Dec. 19, 1961 G. H. KLINGBERG 3,013,588

MULTILAYER HEAT INSULATING FABRIC

Filed Dec. 16, 1959

Fig. 1.

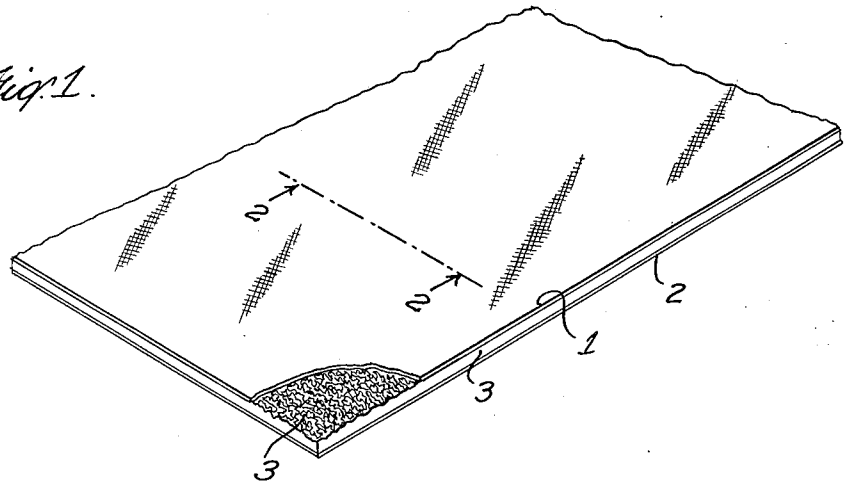


Fig. 2.

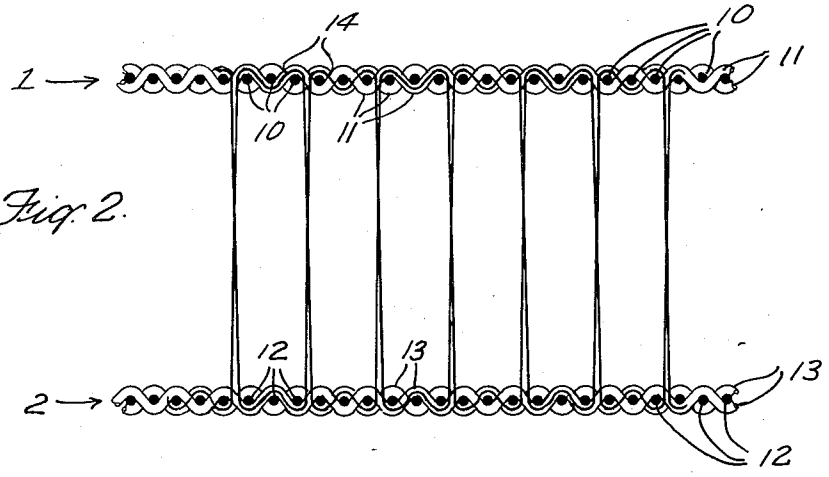
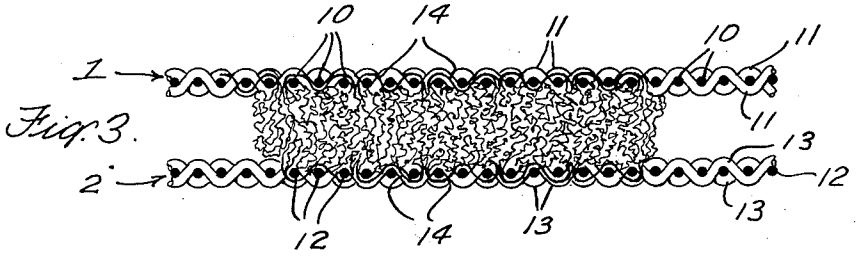


Fig. 3.



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MULTILAYER HEAT INSULATING FABRIC

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This invention relates to a heat insulating fabric and a method of making the same and has for an object to provide a fabric of the above type having novel and improved characteristics.

Another object is to provide a fabric of the above type composed of a pair of woven plies bound together by a dense layer of a pile yarn which entraps a layer of air and thus provide improved insulating properties.

