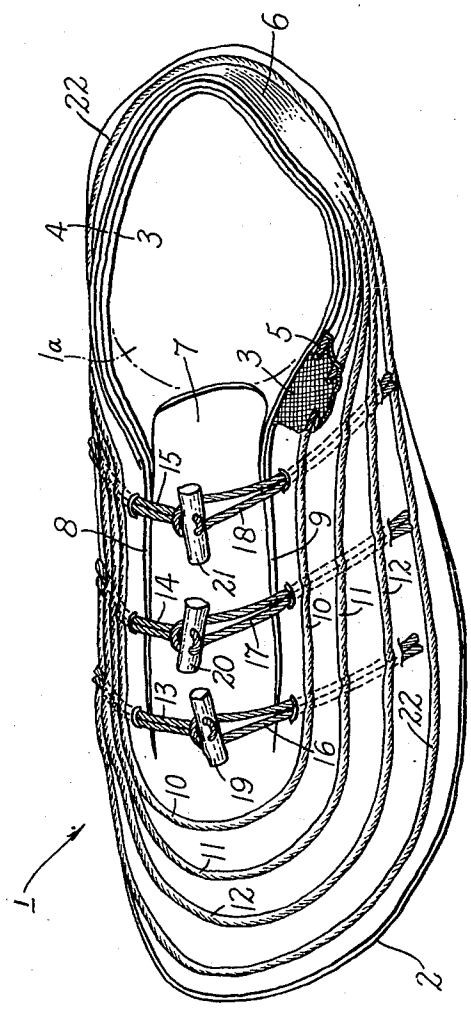
Sept. 18, 1951 A. E. MURRAY 2,568,292

METHOD OF MAKING CASTS AND FOR MAKING SHOES THEREFROM

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METHOD OF MAKING CASTS AND FOR MAKING SHOES THEREFROM

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Fig. 2.

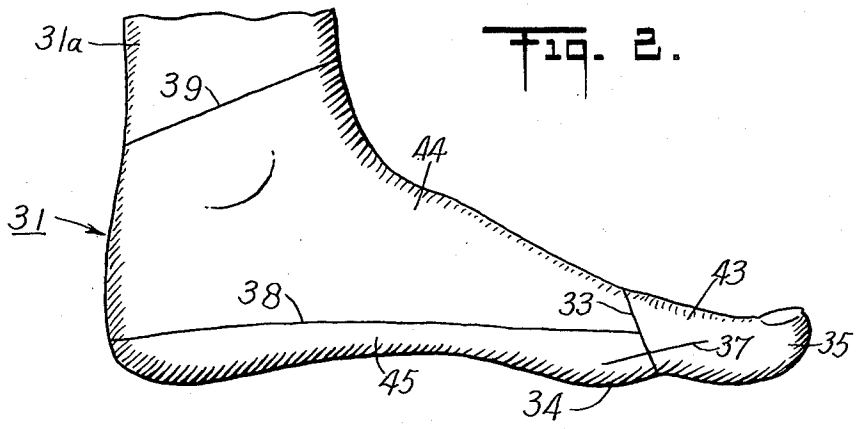


Fig. 3.

