Jan. 18, 1955 A. E. MURRAY 2,699,562

PROCESS OF MAKING FOOT CASTS

Original Filed May 14, 1949 2 Sheets-Sheet 1

Fig. 1.

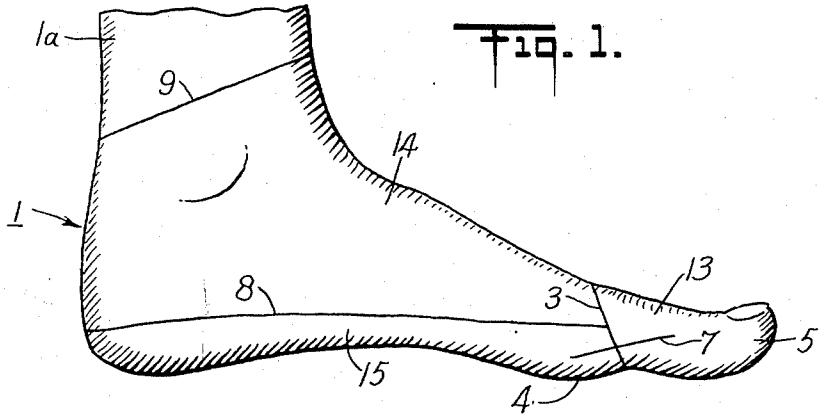


Fig. 2.

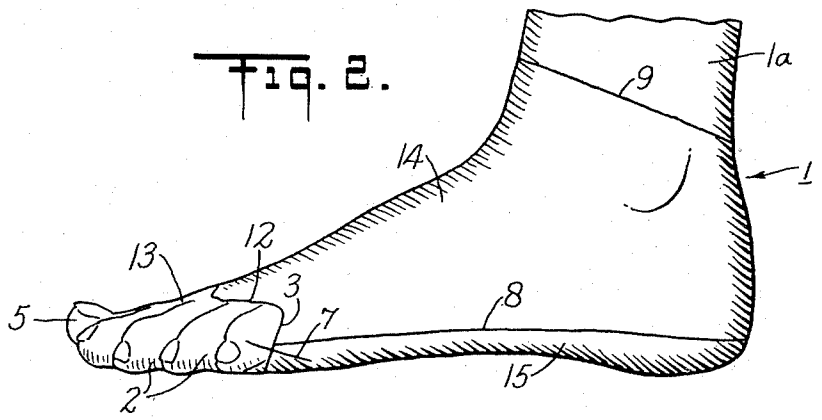
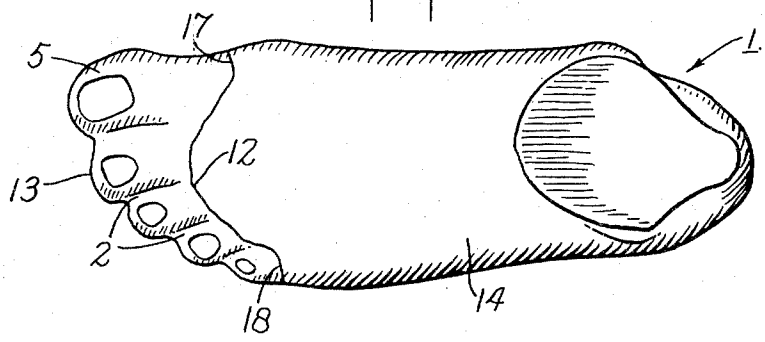


Fig. 3.



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Fig. 4.

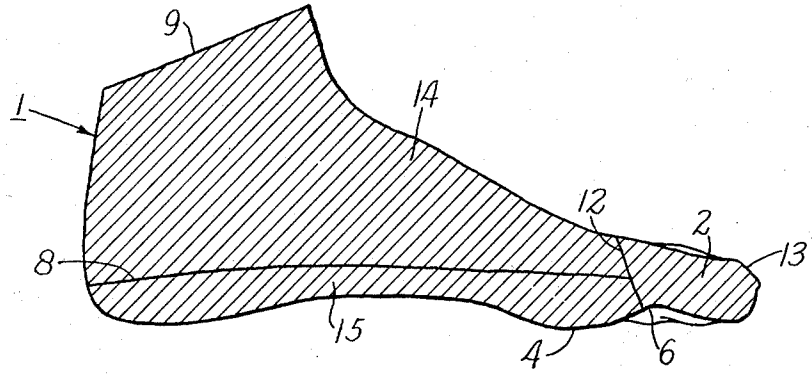


Fig. 5.

