March 1, 1966 S. M. GRISWOLD 3,238,089

SHEET STIFFENER MATERIAL FOR SHOES

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Fig. 1

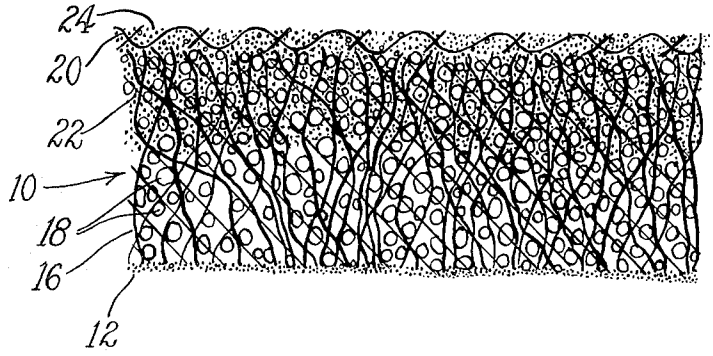
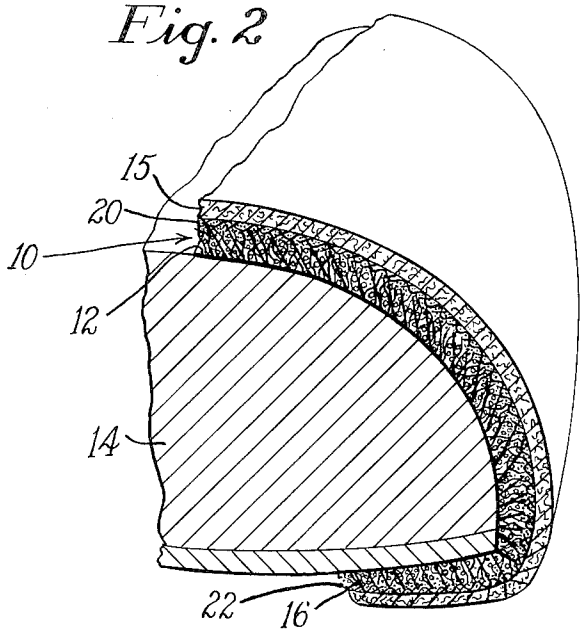


Fig. 2



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SHEET STIFFENER MATERIAL FOR SHOES

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This invention relates to an improvement in solvent activatable sheet stiffener material, particularly to a material for stiffening end portions of unlined shoes.

Solvent activatable sheet stiffener materials have been found particularly satisfactory for stiffening shoes because of the ready comformability of the material in solvent activated condition and the length of time permitted for conforming the activated stiffener material in the course of shoemaking. A further important factor in such stiffener material is the ability of the stiffening agent component or other solvent softenable components of the stiffener material to form strong bonds to adjacent layers of the shoe material when squeezed against such layers of the shoe in the course of lasting. This factor of adhesive ability, however, becomes a liability in the making of unlined shoes where the stiffener component in softened condition may be squeezed against and bonded to the last around which the shoe portion is shaped and interfere with removal of the shoe from the last at a later stage.

It has been proposed to laminate a continuous impervious film of polyethylene to the face of the stiffener material which will be adjacent the last to prevent contact of the softened stiffener material with the last. However, the polyethylene film not only constitutes an item of extra expense particularly in view of the difficulty of securing it permanently to the stiffener so that it does not separate in use; but it also interferes with the activation of the stiffener by solvent.

It is an object of the present invention to provide a solvent activatable sheet stiffener material which is readily and completely wet and softened by solvent and which will not adhere to a last when used in the manufacture of unlined shoes.

To this end and in accordance with a feature of the invention there is provided a solvent activatable sheet stiffener material including a stiffening agent soluble at room temperature in an organic solvent and a deposit of resinous material on a face of the sheet effective to prevent adhesive engagement of the solvent softened stiffening agent with a last when used in an unlined shoe but permeable to organic liquid soluble activator for the stiffener material.

