Jan. 5, 1960 S. G. SHUTTLEWORTH 2,919,453

PROCESS FOR STIFFENING PARTS OF FOOTWEAR BY INSERTION OF HARDENER IMPREGNATED BLANK COATED WITH SYNTHETIC RESIN

Filed April 23, 1956 2 Sheets-Sheet 1

Fig. 1.

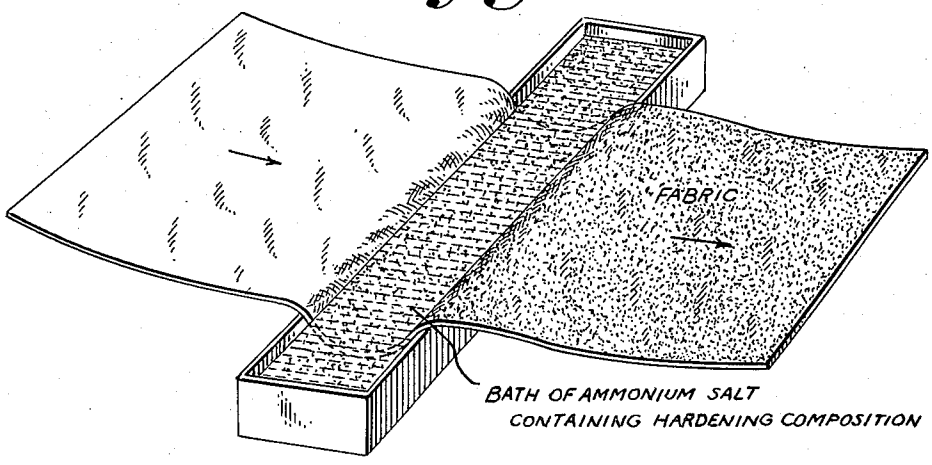


Fig. 2.

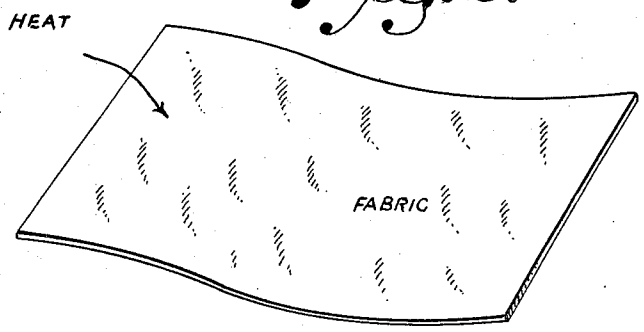
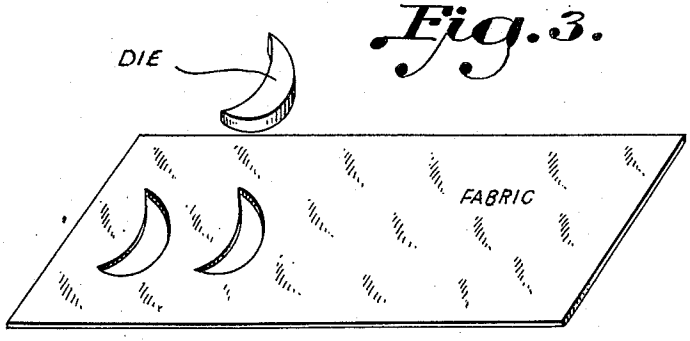


Fig. 3.



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Fig. 4.

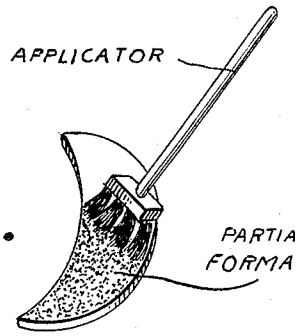


Fig. 5.

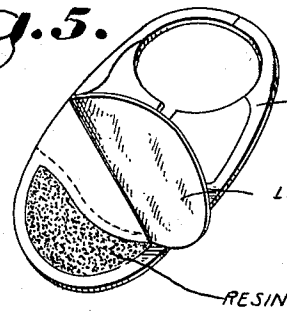
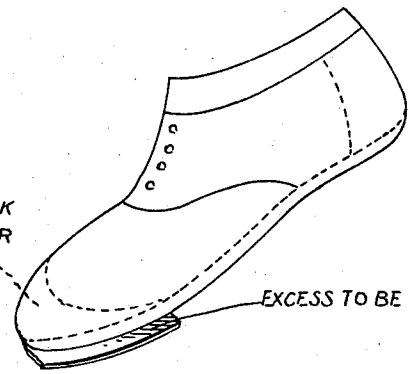


Fig. 6.



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PROCESS FOR STIFFENING PARTS OF FOOTWEAR BY INSERTION OF HARDENER IMPREGNATED BLANK COATED WITH SYNTHETIC RESIN

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2 Claims. (Cl. 12—146)

This invention relates to a process for stiffening parts of footwear such as toes and heels.

