

Jan. 15, 1952

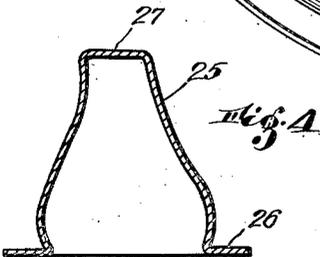
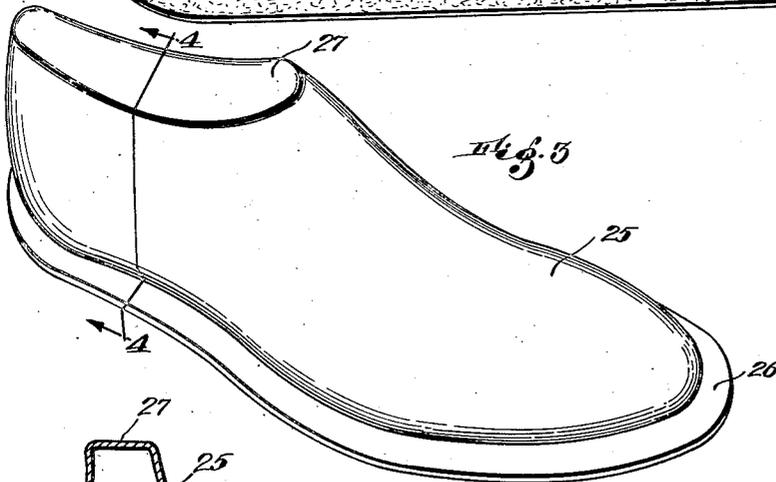
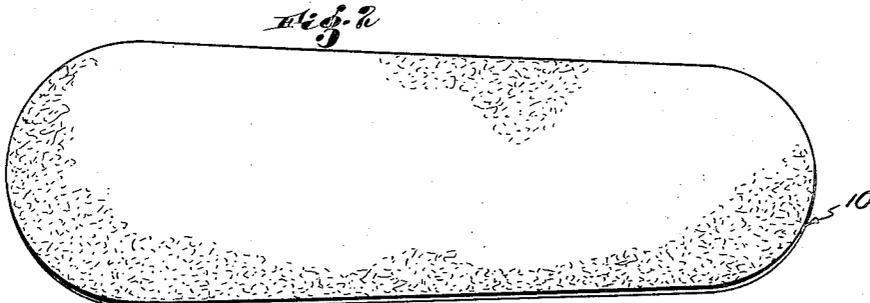
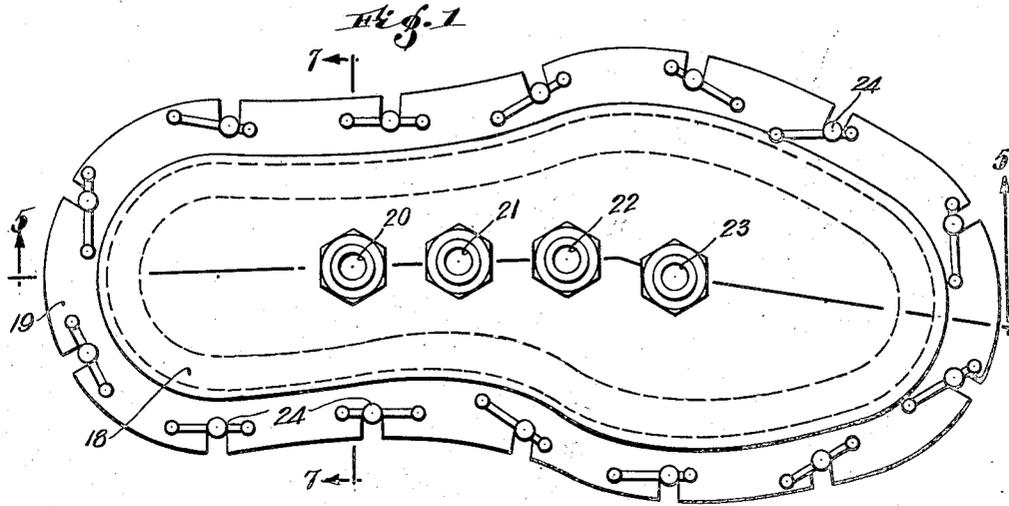
A. E. USHAKOFF

