Jan. 12, 1932. W. B. PRATT 1,840,603

BOX TOE

Original Filed May 25, 1925

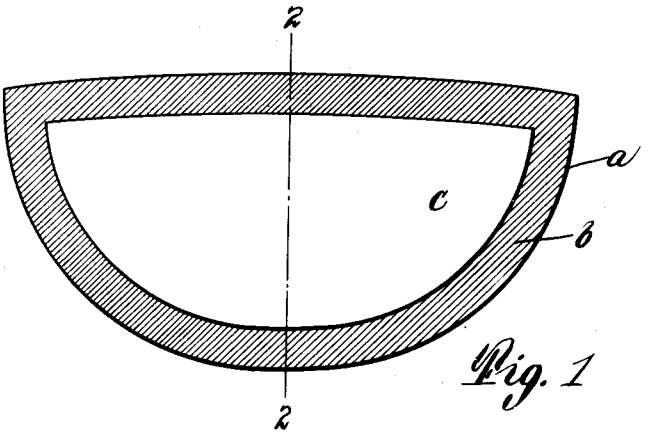


Fig. 1

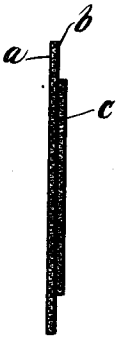


Fig. 2

Inventor:

William Beach Pratt,

by Wright Brown Quinby & May

Attys.

Patented Jan. 12, 1932

1,840,603

UNITED STATES PATENT OFFICE

WILLIAM BEACH PRATT, OF WELLESLEY, MASSACHUSETTS, ASSIGNOR TO BECKWITH MANUFACTURING COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

BOX TOE

Application filed May 25, 1925, Serial No. 32,576. Renewed October 1, 1931.

This invention has relation to shoe stiffeners and more especially to box toes and box-toe material. It has been the practice for some time to employ for the purpose of stiffening the toe end of a boot or shoe a box-toe blank, which is properly located in the toe end of an assembled sheet upper, and which is then rendered limp or plastic by the application of heat, so that in "pulling over" and "lasting" the upper, the blank is molded about and takes the shape of the toe end of the last, and on cooling retains its molded shape. Such a blank ordinarily consists of a fibrous base treated with a thermoplastic stiffening agent which must be of such character that, when cold, the blank or the molded box toe is stiff, rigid and more or less resilient, so that, when subjected to a deforming pressure, it will resume its original shape on removal of the pressure. Various thermoplastic materials or combinations or mixtures thereof have been employed, such as rosin, copal, asphalt, Montan wax and the like, and while they have served the purpose, their use has been attended by certain disadvantages. For example, since stiffness and rigidity of the box toe have been a prime consideration, this has been at the expense of the characteristic of toughness or non-friability, and consequently in dieing out and skiving the box toe blanks and in their manipulation, the stiffening agent, being friable, forms a dust or impalpable powder, and the blanks themselves are apt to break when bent beyond a certain angle. Furthermore, the characteristic of adhesiveness of the thermoplastic agent has suffered because of the necessity of so combining the components of the thermoplastic agent that it would readily penetrate the absorbent base of the blank, and at the same time furnish the desirable property of stiffness, rigidity and resilience to the box toe.

The present invention has for its object to provide a box toe or box-toe blank, which possesses not only the optimum characteristics of a high degree of stiffness, rigidity and resiliency when cold, and of being made limp or plastic when heated to a moderate temperature not injurious to leather, but which in addition is non-friable and tough, and which releases no powder or dust during a dieing out, skiving or other operation.

According to the present invention, I employ as the stiffening agent a composition of matter comprising a gum, wax, resin, bitumen or other water-repellent thermoplastic substance or combination or mixture thereof, in which rubber, or reclaimed or substitute rubber, is intermixed and dispersed. This stiffening agent is so compounded or prepared that it has a melting or softening point at a moderate temperature, say 175° F. to 185° F., which is not injurious to the leather components of a shoe, and yet sets rapidly when cooled. A fibrous base or foundation such as felt, or canton flannel, or canvas duck may be saturated or impregnated or coated therewith, or unfelted fibers, such as asbestos fibers or cotton, hair or wool, may be intermixed with the stiffening agent, and in each case formed into shoe-stiffening blanks of appropriate size and shape.

