired that any stretching shall obtain as will be further described herein.

A further object of the invention is to provide an improved structure for fabrication of ventilating covers, the construction and economy of which will generally enable more universal application thereof.

Another object of the invention is to provide an improved air-ventilating cover which insures more uniform temperature and humidity control adjacent the surface of the body covered.

An additional object of the invention is to provide an improved structural arrangement for ventilating covers and the like wherein uniform temperature and humidity control of the body being covered is enabled by providing a bag-like enclosure of a fabric having inter-connecting circulating valleys spaced by surface elevations.

Another object of the invention is to provide an improved ventilating cover consisting of peripherally joined flexible sheets which are uneven on at least one side in order to provide circulating passages for air flow inside and outside the cover and within its surfaces.

A further object of the invention is to provide an improved ventilator cover consisting of flexible sheets of impermeable material joined along peripheral edges to form a bag-like enclosure wherein free air exit is insured through openings in the sheet which is to be placed adjacent the body to be ventilated by placing these openings to at least partially connect into narrow inter-connecing depressions for air flow formed by uneven sheet surface.

An additional object of the invention is to provide an improved ventilating cover structure for use in producing ventilating garments, covers, and the like assuring low resistance to air flow from the inside to the outside of the cover and additionally affording localized stretchability to the cover.

Another object of the invention is to provide an improved ventilating cover possessing the advantageous structural features, the inherent meritorious characteristics, and the mode of operation and application herein described.

With these and other objects in view, as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation or utilization or their equivalents, as hereinafter described or illustrated in the accompanying drawings.

Referring to the drawings wherein are found illustrative but obviously not the only forms of embodiment of the invention:

Fig. 1 is a schematic fragmentary plan view of a ventilating cover in accordance with the invention taken from the side to be placed adjacent the body to be ventilated;

Fig. 2 is a cross-sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is an enlarged schematic fragmentary view in cross-section of a modification of the ventilating cover of Fig. 1; and

Fig. 4 is a fragmentary view in perspective of an illustrative sheet structure which may be employed in the practice of the invention. Such a sheet structure may constitute a single layer of the ventilating cover schematically shown in Figs. 1 to 3.

The invention can be best described with reference to the drawings. It is to be understood that the cover illustrated merely indicates the structural composition and arrangement of a cover element and the same can be formed as a garment or cover of any sort, shape or size. The cover 11 shown consists of an outer layer or sheet 1

of flexible impermeable material such as plastic film and an inner sheet 2 of the same type material which are peripherally welded to form a bag-like enclosure, the extent of the peripheral weld being dependent on the application. The sheets 1 and 2 are formed to mate and provide an air inlet 13 at their periphery. As illustrated, the surfaces of the flexible sheets 1 and 2 are uneven, being fabricated to effect cross-corrugations providing rectangularly intersecting continuous small channels, grooves or valleys 3 about spaced, relatively elevated surface portions 4 in the sheet surfaces. More specifically, the grooves or valleys 3 are schematically shown in Fig. 1 of the drawings by intersecting lines 3 which form generally rectangular islands therebetween which are isolated by the intercommunicating valleys 3 in the surface of the sheet material. The inner sheet 2 is provided with small air exit holes 5 in groups of four which are rectangularly arranged in offset relation to the valleys 3 in the sheet surface to insure that air passing through the holes in their grouped locations will immediately communicate with channels or grooves 3 on the surface of sheet 2 which is to be placed adjacent the body to be ventilated. The invention eliminates manufacturing problems by providing spacing between the respective holes 5 in each group that is non-uniform and fractionally differs with respect to the spacing of the channels or valleys 3. Thus, irrespective of the group spacing, each group of holes may be simultaneously punched and at least some of each group will always be located to open in the channels 3. If desired, individual enlarged holes 5 may be employed which will insure communication with the valleys 3, but this is not the preferred form.

