Jan. 23, 1951 S. M. GRISWOLD 2,538,776

METHOD OF MAKING INSOLES

Filed Dec. 19, 1946 2 Sheets-Sheet 1

Fig. 1

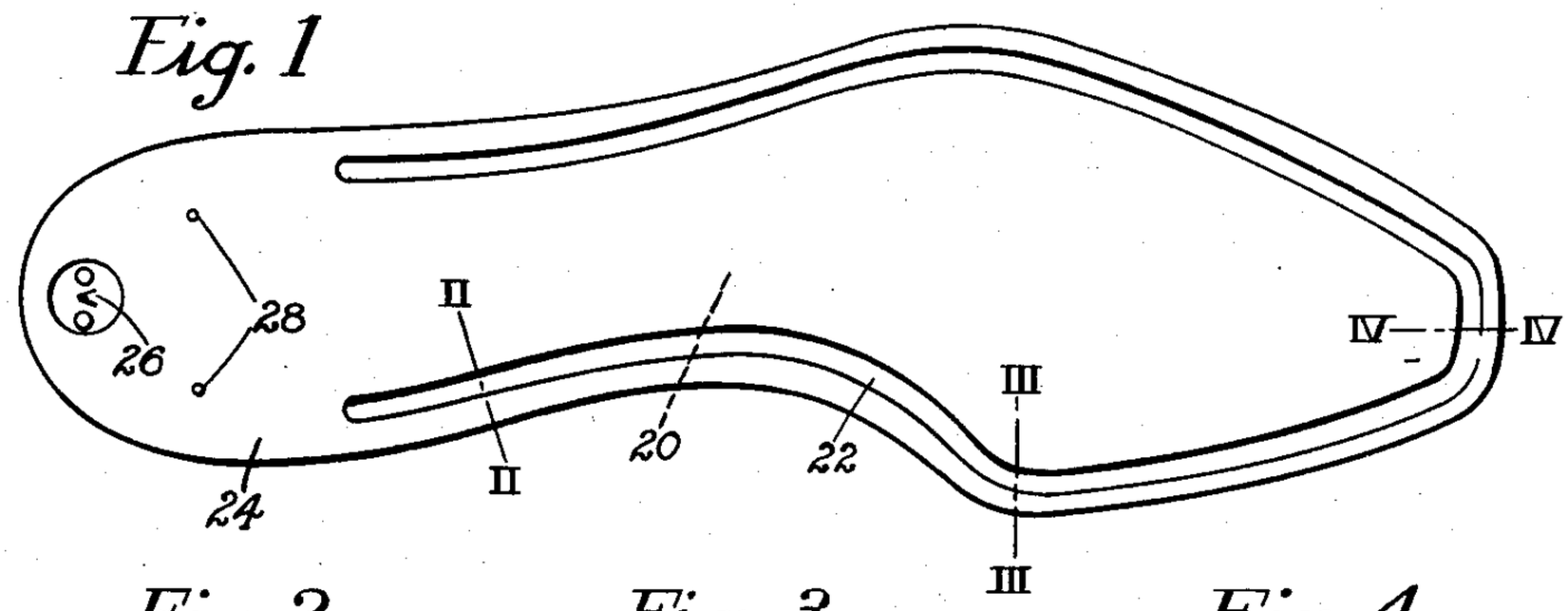


Fig. 2

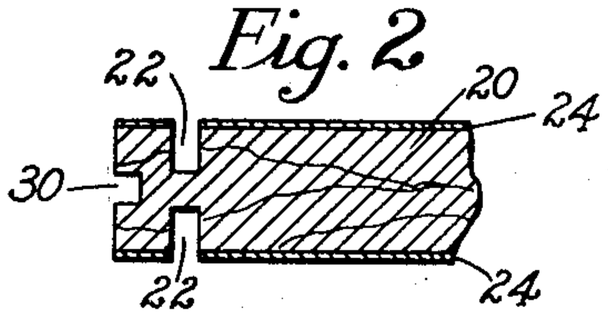


Fig. 3

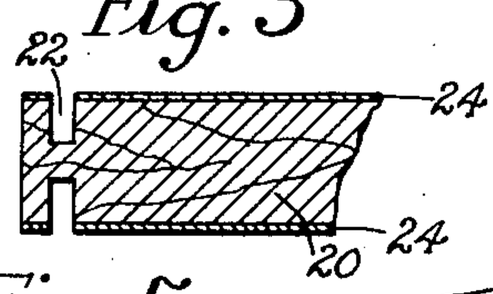


Fig. 4

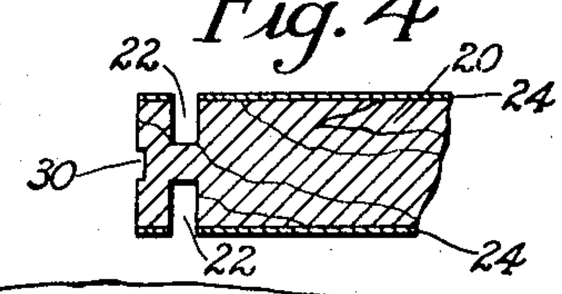


Fig. 5