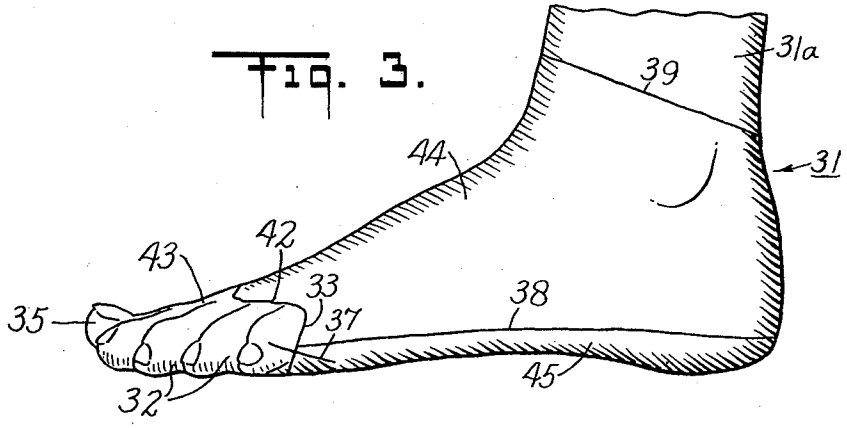
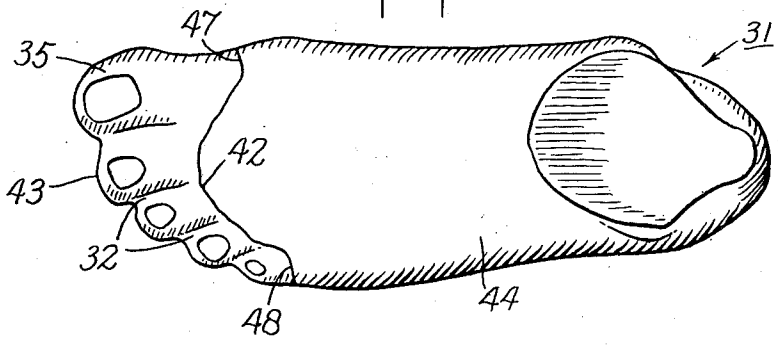


Fig. 4.



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Fig. 5.

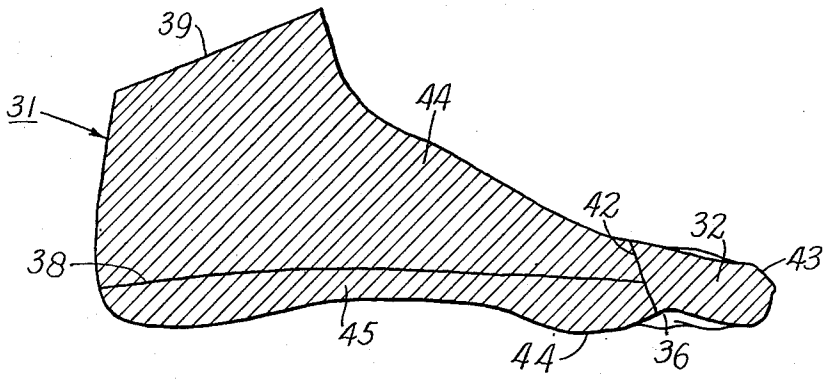


Fig. 6.

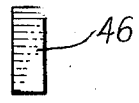


Fig. 7.



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UNITED STATES PATENT OFFICE

2,568,292

METHOD OF MAKING CASTS AND FOR MAKING SHOES THEREFROM

Alan E. Murray, New York, N. Y.

Application May 14, 1949, Serial No. 93,272

3 Claims. (Cl. 18—55.05)

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My invention relates particularly to a method of making casts of the feet and for making shoes thereon.

The object of my invention is to make casts and shoes therefrom, having an extraordinary fidelity to the shape of the foot in action, as they truly conform to the shape which the feet have when in use, not only while weight-bearing but also during the motility of the foot in action. Also, they conform to the changed foot-shape attained as a result of walking in a molded shoe made to fit the static foot shape. An object is, therefore, to make the active foot cast in such a molded shoe that has been made onto the static foot or onto a cast conforming to the static shape of the foot, and which primary molded shoe has thereafter been worn and put to use dynamically so as to acquire the active foot shape of the foot of the wearer, a secondary or active foot cast and shoe thereon being made therefrom. Further objects of my invention will be evident from the detailed description hereinafter.

While my invention is capable of being carried out in many different ways, by way of illustration I have described only certain examples of my invention, in connection with the accompanying drawings, in which—

Fig. 1 is a plan view of a shoe made in accordance with my invention;

Fig. 2 is an inside side elevation of a cast made in accordance with my invention, showing a filled-in interval between the severed toe portion and the remainder of the cast, and showing the longitudinal cut made from the rear of the toe portion to the rear end of the foot;

Fig. 3 is an outside side elevation of the same;

Fig. 4 is a plan view of the same;

Fig. 5 is a longitudinal vertical section thereof;

Figs. 6 and 7 are, respectively, a front and side elevation of a spacing member used in gauging the thickness of the filling added at the rear of the toes.