A particularly desirable solvent activatable sheet stiffener material comprising a water-laid layer of intermixed fibers and particles of a stiffening agent soluble at room temperature in an organic solvent is shown in my U.S. Patent No. 3,102,836 which issued September 3, 1963. In this sheet material there has been some tendency for displacement of stiffener particles from surface portions of the stiffener material and it has been found desirable to treat one or both surfaces of said sheet material to reduce this tendency. For example in my U.S. Patent No. 3,102,837 of September 3, 1963, there is disclosed provision of a binder swellable by solvent to tacky condition and in my U.S. Patent 3,021,240 of February 13, 1962, there is disclosed a controlled solvent treatment of such sheet material.

It is an object of the present invention to provide a sheet material useful in the manufacture of unlined shoes which is resistant to loss of stiffener particles from its surface.

To this end and in accordance with a further feature of the present invention, a water laid sheet material comprising fibers and coalescible particles of stiffening agent

is coated on a surface with an activator solvent-insoluble resin deposit which aids in holding the fibers and particles in associated relation in the surface but does not markedly interfere with the passage of activating solvent into the sheet stiffener material from the surface.

Other features and advantages of the invention will be understood more fully from the following detailed description taken in connection with the accompanying drawings in which:

FIG. 1 is a partial section greatly enlarged of a sheet of stiffener material constituting one embodiment of the present invention; and

FIG. 2 is a fractional angular view partly in section and greatly enlarged showing an unlined shoe incorporating the stiffener material disposed on a last.

The stiffener of the present invention comprises a fibrous sheet stiffener material **10** including a stiffening agent soluble at room temperature in an organic solvent and a resin deposit **12** of special character on a surface of the sheet for preventing adhesion of the stiffener to a last **14** in making an unlined shoe **15**. The stiffener material may comprise a woven or nonwoven fabric carrying solvent softenable resin deposited from a solution or a latex resinous material as well known in the art. The preferred sheet material is that described in my prior patents above referred to including a water-laid layer **16** of fibers with coalescible particles **18** of an organic solvent soluble stiffening agent formed by filtration from an aqueous suspension of the fibers and particles through a sheet **20** of relatively open woven or nonwoven fibrous fabric so that the fibers of the layer **16** and the sheet **20** are interspersed at the interface. This sheet may include a solvent permeable deposit **22** of solvent softenable binder material on the fibers and particles in a portion of the layer **16** extending from one surface **24** of the layer depthwise into the layer **16** a substantial portion of the entire thickness of the layer. This binder material will adhere to the inner surface of a shoe **15** against which it may be pressed in activated condition. The fiber content of the layer **16** may comprise any suitable paper making fibers or mixture of fibers such as cotton, nylon, jute, hemp, hair, wool, kraft and sulfite pulp or asbestos.

As discussed more fully in my prior patents above referred to, the coalescible material used in the sheet stiffener material may comprise small particles or beads **18** of suitable size of a normally solid resilient high molecular weight material soluble at room temperature in a volatile organic solvent. It is desirable that substantially all of the particles be small enough to pass through a No. 100 sieve (screen opening 0.006") and that there be not more than about 25% capable of passing a No. 300 sieve (screen opening 0.019"). Useful materials include, for example, organic solvent soluble resinous polymers and copolymers of ethylenically unsaturated monomers such as, the monovinyl aromatic hydrocarbons of the benzene series including polystyrene and polyvinyl toluene, polyvinyl acetate and the acrylate and methacrylate polymers. Cellulose derivatives, such as cellulose acetate, natural resins, such as modified rosin and the like may also be used alone or in combination.

The proportion of plastic particles to fiber may be varied considerably, but for most purposes I find that at least an equal weight is needed and a ratio of about 2 to 5 parts by weight of plastic particles to one part of fiber is most suitable.

