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3,365,727

FLOCKED THERMOPLASTIC FABRIC HAT

Filed Nov. 12, 1963

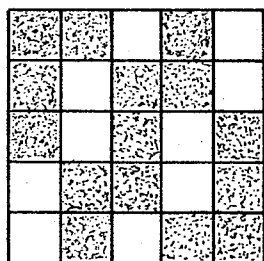


FIG-1

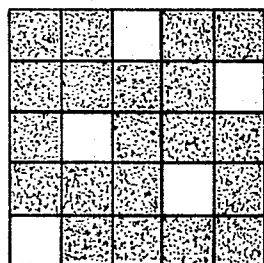


FIG-2

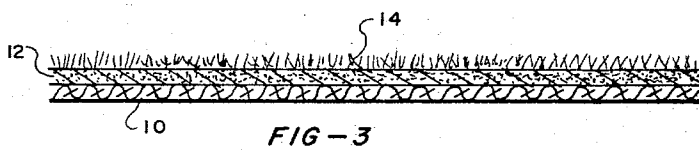


FIG-3

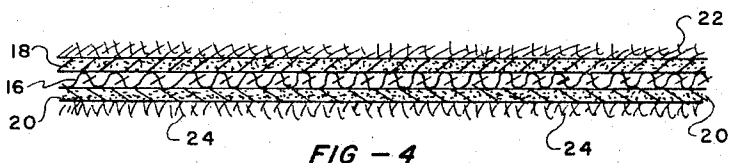


FIG-4

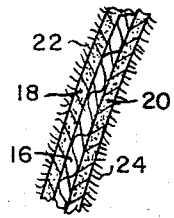


FIG-6

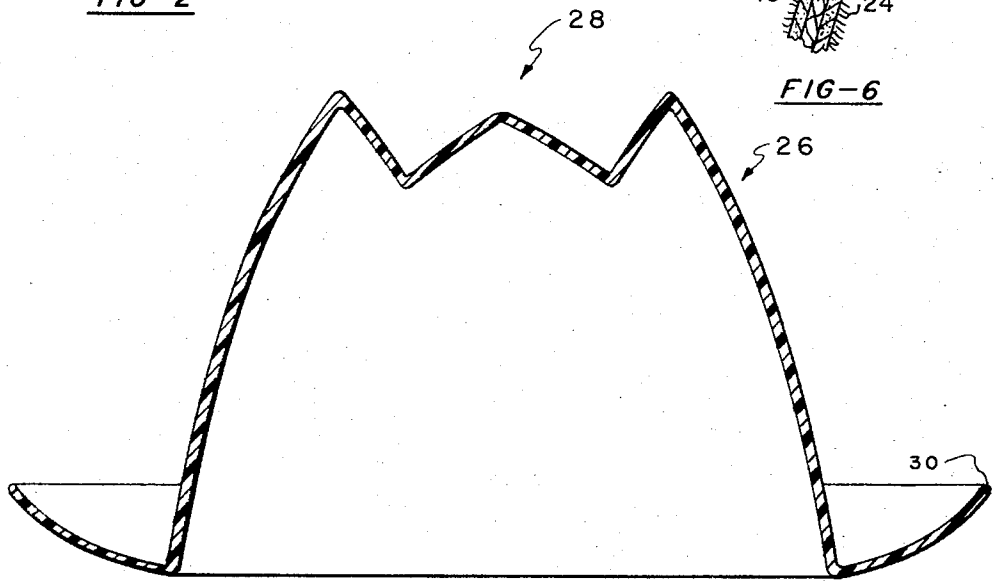


FIG-5

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3,365,727

FLOCKED THERMOPLASTIC FABRIC HAT

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12 Claims. (Cl. 2—192)

This invention relates to hats made of moldable thermoplastic fabrics having flocking adhesively secured to said fabrics prior to the molding operation. More particularly, this invention contemplates the manufacture of a one-piece molded hat body made out of a flat thermoplastic flocked starting material to produce a hat which will have the look, feel and wearing qualities of a fine natural felt hat.