Interrupted elongated slots 7 are provided in aligned fashion in selected intermediate locations in the inner and outer sheets 1 and 2 respectively where the cover may be required to accommodate stretching. The respective sheet 1 and 2 are welded together about the interrupted slots 7 at 8 to provide spaced elongated connecting means between the sheets 1 and 2 which basically prevent billowing upon introduction of air into the bag-like enclosure. As illustrated, the welded portions 8 about slots 7 define intermediate connection between the sheets 1 and 2 yet provide for uninterrupted rectangular association of the valleys or grooves 3 in the sheet surfaces. It is noted the slots 7 are only provided in the cover or garment fabricated in areas where greater resiliency and comfort is required. In this fashion the enclosure may be stretched without danger of tearing while the slots 7 provide for exit of hot humid air from adjacent the body being ventilated.

In addition to being connected at intermediate portions 8, the layers 1 and 2 are further welded together in other spaced elongated areas 9 within their joined peripheries. A series of apertures 10 are provided in each of the joined areas 9 which serve as outlets for heated air scavenged from adjacent the body being ventilated. However, these apertures 10 are not so disposed or formed to permit stretching of the ventilating cover as the slots 7.

In the use of the invention structure, the cover in its desired form is applied with the layer or sheet 2 adjacent or about the body to be ventilated. Ventilating air is then introduced through the air inlet 13 within the bag-like enclosure defined by the joined outer layers 1 and 2. The cross-corrugated surface effected in the plastic layers insures continuous circulation of air within the enclosure, even if external load is applied to the cover structure. The connecting valleys 3 in the uneven surface are protected by the relatively elevated portions and if flow is blocked in a particular area, the air will merely take a devious path in the layer surface and communicate with air exit apertures 5. Air which is pressured from the enclosure exits through the groups of small holes 5 in the layer 2 and directly into the connecting valleys or

grooves in the outer surface of the layer 2 and adjacent the body being ventilated. Thus, even if the cover is in close containing relation to the body, the air will continuously circulate in the surface of the sheet 2 within the valleys 3 which are in direct communication with the holes 5. Thus, the body is assured of substantially complete ventilation over the entire surface adjacent the sheet 2. This is not a localized ventilating process but a generously circulating system that is effected by the invention embodiment. Local loads cannot destroy the ventilating effect. The provision for the small groups of exit holes 5 in the sheet 2 substantially insures that at least a portion of each group will always be open into the valleys 3 in the outer surface of sheet 2 adjacent the body being ventilated.

Depending on the form the ventilator cover takes, the air which has been circulated and heated by the body may be scavenged through the stretchable slots 7, the apertures 10 or other outlets which may be defined by the form of the cover. The continuous nature of the connection of the valleys 3 facilitate efficient scavenging of the hot humid air from adjacent the body being ventilated as fresh air continues to flow from the air exit holes 5.

The slots 7 defined by the intermediate welded portions 8 of the layers 1 and 2 of the enclosure are particularly advantageous in ventilating garments since they permit motion of the body being ventilated and permit the cover to stretch in necessary areas without damage resulting. As should be apparent, this type of slot need not be used in a cover which does not require stretchability of the nature described. In such instance the expanded welded portions 9 having the series apertures 10 may be solely employed in the intermediate connection of the layers 1 and 2. The distinct nature of the slots 7 and the apertures 10 within the welded areas assure low resistance to air flow from adjacent the body to the outside of the bag-like enclosure.

Cross-corrugation of the outside surface of the layer 1 is particularly advisable and advantageous where an additional outer cover or garment is to be placed over the ventilating cover. The grooves or valleys 3 in the outer surface of the sheet 1 insures circulation of air between such outer garment and over the entire surface of the ventilating cover.

It is noted that the surfaces of the layers 1 and 2 can be similarly grooved or cross-corrugated by making the material of varying thickness in a manner believed obvious.

The improved ventilator cover assures substantially uniform, complete and continuous air circulation within and over the surface of the enclosure provided thereby. The provision for uneven surfaces as prescribed insures minimum resistance to air flow and maximum ventilating efficiency. Of course, where no outer garment is contemplated, the outer surface of the sheet 1 need not be formed to be uneven as described.

Fig. 3 of the drawings illustrates a modification of the invention as illustrated and described with references to Figures 1 and 2 of the drawings. As shown in Fig. 3, the apertures 5 in the sheet 2 are replaced by single apertures 5', with the area 15 about each aperture 5' being flattened to put the air exiting from the apertures 5' in direct communication with the connecting valleys 3 in the surface of the layer 2 placed adjacent the body being ventilated.

