March 1, 1938. H. V. S. MOTT 2,109,780

SHOE FITTING INDEX

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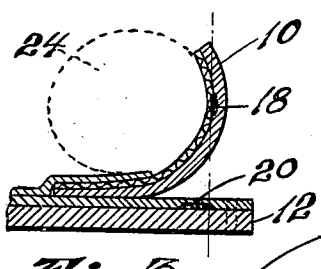


Fig. 3.

Fig. 1.

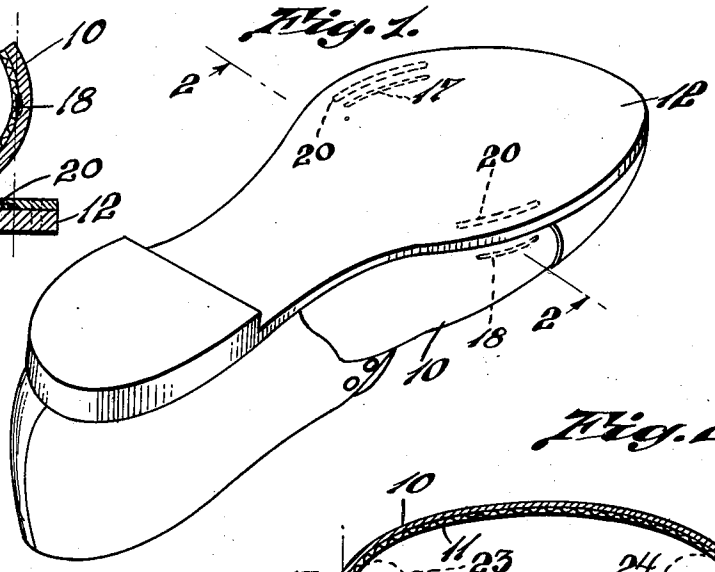


Fig. 2.

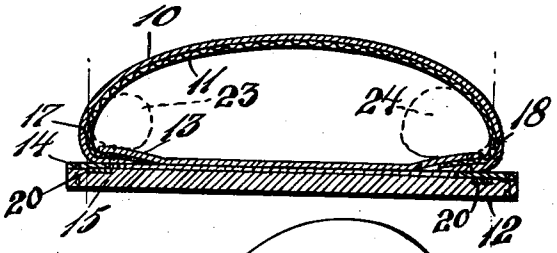


Fig. 7.

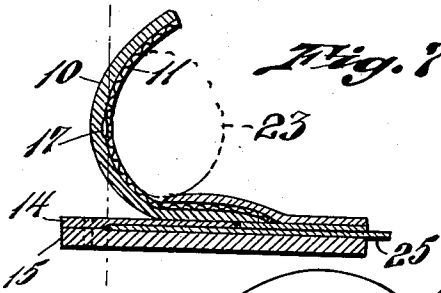


Fig. 4.

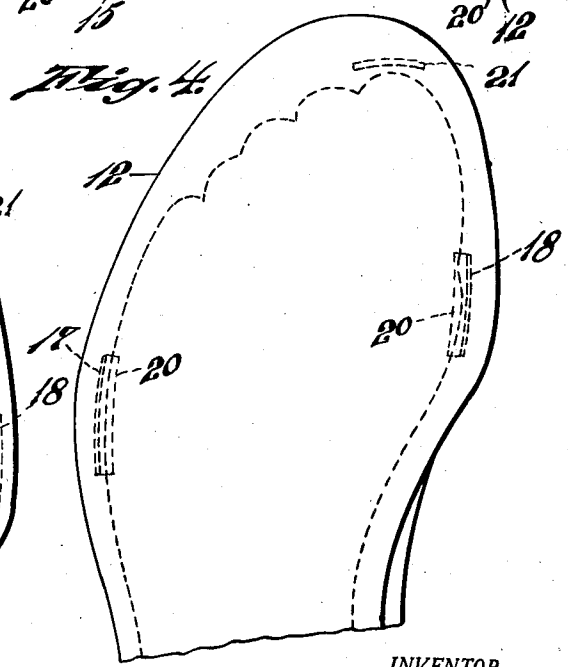
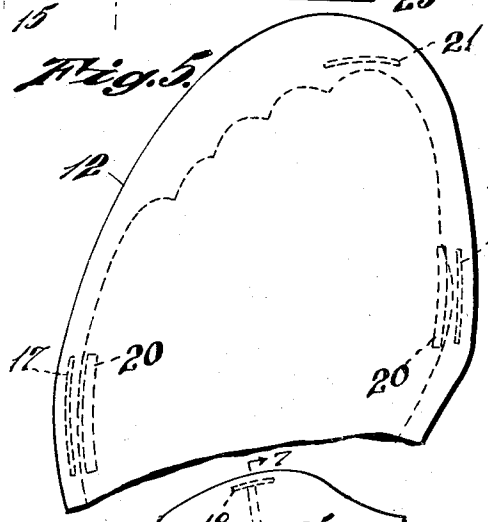