Methods of stiffening, usually in the toe area and heel area, are used in the manufacture of many types of footwear. This usually involves the use either of a premoulded stiffener, or of a woven material impregnated with starch, nitrocellulose, bitumen or synthetic resin, which is dipped into solvent to soften, and placed in the shoe or is softened or activated by heat, prior to moulding the shoe on the last.

Investigations have been carried out by applicants on the possibility of mixing synthetic resin and hardener and applying the mixture to the shoe with or without added fabric. This has proved to be inconvenient in the footwear assembly plants in which these investigations were conducted, due to the rate of hardening being required to fit in with the time the footwear is on the last, which results in a synthetic resin plus hardener mixture with only a short period of usefulness prior to the onset of increased viscosity leading to the danger of non-uniform or otherwise unsatisfactory results.

Further investigations carried out by applicant have revealed that footwear factory assembly plants require methods of stiffening toes and heels of footwear which give perfectly uniform and consistent results with the minimum of labour required in application. Such uniformity and low labour costs are achieved by the existing techniques of incorporating starch, nitrocellulose, bitumen or synthetic resin in a woven material, and alternative methods must be capable of achieving similar uniformity without the need of employing additional labour.

These disadvantages have been overcome and the requirements of uniformity and labour economy have been met by the use of this invention in accordance with which there is provided a process for stiffening parts of footwear comprising the impregnation of a fabric blank with chemical hardener and drying, followed by uniformly coating this fabric blank by a suitable machine with a synthetic resin in the form of a liquid or paste capable of being solidified by said chemical hardener, followed by insertion of the freshly synthetic resin coated fabric into the appropriate position in the footwear followed by moulding to the last.

In accordance with further features of the invention the synthetic resin may consist of partially condensed urea formaldehyde and the chemical hardener of ammonium chloride or any other suitable chemical which will not weaken the fabric, and the blank may be pre-stiffened prior to coating with the synthetic resin in order to facilitate handling, provided that such pre-stiffening does not interfere with the subsequent moulding operation.

It has been found that very thin and porous fabrics can be used to carry an adequate quantity of chemical hardener, thereby minimising cost and reducing both the bulkiness of toe or heel as well as providing greater ease of moulding in the shoe factory. Furthermore, the synthetic resin can be applied in a uniformly liquid and

active form, capable of being forced well into the fibres of both upper and lining producing a three ply laminated structure, thus securing very good adhesion, firmness and resilience, with a minimum of thickness and without heating. Further investigations have revealed that, for purposes of storage of the treated fabric, the chemical hardener should be of a type which does not weaken the fabric blank and preferably one giving a pH value to the fabric not lower than 3.0. Chemical hardeners such as ammonium chloride, ammonium phosphate or ammonium sulphate, have been found to be very suitable when used with a urea formaldehyde type of synthetic resin.

The application of the synthetic resin to the treated fabric (containing the chemical accelerator or hardener) in the footwear factory is accomplished by machine in order to provide uniformity and to minimise labour costs, and a slightly stiffened fabric is easier to use. Stiffening of the fabric can be accomplished by means of a variety of stiffening agents such as a small proportion of synthetic resin, or a larger proportion of starch, dextrine, glue, casein, or other stiffening agent. Such stiffening agent may be added to the fabric before, during or subsequent to the impregnation of the fabric with the chemical accelerator or hardener. Such pre-stiffening is primarily to facilitate handling of the fabric blank and does not replace the use of synthetic resin in the footwear factory itself. The amount of pre-stiffening is such that the moulding of the fabric to the shape of the footwear is not interfered with.

The pre-impregnation of the fabric medium may be by spraying or dipping and may be assisted by the addition of a small percentage of a wetting agent such as a synthetic detergent, followed by drying and storage.

The chemical hardener used is of a type and left in sufficient quantity on the dried fabric medium to cause hardening of a subsequent coating of an appropriate synthetic resin. When required, suitably shaped blanks are cut from this treated fabric and are coated by machine at the most suitable place and time in the footwear factory with the synthetic resin in the form of a partially condensed solution or paste, and placed in the footwear prior to moulding of the upper on the last.

The accompanying drawings illustrate diagrammatically the steps of the process according to the present invention. In the drawings:

Fig. 1 illustrates the step of impregnating the fabric with a hardening composition;

Fig. 2 illustrates the drying of the impregnated fabric;

Fig. 3 illustrates the step of cutting blanks from the impregnated fabric;

Fig. 4 illustrates the step of coating the impregnated fabric with a resin composition;

Fig. 5 illustrates the insertion of the blank in the shoe upper; and

Fig. 6 illustrates molding the upper to a last.

