May 21, 1946. M. A. CHAVANNES 2,400,627

VENTILATOR FOR RAINCOATS AND THE LIKE

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FIG. 1.

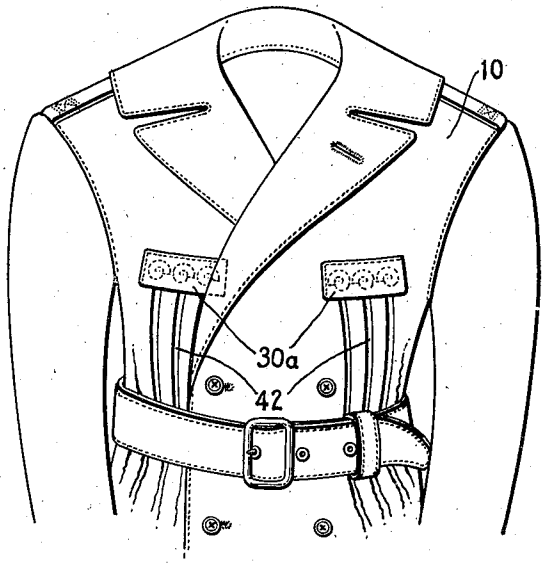


FIG. 2.

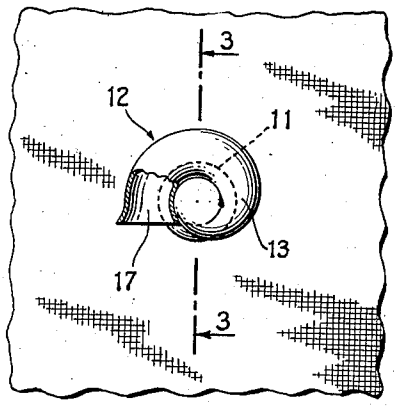


FIG. 3.

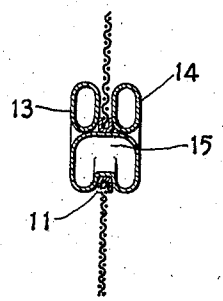


FIG. 4.

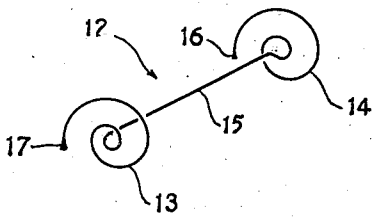


FIG. 5.

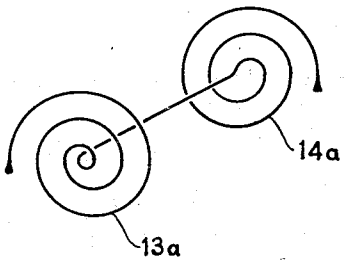
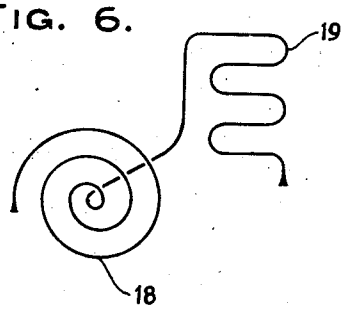


FIG. 6.



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FIG. 7.

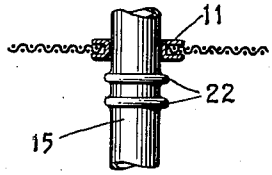


FIG. 8.

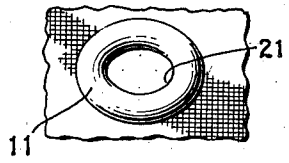


FIG. 9.

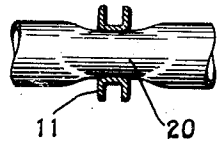


FIG. 10.

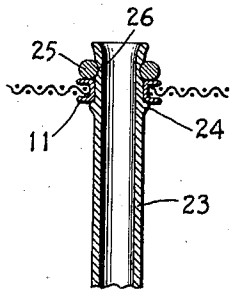


FIG. 11.

