Oct. 27, 1953 J. E. WALSH 2,656,622

COUNTER CONSTRUCTION AND METHOD

Filed May 23, 1947

Fig. 1

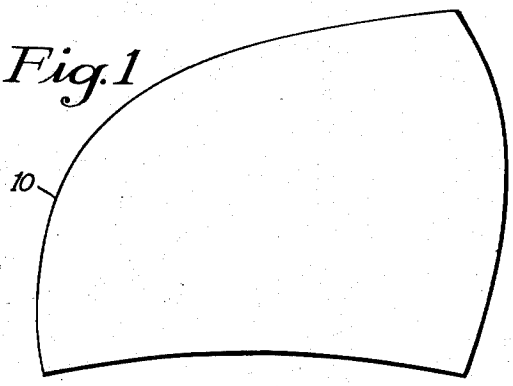


Fig. 2

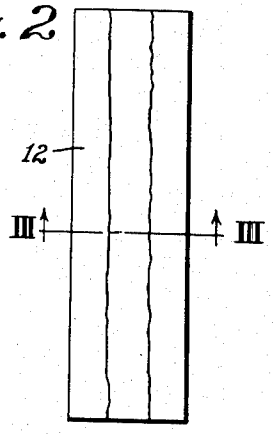


Fig. 3

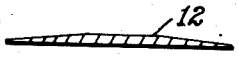


Fig. 5

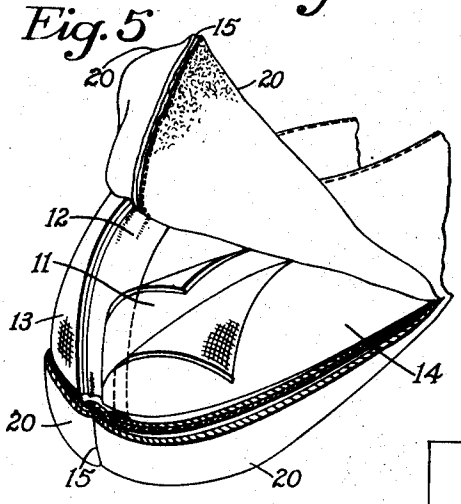


Fig. 6

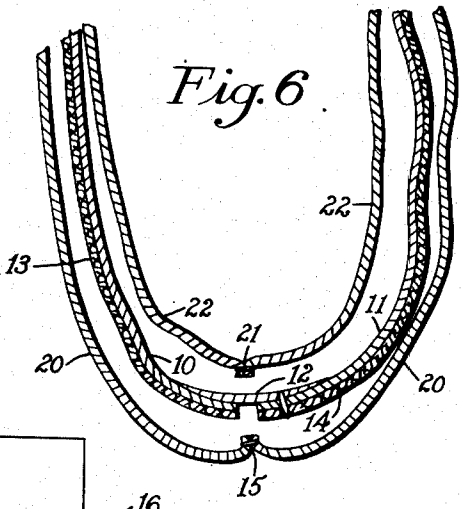


Fig. 4

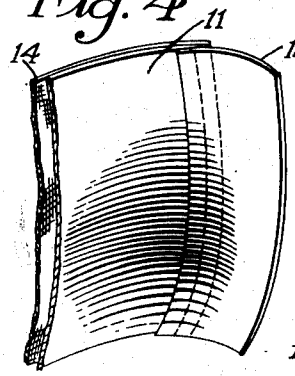


Fig. 10

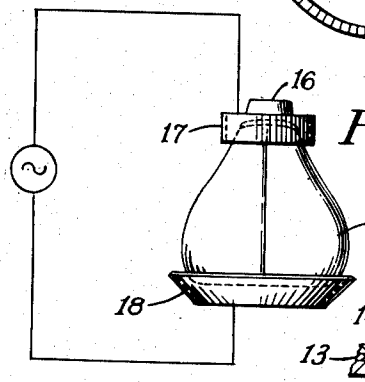


Fig. 9

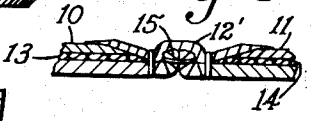


Fig. 7

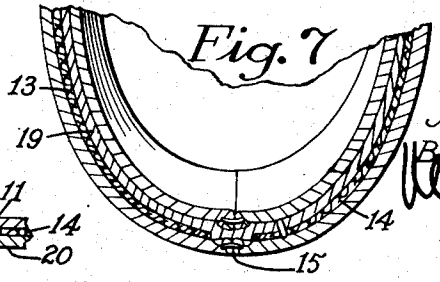


Fig. 8



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COUNTER CONSTRUCTION AND METHOD

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Application May 23, 1947, Serial No. 750,046

3 Claims. (Cl. 36—68)

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This invention relates to stiffening shoes and particularly to improved methods and constructions for stiffening the heel portions of shoes.