Fine quality felt hats are presently being made of blends of fibers from fur bearing animals such as rabbits, muskrat, beaver and mink. These furs are becoming more costly and difficult to obtain. For example, England, which used to export 200,000 pounds of rabbit fur annually, now does not export any fur; Australia, which exported as recently as 1958 over 600,000 pounds of fur, only had 260,000 pounds 1962. This situation has been brought on by economic changes within these countries with strong de-emphasis on fur production in favor of farming in England and wool in Australia. In fact, both of these countries consider the rabbit a pest and drastic measures are being undertaken to obliterate them. In addition, as the population of the world grows larger and rural areas become cities, the natural habitat of muskrats and beaver is disappearing with the result that fur from these animals is also becoming scarce.

It is, therefore, an object of this invention to make a quality hat of a moldable flocked fabric which will have the appearance, feel and wearing qualities equal to or superior to a fur felt hat.

It is a further object of this invention to make a synthetic hat out of a flat starting material which can be stretch molded into a one-piece hat body having a unitary crown and brim.

It is also an object of this invention to provide a synthetic hat which will be capable of being washed, and which will retain its fine appearance and resume its proper shape after washing, and which may be truly called a wash and wear hat.

It is a special object of this invention to provide a suitable thermoplastic fabric for the hat body and a suitable adhesive for securing the flock to the thermoplastic fabric to form the flat body material which can then be stretch molded into the hat body.

Further objects and advantages of the invention will appear in the specification hereinbelow. These objects and advantages are achieved with the invention as illustrated in the accompanying drawings in which:

FIG. 1 is a diagrammatic construction detail of a fabric;

FIG. 2 is a diagrammatic construction detail of another form of fabric;

FIG. 3 is a sectional view of a flat composite fabric;

FIG. 4 is a sectional view of another form of flat composite fabric;

FIG. 5 is a sectional view of a hat body made of a material of the invention; and

FIG. 6 is an enlarged sectional detail taken between the lines 6—6 of FIG. 5.

It is well known in the art that hats can be made of moldable fabrics of thermoplastic synthetic fibers, and there are patents describing this art; for example: United States Letters Patent No. 2,926,358 issued on March 1, 1960, on application of S. G. Hoffman et al.

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It is equally well known that flock prepared of such synthetic and natural fibers as nylon, Dacron, Orlon, rayon, cotton, wool, fur and other materials, can be applied and adhesively secured to various synthetic and natural textiles in the manufacture of articles such as shoe uppers, simulated leather jackets and coats, handbags, vests, dresses and similar articles.

In the manufacture of a hat in accordance with the invention, it is desirable to provide a flat starting material which may be stretch molded by the application of heat, and molding in a proper apparatus (in accordance with the patent set forth above) from said flat starting material to a properly shaped hat body including the brim and crown portions. In hat manufacture of this nature, a deep stretch or draw is required to mold the hat crown. By stretch molding, I mean simultaneously stretching and molding the flat starting material in the form such as shown in FIG. 4 into a hat body in the form such as shown in FIG. 5 having brim and crown portions.

I have found that the usual thermoplastic fabrics used in the manufacture of the above mentioned articles of apparel are not suitable for use in the manufacture of felt type hats by the stretch molding process. Thus, it is necessary to provide a woven thermoplastic material having a specific fabric constructional weave pattern which would permit obtaining the deep draw required to mold the hat crown, but also to retain a dense surface with a minimum of porosity after stretch molding. A suitable adhesive must also be provided, for applying the flock to the thermoplastic material, which would be capable of being heated and molded during the manufacture of the hat so that the bond between the thermoplastic body material and the flock would not be impaired in such manufacture.