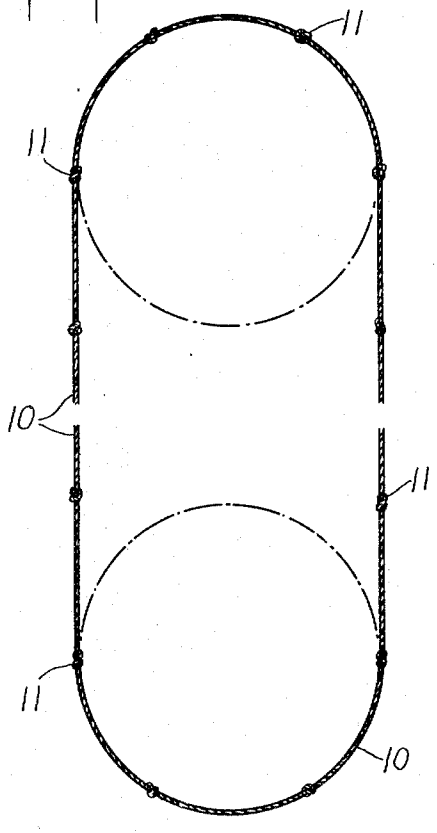


Fig. 6.



Fig. 7.



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PROCESS OF MAKING FOOT CASTS

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Original application May 14, 1949, Serial No. 93,271. Divided and this application January 24, 1952, Serial No. 268,037

3 Claims. (Cl. 12—146)

My invention relates to processes by means of which previous serious difficulties encountered in the making of casts as well as lasts and shoes therefrom can be effectively eliminated.

This application is a divisional of my application Ser. No. 93,271, filed May 14, 1949, upon Process of Making Foot Casts and Shoes Thereon as Well as Products Thereof, since abandoned.

Previously, in the art of shoe making, great difficulty has occurred in adequately fitting the toe portion of shoes, to such an extent that the usual types of shoes have almost invariably been supplied without even trying to fit the front toe portion of the shoe to the foot, the shoes customarily supplied to the wearer having been much longer than the feet for which they were intended. This has had the result of tending, unnaturally, to lengthen the foot, with consequent lowering or detrimentally affecting the normal arch of the foot, especially when the feet are subjected to heavy duty.

The shoes made in accordance with my invention avoid this difficulty by accurately fitting the length of the foot as actually required by the dynamic position of the toes in action so as to preserve, and restore when necessary, the natural arch of the foot. Accordingly, these shoes have even tended to shorten the feet when worn for a reasonable length of time. However, to accomplish this purpose, it is very important to have an effective and correct fit of the shoes against the outer ends of the toes in use, and to bring this about I have found it important to have adequate but accurate space provided to accommodate the ends of the toes when in dynamic position, notwithstanding the fact that when the cast of the foot for the shoe is being made the toes are in a static, that is, relaxed length, which is generally shorter than the dynamic length, in which the toes are being used.

In accordance with my invention, therefore, while preserving the natural contours of the foot and toes, I have made provision for extending or retracting the natural position of the contours of the toe cast, and of the shoe which fits the cast, just enough to accord with and fit the dynamic position of the toes. This I have done by severing the toe portion from the rest of the cast by a transverse cut, and filling in the interval to any extent required if the toe position is to be extended. In other words, this makes possible the effective fitting of the shoe to the toe ends even though the cast of the foot is made initially in a static position. Also, I may, if desired, similarly shorten the vertical depth of the cast by making a longitudinal, but preferably upwardly arched, cut extending rearwardly from the transverse cut, and then securing the parts together with any desired adhesive or filling material, so as to lessen the depth of the cast to equal the lessened depth of the foot when in dynamic weight-bearing position as compared to the relaxed position.

While my invention is capable of being carried out in many different ways, for the purpose of illustration I have shown only one embodiment thereof in the accompanying drawings, in which—

Fig. 1 is an inside side elevation of a cast made in accordance with my invention, showing a cut made thereon which can be utilized to provide a filled-in interval, between the severed toe portion and the remainder of the cast, and showing a longitudinal cut made from the rear of the toe portion to the rear end of the foot;

Fig. 2 is an outside side elevation of the same;

Fig. 3 is a plan view of the same;

Fig. 4 is a longitudinal vertical section thereof;

Fig. 5 is an elevation of the cutting wire used for making the curved cuts of the cast; and

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;

In the drawings, I have shown a cast 1 of a foot made of plaster of Paris in any desired way, preferably partly filled in between its toes 2, as shown in Fig. 3, but, for example, in accordance with the technique of attaining an accurate duplication of the shape of the foot, as in my Patent No. 2,177,304, upon Process of Obtaining Effective Foot Impressions and Products Thereof, granted October 24, 1939.

A pencil line 3 is now made on the inside side of the cast 1, beginning at its lower end at a point where the pad 4 of the cast joins the big toe 5, that is, at substantially the location of the pyramidal recess 6 between the toes and the ball portion of the cast, thence extending upwardly and rearwardly in substantially a straight line to the meeting point of the said toe 5 with the upper surface of the cast and then transversely over the cast just at the rear of the toes and to the other side of the cast but so as to form a line for locating a U-shaped cut following said pyramidal recess 6. A straight pencil registry line 7 is then made longitudinally on the side of the cast extending from the pad 4 to the said toe 5, to preserve a record of the natural angularity of the toe portion to the remaining non-toe portion of the cast. Also, a pencil line 8 is made, slightly arched upwardly, extending rearwardly from the line 3 to the rear of the cast 1. A rearwardly sloping pencil line 9, now, is made on the side of the ankle of the cast to indicate a plane at right angles to the line 3.