In conventional shoemaking a stiff fiber or leather preformed counter is coated with paste and inserted into the space between the quarter and quarter backer at the heel portion of the shoe upper. The counter liner, quarter backer and quarter are smoothed out and the assembly is tacked to the last. The heel portion is then shaped, usually in a heel seat lasting machine. Preformed counters fit the heel of a last only very approximately and even though the counters are soaked and mulled to soften them, a powerful shaping action is required of the heel seat lasting machine to push and force the counter into conformity to the contour of the heel end of the last.

It has been proposed to avoid these difficulties by providing a counter in several sections, stitching these sections to portions of the shoe upper and softening the counter material by solvent action immediately before lasting the shoe. This method reduces the power required to shape the heel portion of the shoe but it involves the added difficulty of spreading open the layers at the heel portion of the shoe and applying solvent to the portions of the counter immediately prior to lasting. Also, there are lines of weakness at the junctures between the parts of these counters.

It is a feature of the present invention to provide a method and a stiffener assembly for stiffening the heel portion of a shoe which avoid the usual difficulties of providing a counter in a shoe.

In accordance with my new method for making a shoe, segments of a relatively limp material adapted to be stiffened are positioned in overlapping relation in a shoe. The upper is shaped and the material is then converted to a stiff condition in which it retains the shape imparted to the shoe upper. In the shaping and stiffening process the segments of the counter are softened and fused together into one piece so that the resulting counter is substantially free from any planes of cleavage or lines of weakness in those portions where the segments overlapped prior to treatment.

A shoe construction constituting one embodiment of my invention is shown in the accompanying drawings, in which

Fig. 1 is a plan view of a counter side section which may be used in my construction;

Fig. 2 is a plan view of a combining piece which may be used with counter side sections;

Fig. 3 is a cross section of the combining piece taken on the line III—III of Fig. 2;

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Fig. 4 is a perspective view showing the counter side section of Fig. 1 and combining piece secured in position to shape the counter side section;

Fig. 5 is a perspective view, partly in section, and with parts cut and folded back, showing two quarters secured together by the backseam and showing counter side sections, combining piece and doublers in position;

Fig. 6 is a horizontal sectional view of the after portion of a shoe constructed as shown in Fig. 5, showing the relation of the parts before treatment to stiffen the counter sections;

Fig. 7 is a view similar to Fig. 6 but showing the relation and appearance of the parts after treatment of the counter section to convert it to a stiff resilient condition;

Fig. 8 is a sectional view similar to Fig. 6 showing a modified construction employing the principles of my invention;

Fig. 9 is a sectional view similar to Fig. 6 showing another construction employing the principles of my invention; and

Fig. 10 is a diagrammatic end view of a shoe upper mounted on a last and positioned in operative relationship to a high-frequency system used in a preferred form of the method.

In the construction of a shoe according to the present invention, parts of a shoe upper 9, for example the quarters, vamps, tips, and linings, may be stitched together in accordance with conventional fitting room methods. Segments of a counter stiffener material, e. g., complementary side sections 10 and 11, and a combining piece 12, are positioned in the upper 9, and, according to a preferred procedure, are affixed, as by stitching, cementing, or pressing to the quarter backers 13 and 14 in position to overlap and form a continuous inner layer when the shoe is given its final shape.

As shown in Fig. 4, the combining piece 12, which is illustrated as a simple, tape-like strip of counter material with skived edges, may be stitched along a line parallel to the curved rear edge of a counter side section 11. This stitching forces the side section 11 and the combining piece 12 into a cupped contour which assists in positioning these parts in the heel part of the shoe upper 9.

According to a modification (not shown) combining pieces 12 may be stitched along lines parallel to the curved rear edges of each of the counter side sections 10 and 11. This stitching forces both side sections 10 and 11 and the combining pieces 12 into cupped contours, similar to that shown in Fig. 4, which assist in positioning these parts in the heel part of the shoe upper 9. When

combining pieces 12 are stitched to each of the side sections 10 and 11 a double thickness of counter material is provided at the rear of the shoe. The combining pieces 12 overlap to give additional reinforcement at this point of localized stress.

