# PATENT SPECIFICATION

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COMPLETE SPECIFICATION

## Improvements in Footwear

We, ERNEST E. ROLLMAN, a citizen of the United States of America, and ANDREW SZERENYI, a citizen of Canada, both of Waynesville, North Carolina, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statements :—

This invention relates to footwear with soft, flexible soles made wholly or partly of sponge rubber.

In the manufacture of footwear of this kind the procedure hitherto has been first to form an upper of leather or other material by cutting and sewing, then to place said upper on a last or into a mould and finally to form and vulcanize the porous rubber sole onto the upper. This method has the advantage of ensuring a good bond between the upper and the sole, but it has been found that the heat of the vulcanization process sometimes causes unequal shrinkage or distortion of the upper due to its influence upon the material of the upper.

According to the present invention these disadvantages are overcome and a number of advantages obtained by forming and vulcanizing the sponge rubber sole *in situ* to the upper before the upper is formed into its final shape.

The invention can be carried out, as an example, by uniting the sole with a piece of material, such as leather, large enough to enable the upper to be cut and partly stitched before vulcanization, but is formed into its final shape after completion of the vulcanization.

In order that the invention may be more clearly understood various embodiments thereof will now be described by way of example, with reference to the accompanying drawings wherein :—

Figure 1 is a top plan view, in flattened form, of a sandal according to the invention, wherein a single piece of leather forms a sock lining and the upper.

Figure 2 is a cross section on the line II—II of Figure 1 of the sandal placed in a vulcanizing mould.

Figure 3 shows the same sandal in perspective view on the foot of the wearer.

Figure 4 is a diagrammatic cross section showing the vulcanization of a sponge rubber sole to a partly formed upper which has been previously turned so as to present its inside surface to the sole.

Figure 5 shows the same shoe after the partly formed upper is turned back so as to enclose the sole.

In the embodiment shown in Figures 1 to 3 the sandal comprises a piece of leather 1 shaped to form the inner sole or sock lining 2 and having tongues or flaps 3, forming the upper proper, with eyelets 4. A sole 5 of sponge rubber is formed and vulcanized *in situ* with the leather piece 1. This can be done in a simple mould (shown in Figure 2), formed by flat top and bottom plates 6 and 7 and an intermediate frame 8. By reversing the frame 8 the same mould can be used to make "right" and "left" foot sandals. After the vulcanising process a lace 9 is threaded through the eyelets 4 in the upper to hold the flaps or tongues 3 in position and to fasten the sandal to the foot, as shown in Figure 3.

If desired the sponge rubber sole may be covered on its underside with a tread-sole or may be provided with heel lifts The upper may be made from material other than leather, for example it may be made of any suitable fabric or other flexible material. In some instances it might be preferred to cut some or all of the flaps or tongues forming the upper from material other than the material from which the sock lining is cut. Due to the excellent adherence of the sponge rubber sole to the parts of the upper situated within the mould during vulcanization it is possible to omit any stitching or cementing of the sock lining to the parts of the upper or to provide such loose connections between these parts of the upper and the sock lining that

the flexibility of the sandal is not impaired. Local stitching may also be provided either for the ornamentation of the footwear or to connect the flaps or tongues 3 to each other after the vulcanization of the footwear.

The method of forming the upper after the formation and the attaching of the sole, which is contrary to the hitherto established practice of making such footwear, has the further advantage that a variety of patterns can be produced without any change in moulds or material. The footwear can be produced as uniform items including the step of vulcanization. The flaps or tongues 3, shaped accordingly, can be made to overlap and by varying the sequence of overlapping the variety of pattern of the finished footwear is produced. An ornamental piece of material may be used as an inset or instep to connect the flaps through the lacing 9 or other fastening means. This permits a variety of patterns of the finished footwear to be obtained by changing only the one piece forming the inset or instep, as example from heart shaped to diamond shaped, or by placing said piece above and below the flaps 3 alternately.

In some footwear it is desirable to use for the upper, leather which has a very smooth polished outer surface while the inside or " flesh side " remains relatively rough. The construction of footwear as described with reference to Figures 4 and 5 may be used to great advantage for such leather and the vulcanization may take place while the partly shaped upper 15 is turned and placed " flesh side out " onto a last 16 having a relatively flat extension 17. This extension 17 corresponds in size and shape to the sponge rubber sole 18 so that after it is removed from the mould, consisting of a frame 20 and a bottom plate 19, the upper may be turned with the polished surface outside and the sponge rubber sole inside. Part of the material forming the upper then forms also the treadsole and covers the side rim of the sole as shown in Figure 5. Reinforcements may be applied thereafter to the footwear and the upper can be finally shaped and completed by sewing or blocking or by any other of the customary finishing operations.