2,582,298

FORMED SHOE UPPERS AND THE LIKE

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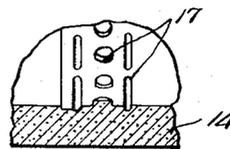
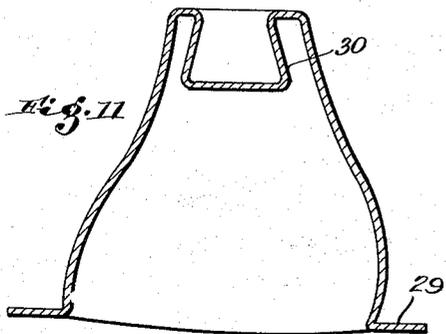
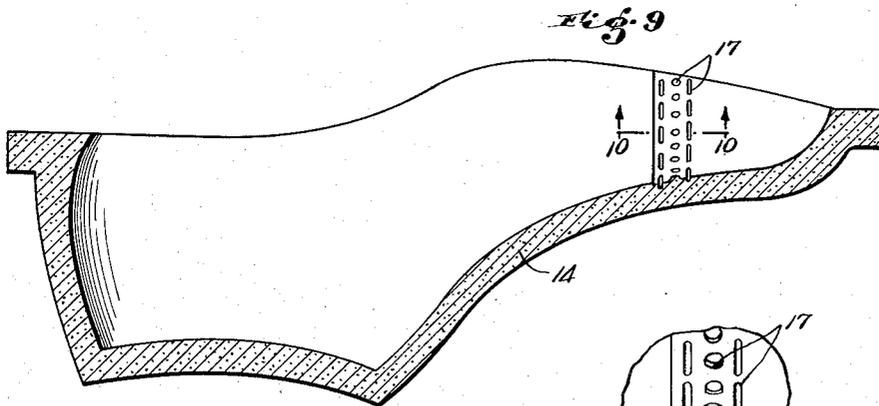
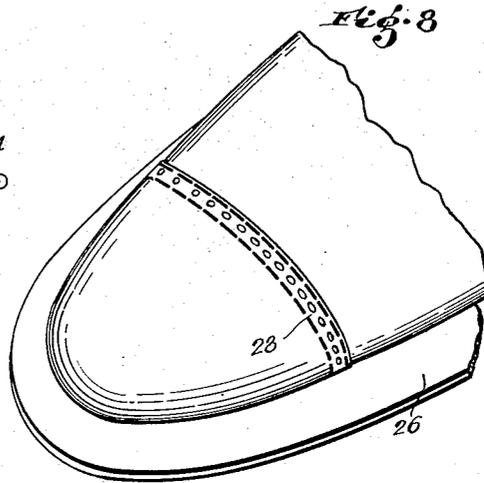
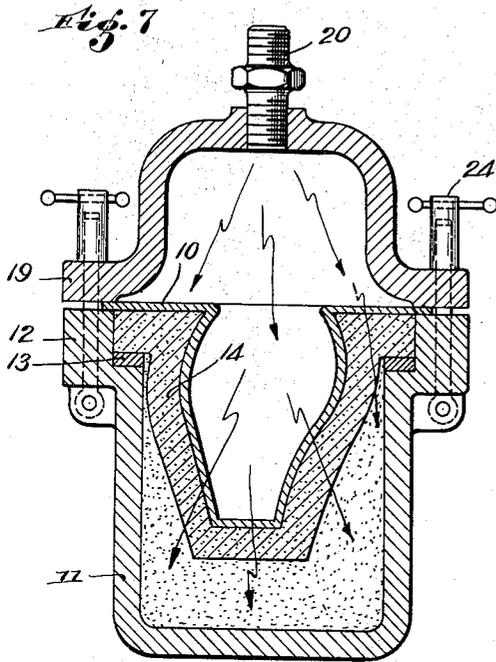
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FORMED SHOE UPPERS AND THE LIKE