For example, a cast, in accordance with my invention, may be made after a molded shoe substantially fitting a static shape of the foot has been walked in an appreciable length of time, so as to change the shape of the shoe to approximately the shape of the foot in action and, preferably, to approximate the changed shape of the foot due to walking in the molded static-form fitting shoe made with plastic molding materials, as for instance a shoe or shoes which may be made in accordance with my Patent No. 2,332,000, upon Method of Manufacturing Shoes, granted October 19, 1943 (as made on the physiologically

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accurate cast of my Patent No. 2,177,304, granted October 4, 1939, mentioned therein); my application upon Method of Making Shoes and Product Thereof, Ser. No. 69,887, filed January 8, 1949; or my application upon Shoes for Normal Wear, Ser. No. 58,470, filed November 5, 1948; or my application upon Process of Making Foot Casts and Shoes Thereon as well as Products Thereof, executed April 6, 1949, Serial No. 93,271, filed May 14, 1949.

In accordance with my invention, any of the above shoes, for example either in accordance with my application Ser. No. 69,887 or as made in accordance with my Patent No. 2,332,000 (as made on the physiological cast of my Patent No. 2,177,304, granted October 4, 1939, mentioned therein), both of which are referred to in my application Ser. No. 93,271 aforesaid, made from the moldable materials to fit physiological contours of the static foot shape is first walked in, for any desired length of time, for instance one or more weeks or longer, to enable the natural elasticity and plasticity of the molding materials to fit the shape of the foot in action, and especially the upper surfaces of the foot within the shoe upper, and also, preferably, so as to accord with the changes in shape of the foot acquired by walking in said molded shoes, as the wearing of such shoes tends to restore the natural shape of the foot in action, and to correct any malformations, which may have been due to the wearing of conventional shapes of shoes not conforming to the foot contours.

Thereupon, I make a cast, in each of the said walked-in molded shoes, of plaster of Paris mixed with water, such for example as utilized in my Patent No. 2,177,304 aforesaid, after filling in or covering temporarily, for this purpose, with adhesive tape, any cracks or crevices at the front of the shoe for the lacings, etc. When the plaster of Paris has set, the adhesive tape or other filling material is removed from the said cracks and crevices and the cast of the foot in action thus obtained is removed from the shoe.

A shoe, having very great fidelity to the shape of the foot in action, is now built on each of the foot-action casts so made for the same wearer of the original shoes, in which the foot-action casts have just been made. These shoes may be made on the foot-action casts in accordance with any of the processes disclosed in my patents and applications for letters patent aforesaid.

Preferably, however, before making the shoes on the foot action casts the said casts are altered to provide the changed or increased toe length

and/or lessened foot depth, as set forth in my application upon Process of Making Foot Casts and Shoes Thereon as well as Products Thereof, executed April 6, 1949, Ser. No. 93,271 filed May 14, 1949, as hereinafter further referred to.

A shoe made in accordance with any of said procedures, however, may be made with variations of any such procedures, as for instance in regard to the binding or fastening of the shoes to the feet, and in regard to the provision of a tongue therein, as shown in the figure of the drawings. For this purpose, as shown in the drawings, I may provide such a molded shoe 1, made on a cast of the shape of the foot in action, 1*a*, as above, having a sole portion 2, also an upper comprising an inner lining 3 of woven fabric, such as monks cloth, and an outer covering 4 of set latex-impregnated elastic leather or other material, bonded to the woven fabric 3 with a cord 5 between the top edges of the fabric 3 and leather 4, all bonded together to form a side wall 6 with the set latex. The shoe 1 is, preferably, formed with a tongue 7 cut from the body of said wall 6 by making two slits 8 and 9, substantially parallel to each other, along the crown of the foot cast. The said tongue is located within the same level as the thickness of said wall and, therefore, does not exert any uneven pressure on the top of the foot, especially as there need not be any sewing or binding to fasten the tongue to the shoe wall with which it is integral. Also, to hold the tongue in place at this level, without exerting any such undesirable pressure on the foot, I may provide a series of cords 10, 11 and 12, extending partly or entirely around the shoe and cemented between the fabric 3 and leather 4 in tiers around the slits 8 and 9, said cords 10, 11 and 12 each having at the tongue 7, three pairs of holes passing through the leather 4 beneath said cords, to receive tightly, for adjustment, six adjustable shoe-tightening looped cords 13, 14, 15, 16, 17 and 18. The cords 13, 14 and 15 pass through pairs of holes in leather hitches or cleats 19, 20 and 21, respectively, and the cords 16, 17 and 18 are looped over the said hitches or cleats to be held in place thereby over the loops of the cords 13, 14 and 15, respectively. One or more similarly located ornamental cords 22 may be located and bonded as above, between the layers 3 and 4 of the shoe somewhat above the sole 6, extending all around the shoe 1. The cords 13, 14, 15, 16, 17 and 18 can be pulled outwardly with a pair of pliers, or otherwise, to adjust the tightness of the shoe fastening on the foot. When so adjusted, the tightness of the cords 13, 14, 15, 16, 17 and 18 in the said three pairs of holes beneath the cords 10, 11 and 12 holds them in their respective adjusted positions until further adjustment thereof.

