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A. VAMOS

2,184,261

STRETCHABLE LEATHER SHOE

Filed Oct. 14, 1938

Fig. 1.

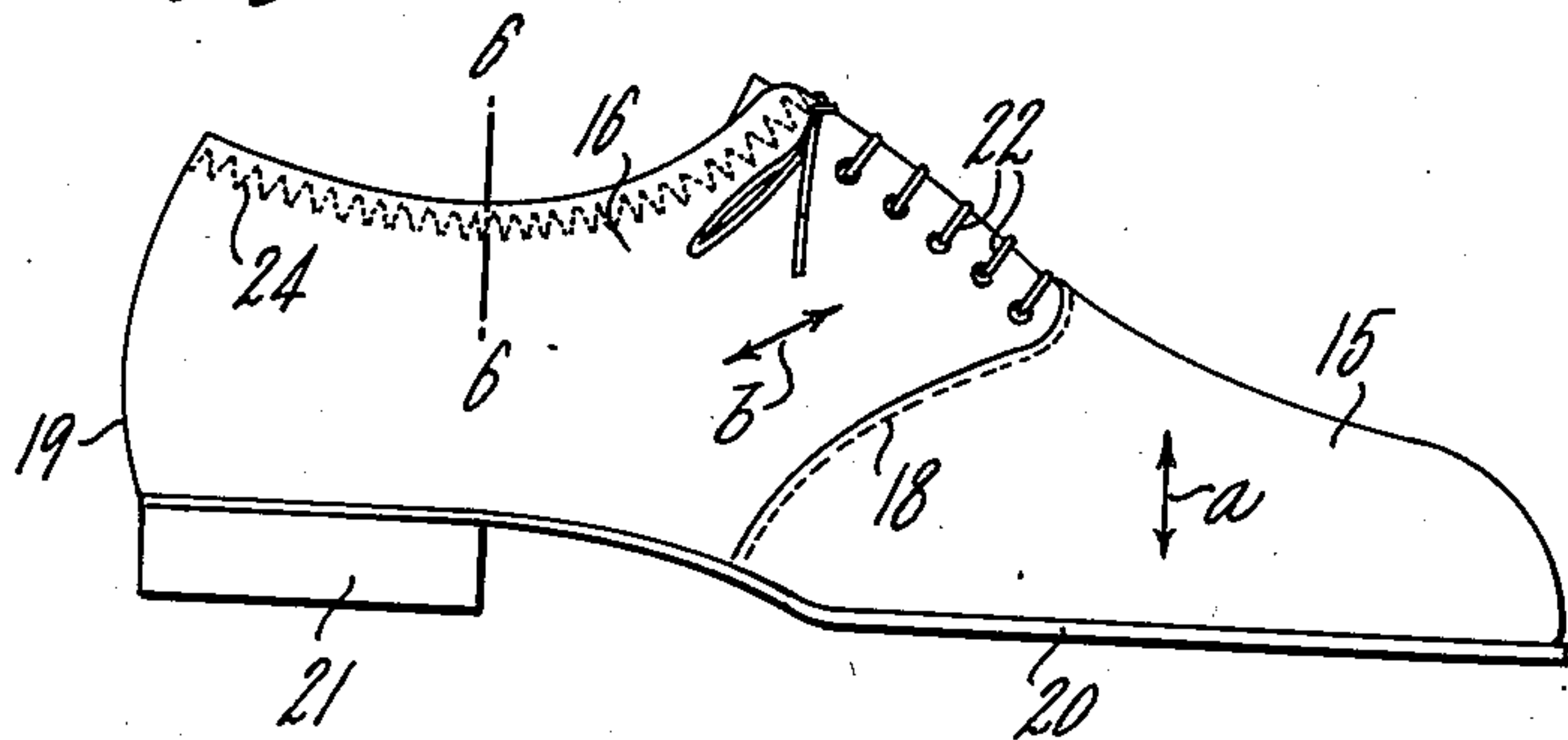


Fig. 2.

