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1,992,439

METHOD OF MAKING ARCH SUPPORTS

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Fig. 1

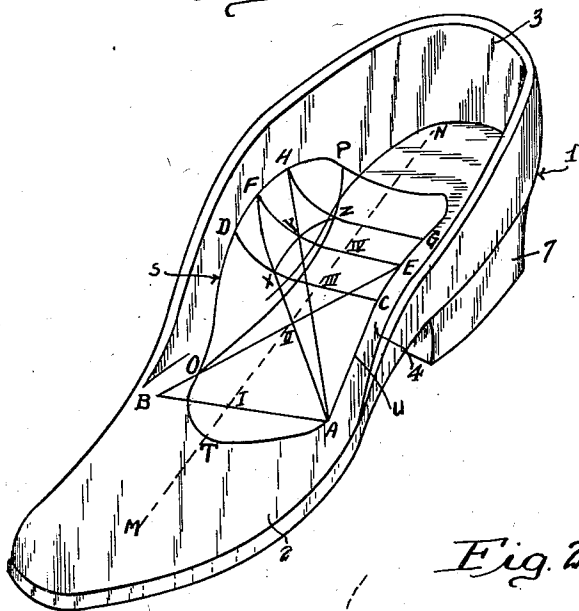


Fig. 4

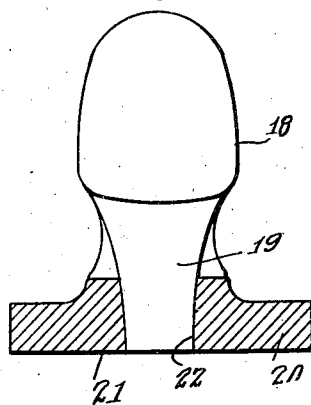


Fig. 2

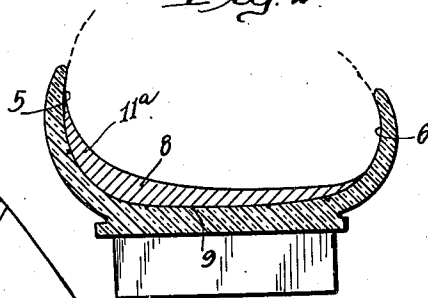
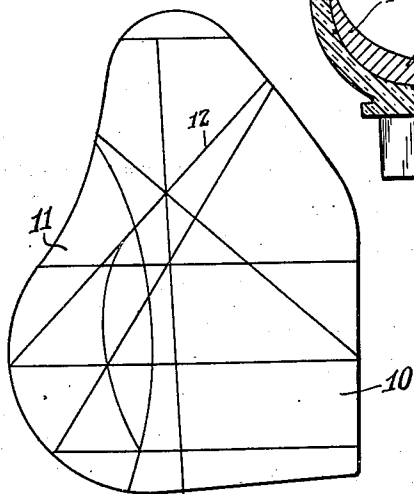
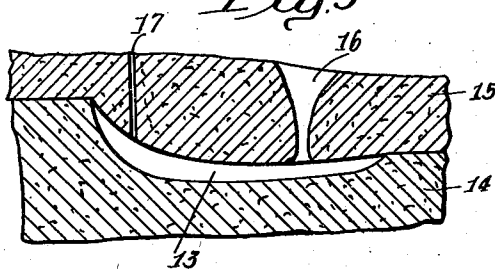


Fig. 3

Fig. 5



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METHOD OF MAKING ARCH SUPPORTS

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9 Claims. (Cl. 12-146)

This invention relates to a method for producing correct arch supports to be worn in a shoe. When pressure is put upon a foot, the arch flexes in a certain way characteristic of that foot, and another foot of the same size and shape and capable of wearing the same shoe may have its arch flex in a different manner so that the two individual feet would require a differently shaped arch support.

It is also a fact that the height of a heel has an important effect on the weight distribution on the foot in the shoe. A relatively higher heel tends to throw increased weight on the forward portion of the foot and tends also to produce a different effect in the flexing of the arch of the foot from the distortion of the arch that would arise from the use of a lower heel.