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4 Sheets-Sheet 3



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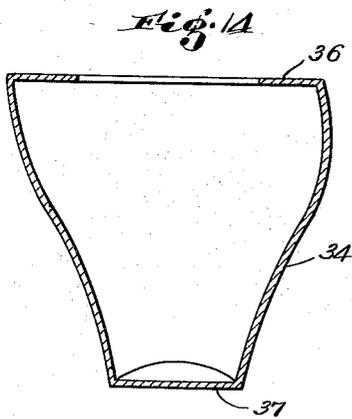
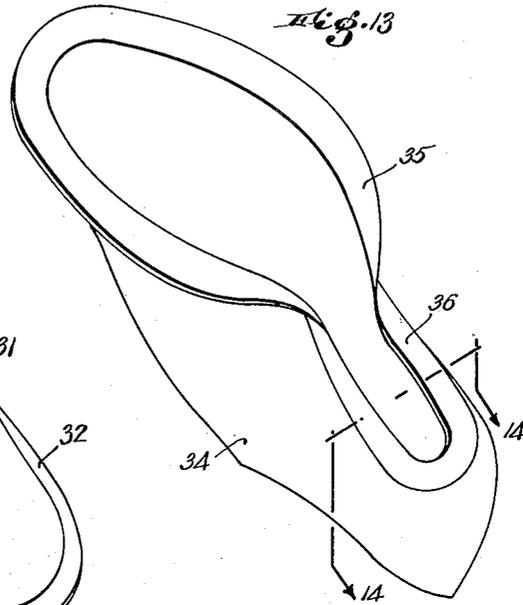
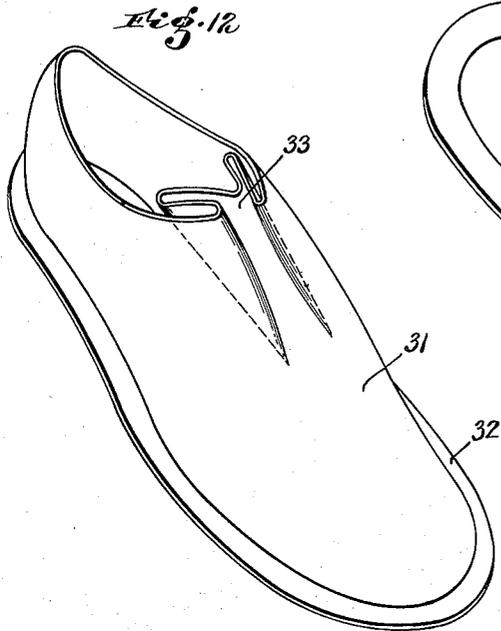
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FORMED SHOE UPPERS AND THE LIKE

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4 Sheets-Sheet 4



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# UNITED STATES PATENT OFFICE

2,582,298

## FORMED SHOE UPPERS AND THE LIKE

Alexis E. Ushakoff, Beverly, Mass., assignor to Secotan, Inc., Cambridge, Mass., a corporation of Massachusetts

Application October 1, 1949, Serial No. 119,054

19 Claims. (Cl. 12-146)

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The present invention consists in a novel process of forming seamless hollow articles such as shoe uppers directly from pickled and untanned skins. It is characterized by the steps of forming the skin in its loose, limp condition by fluid pressure to a concave mold and then tanning the skin while maintained in shape by the mold.

Heretofore attempts have been made to produce shoe uppers by conforming a blank of untreated skin to a last and then tanning the skin while maintained in lasted condition. None of these attempts has proved to be of any commercial value, a controlling reason being that tanning of the skin under those conditions could be carried out only by a diffusion process and therefore required an impracticably long period of treatment. The process of my invention is strikingly different from those above mentioned in that it may be fully carried out in a matter of minutes rather than days or weeks.

Going more into detail, I may start with a blank of suitable shape of skin which has been limed, de-haired and pickled or bated and which is therefore in wet, limp and flabby condition and substantially saturated with water. It will be apparent that a blank of this character may be easily and conveniently conformed to a concave mold such, for example, as a last-shaped mold. Accordingly, it is proposed to clamp or hold the margin or a portion of the margin of the blank and then conform its unconfined area to the shape of the mold by fluid pressure, that is to say, either by fluid pressure of the atmosphere created by suction, or by positive fluid pressure of liquids which have other functions in the process as a whole. The mold employed in carrying out my novel process is constructed of porous material and is readily permeable to air and liquids. Accordingly, I may clamp the entire margin of the blank and then, by creating a vacuum about the outer surface of the mold, draw the blank into conformity with the inner surface of the mold. Having conformed the blank in this manner, the further operations leading up to tanning are performed while the blank is maintained in shape by the mold.