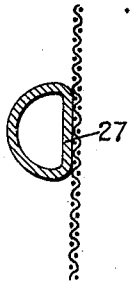


FIG. 12.

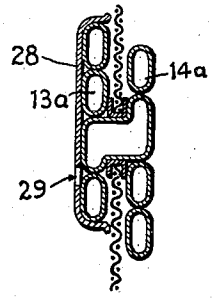


FIG. 13.

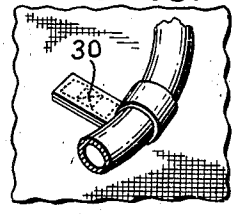


FIG. 14.

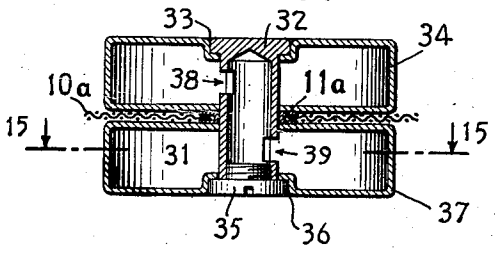
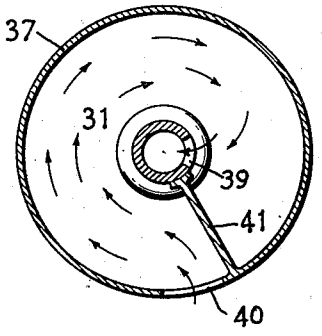


FIG. 15.



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Patented May 21, 1946

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UNITED STATES PATENT OFFICE

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VENTILATOR FOR RAINCOATS AND THE LIKE

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Application February 9, 1943, Serial No. 475,242

5 Claims. (Cl. 2—87)

This invention relates to means for permitting the free passage of vapors and the like from the inside of a raincoat, cap or other article of wearing apparel, or other means of enclosure or protection, to the outside.

In providing protection against rain, it is necessary to employ materials which are impervious to water even when the drops are impelled with relatively great force, as in a driving rain. Materials suitable for this purpose must be substantially air-tight. As a result, garments formed of such materials become extremely uncomfortable when worn for relatively long periods, particularly in warm weather. Perspiration has little or no opportunity to evaporate so that in a relatively short time the clothing beneath the raincoat, or the like, becomes laden with moisture and is just as objectionable as if the wearer had become drenched with rain.

A primary object of the invention has been to provide simple but effective means for permitting the relatively free outward passage of vapors developed on the inside of a raincoat or the like while definitely preventing the ingress of water even in a driving rain.

Another object has been to provide means of the character indicated which may be very simply and quickly applied to existing garments or the like as well as to new ones.

A feature of the invention is the provision of a tubular member, or a member of non-tubular form but having a tortuous or other type of winding passage therethrough, or a plurality of such members, at suitable points, the member or members being so constructed and arranged that air and vapors may pass freely through the same without danger that rain will be forced inwardly therethrough. Each member is preferably formed of a relatively soft, flexible material capable, however, of retaining its shape sufficiently to insure the maintenance of an open passage through the same. Thus, discomfort to the wearer of a garment embodying the improvement is avoided while at the same time the proper functioning of the ventilating means is made certain under all circumstances. Toward this end a further important feature of the invention is the provision of a compact arrangement of a tubular member, such that any force tending to collapse the same and close off the passage through the member is resisted by a number of closely spaced portions of the member acting in parallel.