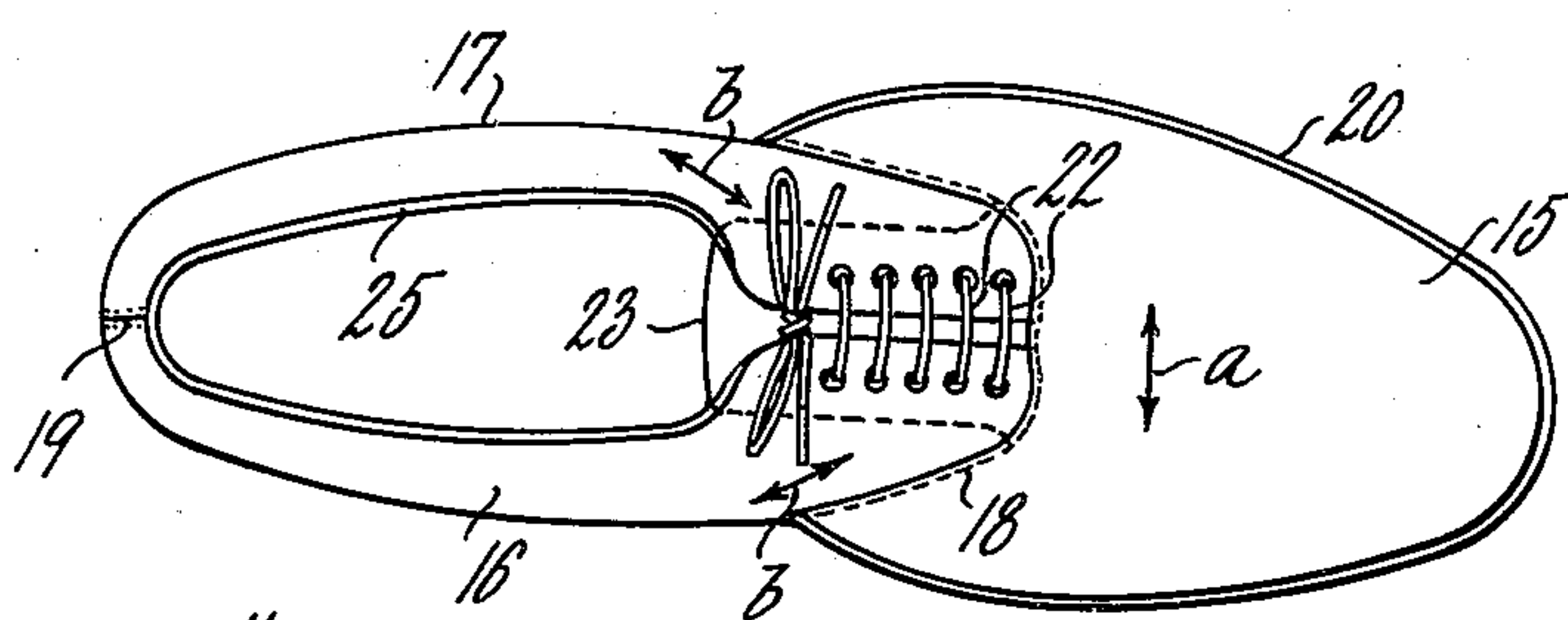


Fig. 3.

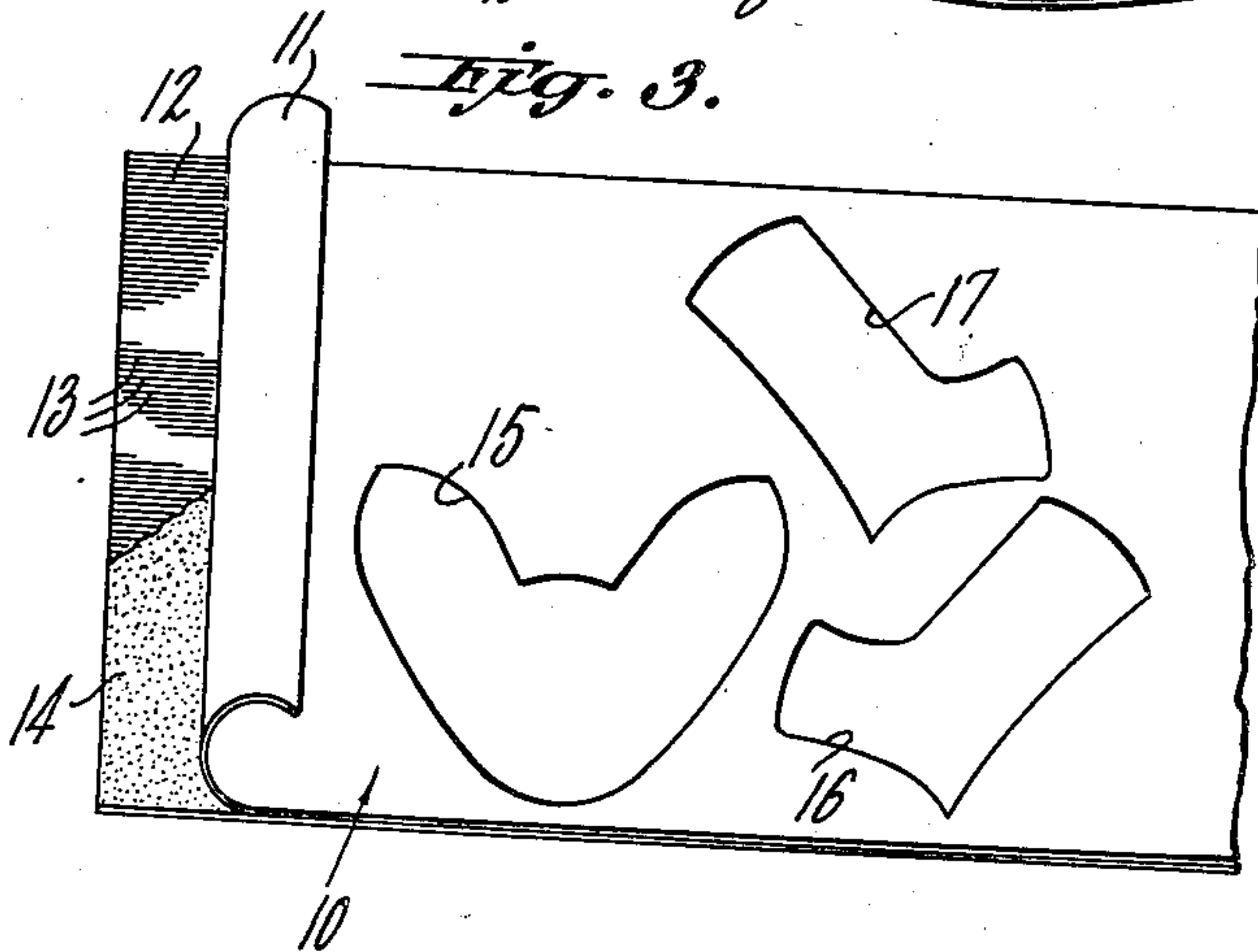


Fig. 5.