In the preparation of the stiffening agent, it is necessary to condition the crude rubber (meaning to include by this term reclaimed rubber and rubber substitute, so-called, but not vulcanized rubber if the rubber is to be subsequently vulcanized, as hereinafter described), in order that it may be dispersed in the thermoplastic gums, resins or bitumens and stabilized against separation when the product is heated. To this end I prepare a paste of water and a suitable water-carrying colloid. While various colloidal materials may be used, I prefer to employ neutral casein which is softened or swelled with an equivalent weight of water. A mass of crude rubber is now milled upon the usual compounding rolls or mills until it is in a softened workable condition and then approximately 30 parts by weight of the casein paste is milled into about 100 parts of the rubber mass. This may be accomplished either on the same compounding mill or by the use of a two-blade mixer of the Werner & Pfleiderer type in the operation of which the mass is stretched, pulled and kneaded until the colloidal paste is thoroughly incorporated into the rubber so as to enter the interglobular

spaces and coat the separated rubber globules. The heat generated by this action is usually sufficient to drive off a portion of the water, but if desired the mass may be further heated to cause the evaporation of most of the water. The rubber-casein mass is now ready for dispersion in the thermoplastic stiffening agent.

As the stiffening agent, I may employ either a mixture of blown asphalt and Montan wax, or asphalt tempered to melt at a moderate temperature, or any other suitable thermoplastic materials which will produce the desired results. For example, I melt together at a temperature of, say 120° C., 60 parts by weight of rosin, 20 parts of Montan wax, 10 parts of "mineral rubber" and 10 parts copal gum, and thoroughly mix the mass until a homogeneous mixture is secured. This may be accomplished in the steam-jacketed mixer previously referred to. At this point the rubber-casein mixture is added to the mass and, as the operation of the mixer continues, the rubber-casein mixture disintegrates and disperses uniformly throughout the thermoplastic mass. After this has been accomplished, the mixture may be heated to 160° C. (or to a point at which rubber would normally depolymerize) without a separation of the rubber. After being cooled, the mixture may again be melted to a liquid condition, without affecting the stability of the dispersion. Before the addition of the rubber casein, the thermoplastic mass had a melting point of about 187° F., and this is not appreciably changed on the addition of the rubber-casein mixture.

The resulting product, while in a molten state, may be mixed with a sufficient quantity of unfelted fibers to form a plastic homogeneous mixture which may, while plastic, be rolled into sheet form and box-toe blanks cut or molded therefrom, although I do not claim broadly a mixture of unfelted fibers, either of mineral or organic origin, and a thermoplastic material, since my invention is more particularly concerned with a thermoplastic agent having rubber incorporated or dispersed therein.

Instead of the foregoing procedure, a sheet of porous felt may be saturated with the thermoplastic agent herein described while the latter is in a liquid molten condition under heat, and after the sheet has been cooled and the thermoplastic agent has frozen or set, box-toe blanks of appropriate size and shape are cut or died out, and are skived as desired to form thin or tapered edges. Such blanks, which, like those previously described, comprise fibers and the enveloping thermoplastic, are tough, rigid and resilient when cold, but are rendered easily moldable about the end of a last by the application of moderate heat. They are not friable and the thermoplastic does not powder or give off dust when the blanks are skived or bent.

The box toes are for some purposes preferably produced by treating a suitable woven fabric, such as drill or thin cotton duck, with the herein-described thermoplastic agent. On a sheet of such fabric is spread a layer of the thermoplastic agent while in a liquid or viscous condition under the influence of heat to form a relatively thick surface layer which penetrates the fabric and is thoroughly interlocked therewith. In fact the thermoplastic may impregnate the fabric as well as forming a surface layer thereon. Box-toe blanks of proper size and shape are cut from the sheet after it has been cooled and the thermoplastic agent has set. In some cases the blanks are made of a double thickness of fabric which are cemented together by an intervening layer of the thermoplastic agent. This is preferably accomplished as indicated by the accompanying drawings in which,—

Figure 1 represents a box-toe blank embodying the invention.

Figure 2 represents a section therethrough on the line 2—2 of Figure 1.

In this case *a* indicates a layer of fabric, preferably "drill", having the desired maximum area requisite for the size and style of shoe in which it is to be incorporated. This is more or less saturated or impregnated with the thermoplastic stiffening agent and has a surface coating *b* of such agent thereon. Upon this layer is placed a second layer *c* of like material, which, if desired, may be similarly impregnated. This layer is, however, of smaller area, so that the marginal coated edges of the layer *a* protrude beyond it. The two layers are cemented together by the intervening layer of thermoplastic agent, this being accomplished by use of a suitable heated implement or tool.