Other objects, features and advantages of the invention will appear from a detailed description of certain illustrative forms of the same which will now be given in conjunction with the accompanying drawings, in which:

Fig. 1 is a perspective view of a portion of a raincoat embodying the improved ventilating means;

Fig. 2 is a detail view showing in plan a portion of the raincoat through which a ventilating tube is passed, a part of the tube being shown in section;

Fig. 3 is a transverse sectional view through the tube and fabric along the line 3—3 of Figure 2;

Fig. 4 is a diagrammatic view illustrating the winding of two portions of a tube embodied in the preferred form of the invention;

Fig. 5 is a similar view illustrating a modified form of tube;

Fig. 6 is a similar view of a further modified form of tube;

Fig. 7 is an enlarged detail view in section through the fabric showing special means for retaining a tube in position;

Fig. 8 is a detail view showing, in plan, an eyelet provided through the fabric;

Fig. 9 is a vertical section through the eyelet of Figure 8, showing a tube in place;

Fig. 10 is a detail view, in section, showing the attachment of a modified form of tube;

Fig. 11 is a detail view, in section, showing a tube of modified cross-section which may be employed in accordance with the invention;

Fig. 12 is a view, in transverse section, through a portion of the fabric carrying a modified form of tube;

Fig. 13 is a detail view showing a special tube fastening means which may be employed;

Fig. 14 is an axial sectional view through a further modified form of ventilating means applied to a section of fabric, and

Fig. 15 is a transverse section along the line 15—15 of Figure 14.

The invention is primarily concerned with the provision of the improved ventilating means in a raincoat or a cap or other article of wearing apparel and it is accordingly illustrated in connection with a garment. However, it should be understood that the invention is of broader application and may be used in connection with the ventilation of larger articles, such as tents and the like, or it may be used in connection with bags or similar means employed for the protection or preservation of food stuffs or other ar-

ticles requiring the relatively free passage of air or vapors but the exclusion of water. For example, in the wrapping of fruit or the like it is frequently desirable to employ a bag or container formed of water-impervious material capable of excluding rain but which, at the same time, is provided with suitable ventilating means for permitting the necessary respiration of the fruit.

Referring now to the drawings, there is illustrated in Fig. 1 a conventional form of raincoat 10, such as now commonly worn by members of the armed forces. This coat may be constructed in any suitable manner but has its outer surface formed of a material which is substantially impervious to both water and air. It may, for example, be a rubberized fabric or it may be formed of a laminated material embodying as one or more of its layers an impervious film formed of rubber or a natural or synthetic resin. At suitable points at which ventilation is found desirable, the water-and-air-impervious material is perforated and provided with an eyelet 11 formed of metal, such as brass, or of any other suitable material capable of forming a rigid, reinforced and protected edge around an opening through the fabric. It should be capable of application to the fabric by a simple tool or implement commonly employed for eyeleting purposes. Eyelets of this character may, for example, be provided in groups across the chest-covering portion of the coat, and across the back just below the shoulders, or at the small of the back, and at any other convenient point or points at which ventilation is desirable.

Now, in accordance with the preferred form of the invention, there is inserted in each of the eyelets a spirally wound tube 12 of snail-like configuration. This tube may be formed of any suitable material, such as a plastic of any of a variety of types—rubber, metal or the like. Preferably it is of a flexible or semi-flexible character so that it will not be uncomfortable to the wearer when pressed against the body. On the other hand, it must not be so flexible as to be likely to be squeezed together and thus closed off in the ordinary course of use. Moreover, as will appear from the description of the mode of application of the tube to the fabric, to be hereinafter given, it is important that the tube have a certain rigidity or ability to retain its shape. If it is formed of an appropriate plastic, such as a thermo-setting resin or a thermo-plastic resin, it will have a desired flexibility but at the same time it will tend to return after deformation to its initial shape. Thus, if the end of the tube is accidentally engaged with some object and partially unwound or otherwise distorted, and is then released, it will have a tendency to return to its initial, spiral form. Thermosetting resins are particularly suitable from this standpoint since they may be readily shaped, prior to thermal setting, and when once set at elevated temperatures, they have a very strong tendency to maintain the shape in which they have been set.