Fig. 5.



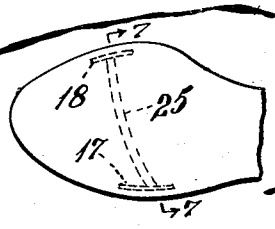


Fig. 6.

INVENTOR.
Howard V. S. Mott
BY
Barlow & Barlow
ATTORNEYS.

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SHOE FITTING INDEX

Howard V. S. Mott, Cranston, R. I.

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14 Claims. (Cl. 36—1)

This invention relates to an index device for use in assuring a correct fitting of the foot to footwear; and has for one of its objects to provide means permanently associated with the shoe structure and capable of giving a visual indication of the exact position of the foot within the shoe upon exposure to Roentgen or X-rays for accurately determining with reference to the usual or common measuring standard of sizes taken from lasts in ratio to the shoe whether or not a proper fitting of a shoe is obtained.

Another object of the invention is to provide means incorporated in a shoe which is opaque or impermeable to Roentgen or X-rays and capable of being readily differentiated from the permeable parts of the shoe structure and the fleshy and boney structures of the foot, and also be responsive to lateral movement of the foot and move relative to a fixed standard of comparison within the shoe to indicate the exact position of the functioning foot in the shoe.

Another object of the invention is to provide means opaque or impermeable to Roentgen or X-rays and movable laterally of the shoe in accordance with any transverse expansion of the inner and outer sides of the shoe upper due to filling the same so that a visual determination of said extent of such movement relative to a stationary index corresponding to the extreme widths of the functioning foot may be observed upon exposure to X-rays in order to indicate the comparative positions of the outlying marginal transverse side portions of the foot with reference to the stationary index whereby an accurate determination of the foot fitting is secured.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described, and particularly pointed out in the appended claims.

In the accompanying drawing:

Fig. 1 is a perspective view of a shoe embodying my invention with the bottom of the shoe being shown in an inverted position;

Fig. 2 is an enlarged transverse sectional view taken on the line 2—2 of Fig. 1 but with the shoe being illustrated in its normal worn position;

Fig. 3 is an enlarged fragmentary sectional view of the right corner of the shoe section shown in Fig. 2 showing one side index piece of the upper in coincidence with the outside edge of one of the sole index pieces;

Fig. 4 is a fragmentary view of the underside of a shoe structure embodying my improved index devices and illustrating diagrammatically the alignment of the inner marginal edges of the movable side index members in the shoe upper with the outer marginal side faces of the stationary reference index pieces in the sole of the shoe when correct shoe fitting is obtained;

Fig. 5 is a fragmentary view similar to Fig. 4 but illustrating diagrammatically the location of the side index members in the upper when laterally moved outwardly by expansion of the upper and in separated relation from the outer marginal edge of the fixed sole index pieces to indicate when an incorrect or unsuccessful shoe fitting is obtained;

Fig. 6 is a fragmentary view, on reduced scale, of the underside of a shoe showing a modified form of the invention and illustrating diagrammatically the alignment of the inner marginal side edges of the side index pieces with the tips of a transverse stationary sole index; and

Fig. 7 is an enlarged fragmentary transverse sectional view of a portion of the shoe structure taken on the line 7—7 of Fig. 6.

