Tentamen Octrooigemachtigden

Tentamen Praktische Vaardigheden: "Schrijven van een advies"

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19 november 2001

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Tentamen praktische vaardigheden

Bijgaand is een brief van een klant (met bijlagen), waarin advies gevraagd wordt over een octrooisituatie. U wordt verzocht deze situatie te analyseren en mede aan de hand van de vragenlijst uw antwoord op te stellen.

INSOLE BV

Aan: Gemachtigde

Zoals u weet zijn wij een bedrijf dat zich bezig houdt met het vervaardigen van op maat gemaakt orthopedisch schoeisel. Dit omvat enerzijds de schoenen, maar vooral ook op maat gemaakte inlegzolen.

Wij zijn momenteel actief in Nederland en in de USA via ons Amerikaans dochterbedrijf. In beide bedrijven vervaardigen wij schoenen op maat, die vervolgens door ons aanvullend voorzien worden van op maat gemaakte inlegzolen. In beide landen bezitten wij ook schoenwinkels, waar dergelijke inlegzolen verkocht en op maat aangepast worden.

De inlegzolen worden gemaakt op basis van de techniek die gelicentieerd is door Von den Benken, en welke techniek beschreven is in de Amerikaanse octrooien 3.641.688 en 4.675.001. Dit laatste octrooi is pas in 1987 verleend, maar heeft wel dezelfde tekst als het eerste octrooi. Wij betalen per inlegzool nog steeds een licentie aan Von den Benken. Wij vragen ons nu af of het eigenlijk wel nodig is deze licentie te betalen.

De techniek komt er in hoofdzaak op neer, dat wij bij het passen door de klant van de op maat gemaakte schoenen, een losse inlegzool op maat maken. Deze inlegzool bestaat uit een kunststoflaag die door verwarming week kan worden, en is aan de onderzijde voorzien van elektromagnetische straling absorberende schijfjes.
De inlegzool wordt in de schoen aangebracht en de schoen wordt aan de voet van de drager aangetrokken. De schoen wordt onderworpen aan een alternerend elektromagnetisch veld. Daardoor warmt de zool op en wordt deze week. Terwijl de zool nog warm en zacht is, loopt de drager een aantal passen met de schoen zodat de zool zich naar de vorm van de voet vormt. Daarbij koelt deze zool af en neemt definitief de vorm van de voet aan. Essentieel aan deze inlegzolen is de combinatie van een thermoplastisch materiaal, dat wil zeggen een materiaal dat week (plastisch) wordt onder verwarming, en een energie absorberend materiaal om de warmte van de elektromagnetische golven aan het materiaal over te dragen.

Recent zijn wij op zoek gegaan naar aanvullende technieken voor het vervaardigen van dergelijke inlegzolen. Deze technieken zijn gebaseerd op hetzelfde principe van het vormen van de inlegzool op basis van de vorm van de voet.

Wij hebben drie verschillende varianten uitgewerkt. Deze technieken wijken van elkaar af in het type materialen dat gebruikt wordt.

De eerste variant lijkt sterk op de nu al toegepaste methode, alleen wordt er geen aanvullend energie absorberend materiaal gebruikt. Doordat wij een thermoplastisch materiaal gevonden hebben dat vanzelf de energie absorbeert en daardoor week wordt, is het toevoegen van het energie absorberende materiaal overbodig.

In de tweede variant wordt gebruik gemaakt van een siliconen materiaal dat in een kunststof omhulsel aangebracht is. Dit siliconen materiaal heeft de vorm van een tixotrope gel (dat wil

zeggen een materiaal dat onder druk vloeibaar wordt). De basissamenstelling van de gel is als volgt:

Materiaal	gewichtsdelen
Silicone 4-4758	8
Silicone 4-2901	60
Elvaloy 742	32

Verder doen wij er nog wat verwerkingshulpstoffen in, zoals een vloeibare weekmaker (5-15 gewichtsdelen), tixotropie hulpstoffen (2,5 - 10 gew. delen), vulmiddelen (10 - 40 gew. delen) en uiteraard een peroxide of een combinatie van twee of meer peroxides. Tenslotte worden er soms nog kleurstoffen en geurstoffen gebruikt.

