

July 24, 1951

J. L. TUCKER  
INSULATING FABRIC  
Filed July 28, 1949

2,561,891

Fig 1

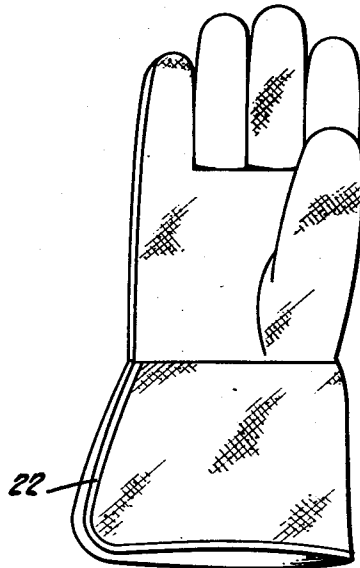


Fig 2

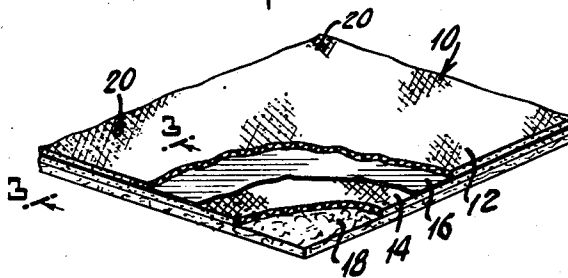
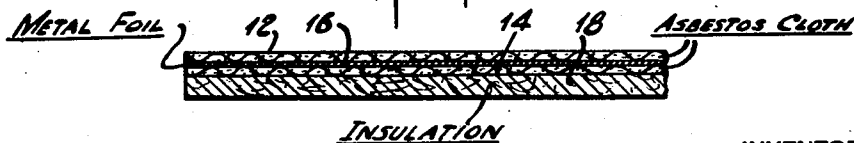


Fig 3



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## UNITED STATES PATENT OFFICE

2,561,891

## INSULATING FABRIC

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Application July 28, 1949, Serial No. 107,324

7 Claims. (Cl. 154-44)

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The instant invention relates to fabrics particularly for use in the fabrication of safety clothing such as gloves, shoes, boots, suits, and the like employed as a protection to the human body against hot oils, flame, chemicals, gases, etc.

Conventional garments of this type, particularly those used for fire fighting, have been made of woven asbestos cloth. These fabrics have the disadvantage that they are pervious to fluids. For example, in the case of fires involving oils or other inflammable liquids, where the suits are exposed to contact with the liquids, they may act as a carrier for, rather than as a protection against, fire. Also, such suits do not have the desired thermal insulating qualities. Attempts have been made to overcome these disadvantages but prior to the instant invention they have not met with complete success.

The instant invention has for its principal object the provision of a fabric retaining the advantages of the conventional asbestos fabrics but which is resistant to penetration by fluids and which is of relatively high insulating efficiency.

Another object of the invention is the provision of a fabric involving inner and outer laminations of protective material, preferably asbestos cloth, and an intermediate fluid-impervious, heat-reflective lamination. In the preferred embodiment, the outer laminations are made of relatively lightweight woven asbestos cloth and the intermediate lamination is a bright, heat-reflective metal foil. The foil serves both to reflect radiant heat and to prevent the penetration of oils, solvents or other inflammable liquids to the inner asbestos layer adjacent the body of the wearer. At the same time the outer and inner asbestos laminations protect the relatively fragile foil against abrasion, tearing, and the like.

A further object of the invention is the provision of a fabric of the type referred to which carries an insulating layer or lining, the lining, in addition to its insulating function, serving to improve the "feel" of the material. Preferably for this purpose a wool fabric is employed, the fabric being either knitted, woven, felted, or the like.

My invention will be more fully understood and further objects and advantages will become apparent when reference is made to the more detailed description of a preferred embodiment of the invention which is to follow, and to the accompanying drawings in which:

Fig. 1 is a perspective view of an article, particularly a glove, formed of the fabric of the instant invention.

Fig. 2 is a perspective view of a fabric embodying the instant invention; and,

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Fig. 3 is a sectional view on an enlarged scale, taken on the line 3-3 of Fig. 2.