Fig. 6.

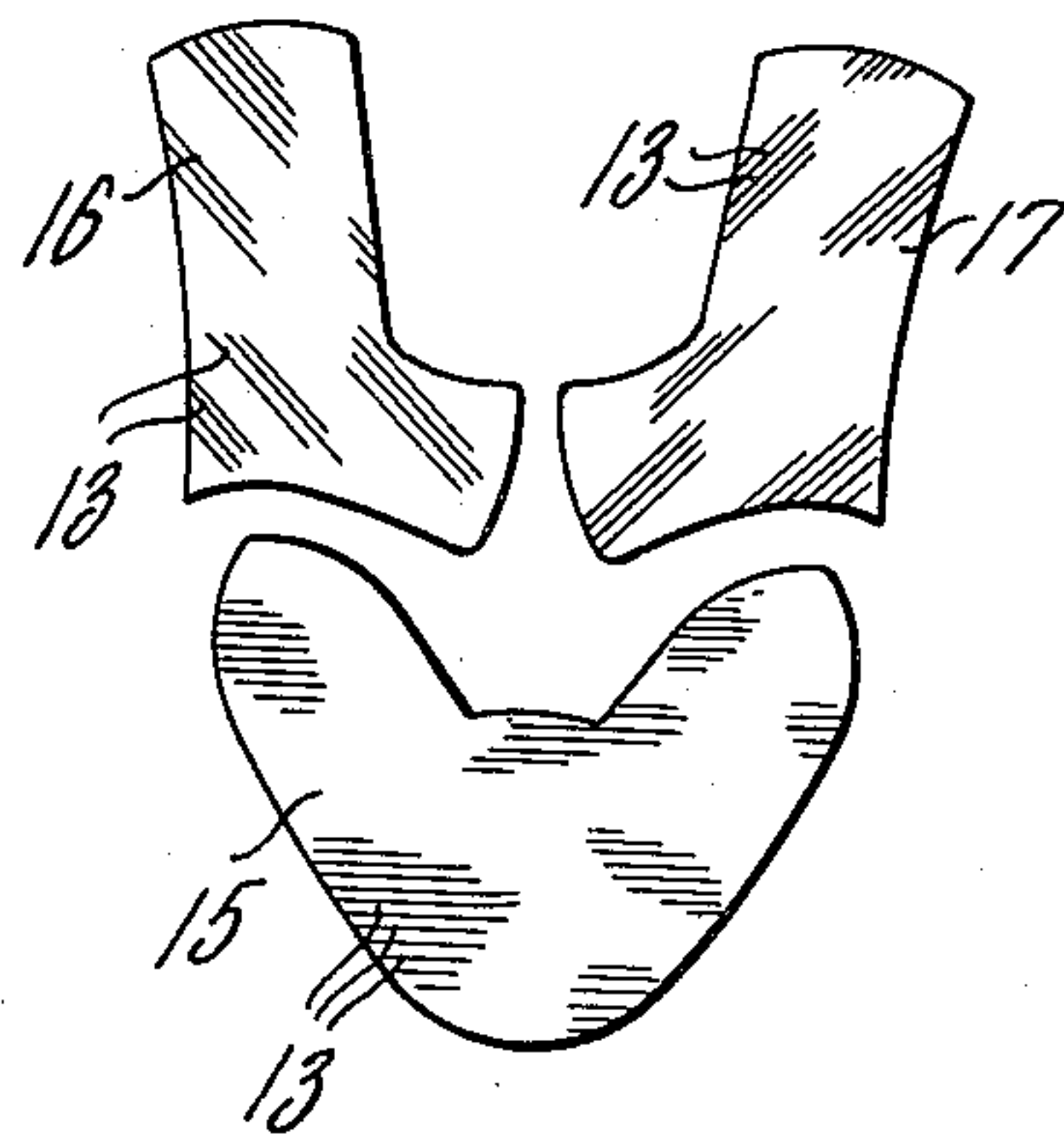
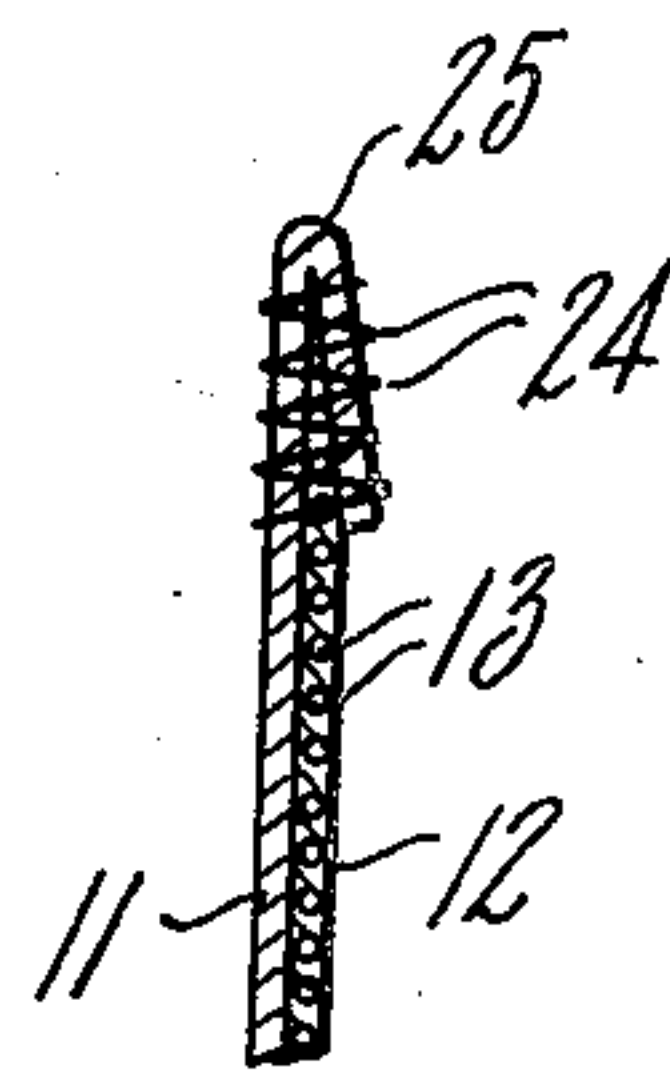