De weke inlegzool wordt bij het aanpassen van de schoenen door de deskundige, arts of schoenspecialist, in de schoen aanbracht. De schoen wordt vervolgens aan de voet gedaan, en door er mee te lopen vormt de zool zich naar de voet. De schoen wordt vervolgens uitgetrokken, waarbij door de keuze van de samenstelling van de gel de inlegzool de vorm van de voet behoudt. Deze wordt vervolgens door de deskundige verwarmd in een magnetron, gevolgd door een verwarming in een hete lucht oven bij 175°C gedurende 20 minuten. Door de verknopende werking van de peroxide(s) vulkaniseert de gel waardoor deze vormstabiel wordt en de vorm van de voet behoudt. De aard van het materiaal is zo, dat het wel rubberachtig en elastisch blijft aan voelen.

In de derde variant wordt gebruik gemaakt van een vergelijkbaar systeem als in de tweede variant, namelijk een tixotroop materiaal in een kunststof omhulling. Het materiaal is echter geen siliconen gel, zoals in de tweede variant maar een schuimvormend polyurethaan. Hierbij wordt het materiaal voor het in de schoen brengen door de deskundige geactiveerd, bij voorbeeld door verwarmen, en na enkele minuten vormt zich dan een schuim. De deskundige brengt de geactiveerde inlegzool snel in de schoen, nog voordat de schuimvorming echt begonnen is. Daarna plaats de gebruiker zijn voet in de schoen. Door de inwendige druk vanuit de schuimvorming, neemt de inlegzool de vorm van de voet aan. De keus van de componenten is zodanig, dat het schuim na enkele minuten uithardt. Dan is de inlegzool ook klaar voor gebruik.

Tijdens een octrooi-onderzoek hebben wij het Amerikaanse octrooi 5,555, 584 gevonden, en het daarmee overeenkomende Europese octrooi 517.200.

Graag verneem ik wij problemen moeten verwachten met dit octrooi.

Insole BV

Bijlagen: EP-B 517 200
US-A 3 641 688
US-A 4 675 001
US-A 5 555 584

Vragenlijst

1. Uw klant is in het bijzonder bezorgd over mogelijke inbreuk van de door hem ontwikkelde alternatieven op het Europese octrooischrift EP-B1-0.517.200, dat hij gedurende een eigen literatuuronderzoek heeft gevonden, alsmede op het equivalente Amerikaanse octrooi 5,555,584 daarvan. Van EP-B1-0.517.200 is een kopie bijgesloten, terwijl van het Amerikaanse equivalent alleen de beschrijvingsinleiding en de claims zijn bijgevoegd. U kunt er van uitgaan dat de tekst vanaf "Brief description of the drawings" van beide documenten hetzelfde zijn. Adviseer uw klant m.b.t. zijn positie t.a.v. de inbreuk op deze octrooien gezien vanuit zijn voorgenomen activiteiten.

2. Adviseer uw klant m.b.t. zijn positie t.a.v. de Von den Benken octrooien, zowel wat betreft zijn voorgenomen activiteiten in Nederland als in de Verenigde Staten.

3. Wat kunt u uw klant melden m.b.t. de geldigheid en eventuele nietigheid van de door uw klant toegestuurde octrooien?

Algemene aanwijzingen voor de kandidaten:

(a) Bij vragen 1 en 2 dient u, in relevante gevallen, een matrix in te leveren waarin u per maatregel de conclusies vergelijkt met de door uw cliënt ontwikkelde alternatieven.

(b) Bij de beantwoording van de vragen mag u ervan uitgaan, dat u uw advies richt aan een octrooicoördinator van uw klant die het octrooivak redelijk kent.

(c) Van u wordt bij elk antwoord een argumentatie verwacht.

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EP-B 0 517 200

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Title: Method of producing custom-fitting articles and composition for use therewith

BACKGROUND OF THE INVENTION

This invention relates in general to custom-fitting articles and compositions useful in making same and in particular to custom-fitting articles which conform to the shape of a body part of a mammal, particularly a person.

DESCRIPTION OF RELATED ART

Many articles which are intended to conform to the shape of a body part of a mammal, such as a person, for example, certain footbeds for footwear, hand grips, protective pads and padding, and medical and veterinary appliances, are not custom-fitted. It has long been recognized that it is advantageous to custom fit articles of these types to the particular conformation and shape of the body so that the article is more comfortable to wear and the weight and pressure is distributed more evenly.