Alternatively, the conforming step may be carried out by fluid pressure of a dehydrating liquid such as acetone or alcohol. Such liquid may be forced against the unconfined area of the blank and by its pressure conform the same to the surface of the mold, at the same time slowly passing through the skin and dissolving the water with which it was originally saturated. Thus, within a few minutes the water content of the skin may

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be removed and the skin left in an open porous condition in which it is best adapted to receive a liquid tanning agent. Accordingly, the dehydrating liquid may be followed up with a tanning agent and the blank conformed in situ while maintained in shape by the mold.

Subsequently the tanning liquid may be followed up with a fat liquor and this, in turn, with a dyeing liquid, or these steps may be reversed or alternated in any desired sequence, it being essential only that the dehydrating step be carried out while the blank is maintained in shape by the mold and by the passage of the dehydrating liquid agent through the skin and through the mold under the action of fluid pressure.

An important advantage of the process of my invention is that the grain side of the skin may be conformed directly to the mold surface and thus partake from it any desired or predetermined configuration as, for example, the appearance of Scotch grain, stitchlines or ornamental perforations.

Another feature of the invention as utilized in the shoemaking field consists in forming the seamless upper with a marginal flange which may simulate a welt, or supply attaching means as in shoes of the stitchdown type. It is contemplated further that the mold may be shaped to create a bellows formation in the instep portion of the upper and this may be utilized to form a folded lacing slit or a seamless tongue in the upper as desired.

These and other features of the invention will be best understood and appreciated from the following description of a preferred manner of carrying it out selected for purposes of illustration and shown in the accompanying drawings in which:

Fig. 1 is a plan view of the apparatus,

Fig. 2 is a view in perspective of a blank cut out for treatment in the illustrated apparatus,

Fig. 3 is a view in perspective of a final product,

Fig. 4 is a view in section on the line 4-4 of Fig. 3,

Fig. 5 is a view of the apparatus in longitudinal section showing the blank in partially conformed position,

Fig. 6 is a similar view showing the blank in fully conformed condition,

Fig. 7 is a sectional view on the line 7-7 of Fig. 1,

Fig. 8 is a view in perspective of a portion of an ornamented upper,

Fig. 9 is a view in longitudinal section of a mold for producing the same,

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Fig. 10 is a fragmentary view of the mold shown in Fig. 9.

Fig. 11 is a view in cross section showing an upper of alternative shape.

Figs. 12 and 13 are views in perspective of uppers of modified shape produced by the process of my invention, and

Fig. 14 is a view in cross section on the line 14-14 of Fig. 13.

For purposes of illustration the invention will now be described as carried out in producing a seamless upper for a man's shoe, although it will be understood that the process of my invention may be applied with advantage to the production of other hollow leather articles. In forming a shoe upper a blank 10, such as that shown in Fig. 2, may be cut from a pickled or bated skin of sufficient size and shape to form the desired upper. The skin in this condition is saturated with water and is consequently impervious or nearly so to the passage of air so long as its water content remains therein. The skin will be in substantially acid condition if pickled and in substantially neutral condition if bated. It is so limp in its texture that it may be easily conformed to a three-dimensional mold surface without being subjected to any substantial tension.

In carrying out the process of my invention I may employ apparatus such as that illustrated in Figs. 1, 5, 6 and 7, although it will be understood that the process is in no sense restricted to any specific form of apparatus. As shown herein, however, the apparatus comprises a substantially rectangular box-shaped casing 11 having a peripheral flange 12 which is recessed internally to provide a shoulder having a flat gasket or cushion 13. Upon this rests the marginal portion of a concave last shaped mold 14 which is constructed of porous material such as plaster of Paris or any other suitable ceramic composition. The inner surface of the mold conforms accurately to the shape of the last including the upper face of the last cone. As herein shown, the mold is supported about its periphery upon the cushioned shoulder of the casing 11 and the body of the mold is supported by a bed of sand with which the casing is filled. A discharge connection 16 is tapped into the bottom of the casing at any convenient location. The inner face of the mold may be smooth or it may be provided with a relief pattern, for example, such a pattern as would reproduce the effect of Scotch grain in the molded upper. If desired it may also be provided with a relief pattern for forming ornamental designs in the surface of the upper; for example, in Fig. 9 the mold is shown as provided with a relief design 17 in the form of tip perforation and stitching.