The following are examples illustrating the invention. Except where otherwise stated, all percentages are on a weight basis in these examples.

Example 1

A cotton fabric or jute hessian is first impregnated by immersion in an aqueous solution containing five percent of a soluble urea formaldehyde resin plus ten percent by volume of ammonium chloride plus 1% of urea and allowed to dry. A small percentage of a wetting agent such as 0.1 percent (per total solution volume) of a synthetic detergent, for example, the sodium salt of a sulphonated fatty alcohol, may be added to the above solution to assist the rapid absorption of the solution by the cotton fabric or jute hessian. The treated material is dried and stored in rolls until required. The treated, dried cotton fabric or jute hessian is cut to suitable

shapes to form blanks for the toes or heels of footwear and coated in the footwear factory by machine, with partially condensed urea formaldehyde resin paste consisting of a mixture of a forty percent by volume solution of a soluble urea formaldehyde resin plus seven percent by volume of finely divided wood flour or other fibrous filler plus twenty-five percent by volume of finely divided kaolin (percentages on a weight basis). The resin-coated fabric blank is placed between the lining and the upper of the footwear immediately after coating with resin and just prior to the manufacturing operation of moulding the upper to the shoe or boot last. The specified amount of ammonium chloride provides sufficient excess for hardening the moulded resin.

Example 2

The process is substantially the same as that in Example 1, except that in the first stage the cotton fabric or jute hessian is impregnated by immersion in an aqueous solution containing ten percent by volume of starch dextrine, glue or casein or other stiffening agent plus five percent by volume of ammonium chloride and allowed to dry.

Example 3

The process is substantially the same as in Examples 1 and 2, except that the cotton fabric or jute hessian is in the first stage impregnated by immersion in an aqueous solution containing either ten percent by volume of starch, dextrine, glue or casein or five percent by volume of a soluble urea formaldehyde resin. The fabric is then sprayed on both sides with a twenty percent by volume solution of ammonium chloride plus 2% of urea and dried. The ammonium chloride solution contains a small percentage of dyestuff as a check on uniformity of application.

Example 4

The process is substantially the same as in Examples 1, 2 and 3, except that the cotton fabric or jute hessian is, in the first stage, impregnated by immersion in a ten percent by volume solution of ammonium chloride plus 1% of urea, followed by spraying with ten percent by volume solution of starch, dextrine, glue, casein or five percent by volume of a soluble urea formaldehyde resin, followed by drying.

Example 5

The process is substantially the same as in any one of the foregoing specific examples except that the resilience of the resin to be applied subsequently to the treated fabric in the shoe factory is enhanced by mixing it with natural or synthetic rubber latex solution in the proportions for instance, of equal parts of the forty percent by volume urea formaldehyde resin solution or paste and

of the rubber latex solution, which is preferably a sixty percent by volume solution. If ammonia stabilised rubber latex is used, it must be stabilised by the addition of formaldehyde and caustic soda, as otherwise the ammonia is removed by free formaldehyde in the resin, and coagulation results.

Example 6

The process is substantially the same as in any of the foregoing specific examples, except that for special purposes such as football and protective footwear two or more layers of resin coated fabric may be used. For even greater impact strength a layer of wire gauze may be inserted between the layers of resin coated fabric.

I claim:

1. A process for stiffening parts of footwear comprising the steps of providing a dry fabric stiffener impregnated with an ammonium salt containing hardening composition, the ammonium salt being one selected from the group consisting of ammonium chloride, ammonium sulphate and ammonium phosphate, coating the stiffener with a partially condensed urea formaldehyde resin composition in at least semi-liquid form at a time just prior to moulding the footwear to the last, inserting the coated stiffener into the part of the footwear to be stiffened, and moulding the footwear to the shape of the last.

2. A process for stiffening parts of footwear comprising the steps of providing a stiffened dry fabric stiffener impregnated with a non-fabric-weakening ammonium salt containing hardening composition, the ammonium salt being one selected from the group consisting of ammonium chloride, ammonium sulphate and ammonium phosphate, coating the stiffener with a partially condensed urea formaldehyde resin composition in at least semi-liquid at a time just prior to moulding the footwear to the last, inserting the coated stiffener into the part of the footwear to be stiffened, and moulding the footwear to the shape of the last.

References Cited in the file of this patent

UNITED STATES PATENTS

2,001,032	Lovell	May 14, 1935
2,254,228	Lovell	Sept. 2, 1941
2,277,941	Almy	Mar. 31, 1942
2,340,591	Hofferbert	Feb. 1, 1944
2,406,738	Brophy	Sept. 3, 1946
2,424,869	Wedger	July 29, 1947
2,512,003	Wedger	June 20, 1950
2,596,136	Wentworth	May 13, 1952

FOREIGN PATENTS

12,641	Great Britain	Jan. 23, 1908
270,959	Great Britain	May 19, 1927