The term " sponge rubber " has been used here to describe not only macro- or microporous structures made from Hevea rubber, but also any other similar elastomer of natural or synthetic origin.

What we claim is:—

1. Footwear comprising a sole of sponge rubber vulcanized *in situ* to material forming an upper before the upper is formed into its final shape.

2. Footwear according to claim 1, wherein the upper is formed by flaps or tongues extending from the edges of a sock lining and suitably connected together.

3. Footwear according to claim 2, wherein the sock lining and the flaps or tongues forming the upper are cut from a single piece of material.

4. Footwear according to claims 1 and 2, wherein the tongues or flaps forming the upper are formed from material other than the material of the sock lining.

5. Footwear according to any of claims 2 to 4, wherein an instep piece is connected to said flaps or tongues.

6. Footwear according to any of claims 1 to 5, wherein the material forming the upper encloses the sponge rubber sole.

7. A method of manufacturing footwear according to claims 1 to 6 wherein a sole of sponge rubber is first formed and then vulcanized *in situ* to material forming an upper and a sock lining and the said material is then shaped to form a finished upper.

8. A method according to claim 7, wherein the sole is formed and vulcanized to the upper in a mould in the uppers reversed position and after removal from the mould the sole is turned inside of the then returned upper.

9. A mould when used for carrying out the method according to claims 7 or 8 comprising a relatively flat top plate or last, a relatively flat bottom plate and an intermediate frame, the arrangement being such that in operation the material of the upper is held between the top plate or a relatively flat extension of the last and the intermediate frame in which is placed the sponge rubber sole to which the upper is to be vulcanized.

10. Footwear constructed substantially as herein described with reference to the accompanying drawings.

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## PROVISIONAL SPECIFICATION

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the flexibility of the sandal is not impaired. Local stitching may also be provided either for the ornamentation of the footwear or to connect the flaps or tongues 3 to each other after the vulcanization of the footwear.

The method of forming the upper after the formation and the attaching of the sole, which is contrary to the hitherto established practice of making such footwear, has the further advantage that a variety of patterns can be produced without any change in moulds or material. The footwear can be produced as uniform items including the step of vulcanization. The flaps or tongues 3, shaped accordingly, can be made to overlap and by varying the sequence of overlapping the variety of pattern of the finished footwear is produced. An ornamental piece of material may be used as an inset or instep to connect the flaps through the lacing 9 or other fastening means. This permits a variety of patterns of the finished footwear to be obtained by changing only the one piece forming the inset or instep, as example from heart shaped to diamond shaped, or by placing said piece above and below the flaps 3 alternately.

In some footwear it is desirable to use for the upper, leather which has a very smooth polished outer surface while the inside or " flesh side " remains relatively rough. The construction of footwear as described with reference to Figures 4 and 5 may be used to great advantage for such leather and the vulcanization may take place while the partly shaped upper 15 is turned and placed " flesh side out " onto a last 16 having a relatively flat extension 17. This extension 17 corresponds in size and shape to the sponge rubber sole 18 so that after it is removed from the mould, consisting of a frame 20 and a bottom plate 19, the upper may be turned with the polished surface outside and the sponge rubber sole inside. Part of the material forming the upper then forms also the treadsole and covers the side rim of the sole as shown in Figure 5. Reinforcements may be applied thereafter to the footwear and the upper can be finally shaped and completed by sewing or blocking or by any other of the customary finishing operations.

The term " sponge rubber " has been used here to describe not only macro- or microporous structures made from Hevea rubber, but also any other similar elastomer of natural or synthetic origin.

What we claim is:—

1. Footwear comprising a sole of sponge rubber vulcanized *in situ* to material forming an upper before the upper is formed into its final shape.

2. Footwear according to claim 1, wherein the upper is formed by flaps or tongues extending from the edges of a sock lining and suitably connected together.

3. Footwear according to claim 2, wherein the sock lining and the flaps or tongues forming the upper are cut from a single piece of material.

4. Footwear according to claims 1 and 2, wherein the tongues or flaps forming the upper are formed from material other than the material of the sock lining.