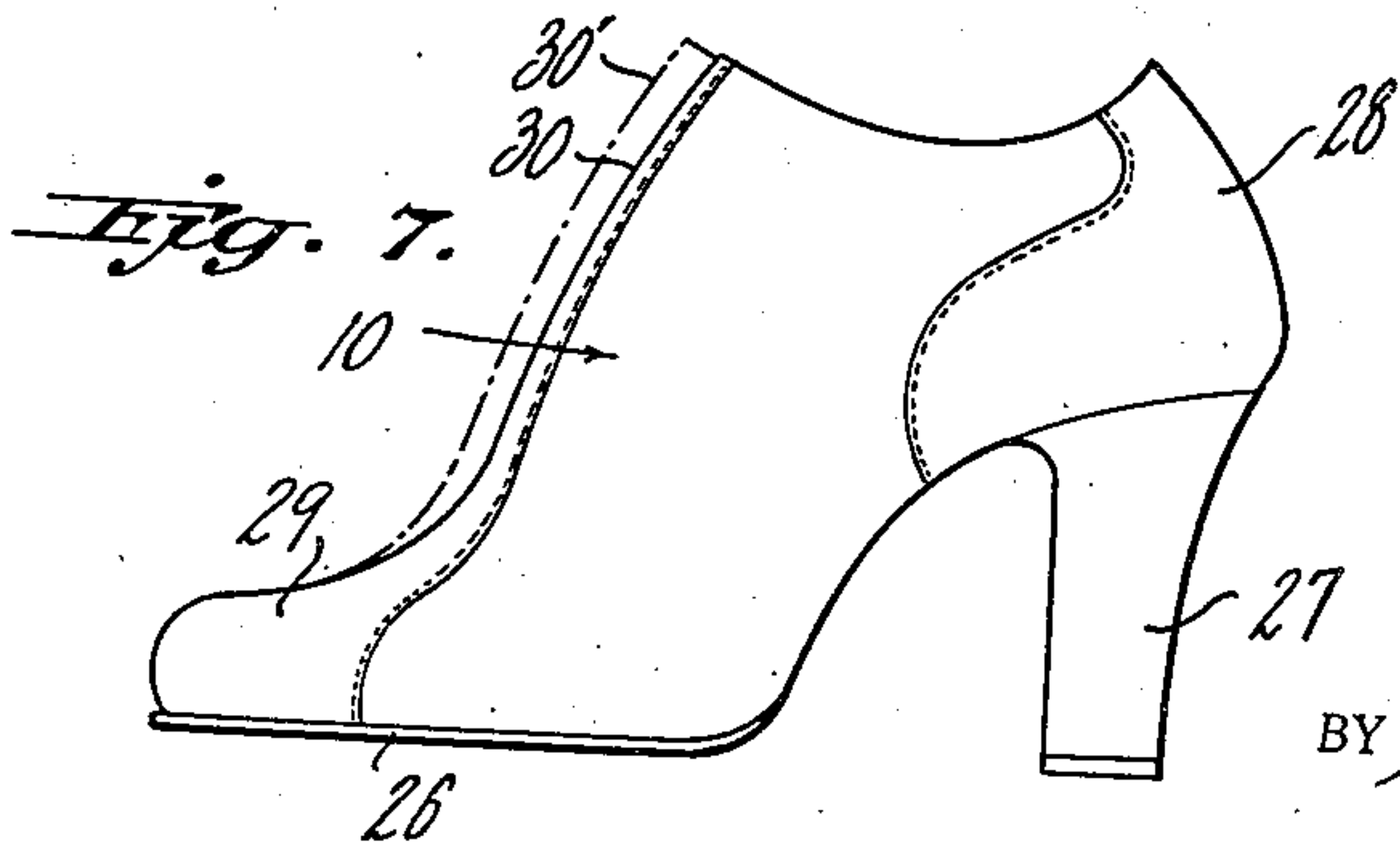


Fig. 4.