As is well known, one method of shoe fitting practiced in some of the shoe stores has been to employ the use of Roentgen-rays or an X-ray device for visually determining the fit of footwear. According to this method, the foot during a trial fitting with a shoe of supposedly the correct size is exposed to X-rays, at which time an observation is made of the shadows of the foot and shoe structures which are cast upon a fluorescent screen. However, the results obtained from the use of such apparatus have not been satisfactory since difficulty has been experienced in determining the exact foot measurements or of locating the positions of its marginal portions in the shoe owing to the contused or indistinct appearance of the portions of the shadows which represent the outer fleshy parts of the foot and the contiguous parts of the shoe upper, which parts of the foot and shoe structures are not of sufficiently different densities to the passage of Roentgen or X-rays to show strong contrast in the shadows cast on the screen; and in order to overcome these prior difficulties and to the end that an accurate determination of the exact location of the functioning foot in the shoe may be assured, and also that an indication of correct fitting of the foot may be clearly and distinctly shown on the fluorescent screen, I dispose marker or index means, opaque to Roentgen or X-rays, within or on the shoe structure above the sole portion thereof and near the outer borders of the foot, and the character of said marker means is such as to be clearly distinguishable from the shoe and foot structures

when exposed and examined under the action of the X-rays; and the marker index means which I employ may comprise two or more index members placed within or on the shoe upper above the sole, each of which is disposed in close adjacency to a side portion of the foot, preferably at the extreme width position thereof, or in proximate relation to the first and fifth metatarso-phalangeal joints thereof; and said marker index members may each take the form of a dense member opaque to X-rays and disposed longitudinally of the shoe at each side of the foot, within or on the side walls of the shoe upper and located in a proper position with respect to the extreme width of the foot and to be close to its outer borders; and these markers preferably should be of such a character that they will be permitted to move in action with any lateral expansion of the side portions of the upper due to filling of the shoe by the foot during a trial fitting. In order that an accurate means of measurement may be had to determine the extent of such lateral movement and correct fitting of the foot, I further provide index means opaque to X-rays and positioned in or on the sole of the shoe in a predetermined fixed relation thereon, preferably at the extreme width position thereof; and said sole index means are so positioned with respect to the sole as to be laterally removed from the borders of the bones of the first and fifth metatarso-phalangeal joints so that the extreme outer borders of said sole index means bear a coincident relation to the soft tissues and extreme width of the foot at such positions while said border portions of said index means are each normally in an aligned relation with its respective index member of the shoe upper which is disposed at the same side of the shoe when correct shoe fitting is obtained; and I preferably make the lateral distance between the extreme outer border edges of said sole index means to correspond exactly with the extreme width measurements of the particular shoe and predetermined by the shoe manufacturer as being correct and proper for that size and last of shoe; and I may also place an opaque marker or index member at the tip end of the shoe either in or on the sole or above the latter and in or on the end wall of the tip or toe cap of the shoe upper in order to demonstrate sufficient length beyond the ends of the toes; and the following is a more detailed description of the present embodiment of this invention, illustrating the preferred means by which these advantageous results may be accomplished:

With reference to the drawing, the numeral **10** designates the upper of a shoe which is usually made of a pliable material, such as leather, and provided with an inner lining **11** composed of a fabric material suitably secured thereto. Affixed to the upper **10** is the usual leather sole **12** consisting of an insole **13**, a slipsole **14** and an outsole **15**, the latter being composed usually of leather, although various rubber compositions or other suitable footwear materials may serve for this purpose.

As one embodiment of my invention I have shown in Figs. 1 to 5 of the drawing a shoe structure in which there is provided a pair of marker index members **17** and **18** which are positioned within or on the sides of the upper **10** and they are preferably so located as to be close to the sides of the foot and disposed at each side thereof. The members **17** and **18** are of similar construction and may comprise a body opaque or impermeable to X-rays, and preferably of a metallic character, such as a metal strip, wire, foil, an impregnated or coated fabric material, or other dense materials or substances which are capable of being easily distinguished from the foot and the shoe materials when exposed to the action of the X-rays. As shown in Figs. 2 and 3, the index members **17** and **18** are each embedded or inserted between the innermost layers of the shoe upper **10** nearest to the skin of the foot and they are each located above the sole of the shoe and extend in a general longitudinal direction of the shoe from heel to toe and lie substantially in a plane passing through the general medial areas of the joints and extending laterally of the articulations of the first and fifth metatarso-phalangeal joints of the foot. As shown in the drawing, the index **17** is located between the layers of or embedded within the outside wall of the shoe upper whereas the other index member **18** is similarly arranged within the inside shoe wall.