5. Footwear according to any of claims 2 to 4, wherein an instep piece is connected to said flaps or tongues.

6. Footwear according to any of claims 1 to 5, wherein the material forming the upper encloses the sponge rubber sole.

7. A method of manufacturing footwear according to claims 1 to 6 wherein a sole of sponge rubber is first formed and then vulcanized *in situ* to material forming an upper and a sock lining and the said material is then shaped to form a finished upper.

8. A method according to claim 7, wherein the sole is formed and vulcanized to the upper in a mould in the uppers reversed position and after removal from the mould the sole is turned inside of the then returned upper.

9. A mould when used for carrying out the method according to claims 7 or 8 comprising a relatively flat top plate or last, a relatively flat bottom plate and an intermediate frame, the arrangement being such that in operation the material of the upper is held between the top plate or a relatively flat extension of the last and the intermediate frame in which is placed the sponge rubber sole to which the upper is to be vulcanized.

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United States of America, do hereby declare this invention to be described in the following statement:—

This invention relates to footwear with soft, flexible soles made wholly or partially of sponge rubber.

Hitherto it is usual to prepare an upper of leather or other material by cutting, sewing etc., to place said upper on a last or into a mould and to form and vulcanize the porous rubber sole onto the upper. This method has the advantage of ensuring a good bond between the upper and the sole, but it has been observed that the heat of the vulcanization process sometimes causes unequal shrinkage or distortion of the material of the upper.

According to the present invention this disadvantage is overcome and a number of advantages obtained by forming and vulcanizing the sponge rubber sole onto the upper before the latter receives its final shape.

This invention can be carried out by uniting the sole to a piece of material, such as leather, large enough to enable the upper to be cut and formed after the vulcanization or the material to be cut and partly stitched but not yet finally shaped. In all instances the final shaping of the upper will be effected after the vulcanization.

In accordance with one particular embodiment of the invention the footwear is in the form of a sandal composed of one piece of leather shaped to form the sock lining and the upper which comprises several flaps or tongues with eyelets through which a lacing is adapted to be threaded to hold said flaps or tongues in position and to secure the sandal to the foot. A sole of porous rubber is formed and vulcanized *in situ* in contact with and to the leather piece. This can be done in a mould of very simple construction formed by flat top and bottom plates and an intermediate frame. By reversing the frame the same mould can be used to make " right " and " left " foot sandals.

Whenever desired the sponge rubber sole may be covered on its bottom with a tread sole or may be provided with heel plates. The upper may be made from material other than leather, such as fabric or plactics. In some instances it might be preferred to cut some or all of the flaps or tongues forming the upper from material other than the material from which the sock lining is cut. Due to the excellent adherence of the sponge rubber sole to the parts of the upper present in the mould during the vulcanization it is possible to avoid any stitching or cementing of the sock lining to the upper or to provide such loose connection between the upper and the sock lining that the flexibility of the sandal is not impaired. Local stitching may also be provided either for the ornamentation of the footwear or to connect the flaps or tongues to each other after the vulcanization of the footwear. In a modification seams or welts are also avoided. In such modification an upper, preferably made from a single piece of leather, encloses the sponge rubber sole. The pressure developed by the sponge rubber during the vulcanization forces the leather to follow the contour of a mould cavity formed by a bottom or base plate, an upper frame and the last. This construction of the footwear permits softness and flexibility to be maintained even for soles with more than $\frac{1}{2}$" thickness. After de-moulding it might be desirable to cement a heel to the tread sole formed by the single piece of leather or to fasten parts such as the so-called " moccasin " plugs to the upper.

For some footwear it is desirable to use for the upper leather which has a very smooth, glazed outside while the inside or " flesh side " remains relatively rough. The construction of footwear according to the second modification described may be used to great advantage for such leather or, according to a further feature of the invention, the upper may be turned after its manufacture and placed " flesh side out " onto a last with a suitable extension. The sponge rubber sole is formed and vulcanized in contact with and to the " flesh side " of the leather so as to assure a good and permanent bond. The extension of the last corresponds in size and shape to the mould cavity so that after de-moulding the upper might be turned " glazed side out " and the sponge rubber sole finds its place in the extension of the upper which forms now the tread sole and covers the side rim of the sole. Reinforcements or ornamentations may be applied thereafter to the footwear and the upper can thereafter be completed by sewing and blocking or other of the customary finishing operations.

The term " sponge rubber " has been used here to describe not only macro- or microporous structures made from Hevea rubber, but also any other similar elastomer of natural or synthetic origin.

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