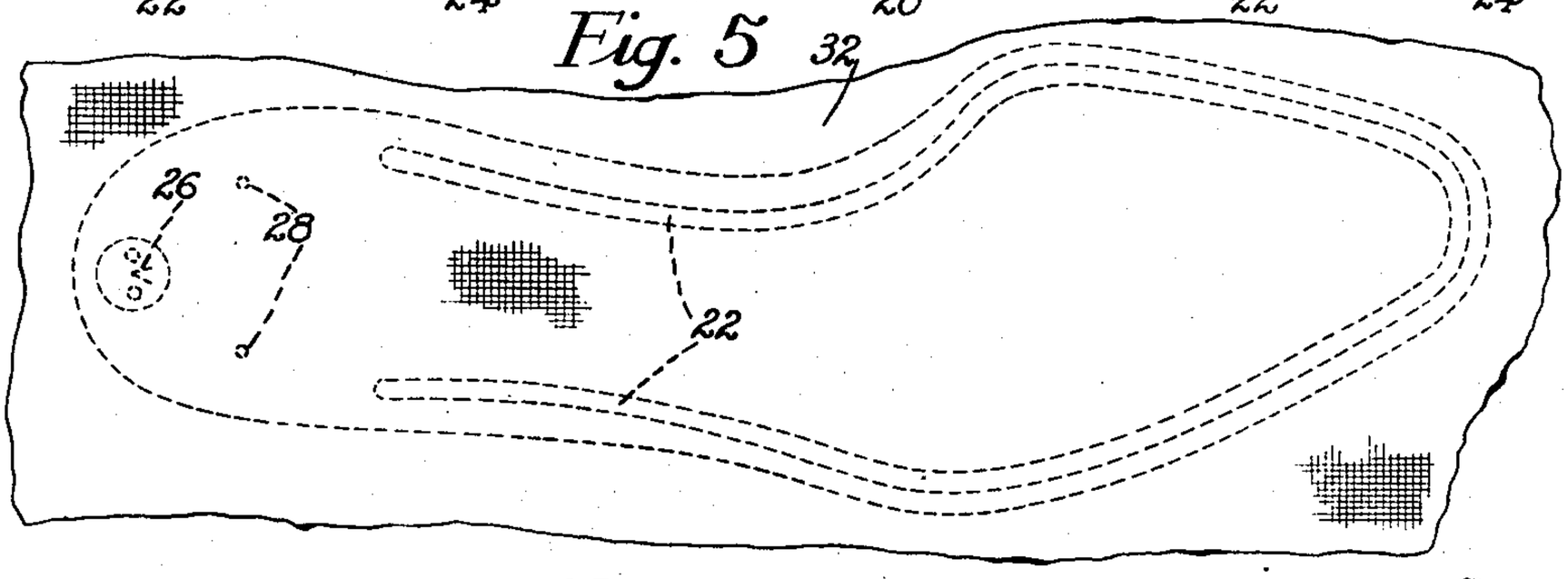


Fig. 6

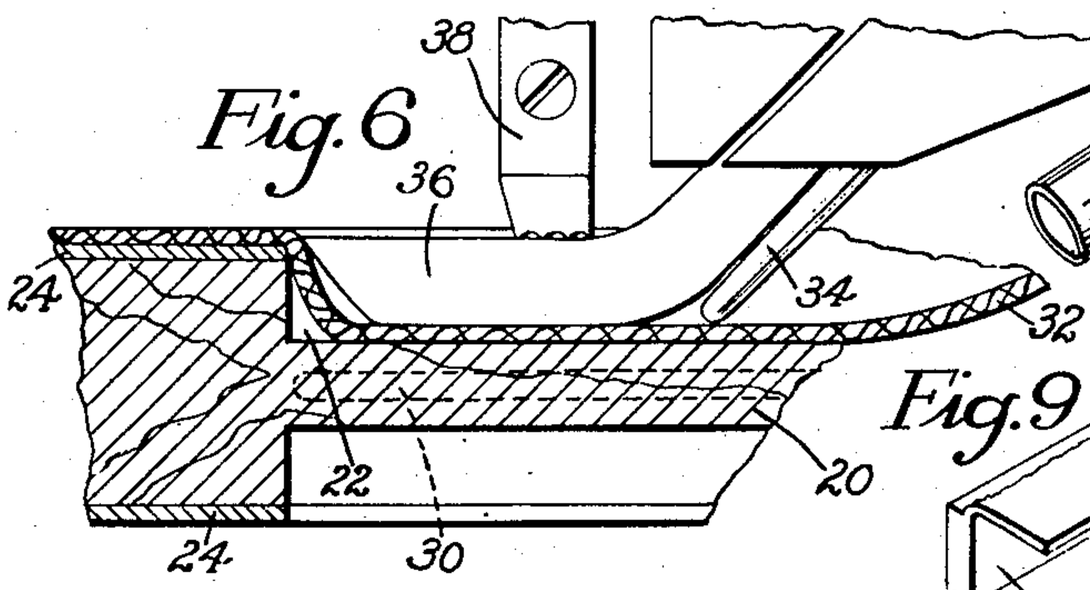


Fig. 7

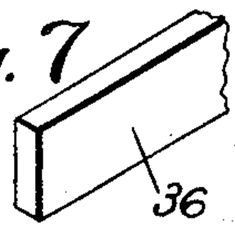


Fig. 8

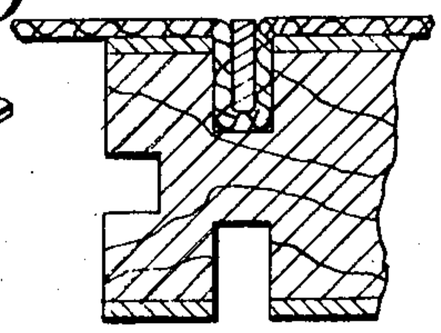


Fig. 9

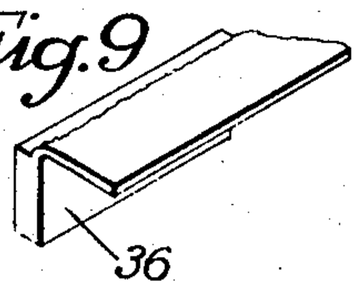


Fig. 11

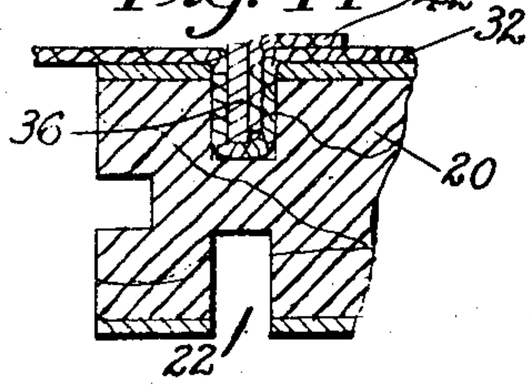
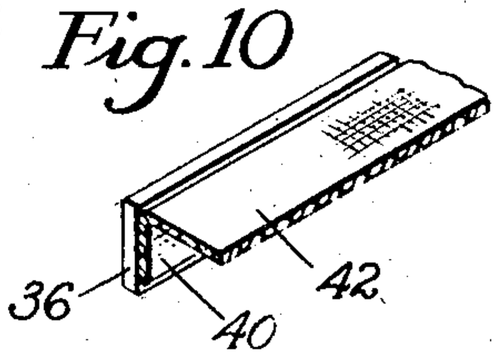


