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COMPLETE SPECIFICATION

Improvements relating to Rubber Footwear.

We, THE BRITISH BATA SHOE COMPANY LIMITED, a British Company, of East Tilbury, Essex, England, 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 statement :

This invention relates to footwear (hereinafter and in the claims referred to simply as shoes) formed wholly or partly of moulded rubber or the like (hereinafter and in the claims referred to simply as rubber) with insoles incorporating sponge rubber. The invention embraces *inter alia* kneeboots of the "Wellington" type, and sports shoes including sports shoes having textile uppers.

The invention is a method of making shoes comprising building together the following components, namely, a sole incorporating vulcanisable rubber, an upper also incorporating vulcanisable rubber and an insole incorporating a top layer of porous fabric and an under layer composed of a composition of vulcanisable rubber containing a sponging agent, and subjecting said components on a last to heat and pressure by an exterior medium to vulcanise the rubber constituents and to convert said composition into vulcanised sponge rubber, the procedure being such that gases produced in the insole during sponging escape through and under the control of said fabric and the components are under the exterior pressure of said medium, the reactive interior pressure of the last and the internal pressure due to said gases, so that the components are united as an integral whole.

It is known to incorporate in shoes, such as aforesaid, insoles which are cut in a clicking press from a sheet of vulcanised sponge rubber. The waste material cannot be reused except after a process of re-claim treatment.

[*Price* 3*s.* 0*d.*]

The present invention also is a shoe made by the foregoing method and comprising, as its components, a sole incorporating vulcanised rubber, an upper also incorporating vulcanised rubber and an insole incorporating a top layer of porous fabric and an under layer of sponge rubber bonded together, said components being welded together by vulcanisation and sponging under heat and under pressure applied to the exterior of the shoe, to the interior of the shoe and internally of the insole so that the sponge rubber is spread to fill spaces round the insole.

An embodiment of the invention will now be described, merely by way of example, with reference to the accompanying drawings, in which :—

Fig. 1 is a transverse section through the foot part of a kneeboot of the "Wellington" type, mounted on a hollow last and constructed in accordance with the present invention ;

Fig. 2 is a fragmentary transverse section through the leg part of such a kneeboot.

Referring firstly to Fig. 1, the sole of a kneeboot of the "Wellington" type formed on a hollow aluminium last 1, comprises a main sole 2 of rubber, a lower insole consisting of outer layers 3 of vulcanisable rubber an intermediate layer 4 of textile fabric, an upper insole consisting of an underlayer 5 of a composition of vulcanisable rubber containing a sponging agent bonded on its upper surface to a top layer 6 of porous textile fabric. The porosity of the fabric layer 6 allows for controlled escape of gases from the composition layer 5 during vulcanisation and sponging. The upper of the kneeboot, at the foot part thereof, consists of a porous textile fabric layer 7 bonded to an outer vulcanisable rubber layer 8 and the lower ends of these layers 7 and 8 are turned in under the layer 5. A vulcanisable rubber

foxing 9 secures the rubber layer 8 to the main sole 2.

The leg part of the upper of the kneeboot, as shown in Fig. 2, may have a layer 10 interposed between the fabric and rubber layers 7 and 8 respectively the layer 10 being composed of vulcanisable rubber containing a sponging agent.

Preparatory to assembling the components of the boot on the last 1, the inter-engaging surfaces are coated with a vulcanisable rubber cement. That is to say, in the assembled boot components, there are coatings of such cement between the main sole 2 and the insole layer 3 and foxing 9, between the insole layers 3 and 5, and between the foxing 9 and the upper 8.

The operator takes the upper composite insole 5, 6 in one hand and positions it upon the bottom of the last. With the other hand he positions and pulls the upper 7, 8 around the last, inturns the margin of the upper and presses the margin against the insole 5, 6. Next, the lower insole 3, 4 is applied and pressed, then the foxing 9 and lastly the main sole 2. The already applied cement serves temporarily to hold the parts together.

