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PHENOLIC MOLDING COMPOSITION

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This invention pertains to an improved molding composition compounded of synthetic resins and a filler consisting of comminuted leather, which will assume a hard and infusible form when subjected to heat and pressure.

Leather and phenol-aldehyde resins have been compounded in the art to form molding compositions. It has been necessary, however, to modify the protein of which the leather is largely composed prior to its incorporation with the phenolic resin. The leather protein is of exceedingly complex nature. In the past a compounding of this protein with resin has been possible only after the submission of the protein to a partial degradation or hydrolysis. Usually the hydrolysis was carried out simultaneously with the initial condensation of the phenol and the formaldehyde. This hydrolysis of the leather protein had certain unfortunate manifestations in the final product. The degradation or weakening of the protein molecule resulting from its hydrolysis tended to decrease the strength of the leather fibers and resulted in a substantial weakening of the final product. Moreover this hydrolysis converted the leather fiber from an ideal filler of great elasticity, tensile strength and toughness to an inferior mass of deteriorated fibers.

The primary object of the present invention, therefore, is to evolve a preliminary processing of the leather fibers which will not reduce their strength or result in their chemical deterioration and which will at the same time place them in such condition as to be readily compounded with phenol-aldehyde condensation products. A treatment of the leather fibers which will preserve their chemical and physical characteristics and maintain them with their inherent toughness and mechanical strength intact, allows a highly superior molding composition to be produced. For this reason a mechanical, rather than a chemical, preparation of the fibers has been evolved.

The processing of leather scrap involves two steps. First, the fibers must be separated and reduced to desirable particle shape and size to suitably increase the impregnating surface of the leather. Secondly, the fats and oily materials added to the leather for the purposes of softening and tanning must be removed.

In the past the hydrolysis step has been found necessary to soften, separate and cleanse the fibers to place them in condition for compounding with the phenolic resin. It has not been considered possible to prepare the fibers by merely mechanical means as it is impossible, due to their toughness, properly to prepare them by grinding in a conventional mill of the hammer mill type. I have discovered that when the leather scrap is first submitted to intense pressures applied perpendicularly to the leather surface, a separating or breaking down between the fibers results which enables them subsequently to be comminuted satisfactorily in the hammer mill. This perpendicular pressing may be accomplished satisfactorily by passing the leather through a system of pressure rollers of small clearance. This step has a flaking and squeezing action on the leather which loosens the bond between the leather fibers without having a deteriorating effect on the fibers. Subsequent to the pressing step a homogeneous fibrous mass may readily be produced by passing the prepared leather through a hammer mill.

The second step involves the removal of the tanning fats and oils added to the leather in processing. The presence of these fats and oils tends to inhibit a proper cure of the phenolic resin when the molding compound is submitted to heat and pressure. The removal of these fats and oils is readily accomplished by the use of an organic solvent. After the leather is reduced to a fibrous mass of decreased particle size, proper penetration of the solvent is greatly facilitated. It has been determined that two washings with petroleum ether or other organic solvents will reduce the fatty content from 20% to .5%. The small residual percentage of oil has no deleterious effect on the curing of the phenolic resin. As a matter of fact it acts as a lubricant which prevents sticking of the compound in the mold and obviates the use of the conventional lubricants usually used with molding compounds for this purpose. The oil recovered by solvent extraction may be reused in tanneries for the further processing of other leathers and contributes to the economy of this process.

One molding composition prepared according to this process is as follows:

150 grams of phenol, 240 grams of a 40% aqueous solution of formaldehyde, and 1.5 grams of sodium hydroxide dissolved in 15 cc. of water, are refluxed for 45 minutes in a glycerin bath of 110° C. The resulting resin syrup is mixed in a dough mixer with 300 grams of comminuted extracted leather and 7.5 grams of lime. The mixed compound is dried for ten hours in a Gordon drier at 55° C. This compound, when subjected to temperatures of from 280–360° F. and pressures of from 2000–4500 pounds per

square inch in a suitable mold, will produce an infusible molded object of superior impact strength and toughness.

In the composition disclosed approximately 36% of phenolic resin is utilized with the fibers. This percentage of resin may be increased or decreased and the procedure may be modified in various ways known to the art as wet mix and dry mix processes. By varying the percentage of resin to leather the characteristics of the plastic material may be modified within wide ranges. Further, if desired, certain other filler materials of known properties may be incorporated with the leather fiber to modify the characteristics of the molding composition.

As indicated above, the invention is susceptible of numerous modifications and embodiments. The foregoing formula is by way of illustration only and nothing in the specification is intended to limit the scope of the invention. Attention is directed to the appended claims for this purpose.

What is claimed is:

1. The method of forming a molding composition comprising a synthetic resin and a leather filler which consists in subjecting leather scrap to a pressure sufficient to break the bond between the fibers and separate the leather into individual fibers with their natural chemical and physical properties unimpaired, then comminuting the fibers to a desired particle size to facilitate removal of the contained oils and fats and increase their resin-impregnating surfaces, then subjecting the comminuted fibers to an organic solvent to remove substantially all of the contained oils and fats, then adding thereto a phenolic-formaldehyde resin syrup and then drying the mixture.

2. The method of forming a molding composition comprising a synthetic resin and a leather filler which consists in subjecting leather scrap to a pressure sufficient to break the bond between the fibers and separate the leather into individual fibers with their natural chemical and physical properties unimpaired, then comminuting the fibers to a desired particle size to facilitate removal of the contained oils and fats and increase their resin-impregnating surfaces, then subjecting the comminuted fibers to an organic solvent to remove substantially all of the contained oils and fats, then adding thereto a phenolic-formaldehyde resin syrup and then drying the mixture at approximately 55° C.

3. The method of forming a molding composition comprising a synthetic resin and a leather filler which consists in subjecting leather scrap to a pressure sufficient to break the bond between the fibers and separate the leather into individual fibers with their natural chemical and physical properties unimpaired, then comminuting the fibers to a desired particle size to facilitate removal of the contained oils and fats and increase their resin-impregnating surfaces, then subjecting the comminuted fibers to an organic solvent to remove substantially all of the contained oils and fats, then adding thereto a phenolic-formaldehyde resin syrup in an amount equal approximately to 40% of the mixture and then drying the mixture.

4. The method of forming a molding composition comprising a synthetic resin and a leather filler which consists in subjecting leather scrap to a pressure sufficient to break the bond between the fibers and separate the leather into individual fibers with their natural chemical and physical properties unimpaired, then comminuting the fibers to a desired particle size to facilitate removal of the contained oils and fats and increase their resin-impregnating surfaces, then subjecting the comminuted fibers to an organic solvent to remove substantially all of the contained oils and fats, then adding thereto a phenolic-formaldehyde resin syrup in an amount equal approximately to 40% of the mixture and then drying the mixture at approximately 55° C.

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