It is common practice to provide the same arch support for a shoe of a certain size and last with the expectation that the arch support will be satisfactory for any person who may buy the shoe. In fact, it has been the practice to build such arch supports permanently into a shoe. These practices are unsatisfactory because the arch support may not be adapted to the peculiar characteristics of the foot with which it is employed.

The general object of this invention is to provide a method which will enable an arch support to be produced which accurately fits the arch of the foot when the weight is on the foot in the shoe.

A further object of the invention is to provide a simple method and means for enabling the posture of the foot to be observed under the same conditions that will obtain when the weight is put on the foot in the shoe, thereby enabling the requirements of the arch support to be studied and its correct shape and dimensions to be determined for correcting faulty posture of the foot when in the shoe.

A further object of the invention is to provide a simple method for enabling the correct dimensions and form for an arch support to be readily determined, and for enabling an arch support to be readily brought to the dimensions that will enable it to conform accurately to the requirement of the foot.

Further objects of the invention will appear hereinafter.

The invention consists in the novel steps and combinations of steps to be described hereinafter, all of which contribute to produce an efficient method of making arch supports.

A preferred embodiment of the invention is

described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawing:

Figure 1 is a perspective of a form, which is of my invention, which I prefer to employ in practicing my method;

Figure 2 is a vertical cross-section through the form illustrated in Figure 1, looking in the direction of the heel, and passing through a matrix which is laid in the form under the arch of the foot and which is pressed by the arch as the weight of the body is placed on the foot;

Figure 3 is a bottom plan of a blank for an arch support which I prefer to employ in practicing my method;

Figure 4 is a rear elevation of a form for a lady's shoe having a high heel and illustrating in cross-section means which I may employ to give this form lateral stability when using it;

Figure 5 is a vertical section taken through a mold, which can be formed of plaster of Paris from the matrix after it has been impressed by the foot to give it the desired shape.

In practicing my invention, I provide a foot form 1, which is preferably made of a transparent material, such as glass. This form is preferably cast and should have a wall of sufficient thickness to insure that it will not break when the weight of the foot is placed upon it. It comprises a sole 2 and a "counter" or flange 3 that extends around the heel and forwardly in the vicinity of the shank 4 of the form. This counter or flange, in the vicinity of the shank, is curved upwardly (see Figure 2), so that its inner faces 5 and 6 give a correct profile or contour of the shoe which the form represents. In other words, this form has a sole which corresponds to the last of the shoe, which it represents, and the upwardly projecting flange 3 corresponds in shape to the upper of the shoe.

On the interior of this form and on the upper side of the sole I provide chart lines which have a definite location and direction with respect to the anatomical characteristics of the foot that is to wear the shoe and the arch support to be produced. This chart preferably includes the line A—B drawn from the lateral plantar point "A" of the fifth metatarsal, phalangeal articulation, to point "B", which is the medial plantar point of the first metatarsal phalangeal articulation. The chart also includes a line M—N, which extends from the anterior plantar point of the third phalanx to the posterior medial point of tuberosity of the calcaneus. This line from point

"M" will bisect the plantar surface of the phalanges of the third toe and pass along the medial border of the third metatarsal and the plantar tuberosity of the third cuneiform medial border of the tuberosity of the cuboid plantar surface of the sustentaculum tali to point "N".

The line C—D is drawn from the point "C", which is the lateral plantar point of the tuberosity of the fifth metatarsal, to point "D", which is the central point of the medial plantar surface of the first cuneiform. This line C—D will bisect the plantar surface of the first, second and third cuneiform and pass the anterior plantar portion of the cuboid.

The line E—F extends from the point "E" at the lateral tuberosity of the cuboid, bisecting the plantar surface of the cuboid, and the plantar surface of the navicular to point "F", which is the medial plantar surface of the tuberosity of the navicular.

The line G—H extends from the point "G", which is the lateral plantar groove of the calcaneus which lies anteriorly from the location of the point of attachment of the plantar calcaneocuboid ligament, passing the plantar surface of the neck of the calcaneus and bisecting the head of the talus, to point "H", which is the medial plantar point of the head of the talus.

