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W. H. BANCROFT

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SHOE STIFFENER

Filed Oct. 18, 1923

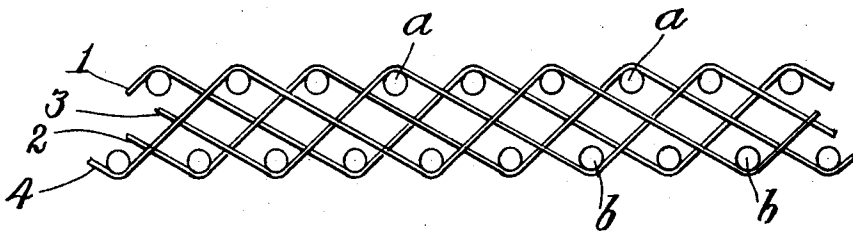


Fig. 1.

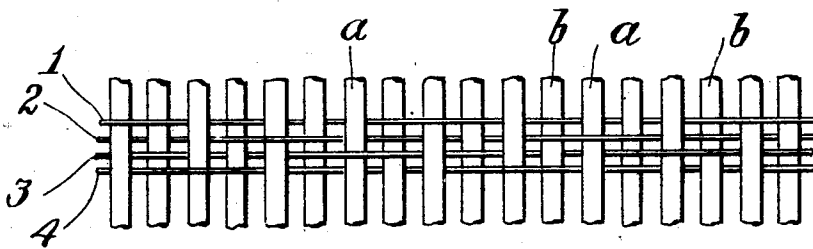


Fig. 2.

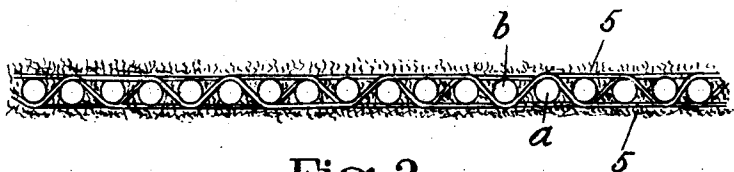


Fig. 3.

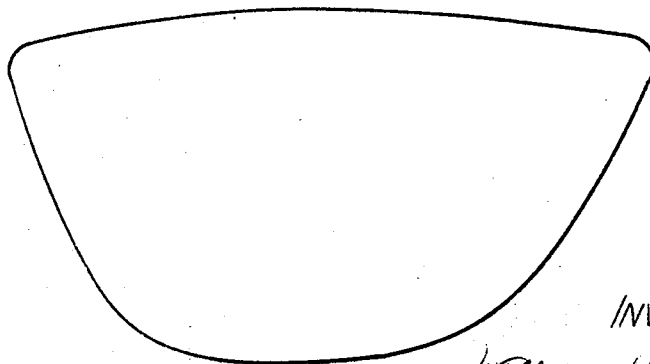


Fig. 4.

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# UNITED STATES PATENT OFFICE.

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## SHOE STIFFENER.

Application filed October 18, 1923, Serial No. 669,428, and in Great Britain November 6, 1922.

This invention relates to thermoplastic stiffeners for parts of boots and shoes and is herein illustrated as embodied in a toe stiffener. The term "thermoplastic" denotes that quality of a substance whereby it is hard and somewhat resilient at ordinary temperatures but may be rendered plastic enough to be molded by subjecting it to a degree of heat insufficient to injure leather.

A toe stiffener of the thermoplastic type and the method of using it is disclosed, for example, in Patent No. 1,124,835.

Thermoplastic toe stiffeners, as heretofore used, have commonly consisted of a blank of felt impregnated with a thermoplastic agent such, for example, as a mixture of 75 per cent of colophony and 25 per cent of blown asphalt. Such stiffeners are incorporated in boots and shoes by inserting them in place in the boot or shoe, heating them to render them limp and plastic, and then molding them to the desired shape during the lasting operation. Felt, however, by reason of its containing necessarily some wool, is costly; but fabrics composed entirely of cotton do not usually provide a stiffener of sufficient strength or stiffness or are not of suitable character to admit of satisfactorily lasting the heated limp stiffener or else have some other defect from the shoemaker's point of view.

It has been found that stiffeners of the kind in question and having a stiffness and strength and other properties generally equivalent in practice to a very large degree to those hitherto provided by felt may be produced by the employment of a suitable woven fabric napped or fluffed upon both sides; and a feature of the present invention consists in a thermoplastic shoe stiffener in which the vehicle for the thermoplastic substance is such a sheet of fabric.