In another modified form of construction according to the present invention (see Fig. 8) the parts of a shoe upper 9 are stitched together and the back seam 15 is rubbed. Quarter doublers 13 and 14 are bonded to quarter side sections 10 and 11, e. g., by heat and pressure, and the assembled doublers and counter sections are pasted to the quarters 20. A combining piece 12 is then secured to the quarters 20, quarter doublers 13 and 14 and counter side sections 10 and 11 by two rows of stitching parallel to the backseam 15 and extending through these parts. The combining piece 12 may be stitched in by a method similar to the present method of applying reinforcing tape. In this modification the combining piece not only joins the counter sections into a strong stiff counter, but serves the further function of reinforcing the backseam.

According to a further modification shown in Fig. 9 a combining piece 12', which may be substantially wider than the combining pieces 12 employed according to the previously described methods, is secured over a rubbed backseam 15 of a shoe upper by two lines of stitching parallel to the backseam. The free edges of the combining piece are lifted and the skived edges of the quarter doublers 13 and 14 and counter side sections 10 and 11 are placed under the raised edges of the combining piece 12'. In this modification also the combining piece serves to reinforce the backseam.

The counter side sections 10 and 11 and the combining piece 12 comprise a material capable of being fused by external treatment after the material is in the shoe so that the overlapping segments join together in a homogeneous structure. A suitable material for forming the counter sections 10 and 11 and combining piece 12 is that disclosed in the application of John J. Brophy and Charles G. Newton, Serial No. 714,812, filed December 7, 1946, now abandoned.

The stiffener material disclosed in that application is a limp sheet comprising a thermoplastic resin and a compound which in its untreated state acts as a plasticizer for the resin but which is capable, upon being treated, for example by heat, of converting the whole mass to a nonplastic, nontacky, less soluble condition wherein it is hard and resilient. The mass may include plasticizers for the resin which are not convertible like the above-mentioned compound, as well as fillers, catalysts, and other agents. The limp sheet may be an unsupported layer of the above components or may be associated with a fibrous supporting sheet.

The thermoplastic, resinous material is one which is relatively strong and stiff at normal atmospheric temperatures but which softens within the range of about 150° to 210° F. Among the materials which have been found suitable are ethyl cellulose, benzyl cellulose, and vinyl chloride vinyl acetate copolymer resins containing from about 88 to 95% vinyl chloride. These resins may be used alone or in mixture.

A butadiene-acrylonitrile copolymer which may contain up to about 40% of acrylonitrile has been found satisfactory as a nonconvertible plasticizer component for a mixture comprising the vinyl copolymer resins. Other plasticizers which may be used with any of the base resins include ester-type compounds such as dioctyl phthalate and tricresylphosphate, and resinous plasticizers, plasticizers, such as chlorinated diphenyls and hydrogenated resins. These plasticizers may be employed in proportion of about 5% to about 20% of the thermoplastic resin. The proportion used is sufficient to prevent brittleness in the stiffened material but not sufficient to soften the final product excessively.

Any conventional, finely divided mineral filler may be employed in the composition although titanium dioxide is preferred. From about 15 parts to about 50 parts of the mineral filler will usually be employed with 100 parts of the thermoplastic resin.

The polymerizable ingredient of the composition, which is convertible to a condition in which the entire mixture stiffens to a strong resilient condition, is preferably a compound having a relatively low vapor pressure. Such a compound in unpolymerized state is compatible with and softens the resinous constituents of the mixture so that they can be readily mixed and sheeted, but may be polymerized or hardened by the action of heat, light, or other treatment. From about 5 parts to about 75 parts of this polymerizable ingredient will be employed in combination with 100 parts of the thermoplastic resin. Suitable compounds are those containing the polymerizable group $=C=CH_2$ and at least one other polymerizable olefinic group separated therefrom by at least one intervening atom so that the double bonds do not form a conjugated system. Polymerizable constituents which have been found highly satisfactory for use in combination with a thermoplastic resin, such as a vinyl copolymer which may contain nonconvertible plasticizers such as butadiene acrylonitrile copolymer or dioctyl phthalate, are the liquid dimethacrylic acid esters of polyethylene glycols. A particularly suitable polymerizable constituent is polyethylene glycol 200 dimethacrylate, which is a mixture of monomeric esters which may be prepared by the esterification of methacrylic acid with polyethylene glycol 200, which is a mixture of various glycols, said mixture having an average molecular weight of 200 ± 15. Other suitable polymerizable ingredients are diallyl phthalate, tetraethylene glycol dimethacrylate, pentaethylene glycol dimethacrylate and divinyl benzene. Mixtures of two or more polymerizable compounds are just as suitable for use as the polymerizable ingredient in this invention as is a single compound.