In the preferred construction illustrated, diagrammatically, in Fig. 4, the tube 12 is formed of two spirally wound portions 13 and 14 connected by a short, substantially straight section 15. The spiral portions are wound in the same sense from the intermediate, straight section 15. It will be understood that in the diagrammatic showing in Fig. 4, the section 15 is of much greater length than in actual practice, for the purpose of more clearly indicating the form of the two spiral end portions. Actually, the section 15 is simply of sufficient length to extend through the eyelet 11, as shown in Fig. 3.

In applying the tubular element to a garment, the eyelet 11 is first inserted in the proper location through the fabric by means of a suitable eyeleting punch or the like. The free end 16 of the portion 14 of the tube is then inserted in the eyelet and the portion 14 is rotated until its complete length is passed through the eyelet and the short, straight section 15 is brought into the plane of the eyelet. The parts will then assume the position indicated in Figs. 2 and 3. The free end 17 of the outer portion 13 of the tube is at this time so disposed as to have its opening facing downwardly so as to make it substantially impossible for even a most driving rain to enter the tube or, at any rate, to pass very far into it. As indicated in Fig. 2, the free end of the outer portion 13 of the tube is preferably flared outwardly, or is otherwise formed with a shoulder or the like, so as to cause any drops of water, which may collect on the tube and descend along the free end by gravity, to be discharged outwardly away from the axis of the opening. This will minimize the danger of a drop of water collecting at the open end of the tube and forming a seal. This danger, moreover, is very small if the tube has a passage of sufficiently large cross-section.

The diameter of the tubing employed may vary considerably, according to the specific application of the invention. In any case, the tubing should be of sufficient diameter not to induce capillary action. Furthermore, it should be sufficiently large to permit the relatively free passage of air through the same. The friction to be overcome by the vapor pressure within the garment should be as small as practicable. For this purpose, the diameter of its passage should be at least ⅛ of an inch and preferably between ¼ and ⅜ of an inch, or even larger. The wall thickness of the tube, if it is formed of a thermo-setting plastic, may vary between .01 and .025 of an inch or it may have a greater thickness than this, if desired, and particularly if its diameter is relatively large. The over-all length of the tube prior to winding the same into the spiral form may suitably be between 5 and 10 inches.

It will be understood that in the use of the improved ventilating tube, vapors generated on the inner side of the garment, due to the heat of the body, will pass freely outwardly through the tube while water, even in the most driving downpour of rain, will not enter and pass through the tube from the outside to the inside of the garment. An advantage of the reversely-wound spiral arrangement of the two portions 13 and 14 of the tubular element is that it avoids the danger of carrying a drop or slug of water from the outer to the inner end of the tube by a possible rhythmic movement of the body in the course of walking. Thus, if such rhythmic movement would tend to carry a drop of water caught at the end 17 of the tube completely through the spiral portion 13 to the part 15, the same rhythmic movement would tend to prevent the passage of this drop outwardly along the spiral portion 14. However, as indicated in Fig. 5, the two end portions 13a and 14a may, if desired, be wound in the same sense for simplicity of manufacture. If so, there is a slight danger that a drop of water will be forced completely through the tube by the rhythmic motion referred to, but this possibility is relatively remote and the modified construction has the possible advantage that a drop of

water will not permanently close off the tube and prevent the free passage of the vapors, as desired.

It is not essential that the tubular element be of spiral form. For simplicity of application of the tube, it is desirable to have that portion which is to be passed through the eyelet wound into spiral form, although even this portion of the tube may be of other configurations capable of being forced relatively quickly and easily through the eyelet. In Fig. 6 there is shown a suitable construction in which the inner portion 18, adapted to be passed through the eyelet, is of spiral or snail-like configuration while the outer portion 19 is simply bent first in one direction and then the other to provide a tortuous passage for the air or vapors, which will definitely prevent inward and upward movement of water even in a most driving rain.