With regard to custom-fitting footwear, there have been a number of approaches. In one approach, a chemical reaction is initiated in a formable material in a footbed, the person then steps into the footwear or shoe and forms an impression and the material is allowed to cure before the footbed is used. See U.S. Pat. Nos. 4,520,581; 4,128,951; 2,838,776; and 4,888,225. U.S. Pat. No. 3,968,577 illustrates a system in which an impression of the foot is made, and the material is cured or set either pursuant to room temperature vulcanizing or by being heated in an oven for an unreasonably long period of time.

Other patents disclose a shoe or sandal having a bottom layer of a thermoplastic material. The thermoplastic material is heated, thus softening it. The person steps into the shoe and makes an impression. The material then cools, retaining the impression of the foot. See U.S. Pat. Nos. 3,641,688; 4,413,429; 4,433,494; 4,503,576; 3,895,405; and 4,901,390.

These approaches suffer from a number of deficiencies. Once a catalyst is added, the activation may be irreversible and the impression may have to

be made quickly. Some catalysts may require kneading, which is difficult with viscous material and time-consuming. Making an impression in hot thermoplastic material may be dangerous to the foot and it is not possible for the customer to feel how the shoe will fit prior to heating.

Most hand grips, such as for bicycles, sports rackets, ski poles, etc., are not custom-fitted; they are made so that one size fits all. Most body pads, such as knee pads, elbow pads, helmet pads, shin guards, etc. are also made so that one size fits all. Many prosthetic or orthopedic casts, splints, and braces do not have, biased against the body part, a custom-fitted flexible yet resilient member conforming to the body part to cushion and more evenly distribute the weight or pressure.

It is an object of this invention to provide a method of producing a custom-fitting article which overcomes these deficiencies, the method being quick and effective and producing a member which remains flexible while resiliently retaining the impression of the body part. It is also an object to provide a member or article which the purchaser or user can test for feel and fit before the impression is set.

SUMMARY OF THE INVENTION

A method of producing a custom-fitting article which conforms to the shape of a body part of a mammal is provided. This method is defined in the claims appended hereto. In a preferred embodiment, the method includes providing a member comprised of a body of formable material, the body of formable material having a minimum setting temperature greater than 130° F (54°C). and being setable by heating for a period not exceeding 30 minutes and subsequent cooling. The member is conformed by biasing the member against the body part with sufficient pressure to conform the member to the shape of the body part. The member is then heated for a period not exceeding 30 minutes and thereafter cooled so that the formable material is set and the member remains flexible while resiliently retaining an impression of the body part. The member is utilizable by the mammal as part or all of the custom-fitting article. A member for use in connection with the method is also provided. A composition is also provided which comprises uncured silicone rubber, an effective amount of crosslinking agent, and effective amounts of a) fine powder ethylene copolymer or terpolymer or a mixture thereof and b) liquid plasticizer to form a gel effective to receive and retain an impression, the composition having a minimum setting temperature greater than 130°F (54°C). and being formable and setable to form a flexible and resilient body.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of footwear, specifically a sandal, according to the present invention.

FIG. 2 is an exploded view of the sandal of FIG. 1.

FIG. 3 is a sectional view taken along line 3--3 of FIG. 2.

FIG. 4 is a perspective view of a removable insole in accordance with the present invention.

FIG. 5 is a sectional view taken along line 5--5 of FIG. 4.

DESCRIPTION OF PREFERRED EMBODIMENTS

A footbed supports the foot when footwear is worn and/or provides the bed upon which the underside of the foot rests when footwear is worn. As used herein the term "footbed" includes a removable insole or innerliner. Thus a footbed may be a separable or integral component of footwear. Footwear includes sandals, shoes, slippers, and boots. Footwear, which also includes socks for diving suits, swimming flippers, water and snow ski boots, and skates such as ice skates and inline skates, is worn on the foot.

