



April 14, 1925.

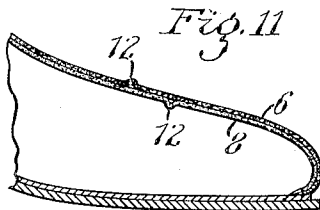
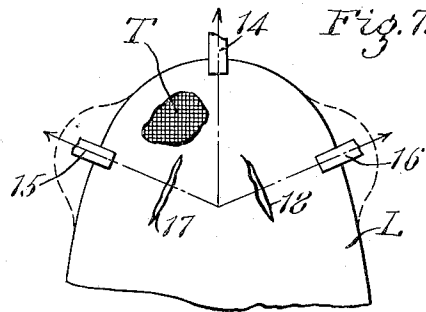
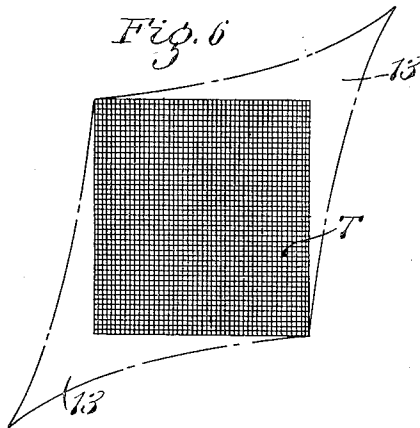
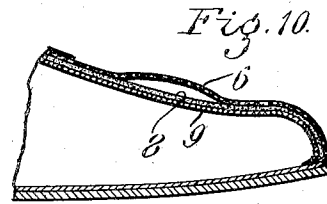
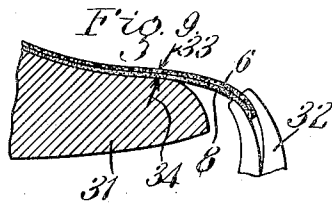
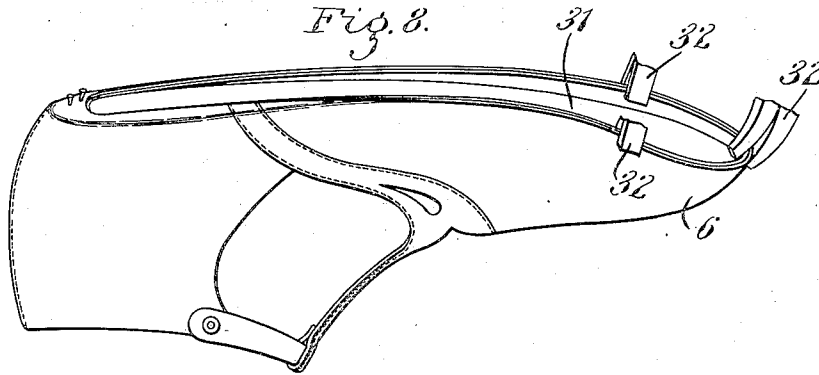
1,533,668

H. H. SMITH

MANUFACTURE OF FOOTWEAR

Filed Aug. 15, 1924

2 Sheets-Sheet 2



Inventor  
Harry H. Smith.  
by *Roberts Roberts & Cushman*  
Att'ys.

# UNITED STATES PATENT OFFICE.

HARRY H. SMITH, OF CONIMICUT, RHODE ISLAND, ASSIGNOR TO RESPRO INC., OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

## MANUFACTURE OF FOOTWEAR.

Application filed August 15, 1924. Serial No. 732,193.

*To all whom it may concern:*

Be it known that I, HARRY H. SMITH, a citizen of the United States of America, and resident of Conimicut, in the county of Kent and State of Rhode Island, have invented new and useful Improvements in the Manufacture of Footwear, of which the following is a specification.

This invention pertains to footwear and more particularly to boots and shoes and to an improved process of making the same.

Principal objects of the present invention are to devise a shoe and process of making the same wherein and whereby it is possible to employ the very thinnest and tenderest of leathers in the uppers without in any substantial particular interfering with or complicating the usual manufacturing methods or necessitating the employment of special machinery, and at the same time producing a shoe having all of the wearing qualities of shoes made of heavier leather together with the superlative appearance, pliability, and comfort to the wearer which are attendant upon the employment of such soft, thin and light weight leathers.

The purchasing public insistently demands that the leather in shoe uppers be extremely soft and pliable and yet capable of retaining its lasted shape when subjected to wear, and withal of a pleasing appearance and adapted to be dressed in accordance with the prevailing mode.

