

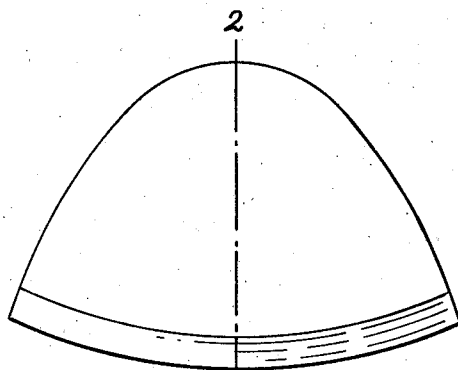
Jan. 27, 1931.

E. LIONNE

1,790,240

SHOE STIFFENER

Filed Sept. 24, 1928



²
Fig. 1.



Fig. 2.

Inventor,

Ernest Lionne

by Greenwood
att

UNITED STATES PATENT OFFICE

ERNEST LIONNE, OF SWAMPSCOTT, MASSACHUSETTS

SHOE STIFFENER

Application filed September 24, 1928. Serial No. 308,082.

This invention relates to a sheet material adapted especially for use as stiffeners for shoes as box toe stiffeners, counters and the like.

5 A shoe stiffener and especially a box toe stiffener is composed of a sheet of material that can be made limp and pliable so that it readily can be shaped to conform to the last of the shoe during the lasting operation and
10 will ultimately become permanently stiff and hard whereby to support and preserve the lasted shape of the adjacent part of the shoe.

There is a certain class of shoe stiffeners, which is composed of textile material im-
15 pregnated with a nitro-cellulose, as celluloid, adapted for lasting by immersing them in a suitable softening agent for the nitro-cellulosic material, and which are adapted to be-
20 come hard and stiff as soon as the solvent has evaporated therefrom. This class of stiffener has many desirable characteristics which especially adapt it for use in the better grades of shoes. It is however relatively expensive. Many attempts have been made to devise a
25 stiffener of the above class which can be manufactured cheaply but the stiffeners thus produced have been commercially unsatisfactory as they were either mechanically weak so that they could not be lasted readily, or rela-
30 tively impervious so that it took a long time for the solvent to penetrate and soften the stiffener, or bulky so that they occupied too much space in the shoe, or too expensive to be commercially practicable.

35 It is an object of the present invention to provide a sheet material especially adapted for use for stiffeners for shoes, and a stiffener made from such material, that can be softened quickly by the application of a suitable
40 softening agent and can be shaped into the desired form on the last and will harden into the shaped form when the solvent has evaporated and will have increased stiffness and can be cheaply made by paper making meth-
45 ods and apparatus.

In accordance with this invention, I provide a paper sheet which in its preferred form is composed of fibres at least some of which are soluble and are capable of being
50 converted from a fibrous to a gelatinous or

colloidal and film forming nature by the application of a suitable softening agent or solvent for such soluble fibres and which when the film has hardened due to the evaporation of the solvent therefrom, bonds the remaining and insoluble fibres firmly to-
55 gether in a hard, dense and relatively inflexible sheet. The soluble fibres that I prefer to use for the manufacture of the paper sheet are cellulose fibres which have been formed by the
60 action of acids thereon, such as cellulose acetate or cellulose nitrate. I prefer to use cellulose nitrate fibres, however, by reason of their relative cheapness. Such fibres are known as pyroxyline and are cotton fibres of
65 a relatively low degree of nitration. The degree of nitration does not particularly matter however so long as the nitrated fibres are quickly soluble in a suitable cheap solvent.

A further object of the invention is the combination of a sheet containing soluble and insoluble fibres, and a softening agent there-
70 for which contains a solvent for the soluble fibres and a softener for the insoluble fibres, whereby the sheet can be rendered extremely
75 pliable.