Fig. 10



Inventor

Stanley M Griswold

By his Attorney

Jan. 23, 1951 S. M. GRISWOLD 2,538,776

METHOD OF MAKING INSOLES

Filed Dec. 19, 1946 2 Sheets-Sheet 2

Fig. 12

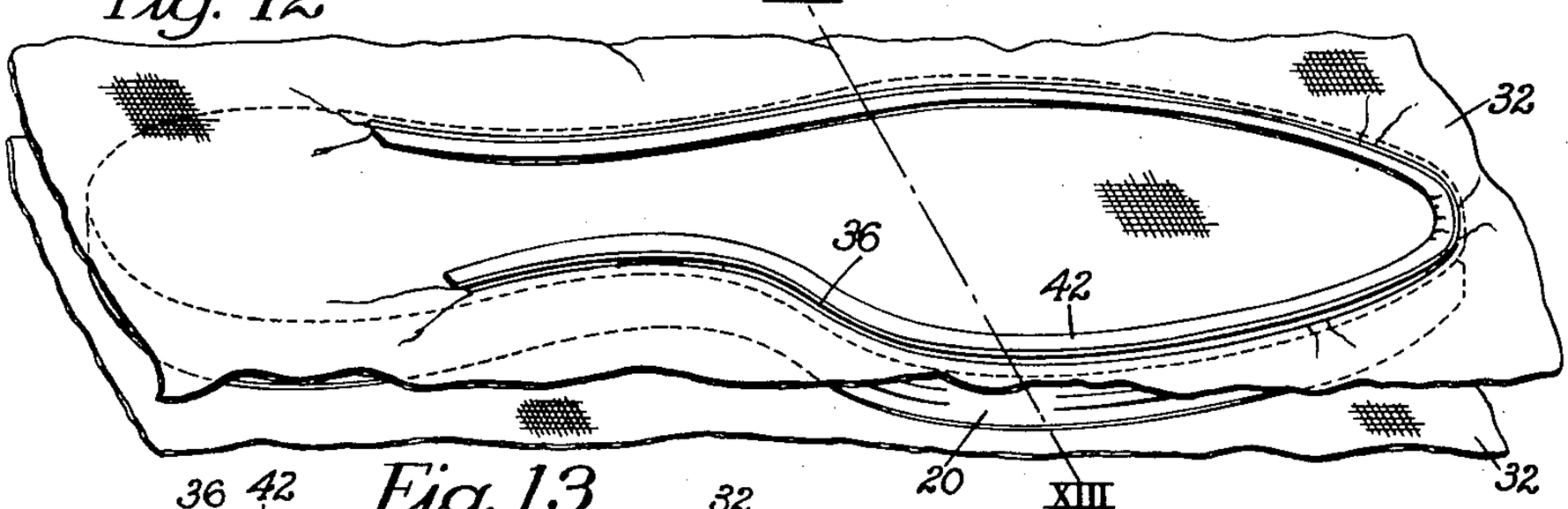


Fig. 13

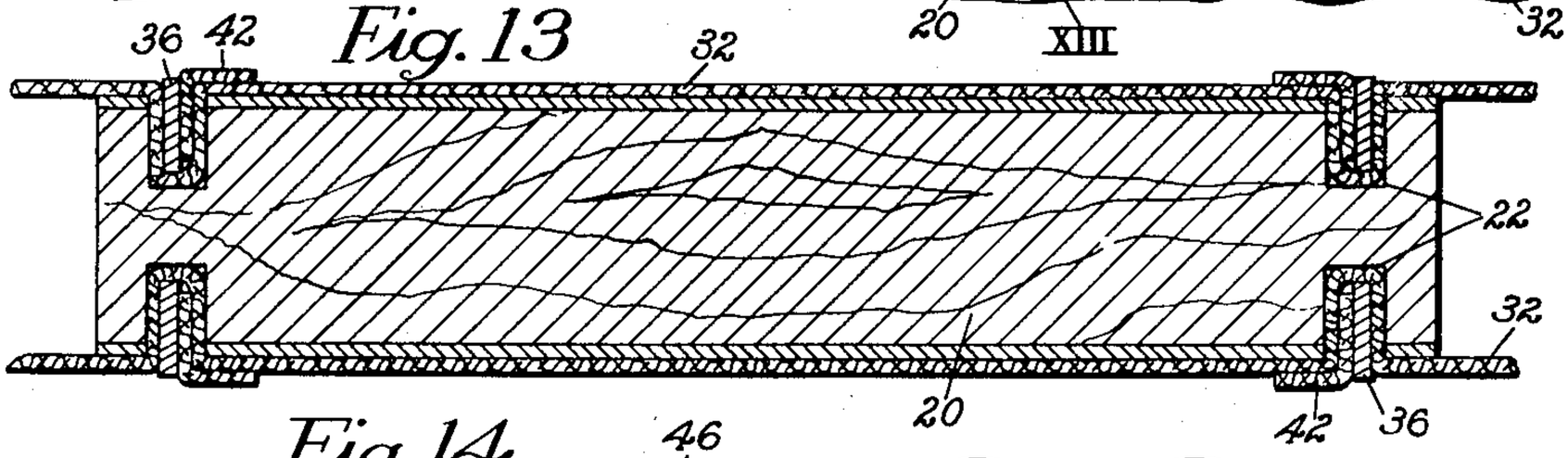


Fig. 14

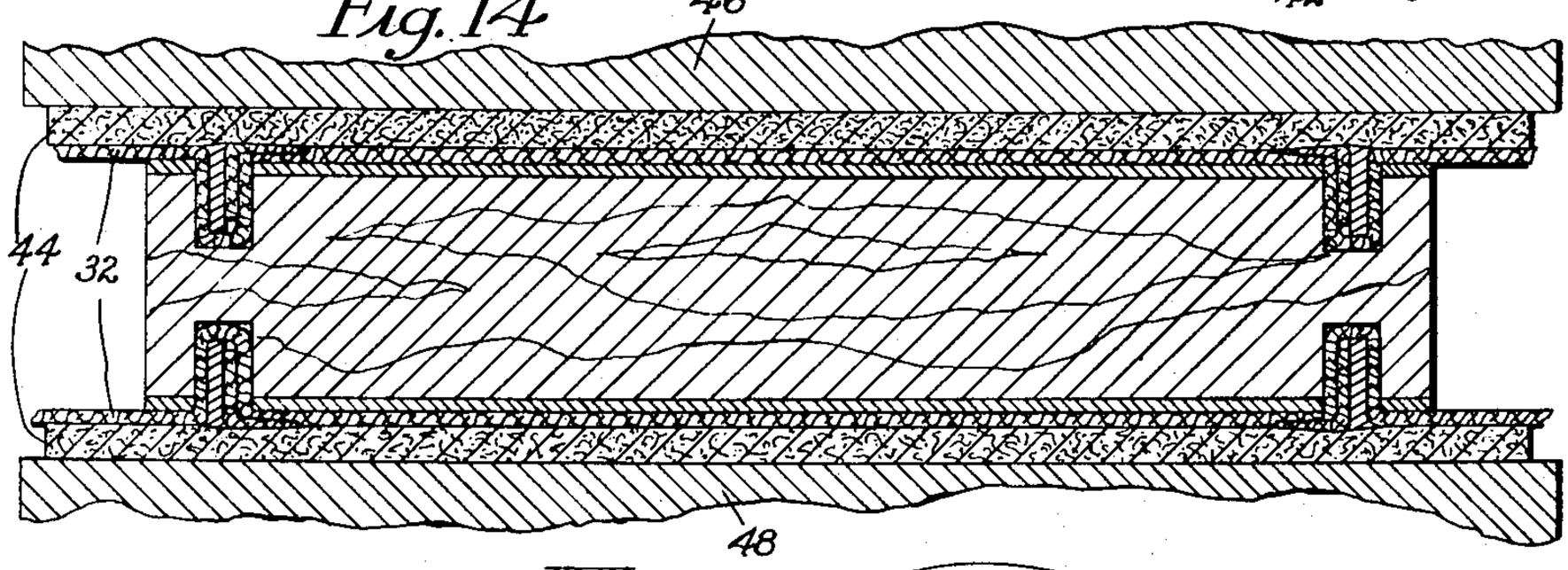


Fig. 16

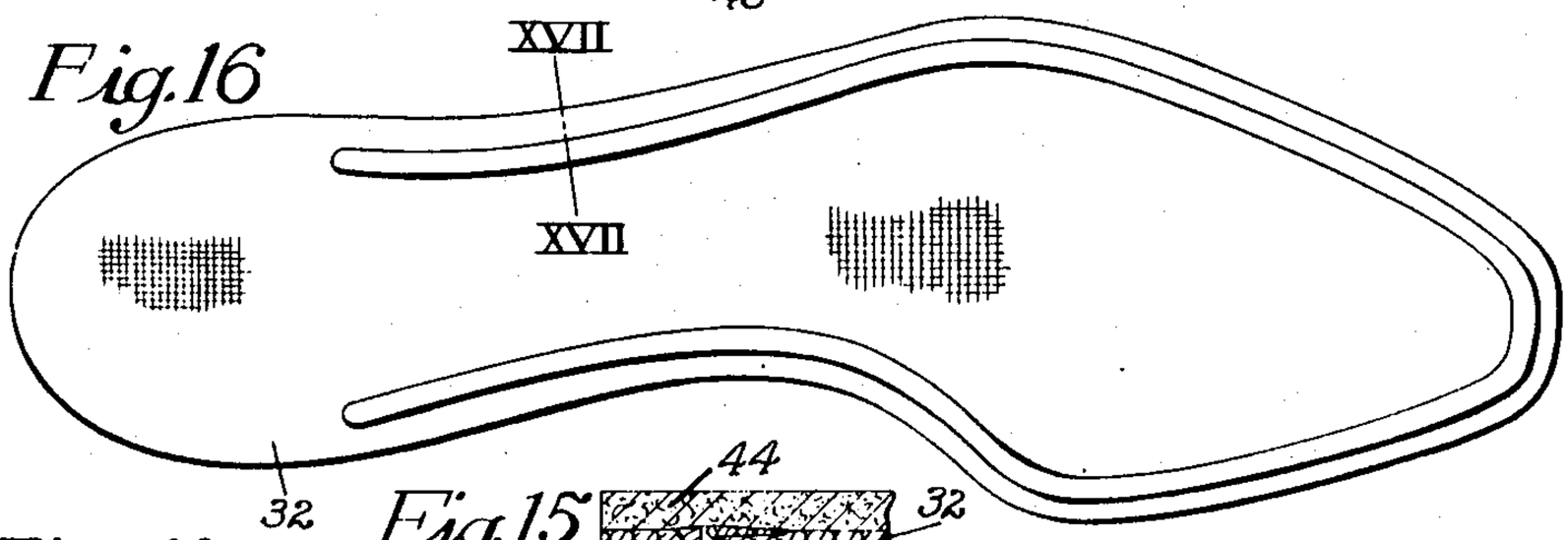


Fig. 17

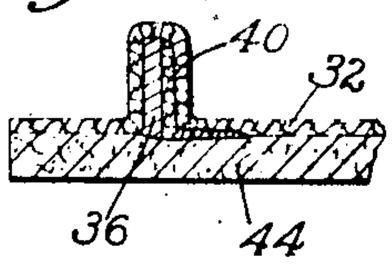
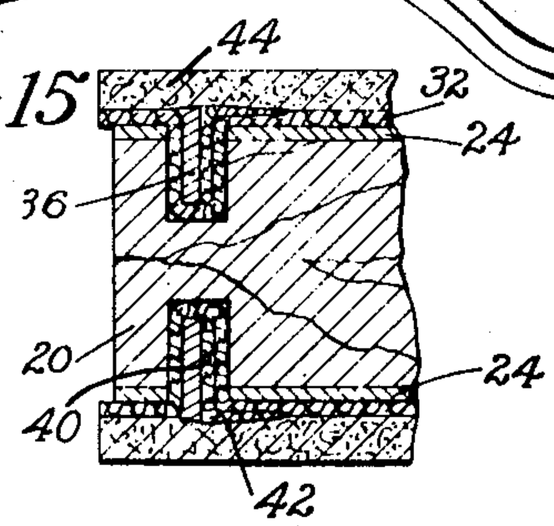


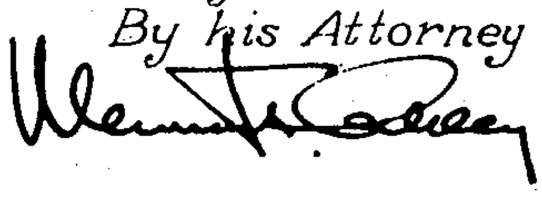
Fig. 15



Inventor

Stanley M. Griswold

By his Attorney



Patented Jan. 23, 1951 2,538,776

UNITED STATES PATENT OFFICE

2,538,776

METHOD OF MAKING INSOLES

Stanley M. Griswold, West Newton, Mass., assignor to B. B. Chemical Co., Boston, Mass., a corporation of Massachusetts

Application December 19, 1946, Serial No. 717,121

23 Claims. (Cl. 12—146)

1

This invention relates to methods of making insoles.