When the boot is assembled, as shown, on the hollow aluminium last 1, the whole is then introduced into the vulcanising boiler, which is a chamber containing hot air under pressure, subjected to vulcanising and sponging heat and to the three following pressures:

(1) Pressure in the boiler acting on the exterior of the boot.

(2) Pressure by the hollow aluminium last reacting on the interior of the boot.

(3) Pressure on the welds formed by the cement between the sole, insoles foxing and upper caused by expansion of the sponge rubber insole caused by the production of gases during vulcanisation and sponging.

The porosity of the fabric layers 6 and 7 allows for controlled escape of gases from the sponge rubber layers 5 and 10 during vulcanisation and sponging.

After vulcanisation and sponging, the rubber components of the boot constitute an integral whole, the rubber components all uniting into each other under the heat and pressure within the boiler.

The layers 5 and 10 may initially be bonded with fabric layers 6 and 7, respectively, directly by layering on a three bowl calendar.

The sponge insole may conveniently be made of any desired thickness.

As a result of the invention:—

(a) The upper insole of a built-up shoe is produced in vulcanised sponge rubber form and is incorporated as an integral component of the shoe by one operation.

(b) Clicking waste from the uncured sponge material can be re-used without reclaiming as is the case with pre-vulcanised waste material.

(c) During vulcanisation internal pressure is exerted by expansion of the sponging insole against the other parts of the built-up shoe in opposition to the normal pressure in the boiler, so that the sponge rubber of the upper insole is spread outwards and completely seals the bottom of the shoe and will fill any small spaces round the upper and lower insoles.

If desired, the initial layer 5 of vulcanisable rubber and sponging agent may be interleaved between top and bottom textile layers, all finally bonded together by the vulcanising procedure.

Lighter textile fabrics may replace heavier and more expensive ones for the bootee type of shoe; such lighter fabrics give warmth and heat retention equivalent to heavier fabrics.

The rubber of the upper insole may be coated as composition of uncured rubber and vulcanising and sponging agents coated on to uncoated textile material. The compound may be applied by spraying or spreading or by coating.

What we claim is:—

1. A method of making shoes comprising building together the following components, namely a sole incorporating vulcanisable rubber, an upper also incorporating vulcanisable rubber and an insole incorporating a top layer of porous fabric and an under layer composed of a composition of vulcanisable rubber containing a sponging agent, and subjecting said components on a last to heat and pressure by an exterior medium to vulcanise the rubber constituents and to convert said composition into vulcanised sponge rubber, the procedure being such that gases produced in the insole during sponging escape through and under the control of said fabric and the components are under the exterior pressure of said medium, the reactive interior pressure of the last and the internal pressure due to said gases, so that the components are united as an integral whole.

2. A method of making shoes according to Claim 1 in which the insole is made beforehand by bonding a sheet of textile fabric to a layer of the composition.

3. A method of making shoes according to claim 1 or 2 in which the said insole is inserted above a lower insole composed of layers of vulcanisable rubber with a textile layer between, said insoles becoming integrally united with one another in the vulcanising operation.

4. A method of making shoes according to any preceding claim in which the sponge rubber composition is coated on to uncoated textile material.

foxing 9 secures the rubber layer 8 to the main sole 2.

The leg part of the upper of the kneeboot, as shown in Fig. 2, may have a layer 10 interposed between the fabric and rubber layers 7 and 8 respectively the layer 10 being composed of vulcanisable rubber containing a sponging agent.

Preparatory to assembling the components of the boot on the last 1, the inter-engaging surfaces are coated with a vulcanisable rubber cement. That is to say, in the assembled boot components, there are coatings of such cement between the main sole 2 and the insole layer 3 and foxing 9, between the insole layers 3 and 5, and between the foxing 9 and the upper 8.

The operator takes the upper composite insole 5, 6 in one hand and positions it upon the bottom of the last. With the other hand he positions and pulls the upper 7, 8 around the last, inturns the margin of the upper and presses the margin against the insole 5, 6. Next, the lower insole 3, 4 is applied and pressed, then the foxing 9 and lastly the main sole 2. The already applied cement serves temporarily to hold the parts together.