In carrying out my invention, I mix, in the ordinary beater for making paper, a suitable proportion of the soluble fibres with other paper making fibres, such as rag stock, or
80 any other suitable and well known paper making fibres or mixture of fibres. The proportion of soluble fibres to the paper making fibres can vary in accordance with the particular requirements demanded of the fin-
85 ished product. For a finished sheet which is adapted to be exceptionally stiff and rigid after its treatment with the solvent, I can make the paper sheet entirely from soluble fibres without the admixture thereto of in-
90 soluble fibres. For the usual box toe stiffener, however, a mixture of fifty per cent soluble fibres and fifty per cent insoluble fibres gives very satisfactory results. The fibres are sub-
95 jected to the action of the beater preferably only for so long a time as is necessary to reduce them to the proper length and to ensure an even intermixing of the fibres. A longer period is undesirable since the soluble pyroxyline fibres, being more brittle than the

usual paper making fibres, tend to become shorter than the paper making fibres and so will not felt so well with the paper making fibres in the paper making machine if the beating action is unduly prolonged. After the beating action has been completed, a paper sheet is formed of the fibres in the usual manner in any suitable paper making machine as a Fourdrinier, or a cylinder, machine. On the paper making wire, the fibres form into a sheet wherein the soluble and insoluble fibres are felted together, the soluble fibres being interlaced with the insoluble fibres. The sheet thus formed can be made of any desirable thickness in accordance with any usual or desirable paper making practice. The sheet is then dried to remove surplus water therefrom but not to a degree to modify the structure or physical characteristics of any of the fibres. The sheet is also preferably lightly calendered in order to smooth the surfaces of the sheet but care is taken that the sheet is not compacted together by severe pressure, as the sheet is required to be porous and solvent-absorbent to such degree that it can be rapidly penetrated by the solvent for the soluble fibres.

Shoe stiffeners of the usual form are adapted to be cut from the sheet prepared as above described. Immediately prior to the last- ing, the stiffeners are treated with, as immersed in, a softening agent for the stiffeners, which, due to the marked porosity of the sheet, rapidly penetrates it and comes in intimate contact with practically all of the fibres of the stiffener. The softening agent contains a solvent for the soluble fibres of the stiffener, which solvent, in the case of pyroxyline fibres, can be acetone, a mixture of alcohol and ether, ethyl-acetate, or any one of a number of the well known commercial solvents therefor. The softening agent, in accordance with this invention, also contains a liquid, as water, which is capable of being absorbed by the insoluble fibres. The action of the solvent is to soften and at least partially to dissolve the soluble fibres of the stiffener and to convert them to a colloidal or jelly form and consequently to increase the pliability of the stiffener. The action of the water is to soften the insoluble fibres and thus to render them more pliable. The combination of the solvent and the water is thus to increase the pliability of the stiffener over the action of one of these alone. The action of the softening agent can be regulated in an obvious manner to accord with the amount of soluble fibres in the sheet and the uses to which the sheet is to be put.

The amount of water in the softening agent preferably is small, as not greatly in excess of ten per cent. A large amount of water is detrimental as its presence in the insoluble fibres prevents the film formed of the soluble fibres from adhering strongly thereto.

Broadly considered, the practice of adding water to a solvent for celluloid-containing or impregnated stiffeners has been in use for many years for the purpose of moderating the action of the solvent and to prevent the softened stiffeners from adhering to each other while in the mulling box. The water however can not act to soften the fibrous body of the impregnated stiffener as the fibres are coated with the celluloid film which acts as a protective cover to keep the water away from the fibres.

The solvent impregnated sheet is then lasted into the shoe between the upper and the lining in the usual manner and is adapted to stay on the last until the solvent has evaporated. Due to the evaporation of the solvent and also due to some extent to the last- ing pressure, the colloidal pyroxyline is caused to be dispersed throughout the stiffener and to occupy the voids between and overlie and surround and become attached to the insoluble fibres of the stiffener and thus to appear as a hard relatively inflexible film in the dry stiffener. Due to the fact that the soluble fibres are dissolved or softened and the film formed thereof occupies the spaces between the insoluble fibres, the hardened stiffener is materially thinner than the stiffener before being subjected to the action of the solvent. That is an advantageous feature since the shoe in which such a stiffener is incorporated can have a trimmer appearance than with the usual impregnated type of stiffener. The degree to which the stiffener is reduced in thickness obviously depends upon the relative proportions of soluble and insoluble fibres of which it is composed.