Lines A—F, A—H and E—B are then drawn for the purpose of forming important intersection points for measurement purposes. The chart also includes a curved line O—P, the position of which is governed by the medial border of the shank of the shoe. The curved line X—Y—Z will conform to the arch formed by the head of the talus, navicular and first cuneiform.

The intersection point I should be under the plantar tuberosity of the third metatarsal. The intersection point II should be under the plantar tuberosity at the base of the third metatarsal. The intersection point III should be at the bisecting point of the third cuneiform. The intersection point IV should be at the bisecting point of the medial plantar tuberosity of the cuboid. The intersection point "X" should be approximately under the center point of the plantar surface of the first cuneiform. The intersection point "Y" should be approximately under the central point of the plantar surface of the navicular. The intersection point "Z" should be approximately under the central point of the plantar surface of the head of the talus.

A border curved line "S" can be placed on the form passing through the points P—H—F—D—T and terminating at the line A—F. This border line in the vicinity of the point D—F—H gives an approximate terminal line for the upper edge of the arch support on the inner side of the foot. A slightly curved line "U" may be made on the other side of the form, running through the points G—E—C—A. This line "U", however, is not to be used as a terminal line for the adjacent edge of the arch support.

The lines forming this chart may be in the form of ridges, but preferably consist of small V-shaped grooves, as indicated in Figure 2.

The form 1 is provided with a heel 7 having a height of the heel of the shoe with which the arch support is to be worn. Hence the longitudinal section of the form, taken about on the line M—N, will conform accurately to the profile of a section taken at this point of the shoe.

After having formed a chart as described above, I employ a matrix 8, which has approximately the shape illustrated in Figure 3 and approxi-

mately the cross-section illustrated in Figure 2. This matrix is formed of a soft compressible material, such as gum or soft wax. It should have sufficient vertical thickness to insure that it will be pressed down by the arch of the foot when the foot is put in the foot form and the natural weight of the body permitted to rest upon the foot, that is to say, with about half the weight on each foot. In this way, the arch of the foot with the bones of the arch in correct orthopedic relation, presses the matrix 8 to its correct form and gives it thickness at different points on its area which would be correct for the arch support that will properly support the arch of that foot while permitting proper flexing of the arch in walking. When the weight of the foot comes on the matrix, the arch of the foot flexes naturally and the matrix is pressed down into the shallow V-shaped lines of the chart, thereby giving the matrix the proper thickness and forming small ridge lines 9 with intersections on the under-surface of the matrix, which correspond to the lines and intersections of the chart in the foot form.

Different methods may be employed for producing the arch support so that it is a correct replica of the pressed matrix. I prefer, however, to accomplish this by providing a plurality of previously molded blank arch supports, such as the blank 10 (see Figure 3). These blanks should be formed in a mold with grooves or small ribs on its inner face in the same relation as the lines of the chart within the form. This blank is preferably molded of rubber or similar material and has its left side portion 11, as viewed in Figure 3, curved approximately to correspond with the curvature of the left portion 11^a of the matrix illustrated in Figure 2. If desired, each blank preferably has figures on it indicating its thickness at different intersection points of molded lines 12 formed on the blank when molded and which correspond in position to the chart lines of the foot form. These indicated thicknesses enable a blank arch support to be selected which has dimensions which are generally slightly greater than the dimensions of the matrix (as regards thickness), and this blank is then ground down or cut down to the same thickness as the matrix at all the different corresponding intersection points that appear on the matrix and on the blank.

The shoe in which the arch support is to be worn should have one or more guide points marked on its sole indicating the correct position for two points on the margin of the arch support so as to insure that the arch support will be secured on the sole in precisely the same position which the matrix had in the foot form with respect to the chart lines. This will insure that when the arch support is worn in the shoe it will be correctly placed and give a proper orthopedic support for the arch. The position of these guide points can be determined in the shoe by means of corresponding marked points on the shoe to indicate the proper position of the arch support.