Cuts are now made, in succession, on the lines 9, 3 and 8, although the cuts on lines 8 and 9 can be omitted if desired, with any appropriate tool or machine. As illustrated in Figs. 2 and 3, the cut 12 made on line 3 extends entirely across the cast to the other side thereof.

Preferably, the cuts are made with an endless wire cutter 10 running over the usual rubber-faced wheels of a power band saw, the same comprising one or more malleable or soft steel wires, preferably of small diameter, which may or may not be welded together, and in which, at intervals, there are made a succession of simple knots 11, as shown in Fig. 5. This cutting wire, in which the knots 11 mainly do the cutting, is strong and will not break readily in use even when the direction of cutting is being changed at will. Also, the knots 11, according to the size of the wire used, can make comparatively thick cuts, as desired, while having the needed flexibility, and without requiring the wire to be of the brittle breakable hard steel which would be necessary in case teeth were provided. The wires of the cutter 10 may also be woven or twisted together.

The cut of the cast 1 on the transverse plane of the line 9, which may be about 20° to the horizontal, if desired, and which is made at a right angle to the cut made on line 3, removes therefrom an ankle portion 1a, thus enabling the body portion of the cast 1 thereafter, to be supported on this plane by the work-supporting plate of the power saw. Then, the cut 12 on the line 3 can be readily made, by the power driven wire cutter 10, with the incline shown in Fig. 1 at substantially right angles to the plane at 9, but on a U-shaped line, which may be, if desired, about 70° to the horizontal and which at the bottom follows the line where the pad 4 joins the toes and at the top follows the line where the toes join the foot portion of the cast. The cut at 3 is preferably thin, for example from 1/64" to 1/32" thick, all the way across, leaving a severed group-toe portion 13 separated from the body portion of the cast. Then a cut is made, which can be of greater thickness, with a thicker wire of the kind above referred to, along the arched line 8 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 3, thus leaving an upper body portion 14 severed from a lower body portion 15.

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 **16** is slightly larger than each of the nearly flat portions **17** and **18** at the right and left ends of the U-shaped cut **12**, so that when applied thereto they will project above, below and beyond the outer surfaces of the body portions **14** and **15**. The body portions **14** and **15** are thereupon united together with any desired adhesive material, such as cellulose acetate solution, 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 on the line **8**. Thereupon, the two spacing members **16** are fastened to the area **17** and **18** of the body portions **14** and **15** with rubber cement applied to the front and rear faces of the spacing member **16**, and the group-toe portion **13** is then caused to adhere to the front of the two spacing members **16** with rubber cement, while being careful to preserve the correct registry of the adjacent lateral, upper and lower surfaces of the cast as well as to preserve the original angularity of the group-toe portion **13** to the cast **1**, that is to say, to preserve the group-toe portion **13** in the same angular position to the horizontal relative to the body portion by the interposed fastening material, and so as to locate the group-toe portion **13** in the same plane, heightwise, that it occupies in Fig. 1.

The reconstituted cast **1**, 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 **3**, 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 **3** 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 **16** are removed, and all the remaining crevices between the non-toe portion of 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 **1** and the group-toe portion thereof are then scraped off with a knife, after removal from the sand.

The ankle portion **1***a* can then be stuck to the main body of the cast **1**, if desired, with cellulose acetate solution, or another cement.

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 on the line **8** has been made, the cast and the shoe made thereon may be 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 of the feet, and are such as to fit the feet when

the latter are being used dynamically, as in weight-bearing, which is the main purpose for which shoes are intended. In fact, a very large percentage of foot difficulties arise from the malformation by 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 the static position thereof. In accordance with my invention, the accurate accommodation of the shoes and casts to 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 as well as the group-toe portion thereof. 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.

It is found that these changes solve the residual difficulties of obtaining footwear which do, in fact, fit the entire feet. This is important as it has been well known that if any particular part of the shoe fails to fit the foot series discomfort is entailed in the foot as a whole.

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 severing, at the underneath recess between the group-toe portion and the foot portion of a cast, along a horizontally curved line substantially conforming to the curvature of said recess, the group-toe portion from the foot portion of said cast, and rejoining said group-toe portion to the foot portion of the cast so as to produce a difference of longitudinal length of the cast.

2. The process which comprises severing, at the underneath recess between the group-toe portion and the foot portion of a cast, along a horizontally curved line substantially conforming to the curvature of said recess, the group-toe portion from the foot portion of said cast, and rejoining and fastening said group-toe portion to the foot portion of the cast, so as to produce an increase of longitudinal length of the cast.

3. The process which comprises severing, at the underneath recess between the group-toe portion and the foot portion of a cast, along a horizontally curved line substantially conforming to the curvature of said recess, the group-toe portion from the foot portion of said cast, on a cut extending upwardly towards the rear of the foot cast, and rejoining said group-toe portion to the foot portion of the cast so as to produce an increase of longitudinal length of the cast as a result of introducing spacing members, filling in liquid material, allowing the material to harden, removing the spacing members and filling in the remaining crevices with further such liquid material.

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