Cooperating with the casing 11 and the mold 14 is a cover 18 having a marginal flange 19 with a flat clamping surface which cooperates with the flange of the casing for clamping the margin of the blank preparatory to the molding operation. The cover 18 is arched or dome-shaped and provided with threaded inlet connections 20, 21, 22, 23. It is contemplated that the connection 20 may be employed to admit under pressure a dehydrating liquid such as acetone or alcohol, the connection 21 for a liquid tanning agent, the connection 22 for a fat liquor, and the connection 23 for a dyeing agent or other liquid with which it may be desired to treat the blank. The cover 18 is arranged to be tightly clamped to the casing 11 by a series of tubular nuts 24

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which engage bolts passing through the flange 12 of the casing and the flange 19 of the cover.

In Fig. 5 the blank 10 is shown as clamped about its margin beneath the flange 19 of the cover of the apparatus and as partially drawn into conformity with the mold 14 by suction created through the outlet connection 16 in the bottom of the casing. It will be noted that the mold 14 presents a flat marginal surface just within the clamping area of the flanges 12 and 19 and this is effective to form a flat marginal flange in the molded upper since that portion of the blank engaging with this portion of the mold is exposed and subject to the action of all the liquid agents admitted to the mold. The blank may be presented to the mold and clamped with little or no initial tension, or it may be clamped with substantial longitudinal initial tension and little or no transverse tension or vice versa. The result of such initial tension is to cause the fibres of the complete molded upper to be more or less oriented in the direction of tension, that is to say, the fibres may be oriented either longitudinally or transversely in the upper as desired. It is contemplated in some instances that the blank may slip to a limited degree between the clamping surfaces when subjected to fluid pressure in the conforming step where it is the desire to treat the blank under conditions of tension rather than conditions of no tension.

Having conformed the blank to the surface of the mold, acetone may be delivered through the connection 20 to the interior of the conformed blank or, as already intimated, the dehydrating liquid may be delivered under positive pressure and the conforming step effected or completed by pressure rather than suction alone. When the dehydrating liquid first reaches the blank, the latter is substantially impervious on account of its water content, but after being maintained under pressure for a few seconds the liquid will find its way through the blank at some point or other. The flow immediately increases and in a very few minutes the dehydrating liquid has dissolved practically all the water content of the skin and now passes through the blank in a copious shower. The blank has thus been conformed to the shape of the mold and dehydrated in situ. It may be removed from the mold in this state and will maintain its molded shape so long as moisture makes no contact with it. If desired, the dehydrated and molded upper may be tanned by a non-aqueous tanning solution and so rendered stable in its molded shape. However, it is usually desirable to carry out the tanning step immediately after the dehydration step and while the upper remains undisturbed in the mold. Accordingly, the dehydrating liquid may be shut off at the connection 20 and the tanning liquid at once admitted through the connection 21. This passes immediately through the dehydrated upper coating its fibres with a tanning agent and discharging through the connection 16 as a clear liquid. This continues until the fibres of the upper are completely coated whereupon the tanning liquid passes through the upper without change in its composition and is discharged from the connection 16 in the same condition that it is supplied by the connection 21; for example, if the tanning liquid is a chrome solution in methanol or acetone and of green color, the conclusion of the tanning operation will be promptly and accurately indicated when the discharged tanning liquid changes from a clear liquid to a green colored liquid.

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At the conclusion of the tanning operation the tanning liquid is shut off at the connection 21 and immediately fat liquor may be admitted through the connection 22 and caused to pass through the upper for a short interval, thus filling its pores with oil or grease. Subsequently the supply of fat liquor may be shut off and a dyeing agent admitted through the connection 23. These, of course, may be selected in accordance with the color desired in the finished upper. The dyeing agent passes through the material of the upper and in doing so coats the fibres of its material. Some dyes penetrate freely while others tend to filter out from their carrier in passing through the material of the upper. Consequently, it may be desirable in some cases to employ two or more complementary dye liquids, or even to dye the pickled skin before it is subjected to the dehydrating step, that is to say, the dyeing step may be carried out either before or during or after the tanning step. It is thus possible to take advantage of the fact that some dyes act most effectively while the skin is in acid condition. My novel process also makes it possible to dye the upper one color at its inner surface and another color at its outer surface.