In order that there may be obtained an accurate determination of the extent of lateral movement of the marker index members **17** and **18** and also in order to properly locate the same when a correct fitting of the foot has been effected, I have provided two fixed or stationary index members **20** which are disposed in the sole of the shoe at positions transversely thereof near the outer borders of the foot and at locations corresponding to the extreme width of foot for the particular size and last of shoe being made. The index members **20** may each comprise a small body of any suitable dense material which is opaque to X-rays, such as a piece of metal or vulcanized rubber, and may be of any desired form and size, such as a wire or flat strip, which permits them to be positioned on or in the sole so as to be disposed below and be completely removed laterally from the borders of the bones of the foot and thus be located solely beneath the soft tissues of the first and fifth toes at the extreme outer borders thereof so as to bear coincident relation thereto. The index members **20** may be embedded in the sole of the shoe so as to be entirely disposed laterally thereof and lie at the sides and below the first and fifth metatarso-phalangeal joints so as to be coincident with the marginal edges or outer borders of the soft tissues of the foot and corresponding to the extreme width position of the foot. The members **20** are thus positioned in or on the shoe sole so that they will be in alignment with the movable index members **17** and **18** respectively when examined under the action of X-rays, as shown in Fig. 4, and thus will indicate on a fluorescent screen the extreme width of the functioning foot and the location of the outer borders of the fleshy portions thereof, and also give an indication when a correct fit is had in the shoe.

In Figs. 2 and 3 the positions of the little and great toes respectively, are shown in dotted outline and designated by the numerals **23** and **24** respectively, in order to show their proper positions when correct shoe fitting results.

It will therefore be seen that a correct fit of the shoe is obtained only when each of the index members **17** and **18** respectively is in alignment with an index member **20** disposed in the sole at the same side of the shoe, as shown in Fig. 4. However, should the shoe be too narrow in width or fit the foot too tightly then the side walls of the upper will consequently expand outwardly in the course of which lateral movement of the index members **17** and **18** will occur in opposite direc-

tions and away from the fixed index members **20**, as shown in Fig. 5, to visually indicate the position of the foot within the shoe, when viewed to X-rays, and the extent of improper fitting or the presence of a misfit.

In Figs. 6 and 7 I have shown as a modified form of my invention an index member **25** comprising an elongated strip or thin plate body placed either on or embedded in the sole of the shoe between the insole **13** and the outsole **15** and so located therein as to extend in a transverse direction of the shoe. The strip **25** may be made of any suitable dense material which is opaque or impermeable to X-rays, such as lead, vulcanized rubber and other materials capable of being visually differentiated under the action of X-rays from the structures of the foot and shoe and/or show strong contrast on a fluorescent screen. The strip **25** is preferably made of a length as to extend beyond the joint between the first metatarsal bone and the proximal phalangeal bone of the first or great toe, and extends transversely across the shoe so as to extend beyond the joint between the fifth metatarsal bone and the proximal phalangeal bone of the fifth or little toe. In Fig. 7 the position of the great toe is indicated in dotted outline and designated by the numeral **23** to show its relation to the shoe structure when a correct fitting is obtained. Thus, the sole index member **25** is intended to properly locate the position of the functioning foot within the shoe in generally the same manner, as that illustrated in Figs. 4 and 5 when the separate index members **20** are used, and accordingly, the member **25** will indicate correct shoe fitting when the side index pieces **17** and **18** are in alignment with the tips of this transverse sole member **25**.

If desired, the opaque sole strip **25** may be further provided with permeable size markings, such as perforations, whereby the size of the shoe will be visibly indicated or shown in the X-ray shadow on the fluorescent screen.

As illustrated in dotted outline in Figs. 4 and 5, a fixed index piece **21** also composed of an opaque material may be placed at the tip or forward end of the shoe either on or in the sole or above the sole and on or in the toe cap to indicate and locate the amount of length or clearance beyond the distal ends of the toes or digits of the foot.