Referring now to the drawings and particularly to Figs. 2 and 3, a laminated fabric 10 embodying the instant invention includes an outer lamination 12 of asbestos cloth, an inner lamination 14 of similar cloth, and an intermediate lamination 16 of a reflective foil, or the like. In the preferred embodiment, the inner lamination 14 carries a surfacing layer or liner of insulating material 18. The fabric, when employed in a garment such as that shown in Fig. 1, is placed with the lamination 12 on the outside of the garment, the inner lamination 14, or the liner 18 when the latter is employed, being next to the person of the wearer.

Laminations 12 and 14 are suitably of relatively lightweight, woven asbestos cloth. Such cloth is made from finer strands than those ordinarily employed, the strands being used for both the warp and weft or, in some instances for the weft only, the warp in such instances being composed of fine, heat-resistant, metal wire. Either or both of the asbestos laminations may be coated or impregnated with a suitable plastic or resin such as vinyl (Vinylite) or phenolic resin, or polytetrafluorethylene plastics (Teflon) to improve the abrasion resistance of the fabric and to reduce its liquid absorption characteristics.

Intermediate layer 16 is a fluid-impervious, reflective material, the materials preferred for this purpose being metal foils, such as copper, aluminum, zinc, steel foils, and the like, of low thickness, say, approximately 0.002" in thickness. However, other thin, heat-reflective and fluid-impervious layers or foils may be substituted therefor, such for example, as Teflon, Vinylite, or combinations of these with films of colloidal silicates.

The insulating liner 18 consists of a fibrous, heat insulating material which also has the property of providing comfort to the wearer of the garment. The preferred material for this purpose is woolen cloth or fabric made by weaving, knitting or felting, as desired.

The several laminations making up the fabric may be adhesively secured together, if desired. For example, where a resinous coating or impregnant is used on the asbestos layers, this may also serve to adhere the laminations into a unitary body. However, it is preferred that the laminations be generally unattached whereby an increased insulating value is obtained, due to the air spaces occurring between the laminations. Where the laminations are non-adhered the fabric may be maintained in assembled form by temporary means such as stitchings 20 at suitable

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locations. After fabrication, the laminations are retained in the assembly by the stitching, grommets, or other fastening means employed in the manufacture of the garment, as diagrammatically illustrated in Fig. 1 by the lines of stitching 22.

A fabric in accordance with the instant invention provides protection against flame, burning oils, gases, and the like and, at the same time insulates against the transmission of heat to the body of the wearer. The latter function is obtained from the heat-reflective characteristics of the foil, the preferred wool liner and the air spaces between the several laminations, as well as by the air spaces in the asbestos fabrics. Penetration of fluids to the wearer's body is prevented by the intermediate impervious foil layer. Inasmuch as relatively lightweight asbestos cloths may be employed, the fabric is flexible and readily adaptable to fabrication into suitable articles of clothing, the latter not having the stiffness of conventional types.

Having thus described my invention in rather full detail, it will be understood that these details need not be strictly adhered to but that various changes and modifications may suggest themselves to one skilled in the art, all falling within the scope of the invention as defined by the subjoined claims.

What I claim is:

1. A flexible fabric comprising outer and inner laminations of flexible asbestos cloth and an intermediate lamination of metal foil.

2. A flexible fabric comprising inner and outer laminations of flexible asbestos cloth, an intermediate lamination of metal foil, and a thermal insulating liner on said inner lamination.

3. A flexible fabric comprising inner and outer laminations of flexible asbestos cloth, an intermediate lamination of metal foil, a thermal in-

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insulating liner on said inner lamination, and means securing said several laminations together.

4. A flexible fabric comprising inner and outer laminations of flexible asbestos cloth, an intermediate lamination of metal foil, and means securing said laminations together in non-adhered relationship.

5. A flexible fabric comprising inner and outer laminations of flexible asbestos cloth, an intermediate lamination of metal foil, and a woolen fabric covering the inner lamination.

6. A flexible fabric comprising inner and outer laminations of flexible cloth fabricated from asbestos strands and fine wire strands, and an intermediate lamination of metal foil.

7. A flexible fabric comprising inner and outer laminations of flexible cloth fabricated from asbestos strands and fine wire strands, an intermediate lamination of metal foil, a woolen fabric covering the inner lamination, and means securing said several laminations together.

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