With reference to FIG. 1, there is shown footwear, specifically a sandal 10 for a person's left foot. The sandal has a toe end 15, a heel end 17, an outside 19, and an inside 13 (see FIG. 2). The sandal includes a top sole 18, a bottom sole 12, and a strapping mechanism or system, preferably made of 3/4 inch tubular nylon webbing, to hold the foot. The top sole 18 has a side 14 which meets the bottom sole 12 at margin 16. The toe strap 20 has a lower lateral portion 33 which passes through D-ring 34 and continues as upper lateral portion 35, which is secured to lower lateral portion 33 by hook and loop fasteners, such as Velcro. Toe post 22 secures the D-ring to the sandal. Heel posts 24 and 26 secure the heel portion of the strapping mechanism to the sandal. The strap which forms heel post 26 continues as lateral strap 38 which is secured by stitching to lower lateral portion 33 and continues as lateral strap 36 through the loop formed by heel post 24, continuing on to form heel strap 25, continuing through the loop formed by heel post 26 to form instep strap 30 which can be cinched down through a cinching mechanism in quick release clasp 32. Once the instep strap 30 is properly cinched down, the wearer can take the sandal on and off using quick release clasp 32. Any quick release clasp as known in the art can be used. Heel strap 25 goes around the heel of the wearer. Instep strap 28 is secured at one end to heel post 24 and at the

other end to the portion of the quick release clasp opposite the cinching mechanism. Other strapping mechanisms or systems as are known in the art can be utilized in connection with the present invention.

With reference to FIGS. 2 and 3, there are shown three principal elements of the sandal, including the top sole 18, the bottom sole 12, and the gel layer 50 disposed therebetween. The top sole 18 and the gel layer 50 constitute the member which is used to produce a custom-fitting footbed. The top sole 18 and the gel layer 50 support the foot when the sandal is worn and provide a bed upon which the underside of the foot rests when the sandal is worn. The bottom portions 44 and 46 of the straps 20-22 and 24-26 respectively, are attached by gluing means or other methods known in the art, to the inside surface 48 of the bottom sole 12. The reinforcing strips 45 may be similarly attached to further secure bottom portions 44 and 46 to the bottom sole 12. The gel layer 50 preferably comprises a body of formable material, specifically gel material 57, encased in an envelope 59, preferably airtight, for ease of handling and to keep the gel and any fumes contained. Alternatively the gel material may be unencased. The gel layer and gel material are formable and conformable. Slits 40 are cut or otherwise provided through the gel layer 50 and top sole 18 to permit straps 20, 22, 24, and 26 to pass therethrough. The margins of the envelope 59 at slits 40 are preferably sealed to contain the gel material. The top sole 18 has on its underside a cavity defined by top surface 52 and sides 54. The gel layer 50 has a top 56 and sides 58. The upper portion of the gel layer nests in the cavity of the top sole 18. The bottom surface of the gel layer rests on the inside surface 48 of the bottom sole 12. The beveled surface 42 of the top sole engages the beveled surface 49 of the bottom sole when the sandal is assembled. Lateral flow of the gel layer 50 is thus partially restrained by sides 54, assisted by downward force applied by the foot to engage beveled surface 42 with beveled surface 49.

With reference to FIGS. 4 and 5, there is shown a removable insole 60 which constitutes the member used to produce a custom-fitting footbed. The insole 60 comprises a formable material, specifically a gel material 62, preferably encased in a flexible envelope or pouch 64 preferably heat sealed around the perimeter such as at 66 and preferably airtight to contain fumes, to protect from contamination, and to prevent the possibly sticky gel material from sticking to the person or other objects. The removable insole has the general shape of the underside or bottom of a person's foot or of the interior bottom of a shoe.

The top sole is preferably a light weight sponge or elastomeric foam material, with or without a fabric cover. Alternately, the top sole can be of a similar material to the bottom sole or a light weight fabric. The top sole is flexible and able to conform to the shape of the gel layer. The bottom

sole is preferably a blend of SBR and natural rubber, containing normal rubber additives such as Hi-Sil ABS, which acts as an impact modifier, and accelerators for vulcanization. It can be molded in cast aluminum molds at 350°F (176°). for 4 to 5 minutes using techniques well known in the art. Other polymeric or other materials, including foams such as flexible foams to reduce weight, known in the art may be utilized for the top and bottom soles. These materials and all the non-gel material parts of the footwear should be able to tolerate the microwaving and/or oven heating described hereinafter. The bottom sole is flexible to permit walking.