In any of the constructions above described, it is desirable that the internal diameter of the eyelet be slightly greater than the external diameter of the tubing. The tubing, as indicated, is preferably flexible so that it may be readily squeezed and pressed or drawn through the eyelet by the use of an appropriate amount of force but when once positioned, it will be held firmly and will not be readily displaced by accident. The squeezing of the tube is illustrated in an exaggerated way at 20 in Fig. 9. As a result of the construction of the tube at the eyelet, a good seal is effected between these two parts. To further prevent accidental rotation of the tubing, after proper positioning of the same by force, the eyelet may suitably be of oval form, as best shown in Figure 8. The tubing being either formed initially to correspond in cross-section with the opening 21 through the eyelet, or being squeezed to conform with this opening, will tend to resist rotation within the eyelet. Any other appropriate configuration of the opening and cooperating portion of the tubing may be employed for the same purpose.

If desired, the intermediate section 15 of the tube may be provided with a pair of enlargements or beads, as indicated at 22 in Fig. 7. In attaching the tube to the garment, one of the beads may be forced through the eyelet 11, the tubing being sufficiently yielding to permit this, but assuming its normal condition in the region of the bead after this has passed through the eyelet. Thus, the eyelet will be clamped between the two beads and axial displacement of the section 15 of the tube will be prevented. This construction may be employed also in the event that it is desired to have the spiral or other winding or bent configuration of the tubing only on the outside of the fabric. The coiled tube may be retained merely by the cooperation of the beads, formed adjacent the free, inner end of the tube, with the opposite sides of the eyelet. Or, if desired, the modified construction illustrated in Fig. 10 may be used for this purpose. Thus, the free, inner end of a coiled or bent tube 23 may be formed with a bead 24 which may be held against one side of the eyelet 11 while a split ring 25 seating in a groove 26 in the tube may be held against the opposite side of the eyelet.

In Fig. 11 there is shown a tube of special cross-section, having a flat side 27 adapted to lie flat against the surface of the fabric. This type of tubing may be employed in connection with any of the forms of the invention hereinabove described. If the tube is of such cross-section throughout, the eyelet should have its opening of corresponding shape; however, the portion 15 of the tube may, if desired, be of circular or oval cross-section while the coiled portions only are of the special shape shown.

One or both of the coiled, or otherwise bent, portions of the tubing may be enclosed in a button-like shell 28, as shown in Fig. 12. This shell may be formed of any suitable material, such as metal, or plastic, or the like. It may be formed of the same material as the tubing itself, if desired. Its edge is preferably bent or curled inwardly and adapted to be clamped over the coiled tubing. The lower portion of the shell rim should be cut away or provided with an opening, as indicated at 29, to permit the free passage of air and vapors into and out of the same.

Securing means, such as tapes 30, may be employed to retain the coiled tubing more firmly against the fabric, if desired. Such tapes may be disposed in any convenient and appropriate manner to accomplish the desired purpose and they may be used either with or without the shells 28. The ventilating tubes, or the like, of any of the foregoing constructions may be concealed beneath a flap 30a, if desired, giving the appearance of a pocket. Or, if preferred, they may actually be inserted in a pocket and means, such as a slide fastener, may be employed to close off the pocket and thus prevent ready access of even air to the outer ends of the ventilating tubes. This may be desirable, for example, in the event of a cold, high velocity wind being encountered as the raincoat is being worn.