In addition to the above described advantageous qualities possessed by the sheet it also has the advantage of being economical in use as the waste material remaining after the stiffeners have been cut from the large sheet can be used again, the waste material being placed in the beater with new paper making and pyroxyline fibres and beaten up and formed into a sheet. I find that seventy parts of new material, which is composed of thirty-five parts each of cotton batting and pyroxyline, and thirty parts of waste material form a satisfactory sheet for shoe stiffener purposes.

In the drawing, Fig. 1 is a plan view of a box toe stiffener made in accordance with the present invention, and Fig. 2 is a section along line 2—2 of Fig. 1, wherein the insoluble fibres 10 and soluble fibres 12 are shown felted together.

I claim:

1. A shoe stiffener comprising a paper sheet which is porous and is rapidly penetrable by a suitable solvent for at least one of the constituents of the sheet and which is adapted to be shaped into a form other than

that in which it was made and to retain said form permanently when the solvent has evaporated, said sheet being composed of felted fibres, at least some of which are capable of being dissolved in a suitable solvent therefor and of being converted to a colloidal form and when the solvent has evaporated to form a hard relatively inflexible film which embraces and is attached to the insoluble fibres and holds the sheet permanently in the shape imparted to it.

2. A shoe stiffener comprising a paper sheet which is porous and is rapidly penetrable by a suitable volatile solvent for at least one of the constituents of the sheet and which is adapted to be shaped into a form other than that in which it was made and to retain said form permanently when the solvent has evaporated, said sheet being composed of felted fibres, at least some of which are capable of being dissolved in a suitable solvent therefor and of being converted to a colloidal form and when the solvent has evaporated to form a hard relatively inflexible film which embraces and is attached to the insoluble fibres and holds the sheet permanently to the shape imparted to it, the dry treated sheet being thinner than the sheet before the application of the solvent thereto.

3. A shoe stiffener composed of a paper sheet of felted paper making fibres, at least some of which are soluble in a suitable solvent and are capable of being converted by the solvent from a fibrous to a colloidal form and of forming in the treated sheet a hard relatively inflexible film which embraces and is attached to the remaining fibres when the solvent has been removed from the sheet.

4. A shoe stiffener composed of a paper sheet formed of felted paper making fibres some of which are soluble in a suitable solvent and are capable of being converted by the solvent from a fibrous to a colloidal form and others of which are insoluble in and are unaffected by the solvent, the converted soluble fibres existing in the treated sheet as a hard, relatively inflexible film which embraces and is attached to the insoluble fibres after the solvent has been removed from the sheet.

5. A shoe stiffener composed of a paper sheet of felted pyroxyline and other paper making fibres, the pyroxyline fibres being capable of being converted from a fibrous to a colloidal form by the action of a suitable solvent for the pyroxyline and existing in the treated sheet as a hard and relatively inflexible film which embraces and is attached to and bonds together the other paper making fibres when the solvent has been removed from the sheet.

6. A shoe stiffener comprising a paper sheet composed at least in part of felted pyroxyline fibres which are capable of being converted from a fibrous to a colloidal form

by the action of a suitable solvent therefor and of forming a hard and relatively inflexible film when the solvent had disappeared from the stiffener.

7. The combination of a shoe stiffener comprising a sheet formed of felted soluble and insoluble fibres, and a softening agent for the stiffener composed of a solvent or the soluble fibres and a liquid which is absorbed by and softens the insoluble fibres.

8. The combination of a shoe stiffener comprising a sheet formed of felted soluble and insoluble fibres, and a softening agent for the stiffener composed of a solvent for the soluble fibres and a liquid which is absorbed by and softens the insoluble fibres, which liquid comprises water in an amount which is not materially in excess of ten per cent of the solvent.

9. A sheet composed of felted fibres, at least some of which are soluble in a suitable solvent and are capable of being converted by the solvent from a fibrous to a colloidal form and of existing in the treated sheet as a hard film after the solvent has been removed from the sheet.

10. A shoe stiffener consisting of a paper sheet having a stiffening agent which is present in the stiffener in fibrous form and which is capable of being converted to a stiff film.

11. A paper sheet having felted fibres, at least some of which are capable of being converted to a colloidal form and thereafter of existing in the sheet as a film.

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

ERNEST LIONNE.