An adhesive for such a purpose must possess the following characteristics:

(1) It should be a high temperature thermoplastic;

(2) It must flow during the simultaneous heating, stretching and molding operations without disrupting the adhesive bond between the fabric and flock;

(3) It must not stiffen or harden after being heated or upon aging of the flocked fabric;

(4) It should withstand abrasion in normal wear;

(5) It must be insoluble in water;

(6) It must not be affected by solvents used in dry cleaning such as naphtha and carbon tetrachloride;

(7) It must not be tacky during the molding operation;

(8) It should be odorless after molding; and

(9) The adhesion bond must be resilient.

The plastic fabric out of which the hat body is made is woven from a thermoplastic yarn of vinyl chloride-acrylonitrile which is well known and sold under the trademark "Dynel" by the Union Carbide Corp., or from a modified acrylic fiber such as the type sold under the trademark "Verel" by the Eastman Kodak Company. The thermoplastic material of the hat body may also be woven from a yarn of modified vinyl chloride or any other suitable yarn for weaving a thermoplastic material.

Fabrics having either a 3/2 sheen weave as illustrated in FIG. 1 of the drawings or the 4/1 sheen weave as illustrated in FIG. 2 of the drawings have been developed for making a hat in accordance with the invention. For example, 100% Dynel yarn, 3 denier, 1½" staple with 21/1's cotton count, having at least 80 ends and at least 58 picks in the greige off the loom, will have the proper fineness of weave required to permit the material to be stretch molded into the crown of the hat in accordance with the invention.

While satisfactory hat bodies will be produced from materials such as those illustrated in FIGS. 1 and 2 of

the drawings, in which there are at least 80 ends and 58 picks, it is preferred to have a body material in which there are at least 100 ends and 72 picks. It is considered that the foregoing gives sufficient data to one skilled in the art to reproduce the fabrics required as a starting material for the hat body.

The adhesive 12, 18 or 20 is applied to the fabric 10 or 16 by means of a doctor blade which evenly spreads a thin uniform layer of adhesive onto the fabric, and flock material 14, 22 or 24 is then sprinkled onto the adhesive fabric and caused to adhere to the surface. The flocked fabric as shown in FIG. 3 or FIG. 4 of the drawings is then dried to establish a strong bond between the fabric and flock. Excess flock which has not adhered to the fabric is removed by vacuuming. In the preparation of my flocked fabric, I prefer to flock both sides of the fabric as in FIG. 4. Only one side of the fabric, as in FIG. 3, can be flocked and two pieces of such a flocked fabric can be combined back to back so that there would be a flocked surface on either side of the combined fabric, and would result in a heavier, thicker fabric than if both sides of a single fabric were flocked, and the resultant molded hat from such a fabric would naturally be heavier and thicker.

The adhesive 12, 18 or 20 necessary for the invention, and which will have the qualities outlined hereinabove, comprises vinyl chloride-acetate copolymer resin, acrylonitrile-butadiene rubber; solvents, anti-oxidants, residual chlorine scavengers, and heat and light stabilizers. The vinyl copolymer resin is identified as vinyl chloride-acetate copolymer resin, and the acrylonitrile rubber is identified as acrylonitrile-butadiene rubber. These elements of the adhesive compound are the working elements that actually combine the flock to the material. The solvents, the anti-oxidants, the residual chlorine scavengers and the heat and light stabilizers act as a carrier and for the other purposes indicated respectively, such as to prevent oxidation and to prevent such other chemical reaction by reason of presence of chlorine or heat or light which would ordinarily cause the adhesive otherwise to become hard and brittle. I have found that solvents such as methyl ethyl ketone, xylene, ethyl acetate, di-acetone, isopropyl-acetone and toluene and ethyl alcohol may be used. Of course, other appropriate solvents may also be used. An anti-oxidant such as alkylated phenol may be used, an epoxy resin may be used as the residual chlorine scavenger, and organo tin complex may be used as the heat and light stabilizer. If desirable, I may include a plasticizer for the Dynel such as a mixture of N-ethyl ortho and para toluene sulfonamides.