When the cast obtained is to be provided with increased toe length or lessened foot depth, in accordance with my application aforesaid, Ser. No. 93,271, this may be done as shown, for instance, in Figs. 2 to 7 by making a cast 31 of a foot made of plaster of Paris in any desired way, preferably partly filled in between its toes 32, but, for example, in accordance with the technique of attaining an accurate reduplication of the shape of the foot and the shoe thereon, as in my Patent No. 2,177,304 aforesaid.

A pencil line 33 is now made on the inside side of the cast 31, beginning at its lower end at a point where the pad 34 of the foot joins the big toe 35, that is substantially the pyramidal recess 36 between the toes and the foot, thence extending upwardly and rearwardly in substantially a straight line to the meeting point of the said toe 35 with the upper surface of the foot. A straight pencil registry line 37 is then made longitudinally on the side of the cast extending from the pad 34 to the said toe 35, to preserve a record of the natural angularity of the toe portion to the remainder of the foot. Also, a pencil line 38 is made, slightly arched upwardly, extending rearwardly from the line 33 to the rear of the cast 31. A rearwardly sloping pencil line 39, now, is made on the side of the ankle of the cast to indicate a plane at right angles to the line 33.

Cuts are now made, in succession, on the lines 39, 33 and 38, although the cuts on lines 38 and 39 can be omitted if desired, with any appropriate tool or machine. As illustrated in Fig. 3, the cut 33 is not shown straight across the cast.

The cut of the cast 31 on the transverse plane of the line 39, which may be about 30° to the horizontal, if desired, at a right angle to the line 33, removes therefrom an ankle portion 31*a*, which enables the body portion of the cast 31 thereafter, to be supported on this plane by the work-supporting plate of a power tool. Then, the cut on the line 33 can be readily made, by any power driven wire cutter, with the incline shown in Fig. 2 at substantially right angles to the plane at 39, but on a U-shaped line, which may be, if desired, about 60° to the horizontal and which at the bottom follows the line where the pad 34 joins the toes and at the top follows the line where the toes join the foot. The cut at 33 is preferably thin, for example from $\frac{1}{64}$'' to $\frac{1}{32}$'' thick, all the way across, leaving a severed group-toe portion 43 separated from the body portion of the cast. Then a cut is made, which can be of greater thickness, with a thicker wire, as above referred to, along the arched line 38 approximately in a horizontal plane across the lower portion of the cast and from the rear of the foot up to the inclined toe-severing line 33, thus leaving the upper body portion 44 severed from a lower body portion 45.

There are now made two rectangular spacing members, having a thickness to provide further longitudinal toe-space for the toes when in their dynamic position, out of a plurality of sheets of any desired number, fastened together with an adhesive, such as latex, and made, for example, of any desired material, such as a plastic, cardboard or ply wood. Each of these two spacing members 46 is slightly larger than each of the nearly flat portions 47 and 48 at the right and left ends of the U-shaped cut 42, so that when applied thereto they will project above, below and beyond the outer surfaces of the body portions 44 and 45. The body portions 44 and 45 are now united together with any desired adhesive material, such as cellulose acetate, or even plaster of Paris, to provide any desired lessened fraction of the original thickness of the cut or even an increased thickness so as to provide greater vertical shoe space for the particular wearer, which varies with each wearer, as compared to the thickness of the plaster of Paris cast that has been cut out of the line 38. Thereupon, the two spacing members 46 are fastened to the areas 47 and 48 with rubber cement applied to the front and rear faces of the spacing members 46, and the group-toe portion 43 is then caused to adhere to the two spacing members 46 with rubber cement, while being careful to preserve the correct registry of adjacent foot surfaces as well as the original angularity of the group-toe

portion 43 to the cast 31, with the aid of the registry line 37, which acts as a visual guide.