Other features of the invention will become apparent to those skilled in the art from the ensuing description given by way of example of certain novel forms of stiffeners.

In the accompanying drawings,

Figure 1 is a diagrammatic representation of the cross-section of a particular fabric which is advantageously employed in making forms of stiffeners according to the in-

vention, the fabric being shown as it appears before the nap has been raised upon it;

Figure 2 is a diagram of the face view of this fabric also before the nap has been raised. In both these diagrammatic representations the warp and weft threads are shown spaced from one another in order to promote clearness of illustration, although it should be understood that this condition does not obtain in the finished fabric wherein the threads are drawn taut in the usual manner;

Figure 3 is a cross-section of the finished fabric with a nap raised on both sides of it; and

Figure 4 is a plan of a finished toe stiffener.

The illustrated fabric is a cotton fabric known as duplex cloth having a double weft and having a nap raised upon both sides, preferably of a grade weighing some 8 to 9 ounces per square yard under ordinary conditions of atmospheric moisture and being about 8 to 12 one-hundredths of an inch thick. This thickness is largely due to the very considerable raising of the nap, the woven material before the nap has been raised having a thickness of but some one-half of that of the finished fabric. The warp is composed of fine strong threads and the weft of much coarser and more loosely twisted thread, and it is mainly the weft that is raised or fluffed to produce the nap.

In Figures 1 and 2, the thick, loosely twisted weft threads are shown at "a" and "b", and four adjacent smaller warp threads at 1, 2, 3, and 4. It should be noted that half of the weft threads are exposed principally on one side of the fabric and the other half principally on the other side. Referring to Figure 2, the weft threads marked "a" are exposed principally on that side of the fabric which is presented to the observer, while those marked "b" are principally exposed on the side remote from the observer. The nap on one side of the fabric is raised principally from the threads "a" while that on the other side is raised principally from the threads "b", comparatively little nap being raised from the finer, harder warp threads. Consequently the napping or fluffing operation does not greatly weaken the

5 fabric and leaves it possessed of considerable strength, so as to be capable, when impregnated in the manner presently to be described, of withstanding the strains of the lasting operation.

10 This material may be impregnated in the usual manner by immersion in molten thermoplastic stiffening material having the requisite properties and well-known in the art, for example the blend of asphaltic and resinous materials referred to above. The impregnated sheet, as it leaves the impregnating vessel and while therefore the thermoplastic material with which it is charged, 15 is still more or less fluid, passes between gage rollers or the like which give it uniform thickness and will usually be set so as to squeeze the material down to a thickness substantially less than that which it had before impregnation, this action compacting the sodden napped sides of the sheet. On 20 the other hand, the napped sides can take up and retain so much of the impregnant that, where a very stiff product is desired, the action of the roller or the like may be allowed to be no more than an evening action, and the product may be of about the thickness of the napped unsaturated material. The impregnated sheet of material after cooling 30 is then cut up into shoe toe stiffener blanks and these may then be skived in the usual way if desired. In cutting the blanks it is preferable to cut them from the sheet in such a direction that in the blank the warp threads run across the blank from side to 35 side and the weft therefore runs lengthwise of the shoe when the blank is incorporated therein.

The blanks thus produced from a cheap cotton fabric have, to a remarkable degree, 40 the desirable properties of those made from the much more expensive wool felt, it being observed that the napping or raising of both sides of the fabric produces a similarity of conditions from the point of view of capacity for impregnation and of strength at 45 the opposite sides that renders the finished blank equally resistant to bending in either direction and thus renders it wholly immaterial which side of it is uppermost in the finished shoe. 50

An alternative fabric which is suitable in many circumstances as an alternative to that just described is the fabric known as swansdown but fluffed or napped on both 55 sides instead of being so treated on one side only as is customary for the purposes to which that article is usually put.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is: 60

1. A shoe stiffener consisting of a single sheet of woven cotton fabric with a multiple weft, having a nap on both sides, and impregnated with thermoplastic material. 65

2. A toe stiffener consisting of a single sheet of woven cotton fabric having a nap on both sides, and impregnated with thermoplastic material, said fabric comprising a fine, hard warp and a thicker, softer weft, 70 the warp extending crosswise of the stiffener.

In testimony whereof I have signed my name to this specification.

WILLIAM HAROLD BANCROFT.