The adhesion-preventing resin deposit **12** on the face of the stiffener sheet is a resinous material insoluble in the volatile organic solvent used for the activation of the sheet stiffener material and may be applied in various forms. Thus, molten or heat softened resin may be sprayed onto a surface of the stiffener material and

hardened, or a dispersion of the material in a volatile liquid vehicle may be coated on and dried. For simplicity it is preferred to use an aqueous emulsion or latex of the resin. Suitable resins include polyethylene, polypropylene and various other high molecular weight polymers and copolymers including polytetrafluoroethylene, polyvinyl chloride, polyesters, polyurethanes, etc. which are insoluble in the solvent used for activating the stiffener.

In order to control the openness of the resin deposit **12**, the quantity of the resin and its penetration into the stiffener sheet are controlled. With the preferred material, namely, an aqueous emulsion of a resinous polyethylene, the desired deposit may be obtained by forming a thin knife coat of the thickened emulsion on the surface of the stiffener sheet. Ordinarily there will be used a relatively low solids content polyethylene emulsion, for example in the range of from about 10% to 25% solids, and the emulsion will be thickened by addition of a water soluble thickening agent such as sodium polyacrylate, vegetable gums or the like to a viscosity of about 1200 to about 2500 centipoises (Brookfield Viscometer at 20° C. using #3 spindle at 60 r.p.m. After application of the coating material the sheet is dried. This deposit **12** extends over the entire surface on one side of the stiffener material **10** but has openings or pores therein allowing passage of volatile organic solvent activator for the sheet stiffening agent. The weight of resin per unit area of surface to give the desired action depends on the character of the resin and of the surface of the stiffener material. A useful measure of the preferred deposit is that it should be just sufficiently open to enable activation of the stiffener by solvent applied to the coated surface. A stiffener **16** with such deposit **12** is rapidly and completely activated by conventional solvent activation treatment but is resistant to passage of solvent softened stiffening agent and the deposit is effected to prevent adhesion of the activated stiffener to a last **14** in making unlined shoes. Where the polyethylene is supplied from aqueous emulsion, a useful coating may be from about 0.25 to about 2.0 ounces per square yard.

The following example is given to aid in understanding the invention, but it is to be understood that the invention is not restricted to the particular materials, proportions or procedures set forth in the example.

EXAMPLE

Kraft paper pulp was beaten in water using a Hollander type beater and the resulting fiber suspension was adjusted to a fiber content of 0.14% by weight based on the weight of the suspension. There were then introduced and thoroughly mixed in polystyrene beads of which 99.7% passed through a No. 40 screen (screen opening 0.0165") and 15% passed through a No. 170 screen (screen opening 0.0035"), the amount of beads being sufficient to bring the resin content of the suspension to 0.35% by weight.

Tobacco cloth was drawn from a roll, laid down on the screen of a cylinder type paper making machine at the top of the cylinder, passed around the cylinder and removed around a couch roll and felt at the top of the cylinder. The cylinder which was 18" in diameter was rotated at about 3 r.p.m. and the suspension introduced into the flow box of the machine to fill the vat of the machine to within about 2" of the top of the cylinder. A layer of intermixed fiber and resin particles was deposited on the cloth, the water component passing through the cloth to the interior of the cylinder. The cloth with the layer of intermixed fiber and resin particles joined to it was lifted off the screen and passed between rolls to squeeze water from it. In this sheet, the fibers of the fiber and resin particle layer were interspersed with the fibers of the tobacco cloth to an extent sufficient to hold the fiber and resin layer firmly to the cloth.

A mixture of 7.8 gallons of a 40% solids latex of a copolymer of equal parts by weight of butadiene and styrene and 7.8 gallons of a 45% solids latex of a copolymer of 80% styrene and 20% butadiene were mixed with a wetting agent and additional water to 40 gallons of mixture. This mixture was applied to the cloth face of the composite sheet by a coating roll rotating in a direction such that its surface moved in the opposite direction to the sheet to deposit mixed latex composition on the cloth surface. The deposited mixture penetrated into the surface promptly after application. The speed of the roller was controlled to provide a deposit of about 2 oz. of solids per sq. yard of the composite sheet. The sheet was then dried by passing it around heated drying rollers.