Objects of the invention are to provide substantially identical insoles for welt work and pairs of such insoles each of which is the mirror image of the other, and also to provide methods of making welt insoles with ribs having the strength and rigidity successfully to withstand the strains incident to the making of a welt shoe as well as those due to subsequent wear.

Another object is to provide methods of making insoles the ribs of which are located at precisely predetermined, varying distances from the edges of the insoles or, differently stated, methods of making insoles in each of which the feather varies in width at different parts of the insole according to a predetermined plan, the width being usually greatest in the shank portion, less about the toe, and still less at the ball.

Still another object of the invention is to improve the method of making insoles disclosed in United States Letters Patent No. 1,382,818, granted June 28, 1921, in the names of D. W. Bunker and C. M. Bradford, which patent discloses an insole of the same general type as that of the present invention.

This prior insole requires for its formation a mold contoured to correspond to the last bottom and having a groove therein corresponding in location to that of the desired rib and a cooperating contoured patrix by which the canvas is forced into all portions of the groove simultaneously to form the rib and to mold the insole.

The term "canvas" will be generally used hereinafter to designate the layer of the insole in which the rib is formed. The fabric usually used for reinforcing insoles, known as gem duck, is suitable for the purpose. It is to be understood, however, that other suitable fabrics, whether woven or not, may be employed.

The present invention employs a flat grooved matrix in place of the mold and, by progressively tucking the canvas into the groove, dispenses entirely with the use of a corresponding patrix, thus greatly reducing the cost of the apparatus for making such insoles. Moreover, the matrix being flat, each side thereof can readily be provided with a rib-forming groove, one groove being exactly opposite to the other so that a mating pair of insoles is made with a single solid matrix.

The prior method requires dieing out of the canvas and body portions and their careful registration on the molds for the molding operation, whereas by the present method the canvas and body portions may be of indefinite shape, and, the

2

matrix being of the shape of the last bottom pattern, its edge face is used as a guide in the final trimming operation to produce a pair of insoles which exactly fit the bottoms of a pair of lasts when conformed thereto. The method of the prior patent requires sewing of the canvas and body portions together, whereas by the method of the present invention the adhesive bond between the canvas and body portion is alone sufficient to produce a satisfactory insole.

The insole comprises a body layer and an all-over layer of stiffened canvas in which the rib is formed by a fold of canvas containing a core piece of suitable material to impart the requisite strength and rigidity to the rib. The core piece preferably has a flange directed inwardly of the insole beneath the canvas to withstand the thrust of the channel guide and the tension of the stitches by which the welt and upper are secured to the rib. As illustrated, the core piece is of firm material, such as pasteboard or fibrous material impregnated with latex, and may have secured to its inner face one part of an L-shaped strip of material such as canvas, the other part forming a flange extending inwardly of the insole between the body layer and the canvas, thus forming a reinforcement for the rib in the locality where the channel guide runs and where the awl strikes in forming a hole for the needle of the inseam stitching machine.

The canvas used is preferably treated with a stiffening material which imparts thereto greater firmness and prevents the cement, such as latex, which is later applied to its surface from being absorbed too much by the canvas. The stiffening material should be such that the canvas treated therewith is limp or can be rendered limp temporarily during the working of it into the matrix groove and will stiffen after that operation. The stiffening material may be thermoplastic so as to be rendered limp by application of heat or it may be a stiffening material that can be rendered temporarily limp by light application of a solvent. In any case, the stiffening material should be water-resistant. Examples of such materials will be given later.

In making such insoles, a matrix is employed which is preferably made by practice of the method disclosed and claimed in a copending application for Letters Patent of the United States Serial No. 717,122, filed December 19, 1946, in the names of Stanley M. Griswold and Hans C. Paulsen.

This matrix consists of a block of suitable material having the shape of the desired insole

and having opposite parallel faces in each of which is formed a groove as wide as the thickness of the desired rib and of a depth corresponding to the height of rib desired, each groove being located with respect to the edge of the block substantially as the rib is to be located with respect to the edge of the insole. In the edge face of the matrix is a groove ending at the breast line for use in locating the matrix for subsequent operations thereon, the bottom of said groove being at a uniform predetermined distance from the rib grooves. For convenience in trimming the insole, the matrix is preferably made somewhat smaller than the desired insole, for example one thirty-second of an inch. The matrix may be provided at its heel portion on each side with a tang to hold one end of the piece of canvas and with a pair of pins to prevent the heel portion of the insole from shifting on the matrix during a subsequent trimming operation.

The invention comprises a method of making insoles which may be implemented by the above-referred-to matrix. A piece of canvas, preferably prepared as above described, is laid cement side out upon the matrix, the tang at the heel end being used to hold one end of the canvas while pulling it straight. The matrix may be located for the following operation by a stop engaging the rear end of the groove in its edge face, and then beginning at the breast line on one side of the matrix the canvas is progressively tucked by a suitable tool into the groove on the upper side of the matrix, thus forming a fold in the canvas, the matrix being guided for the operation of the tool by a guide engaging the bottom of the groove in the edge face of the matrix. Into this fold, immediately after its formation, a core piece may be inserted, the formation of the fold and the insertion of the core piece being continued progressively about the matrix until the other end of the breast line is reached. The tucking and core-piece-inserting operations are facilitated by rendering the stiffened canvas limp during the operation thereon. Where a solvent-softenable stiffening material is used, a solvent for the stiffening material is applied to render it limp, the solvent evaporating after the tucking and core-piece-inserting and restoring the canvas to a stiffened condition. When a thermoplastic stiffening material is used, it is convenient to render the canvas limp by heating it. This may be done by directing a blast of hot air upon the canvas in the region where the tucking and core-piece-inserting operations are taking place. The canvas is quickly restored to its stiffened condition as it cools.