Fig. 7.



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STRETCHABLE LEATHER SHOE

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Application October 14, 1938, Serial No. 234,862

3 Claims. (Cl. 36—51)

This application is a continuation in part of my prior application Serial No. 190,955 filed February 17, 1938.

The present invention relates to stretchable leather shoes adapted to stretch and contract with the foot movement and having the stretchable portion thereof formed of leather that has a substantial stretch and which is backed with an elastic sheet adhesively secured thereto.

The word "stretch" is herein used in the specification and claims broadly to describe materials which are capable of being extended or drawn out whether they possess the property of spontaneously returning to or nearly to their original dimensions or are devoid of this property.

It has been proposed heretofore to secure a thin strip of leather to a strip of elastic webbing to form a leather covered elastic strip suitable for use as a belt worn to support the trousers, but in such construction the wrinkles or lines formed transversely of the leather by the contraction of the elastic webbing are not particularly objectionable.

It has also been proposed heretofore to employ various types of elastic webbing and gores in shoes to make them elastic, but the material which has been universally used for many years in making most types of shoes is leather, and so far as I am aware, it is broadly new to form the upper portion of a shoe of leather that is adapted to stretch and contract with the foot movement, the same comprising a flat sheet of shoe upper leather that has a substantial stretch and to which is adhesively secured an elastic sheet adapted to hold the leather normally in the contracted condition.

The requirements of this stretchable plied material consisting of stretchable leather having an elastic backing, in order to meet the demands of the shoe trade are exacting. One such requirement is that this material shall lie flat and smooth and be capable of stretching repeatedly in the shoe throughout a substantial range without causing any appreciable change in the appearance of the leather. Another requirement is that the leather be so firmly secured to the elastic backing that it will remain free from puckers and wrinkles throughout the life of the shoe. Another requirement is that this leather material be indistinguishable or practically indistinguishable in appearance from the non-stretchable leather forming the rest of the shoe upper. A further requirement is that this stretchable material be sufficiently durable to retain its original stretch characteristic throughout the life of the

shoe in which it is embodied. A still further requirement is that the elastic modulus of this combined leather and backing be such that it will stretch with the foot movement and contract with sufficient force to embrace the foot snugly and conformably without exerting sufficient pressure upon the foot to be painful even when the shoe is worn continuously for many hours.

In addition to the above it is highly desirable that this stretchable plied material be sufficiently permeable to permit air to pass therethrough to thereby improve the foot ventilating properties of the shoe. It is also desirable that this plied material be so constructed that it will lay flat and smooth in the plied sheet without tending to curl up or cause the leather to look different at its outer face from ordinary shoe upper leather.

This stretchable plied material may have the width of the entire skin from which the leather is secured and, the leather employed in the stretchable portion of a shoe may be obtained from the same pig, kid, calf or other skins used heretofore to form shoe upper leather. Care however should be taken to finish the leather for the present invention so that it will retain or have imparted thereto much of the stretch of the original green skin. This may be accomplished by being careful not to stretch the skin during the tanning and calendering operations and by imparting to the same a relatively soft pliable finish so that it will have an easy and substantial stretch. To this end the skins may be calendered less or under lighter pressure than was customary heretofore in making shoe upper leather. This desired stretch may also be imparted to the finished shoe leather by the treatment described in the above mentioned application.

A primary feature of the present invention resides in a leather shoe having the entire upper thereof or a substantial portion thereof formed of the above described stretchable elastic backed leather so that the shoe will stretch and contract with the foot movement.

A shoe constructed as herein contemplated is much more comfortable to the foot than the leather shoes available heretofore, and it fits the foot better in that the present shoe is free to stretch and contract to conform to the particular shape of the foot of the wearer. Furthermore the stretch of the foot receiving opening of the present shoe makes it now practical to construct shoes that have much higher uppers than the ordinary pump without requiring the

use of fastening means, since the stretch of the shoe will permit the insertion of the foot therein. Again the stretch characteristic of the present shoe causes it to cling to the foot much better than the ordinary leather shoe. This is particularly noticeable in pumps for it is now possible to make a pump which fits the foot with sufficient snugness to prevent it from sliding up and down at the heel without binding uncomfortably across the top of the foot.

Another feature of the present invention resides in a leather shoe such as herein contemplated wherein the elastic and non-elastic portions thereof are or may be undistinguishable in appearance, and still a further feature resides in a shoe such as herein contemplated wherein the elastic portions thereof affords the foot better ventilation than the non-elastic portions, and also better ventilation than the ordinary leather shoes.

Still another feature of the present invention resides in the particular arrangement of this material in the shoe in respect to the direction of stretch of this material therein.

In developing the shoe of the present invention it became necessary to depart radically from the long established practice of lasting leather shoes, for heretofore in lasting shoes the shoemaker has been careful to pull the shoe upper tightly over the last so as to remove all stretch and thereby prevent the shoe from stretching out of shape when in use. In constructing the shoe of the present invention special care must be exercised while lasting the same not to stretch the shoe more than a slight amount so that it will have the desired elastic properties when worn.