One of the advantages of providing the transparent foot form 1 is that the posture the foot will have in the shoe when weight is put upon the foot can be observed in the foot form. This is most advantageous because it enables an orthopedic specialist to inform himself fully as to the action of the arch as the weight comes upon it. Without such means as this it is impossible to know the characteristic posture of a foot in a shoe when the weight is placed upon the arch.

By reason of the fact that the flange or counter 3 of the form is low at the sides, the upper side of a foot superposed on the form will be exposed, and the orthopedist can observe the relation of the bones of the arch above the upper edges of the flange or counter 3, as the patient puts his weight on his foot. This enables the orthopedist to note the relation of the bones that form the arch when the weight is naturally resting on the foot. In this position the arch should not be unnaturally flexed, and hence the matrix will have a correct form and size for enabling a pad to be prepared that will properly support the arch, and at the same time prevent too much flexing of the arch when in use.

In Figure 5, I illustrate a mold which may be employed for molding a rubber arch support having the same characteristic shape and size as the matrix. This illustrates another method of producing the arch support which may be followed, if desired.

In order to practice this embodiment of my invention, after the foot is removed from the foot form, I pour a composition consisting of plaster of Paris or a similar plaster over the matrix. This forms a mold for the upper side of the matrix. After allowing the plaster to set, the plaster can be cut away at its sides and removed from the foot form. The matrix will adhere to the plaster. The undersurface of the matrix will have ridges in it where the grooves were located in the foot form. I then oil this surface of the matrix and then pour a mixture of plaster of Paris over this side of the model or matrix in an inverted position. After allowing time for the plaster of Paris to set, the mold formed in this way can be opened and the matrix removed. In this way the cavity 13 will be formed between two blocks 14 and 15 of solid plaster of Paris. This mold can be provided with a gate 16 and a vent 17, and can be employed for molding the arch support.

The foot form illustrated in Figure 1 corresponds to a man's shoe. In practicing my invention with a lady's shoe, it is necessary to provide a form, such as form 18, which conforms in shape and dimensions to a lady's shoe. The invention is practiced in the same way as described above, but as a lady's shoe usually has a high heel, such as the heel 19, it is preferable to provide means for giving the foot form lateral stability. For this purpose, I provide a bar 20 of wood or similar material having a flat bottom face 21 to rest upon the floor and having a socket 22 to receive the lower end of the heel, and fit closely to the same.

It is understood that the embodiment of the invention described herein is only one of the many embodiments this invention may take, and I do not wish to be limited in the practice of the invention, nor in the claims, to the particular embodiment set forth.

What I claim is:

1. A method of producing an arch support to fit a foot, which consists in providing a form open on its upper side so as to leave the upper side of a foot supported in the form exposed, said form conforming to the sole and a portion of the upper of a shoe, and with a plurality of chart lines on the inner face of the form, said lines constructed so as to impress lines in a plastic matrix, placing a matrix of plastic material in the form at the location of the arch of the foot, impressing the matrix by the foot placed in the form with the weight of the body resting

on the foot, and thereby pressing the plastic matrix into a definite and correct thickness at different points and simultaneously forming impression lines in the same corresponding to the chart lines, and then forming the arch support with a thickness corresponding to the thickness of the matrix along the said impression lines.

2. A method of producing an arch support to fit a foot, which consists in providing a form open on its upper side so as to leave the upper side of a foot superposed on the form exposed, said form conforming to the sole and a portion of the upper of a shoe and conforming substantially to the shape and size of the shoe that will receive the arch support, and with a plurality of chart lines on the inner face of the form, said lines constructed so as to impress lines in a plastic matrix, placing a matrix of plastic material in the form at the location of the arch of the foot, impressing the matrix by the foot placed in the form with the weight of the body resting on the foot, and thereby pressing the matrix into a definite and correct thickness at different points and simultaneously forming impression lines in the same corresponding to the chart lines, and then forming the arch support with a thickness corresponding to the thickness of the matrix along the said impression lines.