In Figs. 14 and 15 there is shown a modified construction in which a tortuous or winding passage for the air and vapors is provided by a special button-like construction in lieu of the tubing described in the foregoing. An eyelet 11a may be provided, as before, through the outer fabric 10a at any selected point. Or, if desired, the eyelet may be omitted and simply a hole through the fabric reinforced by suitable buttonhole stitching, or the like, may be provided. Through the opening of the eyelet or the fabric there is passed a tubular or hollow bolt 31 formed of metal or a suitable plastic or the like. The head 32 of the bolt may be received by a pocket or recess 33 of similar shape in the outer surface of a hollow button-like member 34. At its opposite end the hollow bolt is threaded to receive a nut 35 which fits into a recess or pocket 36 in another hollow button-like member 37. Within the member 34 the bolt is provided with an opening 38 which places the interior of the member in communication with the hollow of the bolt. Similarly an opening 39 places the hollow of the bolt in communication with the interior of the member 37. An opening 40 in the rim of the member 37 admits air into the interior of the latter from the bottom. A baffle or partition 41, however, compels the air, so admitted, to traverse substantially the entire circumference of the member before passing through opening 38 into the hollow of the bolt. A similar opening and partition provided in the member 37 will cause the air or vapors to traverse substantially the complete circumference of member 37 in passing between the inside of the garment and the hollow of the bolt. It will be apparent that air and vapors may traverse the winding or tortuous path between the inside and the outside of the raincoat or the like with relative freedom but rain will be quite definitely excluded. As will be understood, the specific construction of the button-like members 34 and 37 and the retaining bolt may be varied materially and may provide a more

or less winding or tortuous path for the vapors and air. In any construction of these parts, however, care should be exercised to provide an air passage of sufficient cross-section in relation to length to keep the friction losses within reasonable limits.

As a special feature of the invention, regardless of the form of the particular ventilating means employed, it is considered highly desirable to so construct the raincoat or other article that a relatively large area within the coat will be effectively ventilated by a single tube or passage. For this purpose it is desirable to so construct the coat as to provide channels within the same, or between the coat and the wearer, which will place the ventilating means in communication with relatively distant points. This may be accomplished, for example, by a belted construction or the like which will cause the coat fabric to fall into folds or tucks that will form channels from the waistline, or some similar region, up to the inner ends of the ventilating tubes. This is illustrated in Fig. 1. If desired, pleats 42 or the like may be employed to assist in forming the desired folds or channels at appropriate points. So also, an air pocket of considerable area may be provided at the inner end of the ventilating passage by any suitable means for holding the coat material spaced from the body in that area. In applying the invention to a cap, any of the above-mentioned forms of ventilating means may be employed. On a military cap the spiral tube construction, for example, may suitably be provided in rear of the usual emblem worn at the front of the cap.

While certain illustrative forms of the invention have been disclosed in considerable detail, it will be understood that numerous other changes may be made in the form and arrangement of the various parts without departing from the general principles and scope of the invention.

I claim:

1. Ventilating means for water impervious fabric which comprises an eyelet secured to said fabric and forming a reinforced opening therethrough, and a tube extending through said eyelet and having a continuous passage communicating with the atmosphere at the opposite sides of the fabric, said tube being firmly retained by said eyelet and having its portion at one side of the eyelet bent into spiral form.

2. Ventilating means for water-impervious fabric which comprises an eyelet secured to said fabric and forming a reinforced opening therethrough, and a tube extending through said eyelet and having a continuous passage communicating with the atmosphere at the opposite sides of the fabric, said tube being firmly retained by said eyelet and having portions at both sides of the eyelet bent into spiral form.

3. Ventilating means for water-impervious fabric which comprises an eyelet secured to said fabric and forming a reinforced opening therethrough, and a tube extending through said eyelet and having a continuous passage communicating with the atmosphere at the opposite sides of the fabric, said tube being firmly retained by said eyelet and having portions at both sides of the eyelet bent into spiral form, the two spiral portions at opposite sides of the fabric being coiled in opposite sense.

4. Ventilating means for water-impervious fabric which comprises an eyelet secured to said fabric and forming a reinforced opening therethrough of substantially oval configuration, and a tube extending through said eyelet and having a continuous passage communicating with the atmosphere at the opposite sides of the fabric, said tube having its portions at both sides of the eyelet bent into spiral form, the intermediate portion of said tube engaged with said eyelet having a cross section corresponding with the interior of said eyelet.

5. Ventilating means for articles formed at least in part of water-impervious fabric, which comprises a substantially rigid element forming a passage through said fabric, and button-like means associated with said element on each side of said fabric providing a tortuous passage in communication with the atmosphere at the opposite sides of said element.

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