As hardening catalysts where heat is used to harden the compound, organic peroxides such as benzoyl peroxide, or di-t-butyl peroxide in amount from about 0.4% to about 5.0% by weight of the hardenable plasticizer have been found suitable. Other catalysts may be used where other hardening treatments are used.

The resin, plasticizer, hardenable material, filler, catalyst and any other desired materials are combined suitably by milling them together, and may be formed into a sheet of from about 0.045 to about 0.055 inch in thickness. Sheets of greater or less thickness may, of course, be formed. The mixed material may also be dissolved in a volatile organic solvent and used to impregnate a porous fibrous sheet material such as a felt, or a flannel or duck cloth. The material may also be calendered on a porous fibrous sheet such as duck.

Other suitable material for forming the counter

segments is disclosed in the application of John J. Brophy, Serial No. 564,605, filed November 22, 1944, which has now matured into Patent No. 2,492,413, granted December 27, 1949. The compositions of that application comprise a resinous material which may be thermoplastic or thermosetting. The material may be associated with a fabric or felted fibrous base or may be in the form of an unsupported sheet material. The fabric or fibrous base may have particles of the resinous material distributed throughout in condition to coalesce to a rigid unitary material upon the application of heat.

It is to be observed that the unsupported resinous sheets formed according to either of the above-referred to applications possess the advantage that when the segments are subjected to fusion the structure of the resulting counter is homogeneous throughout and does not present lines of cleavage which are inherently present in joints between impregnated fabric segments.

Counter side sections 10 and 11 and combining pieces 12 may be cut from any of the above materials by conventional procedures using dies or a knife. The cut pieces may then be stitched together to form cup-shaped assemblies. The segments and/or assemblies are then positioned in a shoe upper 9.

When the counter sections 10 and 11 are in place, the shoe upper 9 may be moulded or otherwise brought into its finnal shape. Where the shoe upper 9 is lasted, it is found that the counter material yields readily under the action of the lasting machine so that the heel portion of the shoe upper 9 conforms exactly to the shape of the last or other shaping form 16. The shoe upper 9, while on the last or form 16, is then subjected to treatment to cause the counter material to soften and fuse together and to be converted to a stiff, resilient material when the treatment is completed. Various heating means including infra red lamps have been found effective to produce this action in the counter material. The heating effect of a high-frequency field on the counter material has been found particularly satisfactory in that it effects a desired rapid heating of the counter material with a minimum heating of the leather so that the leather is not harmed by the heating action.

For heating the counter material by the action of a high-frequency field, a lasted shoe upper 9 is positioned between the upper and lower electrodes 17 and 18 of a high-frequency heating system such as that shown in Fig. 10. The electrodes 17 and 18 are connected to a high-frequency power source capable of creating an alternating electric field having a voltage and frequency adapted to heat the counter material with only a minimum heating of the leather. It is preferred to use a frequency of at least 10 megacycles and frequencies as high as 158 megacycles have been found very satisfactory. Still higher frequencies may be employed under proper conditions. A voltage of from 500 to about 20,000 volts has been employed, the limiting factor on voltage being the formation of corona at higher voltages. With a voltage of about 2600, it has been found that with a material which requires one minute, 45 seconds at 10 megacycles, only 30 seconds will be required at 60 megacycles and only 7 seconds will be required at 158 megacycles.

With other types of material it will be possible to use other means to cause the counter material to fuse and then to harden. For example, mechanical action on the shoe may be effective to fuse together and set up some types of counter material. Also with various types it may be possible to use ultra-violet light, X-rays, etc.

As shown in Fig. 7, when the counter material is treated by heat or otherwise the line of division of the overlapping segments disappears so that the resulting counter 19 is truly integral. It will be observed that the material of the counter has flowed so that it surrounds and smoothly embeds the backseam 15 joining the quarters 20 and the seam 21 joining the counter liner sections 22 to give a particularly smooth interior to the heel of the shoe. Also, by reason of the softening of the counter material, the quarter doublers 13 and 14 are at least partially penetrated by the counter material so that a reinforcing bond is formed which cannot ordinarily be ruptured without destruction of the counter 19 and quarter doublers 13 and 14.