Another type of adhesive 12, 18 or 20 which I have found has the qualities mentioned above is polyglycolterephthalate resin. This type of adhesive is used with a solvent. However, it is not necessary to combine it with an anti-oxidant, chlorine scavenger or heat and light stabilizer because of the nature of the material since it is more stable than the first mixed adhesive.

The following are two examples of adhesives which have been developed for the invention. The amounts are given in percent by weight.

EXAMPLE 1

Di-acetone	16.72
Xylene	39.07
Isopropyl-acetone	14.61
Vinyl chloride-acetate copolymer resin	9.70
Acrylonitrile-butadiene rubber	16.81
Mixture of N-ethyl ortho and para toluene sulfonamides	1.45
Alkylated phenol	0.48
Epoxy resin	0.97
Organo tin complex	0.19
Total	100.00

EXAMPLE 2

Polyglycolterephthalate resin	39.22
Ethyl alcohol	2.94
Di-acetone	5.88
Isopropyl-acetone	51.96
Total	100.00

After the flocking has been bonded to the fabric made of thermoplastic synthetic fibers, by a thermoplastic adhesive as described hereinabove, it becomes a composite flat continuous piece of material (as in FIG. 3 or FIG. 4) from which a hat may be stretch molded in accordance with apparatus and method as shown in Hoffman Patent No. 2,926,358, or by any other stretch molding process which may be known to the art.

It has been found that a satisfactory one-piece hat body 26 having a crown portion 28 and a brim portion 30 may be made in accordance with the invention by heating the composite material within a range of 250° to 350° F. for from 60 to 120 seconds, then immediately placing the heated composite material in an unheated apparatus, and then stretch molding and allowing the composite material to cool and set in the mold.

While the range of heat and time has been given hereinabove, the preferred heat is 300° F. for a period of 90 seconds when using a Dynel material of either 3/2 or 4/1 sheen weave made of a yarn of 3 denier, 1½" staple with 21/1's cotton count, the resulting fabric in the greige off the loom having at least 100 ends and at least 72 picks. After the cooled and set hat body is removed from the mold, all excess material may be cut off the brim 30, and the body may then be placed through the hat finishing operations such as trimming, edge binding, edge welding, lining, banding and any other of the usual hat finishing processes ordinarily found in the art of finishing fine fur felt hats.

While the invention has been described in its preferred form, there are other forms which it may take without departing from the spirit and scope of the invention, and it is, therefore, desired to have protection for all forms coming within the claims hereinbelow.

Wherefore I claim:

1. As a product of manufacture, a stretch molded hat body made from a flat composite material comprising: a thermoplastic synthetic fabric having a 3/2 sheen weave, a 3 denier yarn, and a 1½" staple having 21/1's cotton count, the resulting fabric in the greige off the loom having at least 80 ends and at least 58 picks; a layer of adhesive comprising di-acetone, xylene, isopropyl-acetone, vinyl chloride-acetate copolymer resin, acrylonitrile-butadiene rubber, mixture of N-ethyl ortho and para toluene sulfonamides, alkylated phenol, epoxy resin and organo tin complex; and a plurality of bits of flock; said flock being adhesively bonded to said thermoplastic synthetic fabric; whereby when said flat composite material is heated and stretch molded into a hat body, said material will stretch and mold as a unitary composite material with the bonded flock, the adhesive and the thermoplastic fabric being maintained in proper relationship to each other within the composite material.

2. The hat body as defined in claim 1, in which the woven thermoplastic synthetic fabric is a woven thermoplastic yarn comprising vinyl chloride acrylonitrile.

3. The hat body as defined in claim 2, in which the said ingredients for the said adhesive are comprised substantially in the following amounts given in percent by weight: di-acetone 17%, xylene 39%, isopropyl-acetone 15%, vinyl chloride-acetate copolymer resin 10%, acrylonitrile-butadiene rubber 17%, mixture of N-ethyl ortho and para toluene sulfonamides 1.5%, alkylated phenol .05%, epoxy resin .1%, organo tin complex .02%.