The initial step of tensioning the untanned skin may be utilized to achieve various important results. In the first place, by uniformly tensioning the skin the fibres thereof are oriented in the natural or most favorable direction for the shape in which the blank is to be conformed. They are then fixed in situ in that position by the dehydration and tanning steps carried out while the blank is maintained in shape by the surface of the mold. After such treatment the resulting upper tends strongly to reassume its molded three-dimensional configuration established by the dehydrating and tanning steps upon the removal of a temporary distorting force.

If it is desired to modify the stretch characteristics of the finished article, this may be done by adjusting and regulating the tension of the blank; for example, if it is desired to produce a shoe upper having little or no lateral stretch, the untanned blank may be severely tensioned in a lateral direction and then dehydrated and tanned in this condition. The result will be an upper having capacity for lengthwise stretch but practically no capacity for lateral stretch. Accordingly, my invention contemplates subjecting the untanned blank to severe tension in both directions, or small tension in both directions, or predominant longitudinal tension combined with little or no lateral tension, or predominant lateral tension combined with little or no longitudinal tension.

The process of my invention has the further important advantage that it affords access for the first time to the interior of a shoe upper or the like while the latter is in process of formation. This, of course, is not true of a leather upper in process upon the usual last. In accordance with the present invention, however, when the untanned blank has once been stabilized in its conformed shape by dehydration, its inner surface may be subjected to any desired treatment; for example, a stiffening compound may be applied directly to the counter or toe portions of the upper. For this purpose may be employed either a thermoplastic stiffening agent or a stiffening agent carried by a solvent vehicle; for example, a mixture of polyvinyl resin, rosin and Montan wax may be applied in molten condition to selected areas and will

stiffen these upon cooling, or a colloidal stiffening agent soluble in a non-aqueous solvent such as nitro cellulose or cellulose acetate may be applied in liquid form with the result of stiffening the upper when the solvent evaporates. It will be seen that in this manner the upper may be provided with a stiffened box toe, eliminating the troublesome ridge that often denotes the presence of a separate stiffening blank.

If desired, and in order to produce a lined upper, superposed plies of untanned skin may be employed and treated as a single blank in the manner already explained. For example, a thin leather lining ply may be placed on an outer ply with its grain surface inside and the two plies may be simultaneously dehydrated and tanned to produce a lined upper. Alternatively and if so desired, the inner surface of the conformed upper may be flocked with suitable fibre to form an attractive lining surface.

A novel and characteristic feature of the upper formed as above outlined is that it is fully closed and without an opening corresponding to the top of the usual last. This is a unique and distinguishing characteristic of uppers produced by the present invention. It is contemplated that this area of the upper will be cut out and this may be done in such manner as to leave a margin for folding. Thus a finished edge is produced about the top of the upper.

It is contemplated further that if desired the forepart of the mold may be provided with longitudinal ribs to which the untanned blank may be conformed in such fashion as to produce a bellows configuration. This may be utilized as a seamless tongue in the upper, or the material may be slitted and folded to form the usual lacing slit.

Still another advantage of the process of my invention is that in conforming the untanned skin to the contour of the last-shaped mold, the skin is somewhat thickened by being forced into conformity with the more sharply concave surfaces of the mold as at the vertex of the counter portion. That is to say, the skin is conformed to the mold by an absolute minimum of tensional planar stresses rather than by excessive tensional stresses characteristic in conventionally lasted skins; the mold surfaces tend to confine rather than extend the skin. After the fluid pressure conforms the skin to the mold, further pressure exerts against the mold and not tensionally against the skin. This is desirable since it facilitates subsequent stiffening of those areas in the finished upper.

As suggested in Fig. 7, when it is desired to produce an upper with an out-turned flange, the mold 14 is provided with a flat flange-forming surface extending inwardly from the line of clamping engagement of the blank between the flange 12 of the casing and the flange 19 of the cover. The margin of the blank is drawn smoothly over this flat mold surface and, of course, is exposed to the action of the dehydrating and tanning liquids within the closed mold. Accordingly, the molded upper 25 is formed with an out-turned peripheral flange 26 as shown in Figs. 3 and 8. In Fig. 8 the upper is further shown as presenting a tip line 28 of ornamental perforations and stitchings.

In Fig. 11 a molded upper of modified configuration is shown in cross section. This presents an out-turned marginal flange 29 and a re-entrant section produced by shaping the mold with a wide platform at its smaller end instead

of a flat wall. The section 30 may be severed in such a manner as to leave a margin to be folded and cemented in finishing the top edge of the upper.