The envelopes 59 and 64 are preferably made from aromatic polyether polyurethane thermoplastic film available from Deerfield Urethane, Inc., South Deerfield, Mass. Alternatively they can be made from a coextrusion with nylon or polyester on the outside to provide heat resistance and an olefin on the inside to allow the envelope to be heat sealed. Such coextrusions are available from Roll Print Packaging Products, Inc., Addison, Ill. or Custom Co-Ex, Atlanta, Ga. The envelopes 59 and 64 should preferably be able to withstand the heating process described hereinafter and should be non-crinkly, compliant, flexible and able to conform to the shape of the foot or body part as it makes an impression in the gel material. Alternatively, a piece of woven polyester, such as available from DuPont as SANDED COOLMAX, or a piece of leather can be attached to the surface of the envelope 64 that will be next to the foot or body part to provide more absorbency and to make the member or article more comfortable. Preferably, the envelopes are made from two layers (top and bottom) and are heat sealed using an RF sealing machine available from Callanan in Elk Grove, Ill.. This yields a feather edge as shown at 66.

Preferred embodiments of the gel material are as follows.

PREFERRED FORMULATIONS A, B, & C (Parts by Weight)

Ingredient	A	Preferred B	C
1. High viscosity uncured silicone rubber	10.0	0	0
2. Low viscosity uncured silicone rubber	56.67	66.67	66.67
3. Modified EVA powder	33.33	33.33	33.33
4. Dioctyl adipate	5.0	15.0	15.0
5. Epoxidized soybean oil	7.0	0	0
6. Fumed silica	7.5	5.0	5.0
7. Calcium carbonate	15.0	30.0	15.0
8. Color pigment	0.5	0.35	0
9. Reodorant	0	0.20	0.20
10. Peroxide A	4.6	4.0	0
11. Peroxide B	0	0	10.6
12. Peroxide C	0	0	6.0

The high viscosity uncured silicone rubber used is a high viscosity (10,000 centistokes) vinyl-terminated polydimethyl siloxane available from Dow Chemical as Silicone 4-4758. Silicone 4-4758 contains amorphous silica. The low viscosity uncured silicone rubber used is a low viscosity (1,000 centistokes) vinyl-terminated polydimethyl siloxane available from Dow Chemical as Silicone 4-2901. The modified EVA powder used (Elvaloy 742) is ethylene vinyl acetate modified by the addition of carbonyl groups to make a solid plasticizer. It is available as a fine particle size powder (it has a 30 mesh maximum) from DuPont and acts as a thixotropic agent. It also acts as an extender, reducing the cost.

Dioctyl adipate, a monomeric plasticizer which partially solvates and swells the modified EVA powder, is a liquid and is available from C. P. Hall, Stow, Ohio. The epoxidized soybean oil used is a low volatility polymeric liquid plasticizer and stabilizer liquid and is available as Paraplex G-62 from C. P. Hall, Stow, Ohio. Fumed silica acts as a thixotropic agent and is available from Cabot Corp., Cab-O-Sil Div., Tuscola, Ill. as Cab-O-Sil M-5. The calcium carbonate used (325 mesh) acts as a filler and is available from Harwick Chemical as A-1 Whiting. The color pigment used is ultra marine blue sodium aluminum sulfo silicate complex available from Akro Chemical. Other pigments can be used. The reodorant used (Stan Mask 25243) provides a pleasant smell or odor and

is available from Harwick Chemical.

The peroxides are crosslinking or setting agents and permanently set the silicone rubber by crosslinking.
Peroxide A is Dow Chemical product STI-T, being bis (2,4-dichlorobenzoyl) peroxide. It is a diacyl peroxide.
Peroxide B is Varox 231 XL, available from Atochem, Buffalo, N.Y., being 1,1-di(t-butylperoxy)3,3,5-trimethylcyclohexane peroxide. It is a peroxyketal. Peroxide.C is Luperco 101 XL, available from Atochem, Buffalo, N.Y., being 2,5-dimethyl-2,5-di(t-butylperoxy) hexane. It is a dialkyl peroxide. Alternatively, Luperco AST from Atochem can be used. It is a diacyl peroxide. It operates quickly, since it activates at a lower temperature, and can cause some foaming, which is desirable if a more cushiony product is desired.