When the boot is assembled, as shown, on the hollow aluminium last 1, the whole is then introduced into the vulcanising boiler, which is a chamber containing hot air under pressure, subjected to vulcanising and sponging heat and to the three following pressures:

(1) Pressure in the boiler acting on the exterior of the boot.

(2) Pressure by the hollow aluminium last reacting on the interior of the boot.

(3) Pressure on the welds formed by the cement between the sole, insoles foxing and upper caused by expansion of the sponge rubber insole caused by the production of gases during vulcanisation and sponging.

The porosity of the fabric layers 6 and 7 allows for controlled escape of gases from the sponge rubber layers 5 and 10 during vulcanisation and sponging.

After vulcanisation and sponging, the rubber components of the boot constitute an integral whole, the rubber components all uniting into each other under the heat and pressure within the boiler.

The layers 5 and 10 may initially be bonded with fabric layers 6 and 7, respectively, directly by layering on a three bowl calendar.

The sponge insole may conveniently be made of any desired thickness.

As a result of the invention:—

(a) The upper insole of a built-up shoe is produced in vulcanised sponge rubber form and is incorporated as an integral component of the shoe by one operation.

(b) Clicking waste from the uncured sponge material can be re-used without reclaiming as is the case with pre-vulcanised waste material.

(c) During vulcanisation internal pressure is exerted by expansion of the sponging insole against the other parts of the built-up shoe in opposition to the normal pressure in the boiler, so that the sponge rubber of the upper insole is spread outwards and completely seals the bottom of the shoe and will fill any small spaces round the upper and lower insoles.

If desired, the initial layer 5 of vulcanisable rubber and sponging agent may be interleaved between top and bottom textile layers, all finally bonded together by the vulcanising procedure.

Lighter textile fabrics may replace heavier and more expensive ones for the bootee type of shoe; such lighter fabrics give warmth and heat retention equivalent to heavier fabrics.

The rubber of the upper insole may be coated as composition of uncured rubber and vulcanising and sponging agents coated on to uncoated textile material. The compound may be applied by spraying or spreading or by coating.

What we claim is:—

1. A method of making shoes comprising building together the following components, namely a sole incorporating vulcanisable rubber, an upper also incorporating vulcanisable rubber and an insole incorporating a top layer of porous fabric and an under layer composed of a composition of vulcanisable rubber containing a sponging agent, and subjecting said components on a last to heat and pressure by an exterior medium to vulcanise the rubber constituents and to convert said composition into vulcanised sponge rubber, the procedure being such that gases produced in the insole during sponging escape through and under the control of said fabric and the components are under the exterior pressure of said medium, the reactive interior pressure of the last and the internal pressure due to said gases, so that the components are united as an integral whole.

2. A method of making shoes according to Claim 1 in which the insole is made beforehand by bonding a sheet of textile fabric to a layer of the composition.

3. A method of making shoes according to claim 1 or 2 in which the said insole is inserted above a lower insole composed of layers of vulcanisable rubber with a textile layer between, said insoles becoming integrally united with one another in the vulcanising operation.

4. A method of making shoes according to any preceding claim in which the sponge rubber composition is coated on to uncoated textile material.

5. A method of making shoes according to Claim 4 in which the sponge rubber composition is applied by spraying.

6. A method of making shoes according to Claim 4 in which the sponge rubber composition is applied by spreading or coating.

7. A method of making shoes according to any of the preceding claims and including building-in a lining of porous fabric bonded with a composition of vulcanisable rubber containing a sponging agent with the shoe upper before vulcanising.

8. A method of making shoes substantially as hereinbefore described with reference to the accompanying drawings.

9. A shoe formed of rubber whenever made by the method according to any of the preceding claims.

10. A shoe formed of rubber comprising as its components a sole incorporating vulcanised rubber, an upper also incorporating vulcanised rubber and an insole incorporating a top layer of porous fabric and an under layer of sponge rubber bonded together, said components being welded together by vulcanisation and sponging under heat and under pressure applied to the exterior of the shoe, to the interior of the shoe and internally of the insole so that the sponge rubber is spread to fill spaces round the insole.