In accordance with this invention I have thus provided means of improving and facilitating the art and practice of shoe fitting by incorporating relatively movable opaque structures in shoes in such accurate relationship to important foot measurements that those people, experienced or inexperienced in shoe fitting and interested in the purchasing or sale of shoes can see with the use of X-rays and fluorescent screen that the shoe fits the foot correctly.

In accordance with my invention I have therefore provided not only a means which responds to expansive movements of the side walls of the shoe upper but also one which is capable of being seen with use of Roentgen-rays by those people interested in the purchase or sale of the shoe and indicating the degree of fitting with reference to a fixed index standard of comparison within each shoe, the length of each of said sole reference standards being of a predetermined length whose dimensions are identical with the extreme widths for correct fitting of shoes.

It is to be understood that by the term "extreme width of foot" is meant the transverse measurements of the foot to the extreme outer borders of the soft tissues and skin beyond the lateral borders of the bones of the first and fifth metatarso-phalangeal joints.

The foregoing description is directed solely towards the construction illustrated, but I desire it to be understood that I reserve the privilege of resorting to all the mechanical changes to which the device is susceptible, the invention being defined and limited only by the terms of the appended claims.

I claim:

1. In a shoe or similar article of footwear having a sole and an upper, index members carried by the upper of the shoe, said index members being composed of a metallic material opaque to X-rays and arranged in the shoe upper at opposite sides thereof at the point of extreme width so as to visibly differentiate under the action of X-rays the extreme outer borders of a foot from the contiguous inner borders of the shoe upper, and a separate index member at the forward tip of the shoe for visibly indicating under the action of X-rays the extreme forward end of the occupiable length inside of the shoe.

2. In a shoe or similar article of footwear having a sole and an upper, a pair of opposed index members arranged on the walls of the upper above the sole and at laterally opposed positions corresponding to the normal positions of the outer borders of a foot properly fitting said shoe at the first and fifth metatarso-phalangeal joints thereof, and a separate index member between the layers of the shoe upper and at the forward tip of the shoe for visibly indicating under the action of X-rays the extreme forward end of the occupiable length inside of the shoe, said index members being composed of a substance opaque to X-rays.

3. In a shoe or similar article of footgear having a sole and an upper, index members placed in the sole margin under the point of greatest width of the upper, and other index members fixedly positioned above the sole in the wall of the upper and movable therewith relative to said sole index members in response to transverse expanding movements of said side wall due to filling of the shoe by a foot, said index members being composed of a material opaque to X-rays.

4. In a shoe or similar article of footgear having a sole and an upper, index members placed between the layers of the sole margin under the point of greatest width of the upper, and other index members fixedly positioned above the sole in a side wall of the shoe upper and movable therewith relative to said sole index members in response to transverse expanding movements of said side wall due to filling of the shoe by a foot, said index members being composed of a metallic material opaque to X-rays.

5. In a shoe or similar article of footgear having a sole and an upper, index members placed between the sole layers at the margin thereof at its point of greatest width, and other corresponding index members fixedly positioned above the sole in a side wall of the shoe upper and each movable therewith relative to the corresponding sole index member in response to transverse expanding movements of said side wall due to filling of the shoe by a foot, said upper index members being composed of a flexible material opaque to X-rays.

6. In a shoe or similar article of footwear having a sole and an upper, stationary laterally op-

posed index members between the layers of the sole, and other index members fixedly positioned above the sole index members in the opposite side walls of the shoe upper and movable therewith relative to said sole index members in response to transverse expanding movements of said side wall due to filling the shoe by a foot, said upper and sole index members being composed of a dense material opaque to X-rays, said index members being positioned in said upper at positions thereof where the shoe is adapted to bear against a properly fitting foot at the first and fifth metatarso-phalangeal joints thereof to indicate the limit of the marginal edges of the soft tissues of the foot upon filling of the shoe by the same and to cooperate with said sole index members to indicate the quality of fit.

7. In a shoe or similar article of footwear having a sole and an upper extending transversely thereof, a fixed index member embedded in the sole and extending transversely thereof, and other index members fixedly positioned in opposite side walls of the upper at its point of greatest width and movable therewith relative to said sole index in response to transverse expanding movements of said side walls due to filling of the shoe by a foot, said index members being composed of a dense material opaque to X-rays, said sole index being of a predetermined length such that its ends are spaced a distance to correspond to the correct width measurement of the upper at its point of greatest width and is accurately positioned in the sole so as to extend a sufficient distance laterally beyond the first and fifth metatarso-phalangeal joints of a properly fitting foot when placed in the shoe so as to be coincident with the outer edge limits of the soft tissue and skin at the extreme foot width and so as to be aligned with the upper index members when correct fitting is obtained.