Where necessary, intermediate layers may obviously be provided between the layers 1 and 2 where the cover or garment fabricated may require additional load strength.

The substantial improvements in the art as well as the economies obtaining in the process are believed readily apparent to those versed in the art. The general result is to enable a more diversified application of ventilating covers in a more efficient manner. The body or object

covered is universally maintained in a uniformly excellent condition in employing a ventilating cover in accordance with the invention.

From the above description it will be readily apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprises an illustrative form of several modes of putting the invention into effect and the invention is therefore claimed in any of the forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. An air ventilating structure including, a plurality of sheets of flexible impermeable material joined at their edges to form a bag-like enclosure, air inlet means for said enclosure, said sheets being further connected intermediate their edges at spaced intervals, a network of intercommunicating channels formed in the surface of said enclosure and spaced apertures defined in one outer sheet, said apertures being formed in groups at least a portion of which exit in said channels to insure complete ventilation of the body covered.

2. An air ventilating cover comprising, a plurality of layers of impermeable material joined in peripheral areas to substantially effect an enclosure, each of said layers having its surface to at least one side channeled to provide grooves forming continuously interconnecting valleys therein, air inlet means for said enclosure, at least one of the outer of said layers having air exit apertures in grouped relation, the spacing between the respective apertures in each group fractionally differing with respect to the spacing of said interconnecting valleys so that at least a portion of the apertures in each group will open into said valleys.

3. An air ventilating structure including, a plurality of sheets of flexible impermeable material joined at their edges to form a bag like enclosure, said sheets being further connected together intermediate their edges at spaced intervals, an air inlet means for said enclosure, a network of intercommunicating channels formed in the surface of said enclosure to at least one side substantially over the entire area of said side and groups of spaced apertures punched in said channeled surface portion of said enclosure, the spacing between the respective apertures in each group fractionally differing with respect to the spacing of said channels so irrespective of the manner in which they are punched at least a portion of the apertures in each group will open in said channels for complete continuous air circulation therein.

4. An air ventilating structure comprising, impermeable sheets peripherally joined to form a bag-like enclosure, each of said sheets having a surface on at least one side formed to provide continuously intersecting valleys therein defining isolated projections substantially over a major area thereof, air inlet means for said enclosure, one of said sheets having apertures spaced substantially over its entire area within the valleys therein whereby on application of the structure in selected form, with the apertured sheet adjacent a body to be ventilated, on introduction of air to the enclosure there will resultingly be a minimum resistance to air flow at the sheet surfaces having valleys formed therein, irrespective of loads applied to said enclosure.

5. An air ventilating cover fabricated in suitable form including, a plurality of relatively superposed impermeable sheets joined to form a bag-like enclosure, means providing an air inlet to said enclosure, within said enclosure at least one of the surfaces of one of said sheets having continuously intercommunicating recesses formed therein substantially over its entire area to provide continuously interconnecting valleys, at least the outer surface of one of the outermost sheets being similarly formed to be placed adjacent the body to be ventilated on application of the cover thereto, and apertures in said one of the outermost sheets spaced substantially over the entire area of said similarly formed surface opening in the valleys therein whereby on introduction of air to and from said bag-like enclosure uniform air flow over the entire body to be ventilated will result.

6. Air ventilating structure for fabrication into a cover or garment or the like for air conditioning of a body compising, layers of sheet material having peripheral portions sealingly engaged to form an enclosure thereby, air inlet means for said enclosure, said layers being further engaged at selected intervals intermediate said peripheral portions, air exhaust means defined in said layers in said intermediate engaged portions, air exit means in spaced relation over the entire area of one of the outermost of said layers, said layer provided with said air exit means having an outer surface cross-corrugated providing substantially continuously intercommunicating valleys therein over a major portion of its entire area, said cross-corrugated surface being adapted to be placed adjacent the body to be ventilated whereby on introduction of ventilating air to said enclosure, it will proceed through said air exit means, the major portion of said air exit means being in said valleys whereby to effect a continuous uniform air flow over the body being ventilated circulating through said valleys in generally uninterrupted fashion.