After performing the above-described operations on one side of the matrix, it is turned the other side up and the operations repeated on that side of the marix.

A body layer which has been coated on one side with cement, such as natural or synthetic latex, is applied to each side of the matrix with its cement side in contact with the cemented canvas thereon and the assembly subjected to pressure to cause the body layer on each side of the matrix to become firmly bonded to the canvas layer. The parts of the body layer and canvas which extend beyond the edge face of the matrix are now trimmed away one thirty-second of an inch outwardly beyond the edge face of the matrix, allowance for this having been made in making the matrix. The pair of completed, accurately mated and accurately sized insoles

are then removed from the matrix. When a body layer of flexible material such as split leather is employed, insoles which readily conform to the last bottom without molding are produced, and by this method there is no restriction as to the character of the body layer which may be as thin and flexible as is desired. Thus the flexibility of the insole is under control of the manufacturer, the requisite strength in the insole being provided for largely by the stiffened canvas.

These and other features of the invention will appear more fully from the following description when read in connection with the accompanying drawings and will be pointed out in the appended claims.

In the drawings,

Fig. 1 is a plan view of the matrix;

Figs. 2, 3 and 4 are respectively sections of the matrix taken on the line II—II, III—III and IV—IV of Fig. 1;

Fig. 5 is a plan view showing the matrix with a piece of convas applied thereto and held by the tang at its rear end;

Fig. 6 is a view, partly in section, showing the operation of progressively tucking the canvas into the groove and inserting a core piece into the fold of the canvas;

Fig. 7 is a perspective view of the form of the core piece illustrated in Fig. 6;

Fig. 8 is a fragmentary, transverse section of the matrix after the operation illustrated in Fig. 6 has been performed;

Fig. 9 is a perspective view of a core piece having an integral flange;

Fig. 10 is a perspective view of a core piece similar to Fig. 7 in which part of an L-shaped strip of canvas has been cemented to the core piece, the remainder of the canvas forming a flange thereon;

Fig. 11 is a fragmentary sectional view of the matrix after the core piece illustrated in Fig. 10 has been introduced into the fold of canvas by the operation illustrated in Fig. 6;

Fig. 12 is a perspective view of the matrix after the canvas and the core piece of Fig. 10 have been progressively formed into the groove by the method illustrated in Fig. 6;

Fig. 13 is a transverse section of the matrix on the line XIII—XIII of Fig. 12;

Fig. 14 is a sectional view similar to Fig. 13 showing the matrix of Fig. 12 after the body layers have been applied to each side of the matrix and pressure applied thereto between platens of a press;

Fig. 15 is a fragmentary sectional view of the matrix and the two insoles after the portions of the body layers and canvas projecting beyond the matrix have been trimmed;

Fig. 16 is a plan view of the completed insole; and

Fig. 17 is a sectional detail on the line XVII—XVII of Fig. 16.

The matrix, as shown in Figs. 1 to 4, consists of an insole-shaped block 20 of suitable material having parallel, flat faces in each of which is formed a groove 22 corresponding in depth, width and location to the height, thickness and location of the ribs to be formed on a pair of insoles. When the material used for the block is not of a very durable nature, for example hard wood, each face of the block, before grooving, is reinforced by cementing to each face a thin plate 24 of metal such as aluminum alloy. Near the heel end of the matrix on each side is a tang 26 on

which the end portion of a piece of canvas or duck may be impaled. Pins **28** are also provided at the heel end of the matrix on each side to prevent lateral shifting of the heel portion of the insole with respect to the matrix during trimming. The trimming is preferably done about $\frac{1}{32}$ of an inch from the matrix and therefore the matrix is made $\frac{1}{32}$ of an inch smaller all around than the size of the insole desired. A groove **30**, the bottom of which is at a predetermined uniform distance from the grooves **22**, is formed in the edge face of the matrix, the rear end of this groove being utilized in locating the matrix for subsequent operations.

The canvas may be treated with various water-resistant stiffening materials which can be destiffened to facilitate the tucking operation. The stiffening materials may be thermoplastics such as rosin, rosin derivatives and coumarone-indene resin V, which may be that manufactured by The Barrett Company, 40 Rector Street, New York, N. Y., the requisite being that the canvas may be rendered temporarily limp by application of heat hereto to facilitate forming it into the groove of the matrix and, upon cooling, will reassume its strength and stiffness.

The stiffening material may be one that can be rendered limp by application of a solvent thereto just before the canvas is applied to the matrix, evaporation of the solvent after the tucking operation restoring the canvas to its stiffened condition. Examples of material that may be so used are zein, which may be dissolved in an alcohol-water solution, for example 83% alcohol, 17% water, pyroxylin dissolved in acetone, or cellulose acetate dissolved in acetone, methylethylketone, alcohol or xylol. The stiffening solution is applied to the canvas and allowed to dry and, just before the piece of canvas is applied to the matrix, it receives a light application of the appropriate solvent which renders it limp to assist the tucking operation and soon evaporates to render the canvas stiff again.

A piece of canvas **32** (Fig. 5), which has been treated with a stiffening solution (for example, a 15% solution of the above-mentioned resin in naphtha) and allowed to dry and then coated with natural or synthetic latex and allowed to dry, is laid on the matrix cement side up and pressed down on the tang **26**. The canvas is then pulled straight and progressively tucked by a tool **34** (Fig. 6) into the groove **22**, starting at the breast line on one side and extending along the shank and forepart to the other end of the breast line. Concomitantly with the tucking of the canvas **32** into the groove **22**, a core piece **36** (Fig. 7) may be tucked into the fold made in the canvas by tucking it into the groove and is hammered down by a hammer **38** flush with the canvas covering the matrix. The cross-section of the matrix after this operation is shown in Fig. 8.