The above and other features of the invention and novel arrangement of parts will be more fully understood from the following description when read in connection with the accompanying drawing, wherein:

Fig. 1 is a side elevation of a shoe of the oxford type illustrating one embodiment of the invention.

Fig. 2 is a top plan view of Fig. 1.

Fig. 3 is a plan view of a sheet of stretchable plied material of the present invention having cut therefrom the vamp and quarters for the shoe of Fig. 1, the leather of this plied sheet being partly rolled back.

Fig. 4 is a plan view showing the reverse side of the vamp and two quarters cut from Fig. 3;

Fig. 5 is a vertical sectional view through the plied material showing the fabric skived from the leather adjacent one edge thereof preparatory to finishing the upper edge of this material;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 1 showing the step of Fig. 5 carried forward to provide the upper edge of the shoe with a smooth finished edge; and

Fig. 7 is a side elevation of a woman's shoe formed partly of stretchable and partly of non-stretchable leather.

In carrying out the present invention, it is important to use shoe upper leather, that is leather which has the strength and durability of the shoe upper leather employed heretofore but which has in addition thereto the desired amount of stretch. The softer glove leather stock is not sufficiently tough and durable to give satisfactory service and wear in shoes when backed with an elastic sheet as herein contemplated.

When the stretchable and contractable plied material herein contemplated is to be embodied

in shoes it is important that its elastic modulus be sufficiently low to cause the plied material to stretch with the foot movement, otherwise the advantages herein contemplated in a shoe made of such material would be lost. It has been found in practice that a shoe upper constructed of this plied material may be somewhat thinner than the ordinary shoe upper as constructed heretofore, since the backing material adhesively secured to the inner face of the leather makes it unnecessary to use any other form of lining in the shoe.

In manufacturing this stretchable plied material for use in shoes the stretch employed may be from 10% to 50% depending upon the type of shoe and location of the plied material therein, and this stretch can be secured without causing the leather to wrinkle or pucker or otherwise show any appreciable change in its appearance throughout this range of stretch. The stretch of this plied material desired in most shoes is about 20% to 25%, but as little as 10% stretch in the plied material may be sufficient when the entire upper portions of the shoe surrounding the foot receiving opening is made of this material for with such an arrangement a 10% stretch in the plied material will permit the throat of the shoe to stretch a quarter of an inch or more which may be all that is desired.

When I first became interested in the present invention I found it impossible to secure from the tanners shoe upper leather having the required amount of easy stretch, therefore I developed the treatment described in the above mentioned application to increase the range and ease of stretch of the shoe upper leather as purchased from the tanner. More recently the tanners have made an effort to supply my requirements for a stretchable shoe upper leather and I am now able to buy from them such a leather having a 25% or more easy stretch, this making unnecessary in many cases the treatment described in the above mentioned application.

In carrying out the present invention, the stretchable leather as received from the tanner is first preferably skived to give it a uniform thickness, and it may be skived thinner than the leather commonly used heretofore in shoe uppers because the elastic backing sheet reinforces and strengthens the thin leather sheet. The skiving however should not be carried to such an extent that it produces an excessively thin leather sheet that will not stand up or give good service in a shoe. In most cases this skived leather should not be less than $\frac{1}{64}$ of an inch thick.

When it is not necessary to skive the leather skin to reduce its thickness, it may be desirable to roughen that face of the skin to which the adhesive is to be applied, with sandpaper or other roughening means, in order that the adhesive may more firmly grip this surface of the leather. The adhesive binder may be applied to either the flesh side or the grain side of the leather depending upon which face of the leather is to be exposed in the finished shoe but in either case the face should be roughened. When a suede leather is used having the flesh face finished and exposed at the outer face of the shoe the elastic backing is applied to the previously roughened grain face.

After a leather skin has been acquired from the tanner having a desired range of stretch and sufficiently low elastic modulus, or has been treated by the method described in the above application to impart the desired easy stretch thereto and has had the face to which the adhesive is

to be applied either skived or roughened, the adhesive binder may be applied.

The adhesive used is preferably a latex adhesive which will give a firm bond without needing to be vulcanized and the quickest and most satisfactory way yet devised for applying this latex adhesive is by a spraying operation. One important advantage obtained by spraying the latex upon the leather is that a good bond can be secured without decreasing the permeability of the leather to air. This latex adhesive is preferably sprayed upon the leather skin while it rests upon a supporting surface in a flat but unstretched condition.

After the stretchable skin has had the latex adhesive applied to one face thereof it may then be provided with the elastic backing.

Various elastic sheet materials which will maintain their elastic properties throughout the life of the shoe may be used as a backing for the above described leather sheet to hold the same normally in its contracted condition, but the material preferably used is a sheet of fine woven elastic fabric such as elastic batiste. The backing material preferably has a longer stretch than the leather so as not to interfere with the stretch of the leather and the contractive force may be as strong as needed for its use in the shoe. It is important that this backing material be carefully constructed so that the tension and stretch characteristics of the same shall be uniform throughout that area which backs any one skin, because if local variation exists in the tension of the backing fabric it will tend to pucker or distort the skin to which it is secured.

This backing fabric should have a latex adhesive sprayed upon one face thereof similarly to the manner in which this adhesive is applied to the leather skin, and here again it is desirable that the latex be so applied that it will not appreciably interfere with the passage of air through the fabric.

