Patented Sept. 14, 1926. 1,599,598

UNITED STATES PATENT OFFICE.

CHARLES E. SWETT, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO HARRY H. BECKWITH, OF BROOKLINE, MASSACHUSETTS.

THERMOPLASTIC COMPOSITION.

No Drawing. Original application filed December 1, 1922, Serial No. 604,415. Divided and this application filed October 2, 1924. Serial No. 741,244.

In the manufacture of shoe stiffeners and particularly those which are employed for forming the toe box of a shoe, it is desirable to employ a fibrous foundation and to saturate the same with or incorporate therein a thermo-plastic composition which gives stiffness and resiliency to the blank when cold, and which imparts to the blank a water-resistant characteristic.

It is highly desirable that the thermo-plastic composition should be of such nature that it will soften at a relatively low temperature so that the blank may be rendered limp and flexible, and set rapidly when cooled so that the blank may retain the shape in which it is molded by the pulling-over or lasting operation to which the partially finished shoe is subjected. In addition, the blank when cold should be tough and yet hard and resilient so as to withstand the pressures to which the shoe is subjected in wear and spring back into shape if momentarily deflected or compressed.

In the manufacture of sheet material from which such blanks are made, particularly when the fibrous foundation is to be saturated with the thermo-plastic composition while the latter is in a molten condition, the stiffening agent should possess a relatively high degree of fluidity or penetrability so as to thoroughly impregnate and saturate the fibrous foundation. Moreover the stiffening agent should be of such character that it will not soften when subjected to body or solar heat. Moreover the shoe stiffener itself should be more or less waterproof or water-repellent. Again it is desirable that the stiffening agent should possess more or less of a cementitious quality so that such stiffening agent as is exuded during the lasting or pulling-over operation may serve to bind the lining and upper of the shoe to the blank. It is desirable for use in shoes, made from light-colored material as distinguished from black material, that the thermo-plastic composition should be light in color and non-staining.

After prolonged experimentation, I have discovered that, by combining certain ingredients, I am able to provide a thermo-plastic or stiffening composition with which the fibrous foundation may be saturated or treated to produce a box toe having the desirable characteristics hereinabove referred to. These ingredients comprise an acid resin, a wax, a drying oil and a base of the character of lime, magnesium oxide, zinc oxide or their equivalent. These ingredients may be compounded in varying proportions, but the acid resins may constitute about 80% more or less of the mass. Of the raw ingredients, the wax may constitute 15%, the base 2%, and the drying oil 3% of the total.

I will now give a concrete example of a thermo-plastic composition which has been found in practice to give excellent results. 4,400 pounds of rosin and 700 pounds of copal (which constitute the acid resin of the final product), together with 115 pounds of hydrated lime (the base) are placed in a kettle, melted and thoroughly stirred together to form a substantially homogeneous mass. During the heating and fusing operation, the lime reacts with a portion of the acids of the resins to form resin soaps, such soaps forming however a relatively small portion of the resulting product. By heating the copal and the rosin together, the mass is made fluid at a relatively lower temperature than would be required if the copal were heated separately. Copal breaks down or decomposes to some extent at a temperature of about 500° F., certain volatile matters being evolved at this temperature; but, when mixed with rosin as previously stated, the copal decomposes at a lower temperature and is soluble in the fluid molten rosin. To the fluid mass I now add 1,000 parts of a suitable hard wax, such as carnauba, candellila, shellac wax or Montan wax, preferably Montan wax because of its greater cheapness. The wax may be first melted before being mixed with the first-mentioned mass, or it may be added in the cold and melted while being thoroughly stirred into the said first-mentioned mass. After a homogeneous mixture has been produced, I now add a relatively small quantity (say 150 pounds) of a drying oil. For this purpose, I preferably employ China wood oil which has been heated and polymerized to an incipient gel form. The mass is now ready to be used for treatment of the fibrous foundation.

The fibrous foundation itself may be a sheet of wool felt or mixed cotton and wool felt, or it may consist of a sheet of paper felt manufactured by the aid of a paper machine. In the latter case, the thermo-plastic

composition may by suitable procedure be incorporated with the pulp prior to the formation of the sheet. Ordinarily, however, the sheet is formed, and, when dry, is passed through a bath of the molten thermo-plastic composition so as to be thoroughly impregnated or saturated therewith. After the sheet has been thus saturated or impregnated, it is now cut into blanks of appropriate size and shape, e. g. for use as box toes, which blanks are skived and preferably calendered by heated rolls.

Rosin and copal when cold are brittle or friable and do not possess that degree of toughness which should characterize a thermo-plastic composition or stiffening agent for the use herein described. By utilizing therewith, a base for the formation of resin soaps, and a drying oil, there is imparted to the thermo-plastic composition a relatively high degree of toughness without adversely affecting the relative resiliency of the finished box toe. The wax, which constitutes about one-sixth, more or less, of the entire mass, is added to increase the hardness of the thermo-plastic composition, but in addition it greatly increases the penetrability or fluidity of the mass so that it will thoroughly saturate the fibrous foundation. A thermo-plastic composition as thus described softens sufficiently to render the blank limp and moldable at a temperature of from 180° to 200° F., so that, when the box-toe blank has been assembled with the leather upper, the blank may be rendered limp and flexible by the application of heat at a temperature which is not injurious to the leather.

One of the highly desirable characteristics of the thermo-plastic composition herein described is that it has a relatively short melting-point lag, so that it sets very quickly when cooled, and remains rigid until it is heated to a relatively definite temperature.

A useful procedure, in incorporating the base with the acid resins, is to mix the powdered base with a considerable amount of powdered or crushed acid resin before adding it to the molten resin, since this prevents the formation of lumps which would take place if the base were added in a mass.

This application is a division of my copending application Serial No. 604,415, filed December 1, 1922.

What I claim is:

1. A thermo-plastic composition of matter, suitable as a stiffening agent for fibrous parts of shoes, comprising acid resin, hard wax, resin soap and drying oil.

2. The herein decribed process of producing a thermo-plastic composition for use in the manufacture of shoe stiffeners, which comprises melting acid resin, adding a base thereto for reaction therewith and the formation of resin soap, adding a wax to the molten mass, and then incorporating a drying oil to such mass while the latter is molten.

3. The herein described process of producing a thermo-plastic composition for use in the manufacture of shoe stiffeners, which comprises melting acid resin, adding thereto a base mixed with powdered acid resin, for the formation of resin soap, adding a hard wax to said mass, and then incorporating China wood oil to the molten mass.

In testimony whereof I have affixed my signature.

CHARLES E. SWETT.