In order to facilitate the tucking of the canvas into the groove, a blast of hot air is blown through a tube **39** (Fig. 6) upon that portion of the canvas where the tucking operation is occurring. The hot air, by heating the stiffening material and the cement on the canvas, renders it temporarily limp and tractable so that it can readily be tucked into the groove. The softened materials as they cool assist in holding the core piece **36** firmly in place. To supply the blast of hot air, apparatus similar to that disclosed in United States Letters Patent No. 1,777,744, granted October 7, 1930, and No. 1,869,737, granted August 2, 1932, in the name of A. A. Breuer, may be employed.

While the canvas-tucking and core-piece-inserting operations may be performed by hand, I prefer to employ a machine of the type disclosed and claimed in United States Letters Patent No. 2,493,207, granted January 3, 1950, and No. 2,494,578, granted January 17, 1950, in the name of Hans C. Paulsen, by which the location of the matrix by the groove **30**, the tucking of the canvas into the groove **22**, and the insertion of the core piece **36** into the fold of the canvas are performed substantially simultaneously, that is, concomitantly.

Preferably a core piece having a reinforcing flange is employed. The flange may be integral with the core piece, as shown in Fig. 9, or it may be formed by a wider strip of canvas **40**, one half of which is cemented to the core piece **36** and the other half bent at right angles to form a flange **42**. A section of the matrix, after the above-described operations have been performed using the flanged core piece of Fig. 10, is shown in Fig. 11.

The operations of applying canvas and tucking it into the groove are then repeated upon the opposite side of the matrix, the assembly then appearing as shown in Figs. 12 and 13. Insole body blanks **44**, which have been prepared by coating one side thereof with natural or synthetic latex cement and allowed to dry, are placed one on each side of the matrix, their cemented faces in contact with the canvas on the matrix. This assembly is then subjected to heavy pressure, for example between platens **46**, **48** of a press such as a hydraulic press, thus causing the body portions **44** to be firmly bonded to the canvas layers **32**. A section of the matrix during the pressing operation is shown in Fig. 14.

The portions of the canvas **32** and of the body blanks **44** which extend beyond the edge face of the matrix are now trimmed away, the cuts being made about $\frac{1}{32}$ of an inch from the edge face of the matrix as shown in Fig. 15. The trimming operation may advantageously be performed by use of the machine disclosed and claimed in United States Letters Patent No. 2,472,228, granted June 7, 1949, or by the machine disclosed and claimed in an application for United States Letters Patent Serial No. 30,005, filed May 29, 1948, both in the name of Hans C. Paulsen. The pair of completed mating insoles is now removed from the matrix, which may be used indefinitely to produce pairs of insoles, the right insoles being identical and one of each pair being the exact mirror image of the other.

One of the completed insoles is shown in Fig. 16, the other being, of course, exactly similar except that it is for the other foot. A section of a portion of the completed insole is shown in Fig. 17.

The insole herein disclosed but not claimed is being disclosed and claimed in an application for Letters Patent of the United States Serial No. 30,799, filed June 3, 1948, in my name.

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

1. That improvement in methods of making welt insoles which comprises providing an insole-shaped matrix having a rib-forming groove therein, applying a layer of fabric over the matrix, and progressively tucking the fabric into the groove in the matrix.

2. That improvement in methods of making welt insoles which comprises providing a matrix having the shape and substantially the size of the

insole desired and having therein a groove corresponding to the desired location of an insole rib, laying a sheet of canvas over the grooved face of the matrix, progressively tucking the canvas into the groove, cement-attaching a body blank to the canvas, and trimming the canvas and body blank to the shape of the matrix.

3. That improvement in methods of making welt insoles which comprises providing an insole-shaped matrix having a rib-forming groove therein, applying a layer of canvas over the matrix, progressively tucking the canvas into a groove to form a fold therein and concomitantly inserting a core piece into the fold of canvas.

4. That improvement in methods of making welt insoles which comprises providing an insole-shaped matrix having a rib-forming groove therein, applying a layer of canvas over the matrix, progressively tucking the canvas into the groove, progressively inserting a core piece into the fold of the canvas, and cementing a body blank into the canvas while the rib is in the groove.

5. That improvement in methods of making welt insoles which comprises providing an insole-shaped matrix having a rib-forming groove therein, providing a layer of canvas impregnated with thermoplastic stiffening material, laying the stiffened canvas over the matrix, heating the canvas to make it limp, and progressively tucking the canvas into the groove of the matrix.

6. That improvement in methods of making welt insoles which comprises providing an insole-shaped matrix having a rib-forming groove therein, providing a layer of canvas stiffened with thermoplastic resinous material, applying the stiffened canvas to the matrix, blowing hot air on the canvas locally to render it limp, progressively tucking the limp canvas into the groove of the matrix, and simultaneously and progressively inserting a core piece into the fold of the canvas.

7. That improvement in methods of making welt insoles which comprises providing an insole-shaped matrix having a rib-forming groove therein, applying over the groove in the matrix a layer of canvas stiffened which consists in stiffening the canvas with thermoplastic material, blowing hot air upon the canvas to render it limp, and progressively tucking the limp canvas into the groove.

8. That improvement in methods of making welt insoles which comprises providing an insole-shaped matrix having a rib-forming groove therein, providing a layer of canvas larger than the matrix stiffened which consists in stiffening the canvas with thermoplastic material, blowing hot air on the canvas to render it limp, progressively tucking the canvas into a groove, and progressively and simultaneously inserting a core piece into the fold in the canvas.

9. That improvement in methods of making welt insoles which comprises providing an insole-shaped matrix having a rib-forming groove therein, providing a layer of canvas larger than the matrix, stiffening the canvas with water-resistant material, rendering the canvas temporarily limp, progressively tucking the canvas into a groove to form a rib, and securing a body portion to the canvas.

10. That improvement in methods of making welt insoles which comprises providing an insole-shaped matrix having a rib-forming groove therein, providing a layer of canvas to cover the matrix, applying a solution of stiffening material to the canvas, letting it dry, then treating

the canvas to render it temporarily limp, progressively tucking the canvas into a groove to form the rib, and securing a body portion to the canvas.

11. That improvement in methods of making welt insoles which comprises stiffening canvas with thermoplastic stiffening material, providing an insole-shaped matrix having a rib-forming groove therein, applying the stiffened canvas to the matrix, heating the canvas to render it limp, and progressively tucking the canvas into a groove to form a rib thereon.