4. As a product of manufacture, a stretch molded hat body made from a flat composite material comprising: a thermoplastic synthetic fabric having a 4/1 sheen weave,

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a 3 denier yarn, and a 1½" staple having 21/1's cotton count, the resulting fabric in the greige off the loom having at least 80 ends and at least 58 picks; a layer of adhesive comprising di-acetone, xylene, isopropyl-acetone, vinyl chloride-acetate copolymer resin, acrylonitrile-butadiene rubber, mixture of N-ethyl ortho and para toluene sulfonamides, alkylated phenol, epoxy resin and organo tin complex; and a plurality of bits of flock; said flock being adhesively bonded to said thermoplastic synthetic fabric; whereby when said flat composite material is heated and stretch molded into a hat body, said material will stretch and mold as a unitary composite material with the bonded flock, the adhesive and the thermoplastic fabric being maintained in proper relationship to each other within the composite material.

5. The hat body as defined in claim 4, in which the woven thermoplastic synthetic fabric is a woven thermoplastic yarn comprising vinyl chloride acrylonitrile.

6. The hat body as defined in claim 5, in which the said ingredients for the said adhesive are comprised substantially in the following amounts given in percent by weight: di-acetone 17%, xylene 39%, isopropyl-acetone 15%, vinyl chloride-acetate copolymer resin 10%, acrylonitrile-butadiene rubber 17%, mixture of N-ethyl ortho and para toluene sulfonamides 1.5%, alkylated phenol .05%, epoxy resin .1%, organo tin complex .02%.

7. As a product of manufacture, a stretch molded hat body made from a flat composite material comprising: a thermoplastic synthetic fabric having a 3/2 sheen weave, a 3 denier yarn, and a 1½" staple having 21/1's cotton count, the resulting fabric in the greige off the loom having at least 80 ends and at least 58 picks; a layer of adhesive comprising polyglycolterephthalate resin, ethyl alcohol, di-acetone and isopropyl-acetone; and a plurality of bits of flock; said flock being adhesively bonded to said thermoplastic synthetic fabric; whereby when said flat composite material is heated and stretch molded into a hat body, said material will stretch and mold as a unitary composite material with the bonded flock, the adhesive and the thermoplastic fabric being maintained in proper relationship to each other within the composite material.

8. The hat body as defined in claim 7, in which the

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woven thermoplastic synthetic fabric is a woven thermoplastic yarn comprising vinyl chloride acrylonitrile.

9. The hat body as defined in claim 8, in which the said ingredients for the said adhesive are comprised substantially in the following amounts given in percent by weight: polyglycolterephthalate resin 39%, ethyl alcohol 3%, di-acetone 6%, isopropyl-acetone 52%.

10. As a product of manufacture, a stretch molded hat body made from a flat composite material comprising: a thermoplastic synthetic fabric having a 4/1 sheen weave, a 3 denier yarn, and a 1½" staple having 21/1's cotton count, the resulting fabric in the greige off the loom having at least 80 ends and at least 58 picks; a layer of adhesive comprising polyglycolterephthalate resin, ethyl alcohol, di-acetone and isopropyl-acetone; and a plurality of bits of flock; said flock being adhesively bonded to said thermoplastic synthetic fabric; whereby when said flat composite material is heated and stretch molded into a hat body, said material will stretch and mold as a unitary composite material with the bonded flock, the adhesive and the thermoplastic fabric being maintained in proper relationship to each other within the composite material.

11. The hat body as defined in claim 10, in which the woven thermoplastic synthetic fabric is a woven thermoplastic yarn comprising vinyl chloride acrylonitrile.

12. The hat body as defined in claim 11, in which the said ingredients for the said adhesive are comprised substantially in the following amounts given in percent by weight: polyglycolterephthalate, resin 39%, ethyl alcohol 3%, di-acetone 6%, isopropyl-acetone 52%.

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