Another object is to provide a fabric of the above type in which the two woven plies are tightly and closely bound together by the pile yarns.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

In accordance with this invention the fabric comprises two woven plies joined by pile threads which extend between the plies and are bound therein. Such a fabric can be woven, for example, on a standard two shuttle velvet loom with the cutting knives omitted. In this improved fabric the pile threads are composed of a synthetic continuous filament yarn such as nylon, Dacron, Orlon, saran, dynel, Vinyon or the like which has been previously crimped or bulked by any of the known processes, as by crimping in a stuffer crimper, false twisting or the like. Such yarns are crimped or bulked and permanently set in the bulked state. They are then wound into packages under tension and given a temporary straight set. While in straight form the yarns are woven as pile yarns between opposed backing plies to form a dense layer of yarns or threads which hold the outer plies in closely spaced relationship. The fabric is then steamed or otherwise treated to relax the pile yarns and cause them to resume the crimped form. In so doing the yarns contract in length to pull the outer plies tightly together and the bulked or crimped form of the pile causes the pile to become closely matted so as to form a layer which is so dense as to be practically impervious to water. This feature is of importance when the fabric is used as insulation for arctic clothing since a tear in the outer layer will not cause the entire fabric to become soaked and useless as protection.

The nature of the invention will be better understood from the following description, taken in connection with the accompanying drawing in which a specific embodiment has been shown for purposes of illustration.

In the drawing:

FIG. 1 is a perspective view of a fabric embodying the invention with parts broken away for clarity;

FIG. 2 is a transverse section taken on the line 2—2 of FIG. 1 showing the pile yarns in straight form as woven; and

FIG. 3 is a section similar to FIG. 2 showing the fabric after the pile yarns have been relaxed into crimped form.

Referring to the drawing more in detail the fabric is shown as comprising outer plies 1 and 2 and an inner layer 3 of pile yarns. The outer ply 1 is composed of filler yarns 10 and chain warp yarns 11 woven together in the usual manner. The second outer ply is composed of filler yarns 12 and chain warp yarns 13 interwoven in a similar manner. Pile yarns 14 are bound in the plies 1 and 2 and extend between the two outer plies.

In the form shown pile yarns 14 are woven as chains over and under and over three filler yarns 10 respectively in the outer ply 1, then pass to the outer ply 2

where they are woven as chains under and over and under three filler yarns 12 respectively and return to the first ply. Other pile yarns, not shown, are similarly woven in fillerwise alignment with the first filler yarns to form a dense row of pile extending across the fabric or, if desired, successive pile yarns may be displaced by one and two filler yarns respectively so that the pile yarns are uniformly spaced throughout the fabric to form a dense uniform intermediate layer.

The fabric as woven is shown in FIG. 2. This fabric is then treated as by steaming to remove the temporary straight set of the pile yarn and cause the pile to relax into crimped form as shown in FIG. 3. While the crimp has been shown for convenience as of the saw tooth type which could be produced in a stuffer crimper, it is obvious that any other form of crimp such as that produced by false twisting, or by twisting, setting and untwisting, or by the methods of any of the examples referred to above, may be used. Such yarns are generally composed of continuous filament nylon. Such material is particularly suited for use in clothing fabric.

While the fabric above described is particularly suited for insulation in cold weather clothing apparel and footwear, it may also be used as a filter fabric and as a carrier in plastic fabrication.

What is claimed is:

1. A multilayer fabric having heat insulating properties, comprising a pair of outer plies composed of interwoven filler and chain yarns and pile yarns joining said outer plies and bound in and extending between said plies, all of said pile yarns being under tension to hold the outer plies tightly together and being in the crimped state, said pile yarns being uniformly and closely spaced to form a dense matted layer which is substantially impervious to moisture.

2. A multilayer fabric having heat insulating properties, comprising a pair of outer plies composed of interwoven filler and chain yarns and pile yarns joining said outer plies and bound in and extending between said plies, all of said pile yarns being under tension to hold the outer plies tightly together and being in the crimped state, said pile yarns being uniformly and closely spaced to form a dense matted layer which is substantially impervious to moisture, at least said pile yarns being composed of nylon.

3. The method of making a multilayer fabric having heat insulating properties which comprises weaving a pair of outer plies of fabric having interwoven filler and chain yarns together with pile yarns joining said plies and bound therein, said pile yarns comprising continuous filament synthetic material which has been crimped and then given a temporary straight set, then treating said fabric to remove the temporary straight set under conditions to cause said pile yarns to resume their crimped state wherein the pile yarns are closely spaced and matted and are placed under tension to hold the outer plies tightly together.

4. The method set forth in claim 3 in which said pile yarns are disposed in alignment in the fillerwise direction.

5. The method set forth in claim 3 wherein at least the pile yarns are composed of nylon.

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