The following are examples of compositions from which the counter segments may be cut. It is to be understood that the examples are illustrative only and are included to aid in understanding the invention and that the invention is not limited to the materials, constituents or proportions of the compositions of the examples.

Example I

	Parts by weight
Vinylite VYHH	100
Polyethylene glycol 200 dimethacrylate monomer	100
Benzoyl peroxide	1.5
Acetone	250

Vinylite VYHH is a copolymer of vinyl chloride and vinyl acetate comprising about 15 per cent vinyl acetate and is produced by Carbide and Carbon Chemicals Corporation, of New York.

The Vinylite and monomer are milled together and the mixture together with the catalyst is dissolved in the acetone. The resulting solution is employed to impregnate a No. 15 cotton flannel, the extent of impregnation being such that 60 per cent of the mixture by weight of the flannel is taken up.

The segments of a counter were cut from the impregnated material and skived. The side segments were bonded to the corresponding quarter doublers and the combining piece was stitched to one of the assemblies of counter side section and doubler. The segments were assembled in the shoe with the rear edges of the counter side sections and quarter doublers abutting the backseam and with the combining piece extending across the backseam and overlapping the rear edge of the counter side section to which it was not attached. The upper was then lasted and was subjected for a period of 18 seconds to the heating action of a field created by applying 2.6 kilovolts and 130 megacycles to electrodes disposed as shown in Fig. 10. The heating was then discontinued and the lasted shoe permitted to cool. The last was removed after cooling of the shoe and the counter was found to be stiff and resiliently resistant to deformation.

Example II

	Parts by weight
Vinylite VYNS	100
Polyethylene glycol 200 dimethacrylate monomer	65
Hycar OR 15	18
Titanox	50
Benzoyl peroxide	1.5

Vinylite VYNS is a copolymer of vinyl chlo-

ride and vinyl acetate comprising about 12.5% vinyl acetate and is produced by Carbide and Carbon Chemicals Corporation, of New York. Hycar, a synthetic elastomer, is a butadiene-acrylonitrile copolymer containing in the neighborhood of about 40% by weight of acrylonitrile and about 60% by weight of butadiene put out by the Hycar Chemical Company, of Akron, Ohio. Titanox is a titanium dioxide sold by the Titanium Pigment Corporation, of New York, N. Y.

The mixture of the above ingredients after milling and mixing on rolls was sheeted to a thickness of 0.045 inch and counter segments cut therefrom. The segments of the counter were skived and were then fixed by cementing with a 30% solution of Vinylite VYHH in acetone to the quarter backers of a shoe in position to overlap and form a continuous layer when the shoe was given its final shape. The shoe was then lasted and subjected for a period of 18 seconds to the heating action of a field created by applying 2.6 kilovolts and 130 megacycles to the electrodes which were disposed as shown in Fig. 10. The heating was then discontinued and the lasted shoe permitted to cool. The last was removed after cooling of the shoe and it was found that the counter was stiff and resiliently resistant to deformation.

Example III

	Parts by weight
Vinylite VYNS	100
Diallyl phthalate	65
Hycar OR 15	18
Titanox	50
Benzoyl peroxide	1.5

A milled and sheeted mixture of the above composition 0.045 inch in thickness was cut to form counter stiffener segments, was incorporated in a shoe upper, lasted, heated in a high frequency field for approximately 25 seconds and cooled as in Example I. On removal of the last it was found that the counter was satisfactorily stiffened and that the segments had been fused together into a unitary structure of homogeneous composition throughout presenting the appearance shown in Fig. 7.

Example IV

	Parts by weight
Monochlorostyrene (Q373, Dow Chemical Co.)	60
Vinyl butyral (heat distortion temperature by ASTM test, 58° C.)	100
Ethyl alcohol	50
Trioctyl phosphate	10
Titanium dioxide	20
Silene EF (calcium silicate)	30
Acrawax C	10
Agerite powder	0.1
Benzoyl peroxide	1.5
Calcium Stearate	2.0

The vinyl butyral, alcohol, trioctyl phosphate and monochlorostyrene were mixed together to form a paste and then were milled at about 110° F. to form a smooth sheet. All of the remaining ingredients, except benzoyl peroxide, were then added and after they had been smoothly incorporated the benzoyl peroxide was added. The milled mixture was formed into a sheet 0.045 inch in thickness and counter segments were cut from this sheet. The combining piece was stitched along a line parallel to the curved edge of the counter side member to form an assembly of cup-shaped contour. This assembly and the other counter side member were disposed in a shoe so that the rear edges of the other counter side section and the combining piece were disposed in overlapping relationship. The shoe upper with the counter segments in place was then subjected to a high-frequency field created by applying 2.6 kilovolts at a frequency of 130 megacycles to electrodes disposed adjacent the counter portion of the shoe. The high-frequency treatment was continued for a period of 35 seconds. When the treated shoe was permitted to cool and the last removed it was found that the counter was stiff and resiliently resistant to deformation.