7. The structure as set forth in claim 6, and the outer of said layers with respect to application of said structure to the body to be ventilated having its outermost surface similarly cross-corrugated to form continuously intercommunicating valleys therein substantially over its entire area, the said exhaust means defined in said enclosure being in direct communication with the valleys in said cross-corrugated surfaces whereby said structure may be utilized as an intermediate garment.

8. An air ventilating cover or gament comprising, a bag-like enclosure, means integrally formed on an inner surface of said bag-like enclosure substantially coextensive therewith providing a continuous connecting devious passageway for continuous air flow therein; grooves in at least one outer surface of said enclosure substantially over its entire area, said one outer surface having air exit means spaced over the area thereof substantially disposed within said grooves to provide a continuous circulating path substantially over the area of said one outer surface of said enclosure, means providing an air inlet to said enclosure and said enclosure being formed to provide for exhaust of air from one side of said enclosure to the other.

9. An air ventilating cover or garment including a bag-like enclosure forming a cover for a body, air inlet means connected in said enclosure, portions of said enclosure being sealingly connected at selected intervals within its boundaries, expansion openings in said selectively connected portions of said enclosure, means providing air outlets from said enclosure, said enclosure having substantially the entire surface area to at least one side provided with continuously intersecting recesses, said means defining the air outlets from said enclosure being spaced coextensively with said recesses and substantially disposed therein so that air will be channeled through said air outlets directly into said continuously intersecting recesses in areas to be placed adjacent the body to be ventilated to insure complete air flow and circulation adjacent thereto in required locations.

10. An air ventilating cover structure comprising, a plurality of relatively superposed sheets of flexible im-

permeable material joined at their edges to form a bag-like enclosure, said enclosure having air inlet means, said sheets being further connected at selected intervals intermediate their edges, within said enclosure there being means formed on the surface of at least one sheet defining communicating continuously intersecting channels therein substantially coextensive therewith insuring free air distribution within said enclosure, irrespective of local load application, one of said plurality of sheets forming said enclosure being adapted to be placed with its outermost surface against the body to be ventilated, said outermost surface having substantially the entire area thereof provided with continuously intersecting grooves therein, and air exit means formed in groups in said one sheet to be placed against the body to be ventilated spaced over its area with the major portion of the air exit means in each group being disposed within the grooves therein whereby complete and substantially uniform air flow will be induced through said enclosure and over the entire surface of the body to be ventilated.

11. An air ventilating structure in the form of a garment or a cover including, a bag-like enclosure having air inlet means, at least one of the opposed inner surfaces of said bag-like enclosure having substantially its entire area contoured to provide continuously intercommunicating surface valleys therein to insure air flow substantially over its entire area in continuously circulating fashion and at least the surface of said enclosure to be placed adjacent the body to be ventilated having isolated projections substantially over its entire surface area to define interconnecting valleys over such area, a plurality of apertures in said enclosure within said valleys spaced over said last mentioned surface area insuring substantially continuous circulation of air adjacent the body being ventilated, said enclosure having intermediate portions thereof connected to maintain a particular configuration thereof on introduction of air thereto, at least some of said intermediate connected portions having elongated slots enabling the ventilating structure to accommodate expansion stress from the body being ventilated.

12. The structure as set forth in claim 11, said apertures in said enclosure being small and arranged in spaced groups to insure complete and uniform air circulation about the body being ventilated.

13. An air ventilating structure comprising, impermeable sheets peripherally joined to form a bag-like enclosure, each of said sheets having a surface on at least one side having continuously intercommunicating valleys formed therein substantially over its entire area defining isolated relatively projecting portions, air inlet means for said enclosure, a part of said relatively projecting portions on one of the outermost of said sheets being truncated to provide apertures in said enclosure opening within the continuously intercommunicating valleys in the surface of said one of the outermost of said sheets to insure free air distribution from said enclosure and adjacent thereto.

14. An air ventilating structure comprising, impermeable sheets peripherally joined to provide an enclosure, air inlet means for said enclosure, at least one of the outermost surfaces of said enclosure having a network of intercommunicating valleys formed therein over a major portion of its area and adapted to be placed adjacent a body to be ventilated and apertures in said enclosure spaced in said valleys in the surface to be placed adjacent the body to be ventilated to directly discharge air to continuously circulate in said valleys adjacent the body which is ventilated thereby.

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