The dried sheet was coated on the side opposite the cloth with a thickened emulsion of polyethylene (13% solids) having a viscosity of about 1500 centipoises (Brookfield Viscometer with Spindle #3 at 60 r.p.m. and at a temperature of 20° C.). An excess of the emulsion was applied and the excess was scraped off with a doctor blade leaving a deposit of about 0.7 oz. of polyethylene per sq. yard. The coated sheet material was then dried to form a coherent porous deposit which was effective to hold fibers and resin particles against displacement from the surface.

A box toe blank was cut from the sheet material and activating solvent comprising equal parts by weight of xylol and of regular naphtha was applied to the polyethylene coated surface of the box toe blank. The solvent penetrated readily through the polyethylene deposit and effected a complete wetting out of the blank within about 30 seconds. The solvent activated box toe blank was limp and readily formable and was placed in the toe of an unlined shoe upper with the polyethylene surface away from the upper. The shoe was lasted and the stiffener allowed to harden. It was found that the shoe was easily removed from the last and there was no tendency of the box toe to adhere to the last. The toe of the shoe was found to be stiff and resilient and to maintain its shape under conditions encountered in use.

Having thus described my invention what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a solvent-activatable sheet material for stiffening end portions of shoes comprising a porous layer of fibers carrying a normally solid, organic solvent-soluble stiffening agent, the improvement comprising a resin film united to and constituting the exposed surface of one side of said sheet material, said resin film having openings allowing passage of volatile organic solvent activator for said stiffening agent to permit substantially complete wet-out of said porous layer, but resisting passage of solvent-softened stiffening agent into contact with a last against which said sheet materal may be pressed in solvent-activated condition, the resin of said film being non-adhesive and insoluble in the organic solvent activator for said stiffening agent.

2. In a solvent-activatable sheet material for stiffening end portions of shoes comprising a porous layer of water-laid fibers intermixed with discrete particles of a normally solid, organic solvent-soluble coalescible stiffening agent, the improvement comprising a resin film united to and constituting the exposed surface of one side of said sheet material, said resin film having openings allowing passage of volatile organic solvent activator for said stiffening agent to permit substantially complete wet-out of said porous layer but resisting passage of solvent-softened stiffening agent into contact with a last against which said sheet material may be pressed in solvent-activated condition, the resin of said film being non-adhesive and insoluble in the organic solvent activator for said stiffening agent.

3. In a solvent-activatable sheet material for stiffening end portions of shoes comprising a porous layer of water-laid fibers intermixed with discrete particles of a normally solid, organic solvent-soluble coalescible stiffening agent with said particles being present in the ratio of from about

2 to about 5 parts by weight to 1 part by weight of fibers, the improvement comprising a porous coherent film of resinous polyethylene united to and constituting the exposed surface of one side of said sheet material, said resin film holding said fibers and particles in associated relation and having openings allowing passage of volatile organic solvent activator for said stiffening agent to permit substantially complete wet-out of said porous layer but resisting passage of solvent-softened stiffening agent into contact with a last against which said sheet material may be pressed in solvent-activated condition.

4. In a solvent-activatable sheet material for stiffening end portions of shoes comprising a porous layer of water-laid fibers intermixed with discrete particles of a normally solid, organic solvent-soluble coalescible stiffening agent with said particles being present in the ratio of from about 2 to about 5 parts by weight to 1 part by weight of fibers, the improvement comprising a porous coherent film of from about 0.25 to about 2.0 oz. per sq. yard of resinous polyethylene united to and constituting the exposed surface of one side of said sheet material, said resin film holding said fibers and particles in associated relation and having openings allowing passage of volatile organic solvent activator for said stiffening agent to permit substantially complete wet-out of said porous layer but resisting passage of solvent-softened stiffening agent into contact with a last against which said sheet material may be pressed in solvent-activated condition.

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