While some of the above characteristics, for example, softness, pliability and pleasing appearance, are found in the lighter and thinner leathers the shoe manufacturer is ordinarily limited in this direction by the necessity of using a leather capable of undergoing the mechanical processes employed in modern shoe making practice and particularly of withstanding the strain of pulling-over, and of holding the fine stitches employed in uniting the various parts of the upper without cutting or tearing out at the seams, while the leather must have sufficient inherent stiffness to enable it to retain the lasted shape after the last is pulled. These characteristics are of the utmost importance from the manufacturing standpoint, for unless the leather possess them in a fair degree at least it is impossible to make marketable shoes.

The above considerations have led the

manufacturer ordinarily to employ the heaviest grades of upper stock commensurate with the permissive minimum of pliability and softness, with the result that the demand for such heavier leathers is usually in excess of the supply, while on the other hand there is but little demand in the shoe trade for the thinner and lighter grades of leather which in consequence are relatively low in price.

The necessity of cutting costs of production to a minimum as well as the demand for shoes of extremely light weight, particularly since the low cut shoe has become so popular, has lead manufacturers to attempt various methods of utilizing thin and light weight leathers in shoe making.

According to one such method the thin upper leather is reenforced by cementing a piece of woven cloth to its inner surface. While the leather is thus strengthened to a certain degree, the cloth backing has decided disadvantages which militate against its general adoption. Among such disadvantages is the tendency of such woven fabric to ravel and fray at the edges, causing trouble in the subsequent finishing operations as well as in producing the thin skived edges necessary in seaming together the parts of the upper; the tendency of such fabric to stretch and wrinkle or "pipe" when subjected to use, particularly when the composite shoe part comprising the leather and its backing is bent or folded repeatedly, in which case the cloth backing gradually separates from the leather, producing wales that cause discomfort to the wearer and ultimately leaving the thin and tender leather to bear substantially the entire strain of use; and most important, both from the standpoint of the manufacturer and wearer, the fact that textile fabric is readily stretched in a bias direction so that when the composite fabric is pulled-over in lasting any pull exerted in the bias direction of the cloth may overstrain the leather resulting in incipient or even complete rupture of the latter.

The presence of the backing cloth is easily detected by skillful buyers and the questionable wearing qualities of shoes embodying this construction are so well known that such shoes, although they may be of fine appearance, design, and workmanship, 110

cannot successfully compete with shoes made of unbacked heavier leather.

With the above specific objects in view and with the general purpose of avoiding the difficulties and disadvantages appertaining to, and attendant upon previous proposals for attaining the desired end, the present invention consists in the features hereinafter more fully described and claimed, and to assist in a proper understanding of the invention, reference may be had to the accompanying drawings which show by way of example certain preferred steps and materials employed in manufacturing a shoe in accordance with the present process as well as the resulting shoe.

In the drawings,—

Fig. 1 is a side elevation, with parts broken away, illustrating a shoe of low-cut type constructed in accordance with the present invention;

Fig. 2 is a composite view showing the several parts which are combined to make the composite vamp of the shoe shown in Fig. 1;

Fig. 3 is a side elevation of the shoe upper after assembling;

Fig. 4 is a diagrammatic view illustrating certain preliminary steps involved in the practice of the present invention;

Fig. 5 is a fragmentary sectional view illustrating a piece of reenforce material employed in making the shoe shown in Fig. 1;

Fig. 6 is a diagrammatic view illustrating one of the principal defects in textile fabric when employed as a backing material for leather;

Fig. 7 is a diagrammatic view illustrating the results which occasionally occur when thin leather, backed with cloth, is subjected to the pulling-over operation in lasting a shoe;

Fig. 8 is a perspective view illustrating one of the first steps in the process of lasting a shoe;

Fig. 9 is a fragmentary vertical section illustrating the action of the pulling-over nippers in drawing the leather about the last;

Fig. 10 is a fragmentary vertical section longitudinally of the shoe illustrating the freedom of the intermarginal portions of the outer member of a vamp, constructed in accordance with the present invention, from the other parts of the composite vamp; and

Fig. 11 is a similar view showing the results of cementing the backing material to the outer member of the composite vamp.

Referring to the drawings, the shoe 1 (Fig. 1) shown as illustrative of the invention, may be made in accordance with any of the usual processes, for example the Goodyear welt or the turn process, and in

any desired style, either low or high cut and having its sole 4, heel 5, and the outer members of its upper formed of any suitable material.

Without describing in detail the various steps in the process of making the shoe upper preparatory to lasting, it suffices to say that the parts of the upper, for example the forepart or vamp 2 and the rear parts or quarters 3, as well as auxiliary or lesser parts such as stays, tongues, tips, etc. are usually of composite character, consisting of two or more superposed pieces, for example a leather outer member and a cloth lining, of substantially like configuration, united by sewed means, the same seams, in some portions of the upper at least, uniting such composite parts to form the completed upper.