Alternatively, other organic peroxides known in the art can be used, care being taken to select the peroxide to match the uncured silicone rubber and activate within the preselected or desired crosslinking or heating temperature. Peroxides can be selected to achieve a preselected minimum setting temperature. Preferably, there are generally about 4-10 parts by weight of peroxide agents such as above per 66.67 parts silicone rubber. Enough crosslinking agent should be added to reduce the curing or setting time to the preferred setting time of between preferably 3-30 minutes, but without detrimental effect on the composition such as excessive temperature or excessive foaming. Sufficient amounts of the various ingredients should preferably be added so that the final product meets the preferred characteristics described herein. Alternatively, it is believed one may use platinum crosslinking agents known in the art.

For the modified EVA powder, it is believed that other EVAs in fine powder form may be substituted, including EVA (preferably 18-30% vinyl acetate), and it is believed that other ethylene copolymers and/or terpolymers or mixtures thereof in fine powder form may also be substituted, including ethylene methyl acrylate, ethylene ethyl acrylate, and ethylene vinyl acetate acid terpolymer such as ELVAX 4310 from DuPont. Preferably the ethylene copolymer or terpolymer or mixture thereof is about 20-35% by weight of the uncured silicone rubber, ethylene copolymer or terpolymer or mixture thereof, and liquid plasticizer present. The addition of the Elvaloy 742 with liquid plasticizer (which swells and partially solvates the Elvaloy) to the gel material results in unexpectedly higher viscosity and makes it unexpectedly more thixotropic, which are advantages. Sufficient fine powder EVA or ethylene copolymer or terpolymer or mixture should be added with sufficient liquid plasticizer to provide an effective or sufficiently high viscosity so that the gel material will preferably not creep at room temperature and will hold and provide an effective impression for the intended purpose without detrimentally

affecting the other desired performance characteristics. The phrase ethylene copolymer or terpolymer includes modified EVA and Elvaloy 742.

When the gel material of the present invention is sufficiently heated, followed by cooling, it sets, that is, what was formable before becomes firm yet resilient. The setting is not due to the evaporation of a solvent, as in U.S. Pat. No. 4,120,064.

Formulations A, B, and C, uncured, can be referred to as silicone gel. They use plasticizer to solvate and swell a modified EVA resin. They are white in their unpigmented state, relatively difficult to compress, with a consistency and texture approximating cookie dough or Play Dough. They are moldable and accept and maintain or hold impressions. They are sufficiently stiff or viscous so that the person gets a suitable idea of how it will feel after the gel material is set. They exhibit no discernible creep at room temperature (sometimes called cold flow), which is preferable. The set gel is flexible, resilient, and a soft rubber-like material.

The following example helps to illustrate the present invention.

EXAMPLE

A size 10 sandal comparable to that illustrated in FIG. 1 was produced. The bottom sole weighed approximately 180 g and was 27.5 cm long and about 11 cm wide at the toe section and 8.5 cm wide at the heel section. The top sole was comparably sized and weighed approximately 50 g. The bottom sole was a blend of SBR and NR rubber and contained normal vulcanizing, processing and extender additives. The top sole was a lightweight foamed EPDM rubber available from Spenco Corp., Waco, Tex. The envelope for the gel was the polyether polyurethane film described above, available from Deerfield Urethane, Inc. It weighed approx. 10 g without gel and was 25.4 cm long by 6.3 cm in the heel section and 8.4 cm in the toe section. The top sole was bonded to the bottom sole with a few spots of adhesive around the perimeter with the gel layer therebetween. The uncured gel material, which weighed approximately 70 g and was inside the envelope, was Formulation A described above. The test individual weighed about 100 kg. The ambient temperature was approximately 20°C.

The person inserted his foot into the sandal and tightened the straps. No mixing of an additive, catalyst, etc., or kneading, was necessary prior to the person making the impression. The person rocked from toe to heel and walked for 1 minute to form the impression and see how the sandal would fit prior to setting. This biased the member against the body part. The sandal was removed and inspected for molding properties. The foot imprint was found to be very good with clear definition of contours.