12. That improvement in methods of making welt insoles which comprises providing a matrix of the size and shape of an insole having therein a groove corresponding to the desired location of an insole rib, laying a piece of canvas impregnated with thermoplastic material over the matrix, blowing hot air locally on the canvas to render it limp, progressively forcing the limp canvas into the groove, cementing an insole body blank to the canvas, trimming the canvas and body blank to the shape of the matrix, and removing the insole from the matrix.

13. That improvement in methods of making welt insoles which comprises providing an insole-shaped matrix having a rib-forming groove therein, applying a layer of fabric over the matrix, progressively tucking the canvas into a groove, progressively inserting a core piece having an inwardly directed flange into the fold of the canvas, and cementing a body blank to the canvas while the rib is in the groove.

14. That improvement in methods of making welt insoles which comprises providing a matrix of the size and shape of an insole having therein a groove corresponding to the desired location of an insole rib, laying a piece of canvas over the matrix and progressively forcing the canvas into the groove, cementing an insole body blank to the canvas, trimming the canvas and body blank to the shape of the matrix, and removing the insole from the matrix.

15. That improvement in methods of making welt insoles which comprises providing a matrix having the shape and substantially the size of the insole desired and having in one face a groove corresponding in depth, width and location to the height, thickness and location of the desired rib, forming a piece of canvas into the groove, forcing a core piece into the fold of canvas thus formed, applying to the canvas an insole body blank, and trimming the canvas and body blank to the shape of the matrix.

16. That improvement in methods of making welt insoles which comprises providing a matrix having the shape and substantially the size of the insole desired and having in one face a groove corresponding in depth, width and location to the height, thickness and location of the desired rib, forming a piece of canvas into the groove, forcing a core piece having a flange thereon directed inwardly of the insole into the fold of canvas thus formed, applying to the canvas an insole body blank, and trimming the canvas and body blank to the shape of the matrix.

17. That improvement in methods of making welt insoles which comprises providing a matrix having a flat face of the shape and substantially the size of the insole desired and having in said face a groove corresponding in depth, thickness and location to the height, thickness and location of the desired rib, progressively forming a piece of canvas into the groove of the matrix and substantially simultaneously progressively introduc-

ing a core piece into the fold of canvas thus formed, applying to the canvas on the matrix a cemented insole body blank, applying pressure to cause adhesion between the body blank and the canvas, and trimming the canvas and body blank to the shape of the matrix.

18. That improvement in methods of making welt insoles which comprises providing a matrix having flat parallel faces of the shape and substantially the size of the insole desired and having in each flat face a groove corresponding in depth, thickness and location to the height, thickness and location of the desired rib, progressively forming a piece of canvas into the groove on one face of the matrix and substantially simultaneously progressively introducing a core piece into the fold of canvas thus formed, repeating the operation on the other flat face of the matrix, applying to each face of the matrix an insole body blank, applying pressure to cause adhesion between the body blanks and the canvas, and trimming the canvas and body blank to the shape of the matrix.

19. That improvement in methods of making welt insoles which comprises providing a matrix of the shape of an insole, said matrix having in each face a groove corresponding in location to the desired location of the insole rib, laying a piece of canvas on one side of the matrix, progressively tucking the canvas into the groove, reversing the matrix, applying another piece of canvas to the other side of the matrix, progressively forming the canvas into the groove, cementing an insole body blank to the canvas on each side of the matrix, trimming the canvas and said body blank on each side of the matrix to the shape of the matrix, and removing therefrom the two completed insoles.

20. That improvement in methods of making welt insoles which comprises providing a matrix having the shape and substantially the size of the insole desired and having therein a groove corresponding to the desired location of an insole rib, laying a sheet of canvas containing softenable stiffening material over the grooved face of the matrix, softening the stiffening material, progressively tucking the softened canvas into the groove throughout the extent of the groove, cement-attaching a body blank to the canvas, and trimming away portions of the canvas and body blank extending beyond the edge of the matrix.

21. That improvement in methods of making welt insoles which comprises providing a matrix having the shape and substantially the size of the insole desired and having therein a groove corresponding to the desired location of an insole rib, laying a sheet of canvas carrying thermoplastic stiffening material over the grooved face of the matrix, progressively heating the canvas at the working point to render it limp, progressively tucking the limp canvas into the groove throughout its extent, cement-attaching a body blank to the canvas, and trimming the body blank and canvas to the shape of the matrix.

22. That improvement in methods of making welt insoles which comprises providing a matrix having the shape and substantially the size of the insole desired and having therein a groove corresponding to the desired location of an insole rib, laying a sheet of canvas over the grooved face of the matrix, progressively tucking the canvas into the groove, progressively inserting a core piece into the fold formed by the tucking operation concomitantly therewith, cement-attaching a body blank to the canvas, and trimming away portions of the body blank and canvas extending beyond the matrix.

23. That improvement in methods of making welt insoles which comprises providing a matrix having the shape and substantially the size of the insole desired and having therein a groove corresponding to the desired location of an insole rib, laying a sheet of canvas stiffened with thermoplastic resinous material over the grooved face of the matrix, blowing hot air on the canvas locally to render it limp, progressively tucking the limp canvas into the groove to form a fold therein and simultaneously and progressively inserting a core piece into the fold of the canvas, cementing a body blank to the canvas, and trimming the body blank and canvas to the shape of the matrix.

STANLEY M. GRISWOLD.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,018,132	Preble	Feb. 20, 1912
1,022,391	Preble	Apr. 2, 1912
1,175,200	Thompson	Mar. 14, 1916
1,382,818	Bunker et al.	June 28, 1921
2,068,706	Ray	Jan. 26, 1937
2,142,332	Ridderstrom	Jan. 3, 1939
2,348,327	Calleo	May 9, 1944
2,361,941	Harrison	Nov. 7, 1944

FOREIGN PATENTS

Number	Country	Date
211,776	Germany	July 15, 1909
315,522	Germany	Nov. 7, 1919

Certificate of Correction

Patent No. 2,538,776 January 23, 1951

STANLEY M. GRISWOLD

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 7, lines 46 and 47, and lines 55 and 56, strike out the words "which consists in stiffening the canvas";

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office

Signed and sealed this 29th day of May, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.