3. A method of producing an arch support to fit a foot which consists in providing a form open on its upper side so as to expose the upper side of the foot superposed on the form, said form conforming to the sole and a portion of the upper of a shoe and having a plurality of intersecting chart lines on the inner face thereof, said lines constructed so as to impress lines in a plastic matrix, placing a matrix of plastic material in the form at the location of the arch of the foot, impressing the matrix by the foot placed in the form with the weight of the body resting on the foot and thereby pressing the matrix into a definite and correct thickness at different points on its area and simultaneously forming impression lines in the same corresponding to the chart lines, and then forming an arch support corresponding to the matrix and with substantially the same thickness as the matrix at the intersection points of said chart lines and along the said chart lines.

4. A method of producing an arch support to fit a foot which consists in providing a form open on its upper side so as to leave the upper side of a superposed foot exposed, said form conforming to the sole and a portion of the upper of a shoe and having a plurality of intersecting chart lines on the inner face thereof, said lines constructed so as to impress lines in a plastic matrix, placing a matrix of plastic material in the form at the location of the arch of the foot, impressing the matrix by the foot placed in the form with the weight of the body resting on the foot and thereby pressing the matrix into a definite and correct thickness at different points on its area and simultaneously forming impression lines in the same corresponding to the chart lines, providing a blank arch support having guide lines thereon corresponding to the said chart lines, and then reducing the thickness of the blank arch support to give the same substantially the same thickness as the matrix at the intersection points and along said chart lines.

5. A method of producing an arch support to fit a foot which consists in providing a form open on its upper side to expose the upper side of a

foot superposed in the form, said form conforming to the sole and a portion of the upper of a shoe and having a plurality of intersecting chart lines on the inner face thereof, said lines constructed so as to impress lines in a plastic matrix, placing a matrix of plastic material in the form at the location of the arch of the foot, impressing the matrix by the foot placed in the form with the weight of the body resting on the foot and thereby pressing the matrix into a definite and correct thickness at different points on its area and simultaneously forming impression lines in the same corresponding to the chart lines, providing a blank arch support having guide lines thereon corresponding to the impression lines formed on the matrix, and with the thicknesses at different points on the area thereof indicated on the blank, and then cutting down the blank where necessary to cause the same to conform substantially in thickness to the matrix at the intersection points of the guide lines and along the said guide lines.

6. A method of producing an arch support to fit a foot which consists in providing a form open on its upper side so as to leave the upper side of the foot superposed on the form exposed, said form conforming to the sole and a portion of the upper of a shoe and with a plurality of chart lines on the inner face of the form, and taking an impression with a plastic matrix on the said chart lines by means of the pressure exerted by the foot the arch of which is flexed to determine the correct thickness to be given to the support at different points under the arch of the foot.

7. A method of producing an arch support to fit a foot, which consists in providing a form open

on its upper side so as to expose the upper side of a foot superposed on the form, said form conforming to the sole and a portion of the upper of a shoe, and with a plurality of chart lines on the inner face of the form, said lines constructed so as to impress lines in a plastic matrix, placing a matrix of plastic material in the form at the location of the arch of the foot, impressing the matrix by the foot placed in the form with part of the weight of the body resting on the foot, and thereby pressing the matrix into a definite and correct thickness at different points and simultaneously forming impression lines in the same corresponding to the chart lines, and forming a mold from the matrix for casting an arch support having the same form and dimensions as the matrix.

8. A method for determining the correct form for an arch support, which consists in providing a rigid transparent form giving a replica of the sole and lower portions only of the upper, said form being open on its upper side so as to leave the upper side of a foot superposed on the form exposed, placing a matrix in the form at its shank, and placing the foot in the form with the weight upon it, to press the matrix under the arch of the foot.

9. A foot form for use in producing an arch support, consisting of a replica only of the sole and lower portion of the upper of the shoe in which the arch support is to be worn, said form having chart indicia on the inner surface thereof at a different level from said surface, and corresponding in direction to the anatomical characteristics of the foot to be fitted.

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