When the outer member of an upper part, for example the vamp, is of very thin and tender material, such as thin leather, satin, etc., which material is liable to rupture when subjected to the lasting strain, an additional or reenforce member may be associated with such outer member, and to give the appearance and feel of a heavier leather or other material, a further additional piece technically known as a "doubler" or "plumper", preferably of fleeced textile fabric, is employed.

In Fig. 1 of the drawing the composite vamp 2 is shown as comprising the outer member 6 of thin and flexible leather, a doubler 7 of fleeced textile fabric, a reenforce member 8, and a lining 9 of cloth or other suitable material, the precise sequential arrangement of the several parts being to a certain degree optional. The quarters of the shoe are made in a generally similar way, but omitting the doubler and having a counter 9 interposed between the lining 9 and the reenforce 8 at the rear end of the shoe.

Referring more particularly to the process of making the vamp for example, the workman cuts the pieces 6, 7, 8, and 9 as illustrated in Fig. 2 from the proper material by means of patterns or dies and these pieces are then assembled and united along certain of their margins by sewed seams 11, some of which may also unite the various composite parts to form the complete upper as illustrated in Fig. 1. Under some circumstances the several pieces making up the composite parts of the upper may be cemented together either before or after stitching, and while permissible under some conditions, it is preferred in accordance with the best practice of the invention, to leave the intermarginal portions of the several pieces normally free from connection with each other. This latter arrangement is illustrated in Fig. 10 where the intermarginal portion of outer member 6 of the vamp is

shown as separated from the adjacent vamp member. The relative freedom of the parts thus permitted avoids piping or the formation of wrinkles such as 12 and 13 (Fig. 11) in one or the other of the parts which commonly occurs when they are cemented together, probably due in part at least to their different coefficients of elongation under stress and moisture.

In the lasting process the upper of the shoe is subjected to strain in substantially every direction, and at the toe portion particularly, this strain often approaches closely to or exceeds the ultimate strength of the leather. When a textile fabric is cemented to the back of thin leather to reenforce the leather, it affords but an uncertain protection against overstrain of the leather, for textile fabric, while perhaps of adequate strength both in the warp and weft direction is readily stretched in the bias direction as indicated at 13 in dotted lines in Fig. 6.

When leather, backed with textile fabric, is subjected to the strains applied in lasting, it may resist longitudinal strain (that is strain in the direction of the warp threads) indicated by the arrow 14 in Fig. 7, but the cloth backing or reenforce adds little additional strength to the composite part in diagonal directions, indicated for example by the arrows 15 and 16 in Fig. 7, so that the leather is frequently overstrained and sometimes actually ruptured at the regions 17 and 18.

In accordance with the present process the leather of the upper is reenforced with a material which is capable of adequately withstanding stress in all directions and of bearing substantially the entire strain imposed in lasting, thus relieving the leather and protecting it from injury not only in lasting but also from the multitudinous and varying stresses imposed during wear.

One process of preparing such a reenforce material is diagrammatically illustrated in Fig. 4, wherein the cotton or other fibrous bat 19 prepared by means of carding or other usual and well-known machines is shown as wound in a roll 20, Fig. 4, from which the bat may be drawn off onto a moving support, for example the upper run of a conveyor belt 21. While moving along upon and supported by the upper run of the belt a fluid adhesive binding agent, preferably a compound or solution of rubber, is fed onto the bat from a tank 22 and is evenly distributed over its entire surface by means of a spreader 23 or other suitable device. The bat then passes between pressure rolls 24 and 25 where the binding agent is forced into the interstices of the bat. After relief of the compressive stress the bat is dried, as by passing it through a drying chamber 26, and is then subjected to heavy

pressure and preferably to tension as by passing beneath the weighted tension roll 27 and pressure rolls 31, or other suitable mechanism serving to compress the adhesively coated fibres into firm contact, the tension tending to remove wrinkles, the impregnated bat remaining porous to some degree. Preferably the material is used in this condition, although it may, if desired, be vulcanized by passing it through suitable apparatus 28, the product in either case being wound in a roll 29 for convenience in handling. The impregnated reenforce material 30 thus prepared is of substantially uniform texture and may readily be made of substantially uniform strength in all directions. It is far cheaper than leather and approximately three times the strength of leather of the same thickness and thus may be made substantially thinner than the upper leather with which it is to be combined and yet capable of relieving the leather of substantially all strain.