In Fig. 12 is shown a molded upper 31 having an out-turned flange 32 and a seamless bellows tongue formation 33 provided by modifying the instep portion of the mold as above explained.

In Figs. 13 and 14 is shown a molded upper 34 of somewhat modified shape in that it is provided with an out-turned flange 35 in the shank and forepart and an inturred flange 36 about its heel seat. These and many other desired features of configuration may be formed in the upper by providing appropriate molding surfaces in the proper location. For example, moccasins may be formed with their uppers and soles seamlessly united, or an open top upper may be formed by starting with a blank having an opening which is closed by a clamping plate during at least the dehydrating step. In fact, many different shapes may be provided by employing a mold constructed and arranged to seal all edges of the untanned blank including the edges of an opening if present.

The stiffening of the molded upper by the employment of thermoplastic or solvent stiffening agent has been mentioned. It is also contemplated that for this purpose thermosetting stiffening agents, such as the phenolic resins, may be employed. It is also contemplated that thermoplastic stiffening agents may be applied in monomeric form and cured or polymerized in situ.

Alcohol and acetone have been mentioned as suitable dehydrating liquids, but it will be understood that any water-miscible solvent may be employed in carrying out the process of my invention as a full equivalent. Further, while I have mentioned chrome tanning solution as a suitable non-aqueous medium, it will be understood that the employment of vegetable tanning solutions is contemplated, or that aldehyde, aluminum, titanium and zirconium tanning solutions are also entirely satisfactory for purposes of this invention and that, if desired, aldehyde may be employed in gaseous form for the tanning step. Moreover, it is practical by combining dehydrating and tanning solutions to satisfactorily dehydrate and tan the conformed blank in a single operation. Subject matter disclosed but not claimed herein is claimed in the copending application of Alexis E. Ushakoff, Serial No. 233,424 filed June 25, 1951.

Having thus disclosed my invention and described in detail illustrative examples thereof, I claim as new and desire to secure by Letters Patent:

1. The process of forming seamless shoe uppers which comprises the steps of clamping the margins of a blank of untanned skin, forcing the unconfined area of the blank by fluid pressure into conformity with a concave last-shaped mold, and tanning the skin while maintained in shape by the mold.

2. The process of forming shoe uppers which comprises the steps of forcing by fluid pressure a blank of untanned skin into conformity with a concave last-shaped mold with the grain face of the skin in contact with the mold surface, and then tanning the skin while maintained in shape by the mold.

3. The process of forming shoe uppers which comprises the steps of clamping the margin of an untanned blank, forcing the unconfined area

of the blank into conformity to a concave last-shaped mold of porous composition by fluid pressure of a tanning liquor and thus tanning the blank while maintained in shape by the mold.

4. The process of forming shoe uppers which comprises the steps of clamping the margin of an untanned blank, forcing the unconfined area of the blank into conformity with a concave last-shaped mold having a flat peripheral shoulder, holding the blank in conformed shape by fluid pressure, and then tanning the skin while held by the mold with a flat flange of the blank supported by the peripheral shoulder of the mold.

5. The process of forming seamless shoe uppers or the like which comprises the steps of conforming a blank of untanned skin to the contour of a concave last shaped mold and at the same time orienting the fibres of the skin by tensioning it in one direction, dehydrating the skin while maintained in shape by the mold surface, and then tanning the skin by a non-aqueous agent.

6. The process of forming seamless shoe uppers comprising the steps of conforming a blank of untanned skin to the surface of a concave last-shaped mold, simultaneously tensioning the skin longitudinally in the mold, dehydrating the skin while maintained in shape by the mold surface and while under longitudinal tension, thus producing a molded upper having little longitudinal stretch, and then tanning the upper by a non-aqueous agent.

7. The process of forming seamless shoe uppers or the like comprising the steps of conforming a blank of untanned skin by fluid pressure to the surface of a last-shaped concave mold having an ornamental relief pattern therein, dehydrating the skin while maintained in shape by the mold surface and thereby reproducing the ornamental pattern in the conformed blank, and then tanning it with a non-aqueous tanning liquor.