11. A shoe according to Claim 10 in which the insole consists of an upper layer of textile fabric and a lower layer of sponge rubber bonded together.

12. A shoe according to Claim 10 or 11 in which the shoe upper has a layer of sponge rubber to the inner surface of which a textile lining is bonded.

13. A shoe substantially as hereinbefore described with reference to the accompanying drawings.

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PROVISIONAL SPECIFICATION.

Improvements relating to Rubber Footwear.

We, THE BRITISH BATA SHOE COMPANY LIMITED, a British Company, of East Tilbury, Essex, England, do hereby declare this invention to be described in the following statement :—

This invention relates to footwear (hereinafter referred to simply as shoes) formed of moulded rubber or the like (hereinafter referred to simply as rubber) with insoles.

According to the present invention we provide a method of forming such shoes comprising bonding together layers of textile material and uncured sponge rubber, building an insole of said bonded material in with the sole and upper in the shoe interior, and vulcanising the shoe and insole in situ therein, whereby the shoe and insole become integral.

The invention further comprises a built-up rubber shoe comprising a main sole, a main insole and a sponge rubber insole, the last having on the upper surface thereof a layer of fabric pre-bonded thereto, and the whole being integrally united by vulcanising with the rubber of the insoles and the sole united directly together during vulcanisation.

Hitherto some of the greatest drawbacks with known methods of building sponge rubber insoles into sports and other shoes is that :

(a) They are normally fitted separately into the shoes either during the lasting operation or after actual vulcanisation of the shoes. This separate fitting operation is expensive and does not allow the sponge insole to be held firmly in the shoe during the wearing. It also takes up space in the shoe originally intended to accommodate the foot.

(b) Sponge insoles hitherto fitted during or after the building operation are precured, which involves substantial additional cost. Moreover, the waste from the cured sheets after the insoles have been cut cannot be re-used without reclaim processing.

As a result of the invention :—

(a) The sponge insole may be fitted by one operation directly with the main insole material instead of by two or even three separate operations as heretofore.

(b) Clicking waste from the uncured sponge material can be re-used immediately without further processing or reclaiming as is the case with cured material.

(c) During vulcanisation separate pressure is exerted against the sponge insole, main insole, sole and other parts of the built-up shoe in addition to the normal pressure put into the boiler. These two opposing pressures force the parts together as does happen in the case of vacuum vulcanising, but without additional expense ; it provides a shoe whose parts are welded firmly together, which is otherwise difficult without the application of expensive vacuum vulcanising.

(d) The blowing of the sponge insole completely seals the bottom of the shoe and will even fill in any small spaces at the main insole caused by improper levelling.

In one example as applied, for example, to a kneeboot of the "Wellington" type, the main or outer sole of rubber has above it a main insole of rubber reinforced with fabric and applied in layers, the upper is of rubber with a fabric interior and some parts may have a sponge rubber interior bonded to fabric. The insole comprises a layer of sponge rubber bonded to fabric as aforesaid with the fabric uppermost and the sponge rubber surface in direct contact with the main insole.

The uncured sponge rubber may initially be bonded with a textile material directly by layering on a three bowl calender, and the material of the upper, of the outer or main sole, of the main insole, and of the sponge rubber insole are assembled together during the building-up operation. The shoe is then vulcanised in hot air under pressure where a sponge rubber layer of a predetermined thickness forms itself into a sponge insole similar to that hitherto pre-cured and fitted in a separate operation.

The sponge insole may conveniently be made of any desired thickness.

The method may be used for interleaving textiles with a sponge layer which forms during the actual cure. Lighter fabrics may replace the heavier and more expensive ones for the bootee type of shoe, and at the same time give warmth and heat retention equivalent to heavier fabrics. The resultant shoe, after vulcanisation, is a firmly welded integral unit which has been joined by heat and pressure into a homogeneous whole.

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