Almost immediately after the latex adhesive has been applied to the leather skin and to the backing material, say within two or three minutes, the two sheets may be united. This should be done while both the leather and backing are in an unstretched condition. It is found desirable while uniting these two sheets or shortly thereafter to pass them between calender rolls to increase the bond therebetween and force out any air which might be trapped. The stretchable plied material thus formed may then be placed in a flat condition in a stack with other similarly formed sheets which should be separated from each other by sheets of cardboard placed between the backed leather sheets. They should be allowed to remain in this stack for about 12 hours while the moisture of the latex adhesive escapes or dries out. The material is then ready to be embodied in shoes.

It is found that the moisture of the latex binder has a tendency to swell the textile fibers forming the backing sheet. Therefore, to reduce this swelling tendency, it has been found desirable to treat the face of the backing fabric to which the latex is to be applied with a light coating of any suitable water-repellant substance which will lessen the tendency of the fibers of this fabric to absorb moisture from the adhesive. One well known water repellent substance which may be used consists of water containing about 2% emulsion of soap and carnauba wax.

Most leather skins will stretch more readily in the direction around the animal from which the

skin was taken than longitudinally of such animal, therefore the backing material which is preferably a one-way stretch fabric is so applied to the skin that its direction of stretch will correspond with that of the maximum stretch of the skin.

The treatment involved in imparting the desired amount of stretch to the leather skin and in adhesively securing the elastic backing thereto need not in any way change the appearance of the outer face of the leather, and the total thickness of the two-ply material thus formed may be less than $\frac{3}{64}$ of an inch. The backed stretchable leather such as herein contemplated may have a stretch of 50% or more but a much lower stretch is sufficient in most shoes to impart the desired stretch characteristic thereto.

Having described how the stretchable plied material herein contemplated is made, I will now describe two different shoe constructions embodying the material therein. It will be understood, however, that this material may be employed in various types of shoes and in various portions thereof.

Referring to the drawing the stretchable plied material 10 is formed of a sheet of shoe upper leather 11 which has been treated by the tanner or otherwise, to give it a low elastic modular and the desired amount of stretch, and to one face of this sheet of leather is adhesively secured the elastic backing sheet 12. A perforated rubber sheet may be employed as the backing sheet but it is preferable to use a fine woven elastic fabric having a one-way stretch and having the elastic yarn 13 introduced therein either as warp or weft. These elastic yarns are preferably constructed in accordance with the Adamson Patent No. 1,822,847 for elastic yarn. Such a woven elastic backing sheet makes an excellent lining for the portion of the shoe in which the stretchable leather is embodied and makes the use of any other lining in this area unnecessary.

The sheets 11 and 12 are secured together by an adhesive binder 14 which is necessarily elastic to accommodate the stretch of the plied material and this adhesive binder is preferably the latex binder above described which is so applied to the leather and fabric that it will not appreciably interfere with the passage of air through the stretchable plied material. By using a latex adhesive compound which is not too fluid and by employing a sufficiently small amount it is practical to spray the same on the leather and fabric in separate globules or droplets which will not run together, and thereby provide an air-pervious binder between the plied sheets.

The stretchable plied sheet 10 is shown as having cut therefrom the vamp 15 and quarters 16 and 17 for use in forming the upper of the shoe of Fig. 1. The vamp and quarters are shown in Fig. 4 with the fabric face up so as to illustrate the direction in which the elastic yarns 13 extend in each.

The shoe illustrated in Figs. 1 and 2 differs from the ordinary oxford in that the entire vamp area of the shoe is formed of the stretchable vamp 15 which is placed in the shoe so that the elastic yarns extend transversely of the foot to impart to this part of the shoe a stretch and contractive force crosswise of the foot as indicated by the arrow *a*. The quarters 16 and 17, it will be noted, are so cut from the sheet 10 that the elastic yarns 13 extend in a diagonal direction. The arrangement is such that the portion of each quarter lying in the vicinity of

the throat stretches in the direction indicated by the arrow *b* whereas the portion of the quarter lying at each side of the foot stretches diagonally of the material. The shoe of Figs. 1 and 2 may be built upon a last as usual but it is desirable to secure a binding tape temporarily to certain portions of the inner face of the shoe material during the lasting operation to prevent the upper from stretching too much at this time.

The shoe may or may not have the usual box toe as there is no particular point to having the extreme toe of the shoe stretchable. The box toe is omitted in the construction shown. The vamp 15 as shown is secured to the forward portion of the quarters 16 and 17 by the usual seam 18 and these quarters are secured together at the rear of the shoe along the vertical seam 19. The shoe is shown as having the usual sole 20 and heel 21 and the forward ends of the quarters 16 and 17 may be provided with the usual eyelets to receive the shoe lacing 22, and the shoe is provided with a tongue 23. The upper edge of the shoe around the foot receiving opening may be variously finished to provide a smooth rounded stretchable edge and in the construction shown the finish is secured by skiving away the woven fabric 12 near the upper edge of the shoe so as to expose the inner face of the leather 11 as shown in Fig. 5. This exposed portion of the leather is then folded over upon the skived fabric 12 as shown in Fig. 6 and it may be secured in this folded condition by an adhesive and also by the zig-zag stitching 24 to thereby provide a smooth rounded upper edge 25 around the foot receiving opening that will stretch.