8. The process of forming shoe uppers or the like which comprises the steps of conforming a blank of untanned skin to the surface of a concave last-shaped mold, dehydrating the blank while held in shape by the mold surface, tanning the conformed blank, and applying a stiffening compound to selected areas of its exposed inner surface.

9. The process of forming lined shoe uppers or the like which comprises the steps of superposing a lining blank and an outer blank of untanned skin, conforming the superposed blanks by fluid pressure to a concave last-shaped mold, dehydrating the blanks while maintained in shape by the mold surface, and then tanning them simultaneously by a non-aqueous tanning liquor.

10. The process of making seamless shoe uppers which comprises the steps of conforming a blank of untanned skin by fluid pressure to the concave surface of a last-shaped mold, dehydrating and tanning the blank while maintained in shape by the mold surface, and then cutting out the area corresponding to the last top.

11. The process of making seamless shoe uppers which comprises the steps of conforming a blank of untanned skin by fluid pressure to the concave surface of a last-shaped mold having longitudinal ribs in its forepart, and dehydrating and tanning the blank while maintained in shape by the mold surface, thereby producing a seamless upper with a tongue of bellows formation.

12. The process of making seamless shoe

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uppers which comprises the steps of conforming a blank of untanned skin to the concave surface of a last-shaped mold by fluid pressure, dehydrating and tanning the blank while held in shape by the mold surface, and the dyeing the molded upper thus produced.

13. The process of making seamless shoe uppers which comprises the steps of conforming a blank of untanned skin to the concave surface of a porous last-shaped mold, and while the blank is maintained in shape by the mold forcing through the supported blank first a dehydrating solution and then tanning liquor, fat liquor and a liquid dyeing agent.

14. The process of forming seamless shoe uppers which comprises the steps of conforming a blank of untanned skin to the concave surface of a porous last-shaped mold with the margin of the blank extended and held in a flat peripheral flange, dehydrating the blank and its said flange while maintained in shape by the mold surface, and then tanning the flanged upper so produced.

15. The process of making seamless shoe uppers which comprises the steps of shaping a blank of untanned skin to the contour of a last including the top surface of the last cone, dehydrating and tanning the conformed blank while held in shape, and then cutting out the area of the blank corresponding to the top of the last cone.

16. The process of making seamless shoe uppers which comprises the steps of orienting the fibres of a blank of untanned skin by differential tension thereby moving the fibres some one way and some another way in the skin, conforming the blank to the concave surface of a last-shaped mold, dehydrating the blank while maintained in shape by the surface of the mold, and then tanning the dehydrated upper thus produced.

17. The process of forming seamless shoe uppers or the like which comprises the steps of securing the marginal edges of an untanned skin, forcing the unconfined area of the skin by fluid

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pressure into conformity with a concave last-shaped mold, dehydrating the skin while maintained in shape by said mold and then tanning the skin by a non-aqueous agent, whereby the shape of the dehydrated skin is preserved.

18. The process of forming seamless shoe uppers or the like which comprises the steps of securing the marginal edges of an untanned skin, forcing the unconfined area of the skin by the pressure of a dehydrating liquid into conformity with a concave last-shaped mold, dehydrating the skin while maintained in shape by said mold by forcing the said liquid therethrough, and then tanning the skin by a non-aqueous agent whereby the shape of the dehydrated skin is preserved.

19. The process of forming seamless shoe uppers or the like which comprises the steps of securing the marginal edges of an untanned skin, forcing the unconfined area of the skin by the pressure of a non-aqueous tanning agent which includes a dehydrating liquid into conformity with a concave last-shaped mold, and forcing said tanning agent through said skin while maintained in shape by said mold, whereby the skin is dehydrated and tanned.

ALEXIS E. USHAKOFF.

## REFERENCES CITED

The following references are of record in the file of this patent:

## UNITED STATES PATENTS

| Number    | Name      | Date          |
|-----------|-----------|---------------|
| 214,718   | Sheffield | Apr. 22, 1879 |
| 1,463,066 | Carter    | July 24, 1923 |
| 2,123,552 | Helwig    | July 12, 1938 |
| 2,142,445 | Helwig    | Jan. 3, 1939  |

## FOREIGN PATENTS

| Number           | Country       | Date          |
|------------------|---------------|---------------|
| 572              | Sweden        | May 12, 1886  |
| 2,247<br>of 1902 | Great Britain | June 25, 1902 |