Other shoes having blanks of this material were subjected to heating for approximately ten minutes at 150° C. in an oven. When the shoes were removed and cooled it was found that the toes were stiff and resistant to deformation.

Acrawax C, referred to in this example, is a synthetic wax product having a melting point of 140° C. obtained from Glyco Products of Brooklyn, New York. Agerite powder is phenyl-beta-naphthylamine.

Example V

	Parts by weight
Ethocel 100 C. P. Standard	16.25
Rosin (cherry wood)	5.25
Acetamide	6.75
Acetone	75
Methanol	15

This composition was used to impregnate cotton flannel sheet material and counter stiffener segments were cut from the impregnated sheet and incorporated in shoe uppers as in the preceding example. The assembled shoe uppers were lasted and heated for 18 seconds in a high-frequency field as in Example I. On removal of the last it was found that the counters were stiff and resiliently resistant to deformation.

"Ethocel 100 C. P. Standard" is ethyl cellulose put out by the Dow Chemical Company of Midland, Michigan.

The shoe construction and method above described may be used in any type of shoe having a stiff counter, including welt, stitchdown, cemented, McKay and slip-lasted shoes. The construction is particularly strong because it binds together the quarter doubler and the quarter liner at the rear of the shoe and because it provides desired reinforcement around the backseam. The method is of advantage in that it eliminates the difficulties of incorporating a preformed counter between the layers at the heel of the shoe and avoids the problems of solvent softening of the material while the counter material is in place between the layers of the material at the heel of the shoe.

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

1. A method of stiffening a portion of a shoe upper which comprises positioning in the heel portion of the upper, side sections and a combining piece of dry, unheated, normally limp sheet stiffener material in overlapping relation, said stiffener material comprising a mixture of a vinyl chloride-vinyl acetate copolymer resin softening in the range of about 150° F. to about 210° F., 5% to 75% by weight of said resin of polyethylene glycol 200 dimethacrylate, said polyethylene glycol 200 dimethacrylate in its untreated state being compatible with the resin and being convertible by heat to a condition

hardening the entire composition to a stiff, resilient state, shaping the heel portion of the shoe upper, and thereafter while the upper is in shaped condition subjecting the sections and combining piece to the heating action of a high-frequency electric field for a period sufficient to cause them to fuse together into an integral member and to be converted to a condition in which they will be stiff and resilient when cool.

2. A method of stiffening a portion of a shoe upper which comprises securing in place in the heel portion of a shoe upper a dry, unheated, normally limp multi-part counter stiffener member comprising complementary side sections having rear edges shaped to correspond to the curve of the back seam, and a combining piece secured to one of said sections along a line adjacent to the rear edge of the section to cause the section and combining piece to assume a cupped shape to assist in positioning the section in the rear part of a shoe upper, said stiffener comprising a mixture of a vinyl chloride-vinyl acetate copolymer resin softening in the range of about 150° F. to about 210° F., and 5% to 75% by weight of said resin of polyethylene glycol 200 dimethacrylate, said polyethylene glycol 200 dimethacrylate in its untreated state being compatible with the resin and being convertible by heat to a condition hardening the entire composition to a stiff, resilient state, conforming the shoe upper to a last and thereafter while the upper is conformed subjecting the sections and combining parts to the heating action of a high-frequency electric field to cause them to soften and fuse together into an integral member, and to convert the material to a condition in which it will be stiff and resilient when cool.

3. A dry, unheated, normally limp counter stiffener comprising side sections having complementary rear edges, and a tape-like combining piece secured to one of said sections along a line adjacent to the rear edge of the section to cause the section to assume a cupped shape to assist in positioning the section in the rear part of a shoe upper, said stiffening member comprising a vinyl chloride-vinyl acetate copolymer resin softening in the range of about 150° F. to about 210° F., and 5% to 75% by weight of said resin of polyethylene glycol 200 dimethacrylate, said polyethylene glycol 200 dimethacrylate in its untreated state being compatible with the resin and being convertible by heat to a condition hardening the entire composition to a stiff, resilient state.

JOHN E. WALSH.

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