The blank thus formed is placed between the lining and the toe cap or surface layer at the toe of an assembled shoe upper, and may be cemented in place along its top edge by the use of a heated press. When it is desired to assemble the upper and insole upon a last, and to last the upper, the box toe blank is subjected to moderate heat, say, 140° F. to 185° F., according to the melting point of the thermoplastic agent, and is thereby rendered limp and flexible so that it may be drawn and molded about the end of the last in the pulling-over and end-lasting operation. When the toe box, thus molded, has been permitted to cool and set, it is tough, hard, rigid and sufficiently resilient to resume its shape after a deforming pressure thereon has been removed. By reason of the nature of the thermoplastic, the box-toe blank does not fracture when bent through a wide angle.

Box toes or box-toe blanks or materials, such as herein described, are relatively inexpensive,—particularly those last herein de-

scribed, since they require but a relatively small proportion of the thermoplastic stiffening agent to impart thereto the desired optimum characteristics.

I have stated that the fabric employed in the formation of the box-toe blank specifically described is preferably "drill", but for certain kinds of footwear I would prefer to employ light cotton sheeting, and in other types, light or heavy cotton duck may be employed, according to conditions.

In some instances I may incorporate sulphur in the dispersion in sufficient quantities, say, 0.25% to 3.0%, to cause the vulcanization of the dispersing rubber, as pointed out in my co-pending application Serial No. 31,228, filed May 18, 1925.

In such case the sulphur is preferably mixed with the rubber dispersion to cause its dissemination throughout the mass, which is heated to a vulcanizing temperature,—e. g., 120° C. to 160° C. for a sufficient time to permit the vulcanization to occur.

This has the effect of increasing the elasticity of the product, but by the addition of an increased or excess amount of sulphur, the hardness of the final product is increased. These products being thermoplastic may be employed in the same manner as the dispersions without the addition of sulphur in the production of box toes.

I do not herein claim per se the dispersions or the processes of producing them as they form the subject matter of the application for Letters Patent hereinbefore identified.

What I claim is:

1. A normally stiff shoe stiffener adapted to be softened to a moldable condition upon the application of moderate heat, comprising fibers and a thermoplastic stiffening agent having rubber dispersed therein, the dispersed particles of rubber being protected by a hydrophilic colloid and said thermoplastic agent being present in sufficient amount to be the continuous phase of the dispersion.

2. A normally stiff shoe stiffener adapted to be softened to a moldable condition upon the application of moderate heat, comprising a body of fibrous material and a thermoplastic stiffening agent having rubber dispersed therein, the dispersed particles of rubber being protected by a hydrophilic colloid and said thermoplastic agent being present in sufficient amount to be the continuous phase of the dispersion.

3. A normally stiff shoe stiffener adapted to be softened to a moldable condition upon the application of moderate heat, comprising a body of fibrous material and a stiffening agent consisting of rubber dispersed in a thermoplastic substance with which rubber is immiscible, the dispersed particles of rubber being protected by a hydrophilic colloid, and said thermoplastic substance being present in sufficient amount to be the continuous phase of the dispersion.

4. A normally stiff shoe stiffener adapted to be softened to a moldable condition on application of moderate heat, comprising a body of fibrous material and a stiffening agent consisting of rubber and sulphur dispersed in a thermoplastic substance with which the rubber is immiscible, the dispersed particles of rubber being coated and protected by a hydrophilic colloid and said thermoplastic substance being present in sufficient amount to be the continuous phase of the dispersion.

5. As an article of manufacture, a normally stiff but thermoplastic shoe stiffener, comprising a bibulous foundation carrying a substantially homogeneous mixture of a thermoplastic stiffening agent imparting to said stiffener softenability and mouldability under the application of moderate heat and of rubber in such amount as to enhance the resiliency and flexibility of said stiffener while substantially maintaining the thermoplasticity thereof.

6. As an article of manufacture, a normally stiff but thermoplastic shoe stiffener, comprising a bibulous fabric impregnated with a substantially homogeneous mixture including essentially a thermoplastic stiffening agent imparting to said stiffener softenability and mouldability under the application of moderate heat and rubber in such amount as to enhance the resiliency and flexibility of said stiffener while substantially maintaining the thermoplasticity thereof.

7. As an article of manufacture, a normally stiff but thermoplastic shoe stiffener comprising absorbent sheet material impregnated with a substantially homogeneously mixed thermoplastic composition comprising essentially a thermoplastic stiffening agent imparting to said stiffener softenability and mouldability under the application of moderate heat and vulcanized rubber distributed through said composition in such amount as to enhance the resiliency of said stiffener but having substantially no effect upon the thermoplasticity thereof.

In testimony whereof I have affixed my signature.

WILLIAM BEACH PRATT.