From this, or material having similar characteristics, the reenforce member 7 of the composite shoe upper is prepared as above described. In lasting, and particularly in pulling over the toe portion of the upper, the upper is stretched over the last 31 by means of nippers or pincers 32, (Fig. 8) the pull being first in a generally outward oblique direction to stretch the leather and then inwardly to conform the upper to the last. This pull has the effect of pressing the parts of the composite upper into contact as indicated by the arrows 33 and 34 in Fig. 9.

In accordance with the present invention this pressure of the parts into contact is of very considerable utility, for under pressure the unvulcanized rubber in the reenforce material tends to cling firmly; although temporarily, to the opposed surfaces of the adjacent parts of the upper, with the result that all of such parts are pulled or stretched as a unit, and while the reenforce takes the greater part of the load the leather and other parts of the upper are likewise with certainty pulled smooth and taut. However, as soon as the pressure is relieved the parts are free to separate as the adhesion between the parts is merely of a frictional character and while capable of compelling the parts to move under tension as a unit is not such as to cause them to unite permanently.

After the upper has been lasted, the subsequent operations pertaining to attaching the sole and heel and finishing the shoe may be performed in accordance with any of the usual processes.

The upper of the shoe thus made is so reenforced as to retain its shape after withdrawal of the last and during use, even though the outer material of the upper be so thin and tender in character that its use

in a shoe would ordinarily be considered utterly impractical.

The supply of thin leather is always far in excess of the demand, and the present invention provides a process which makes this abundant supply of relatively low priced leather available to the manufacturer as an acceptable material for shoes. Moreover, as the inherent softness and pliability of such thinner leathers exceeds that of the heavier grades, while it often excels the heavier grades in beauty of grain, shoes made in accordance with this invention are at least equal if not superior, both in appearance and comfort, as well as in wearing qualities, to shoes made of heavier and more expensive leather by the usual processes.

Furthermore, as the reinforce material is substantially impervious to water, although porous to an extent sufficient to permit the natural moisture of perspiration to evaporate, a shoe made in accordance with the present process has decided advantages over the ordinary shoe, being substantially waterproof, and at the same time more comfortable, for by reason of the relatively smaller amount of leather employed, such a shoe is less subject to shrinkage and expansion under the action of atmospheric moisture which causes variations of from two to eighteen per cent in the area of leather and is thus accountable for much foot discomfort.

While a specific application of the invention has herein been disclosed it is to be understood that the various steps herein described relate to a preferred illustrative embodiment exemplifying the general principles underlying the invention and that various changes and modifications may be made therein as circumstances or experience may dictate.

I claim:

1. That process of making shoes which comprises providing corresponding inner and outer elements which tend to adhere only under pressure, and, simultaneously subjecting said elements to the strain and pressure of lasting whereby they are stretched as a unit, said elements again separating except where united by seams after cessation of the strain and pressure of lasting until subjected to use, whereupon temporary adhesion under the stresses incident to use again occurs.

2. That process of making shoes which comprises permanently uniting corresponding elements of a shoe upper comprised of

materials which tend to adhere only under pressure along their margins, lasting the shoe while causing the intermarginal portions of the elements temporarily to adhere, and thereafter permitting the intermarginal portions of said elements to separate.

3. That process of making shoes which comprises preparing an inner member consisting of fibre bound together with unvulcanized rubber, combining said inner member with an outer member to make up a laminated section of a shoe, subjecting said members to a lasting strain whereby they are caused temporarily to adhere and stretch as a unit, and permitting the intermarginal portions of said members to separate at the conclusion of the lasting operation.

4. A shoe comprising inner and outer members normally free to move relatively to each other to a limited extent but temporarily adhering when subjected to the pressure of use as a result of the capacity of one at least of said members to adhere to the other when subjected to the expansive pressure of wear.

5. A shoe comprising an outer member, and an inner member, said members being normally unconnected except at their marginal portions, one of said members having a surface which tends temporarily to adhere to the opposed surface of the other member when the members are subjected to pressure.

6. A shoe upper comprising inner and outer members united by at least one sewed seam but normally being otherwise unconnected, one at least of said members tending temporarily to adhere to the opposed surface of the other when subjected to the lasting strain.

7. A shoe upper comprising a plurality of members normally united only at their marginal portions, one of said members consisting in part of unvulcanized rubber and tending temporarily to adhere to the opposed intermarginal surface of the other member when subjected to pressure.

8. A shoe upper comprising an outer member and a corresponding inner member, one of said members consisting of unspun fibre bound together with unvulcanized rubber, said members temporarily adhering when subjected to the lasting strain and resisting such strain substantially as a unit.

Signed by me at Boston, Massachusetts this 14th day of August 1924.

HARRY H. SMITH.