The construction of the shoe illustrated in Figs. 1 and 2 is such that the entire shoe upper is adapted to stretch and contract to accommodate the foot movements and to conform snugly but comfortably to the contour of the foot. This is just the reverse to the ordinary leather shoe as constructed heretofore wherein care is taken to prevent the shoe from stretching when worn.

In the present shoe the entire forepart or vamp area is so constructed that it will stretch transversely to relieve the pressure upon the toes and sensitive forepart of the foot whereas the upwardly converging portions of the quarter in the vicinity of the throat of the shoe will exert a yielding but comfortable pressure about the foot to thereby yieldingly support the arch of the foot and prevent the foot from crowding forward in the shoe, and the longitudinal stretch of the quarters at the sides of the foot causes the shoe to fit snugly at the heel and around the foot receiving opening. Such a shoe is extremely strong and durable and is capable of wearing as long and probably longer than the ordinary non-elastic leather shoe and is far more comfortable than the ordinary shoe, due to the fact that its stretch characteristics cause it to conform accurately to the contour of the foot and to yield to the foot movement.

Referring now to the modified construction shown in Fig. 7 wherein is illustrated a shoe in which the rear portion in the vicinity of the counter has the usual non-elastic construction and the forepart is constructed of the stretchable ply material 10 to thereby improve the fit of the shoe, and cause the same to stretch sufficiently to permit the insertion of the foot in the shoe and its removal therefrom without requiring the use of any form of fastening means even though the shoe illustrated is considerably higher

in the throat area than the ordinary step-in type of shoe.

The shoe of Fig. 7 may have the usual sole 26 and heel 27 but the entire forepart at each side of the shoe is formed of the stretchable laminated leather fabric 10. The heel embracing or counter portion 28, toe 29 and a narrow strip 30 extending upwardly along the throat of the shoe are formed of the usual non-stretchable leather. The fabric 10 is preferably so placed in the shoe that the elastic yarns 13 extend approximately parallel to the longitudinal axis of the shoe. This construction permits the shoe to stretch in the throat area from its normal position indicated by 30 to the dot and dash line position of 30'.

It is desired to point out that the stretchable portions 10 of the shoe of Fig. 7 and the non-stretchable portion 17 may be indistinguishable in appearance so far as the leather is concerned since it is perfectly feasible to make the shoe upper of matched portions of elastic and non-elastic leather whether such leather be suede or grain leather.

It is well known that it is extremely difficult for the ordinary person to secure a perfectly fitting shoe unless the shoe is custom made, due to the fact that the ordinary shoe is made upon a standard last and nearly every one's foot differs to some extent from the contour of the standard last of the size shoe he wears. As a result of the present invention it is not necessary to have a shoe custom made to secure a perfect fit since the stretch properties of the present shoe will cause it to mold or conform accurately to the foot of the wearer.

It is found that a shoe constructed as herein contemplated affords the foot better ventilation than the ordinary leather shoe, since in the present construction the permeability of the stretchable plied material 10 is very nearly the same as the permeability of the leather sheet 11 before the latex adhesive 14 is sprayed thereupon. This has been established by experiments in which pieces of the leather 11 which had not had the latex applied thereto were fastened in a frame and air was forced therethrough under a constant pressure. Then pieces of the finished elastic backed leather 10 were similarly tested, as were also pieces of the ordinary leather shoe upper over the arch of the foot. It was found that the presence of the light coating of sprayed latex does not affect the permeability of either the leather 11 or fabric 12 and that the permeability of the stretchable plied material 10 is far greater than the ordinary shoe upper having a leather outer surface and leather lining.

Having thus described my invention what I claim and desire to protect by Letters Patent is:

1. A shoe of the type described having the upper thereof formed in part of ordinary shoe upper leather and in part of an elastic plied material at the instep, said plied material consisting of an outer sheet of durable leather having a smooth unwrinkled surface and a substantial and easy stretch and being provided with an elastic backing sheet adhesively secured thereto and co-extensive therewith so that both sheets are free from stress in the relaxed plied material, and arranged to provide the shoe with an elastic area of said material at the instep that is capable of stretching and contracting with the longitudinal foot movement and of giving good wear in the shoe.

2. A shoe of the type described having the

upper thereof formed with an elastic plied material in the area of the instep, said plied material consisting of an outer sheet of durable leather at least $\frac{1}{64}$ of an inch thick having a smooth unwrinkled surface and a substantial and easy stretch and being provided with an elastic backing sheet adhesively secured thereto and coextensive therewith so that both sheets are free from stress in the relaxed plied material, and arranged to provide the shoe with an elastic area of said material at the instep that is capable of stretching and contracting with the longitudinal foot movement and of giving good wear in the shoe.

3. A shoe of the type described having the upper thereof formed in part of ordinary shoe upper leather and in part of an elastic plied

material at the instep, the outer face of the two being matched so that they are practically indistinguishable in appearance, said plied material consisting of an outer sheet of durable leather having a smooth unwrinkled surface and a substantial and easy stretch and being provided with an elastic backing sheet adhesively secured thereto and coextensive therewith so that both sheets are free from stress in the relaxed plied material, and arranged to provide the shoe with an elastic area of said material at the instep that is capable of stretching and contracting with the longitudinal foot movement and of giving as good wear as said ordinary shoe upper leather.

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