The reconstituted cast 31, when the adhesive is substantially dry, is then inserted in a pan containing sand high enough to reach the top level of the cut at 33, and a watery plaster of Paris, containing sufficient water to provide a milk-like consistency, is poured into the sand which surrounds the cut or gap 33 to fill the same and then allowed to set, which will take place in about 10 to 15 minutes. This cast is then removed from the sand, the spacing members 46 are removed, and all the remaining crevices between the cast 1 and the group-toe portion 13 are then filled in with the watery plaster of Paris above referred to and allowed to set. Any excess of the plaster of Paris protruding beyond the edges of the adjacent portions of the cast 31 and the group-toe portion are then scraped off with a knife, after removal from the sand.

The ankle portion 31*a* can then be stuck to the main body of the cast 31, if desired, with cellulose acetate solution, or otherwise.

The cast thus rebuilt and the shoes made thereon have, in effect, the forward ends of the toes moved to the extreme position occupied by the toes normally when in action, that is to say the dynamic position thereof, as compared with the generally shorter static position, or in the case of some persons whose feet are longer in the static as compared to the dynamic position of the toes, the foot casts may be made shorter, if desired, as compared to the uncut cast. Also, if desired, in case the longitudinal horizontal cut 38 has been made, which starts at the transverse vertical cut 33 and ends at the rear of the cast, the cast and the shoe made thereon are provided with a depth which is decreased to accord with the depth of the dynamic or weight-bearing position of the foot as compared with the greater depth occupied by the tissues of the foot when in its static or relaxed state. In other words, the shoes made thereon have a far more effective fit on the feet, and are such as to fit the feet when the latter are being used dynamically, as in weight-bearing, the main purpose for which shoes are intended. In fact, a very large percentage of foot difficulties arise from the malformation of footwear in the region of the toes and when fitting the feet with molded shoes a special problem arises, accordingly, in regard to the position of the toes when in action as compared to static position thereof. In accordance with my invention, the accurate accommodation of the toes in their dynamic as well as their static position, is attained, while preserving the relative foot contours of the main body of the foot support.

Furthermore, in accordance therewith, provision is made to accommodate the footwear to the naturally decreased vertical dimension of the foot when in use dynamically as compared to the static position of the foot.

While I have described my invention above in detail I wish it to be understood that many changes may be made therein without departing from the spirit of the same.

I claim:

1. The process which comprises molding a shoe, having a side wall, from moldable materials so as to conform to a static form of a foot, walking with said foot in said molded shoe until said shoe is modified to the form of said foot in action and making a cast in said modified shoe having the shape of the foot in action.

2. The process which comprises molding a shoe, having a side wall, from moldable materials so as to conform to a static form of a foot, walking with said foot in said molded shoe until said shoe is modified to the form of said foot in action, making a cast in said modified shoe having the shape of the foot in action and modifying the cast to increase the length of the toes.

3. The process which comprises molding a shoe, having a side wall, from moldable materials so as to conform to a static form of a foot, walking with said foot in said molded shoe until said shoe is modified to the form of said foot in action, making a cast in said modified shoe having the shape of the foot in action and modifying the cast to increase the length of the toes and decrease the depth of the foot.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
812,920	Cole	Feb. 20, 1906
1,642,930	Mathewson	Sept. 20, 1927
1,647,639	Larson	Nov. 1, 1927
1,758,706	Kelnhofer	May 13, 1930
1,952,685	Sabel	Mar. 27, 1934
2,177,304	Murray	Oct. 24, 1939
2,204,679	Ingram	June 18, 1940