8. In a shoe or similar article of footwear having a sole and an upper, a fixed index member carried by the sole under the upper at its point of greatest width, a second index member in opposed relation to the sole index and carried by said upper above the sole, the index member of the shoe upper being laterally movable therewith relative to the fixed index member in the sole of the shoe, said index members being composed of a material opaque to X-rays.

9. In a shoe having a sole and an upper, a fixed index member embedded in the sole, a pair of laterally opposed index members each component of which is fixedly positioned in an opposite side wall of the shoe upper and is movable with the latter relative to the other and with respect to said fixed index, said index members being composed of a material opaque to X-rays, said sole index being of a predetermined length from tip to tip to correspond to the correct width dimension of the upper at its point of greatest width when a proper fit is attained, said sole index being accurately positioned in said sole so as to extend transversely thereof and with the tip portions thereof extending a sufficient distance beyond the borders of the bones of the first and fifth metatarso-phalangeal joints of a properly fitting foot to bear coincident relation with the soft tissues and extreme width flesh and skin limits of the foot.

10. In a shoe or similar article of footwear having a sole and an upper, index members in the upper of the shoe above the sole, said index members being composed of a material opaque to X-rays and arranged on opposite sides of the shoe upper at the position of extreme width thereof so as to visibly differentiate on a fluorescent screen under the action of X-rays the inner wall of the shoe that it may be compared with the extreme outer fleshy limits of a foot.

11. In a shoe or similar article of footwear having a sole and an upper, laterally opposed index members in the upper of the shoe above the sole, said index members being composed of a flexible material opaque to X-rays and arranged at the point of greatest width of the shoe upper so as to visibly differentiate on a fluorescent screen under the action of X-rays the inner wall of the shoe that it may be compared with the extreme outer limits of the flesh and skin of a foot when the latter is placed in the shoe.

12. In a shoe or similar article of footwear having a sole and an upper, laterally opposed index members within the upper of the shoe above the sole, said index members being composed of a flexible material opaque to X-rays and arranged in the shoe upper so as to visibly differentiate on a fluorescent screen under the action of X-rays the wall of the shoe that it may be compared with the extreme outer limits of the flesh and skin of a foot when the latter is placed in the shoe.

13. In a shoe or similar article of footwear having a sole and an upper, two pairs of index members at the point of greatest width of the shoe, one pair being carried by the sole of the shoe and located in laterally opposed marginal positions thereof under the upper, the other pair of index members being placed in the shoe upper above the sole, one in each side wall of the upper, each of said upper index members being located in close proximity to the corresponding sole index member at the same side of the shoe and being relatively movable with respect to the adjacent sole index, said index members being each composed of a material opaque to X-rays and of a character visibly distinguishable from the shoe and fleshy foot structures under the action of X-rays so as to locate the inside wall of the shoe that it may be compared with the extreme outer flesh and skin limits of a foot when the latter is placed in the shoe, thereby determining the quality of fit by the positions of the pair of movable markers in the upper relative to those in the sole.

14. In a shoe or similar article of footwear having a sole and an upper, two pairs of index members at the point of greatest width of the shoe, one pair being embedded in the sole of the shoe and located in laterally opposed marginal positions thereof, the other pair of index members being placed in the shoe upper above the sole, one in each side wall of the upper, each of said upper index members being located in close proximity to the corresponding sole index member at the same side of the shoe and being relatively movable with respect to the adjacent sole index, said index members being composed of a flexible material opaque to X-rays and of a character visibly distinguishable on a fluorescent screen from the shoe and fleshy foot structures under the action of X-rays to locate the inside wall of the shoe that it may be compared with the position of the extreme outer limits of the flesh and skin of a foot when the latter is placed in the shoe, thereby determining the quality of fit by the positions of the pair of movable markers in the upper relative to those in the sole.

HOWARD V. S. MOTT.