A Sharp Carousel II, 900 watts, microwave oven was used. The magnetron frequency was 2450 and it had a turntable which automatically rotated the item being heated. The microwave oven was operated throughout at full power. The sandal was placed onto the turntable and microwaved or heated for 30 seconds followed by a 60 second cool down period. This procedure was repeated three more times. The total elapsed time from the beginning of the first microwaving to the end of the last cool down was approximately 6 minutes. No fumes or objectionable smells were observed throughout the heating procedure. The envelope was not pierced and the gel material was not exposed to the ambient atmosphere during the above procedure. The envelope was allowed to cool until it was easy to handle.

Upon inspection, it was observed that the gel layer retained the original impression of the foot. The gel was found to be totally set. It was flexible, resilient, and had a Shore A hardness of 25 hardness points, tensile strength of 10 kg and elongation at break of 500%. There were no signs of thermal degradation of the gel or the envelope. Other power levels and heating and cooling sequences can be used.

The invention is applicable to other mammals besides humans, such as orthopedic casts for horses, dogs, and cats, body pads for horse and dog collars and saddles and other articles worn by horses and/or dogs or other mammals.

Claims

1. A method of producing a custom-fitting article which conforms to the shape of a body part of a mammal, the method comprising the steps of:

- providing a member comprised of a body of formable material,
- conforming the member by biasing the member against the body part with sufficient pressure to conform the member to the shape of the body part, and - setting the formable material so that the member remains flexible while resiliently retaining an impression of the body part and is utilizable by the mammal as part or all of the custom-fitting article.

2. Method according to claim 1, comprising the steps of:

providing a member comprised of a body of formable material sealed inside a flexible container, the formable material being a silicone gel comprising uncured silicone rubber, an effective amount of crosslinking agent, and effective amounts of a) fine powder ethylene copolymer or terpolymer or a mixture thereof and b) liquid plasticizer to form a gel effective to receive and retain an impression, said formable material being capable of remaining at room temperature without curing, the body of formable material having a minimum setting temperature greater than 130°F(54°C) and being setable by heating for a period not exceeding thirty minutes and subsequent cooling,

conforming the member by biasing the member against the body part with sufficient pressure to conform the member to the shape of the body part, and

thereafter heating the member for a period not exceeding thirty minutes and thereafter cooling the member so that the formable material is set and the member remains flexible while resiliently retaining an impression of the body part and is utilizable by the mammal as part or all of the custom-fitting article.

3. A method according to claim 2, wherein said fine powder ethylene copolymer or terpolymer or a mixture thereof is ethylene vinyl acetate modified by the addition of carbonyl groups.

4. A method according to claim 1-3, wherein the custom-fitting article is a custom-fitting footbed which conforms to the shape of the underside of a foot of a person.

5. A member for producing a custom-fitting article which conforms to the shape of a body part of a mammal comprising a body of formable material sealed inside a flexible container the formable material being a silicone gel comprising uncured silicone rubber, an effective amount of crosslinking agent, and effective amounts of a) fine powder ethylene copolymer or terpolymer or a mixture thereof and b) liquid plasticizer to form a gel effective to receive and retain an impression, said formable material being capable of remaining at room temperature without curing, said body of formable material having a minimum setting temperature greater than 130°F (54°C). and being setable by heating for a period not exceeding thirty minutes and subsequent cooling, the member being adapted such that when the member is biased against the body part of the mammal with sufficient pressure, the member will conform to the shape of the body part and the body of formable material is capable of thereafter being set by heating for a period not exceeding thirty minutes followed by cooling so that the member remains flexible while resiliently retaining an impression of the body part and is capable of being utilized by the mammal as part or all of the custom-fitting article.

United States Patent

von den Benken

[15] 3,641,688

[45] Feb. 15, 1972

[54] SHOE MOLDED BY INDUCTION HEATING

[72] Inventor: Elizabeth von den Benken, 2212 Centre St., West Roxbury, Mass. 02132

[22] Filed: Dec. 10, 1969

[21] Appl. No.: 883,952

[52] U.S. Cl. ..... 36/43, 36/2.5 AL

[51] Int. Cl. A43b 13/38

[58] Field of Search ..... 36/2.5 R, 2.5 AL, 43; 12/142

[56] References Cited

UNITED STATES PATENTS

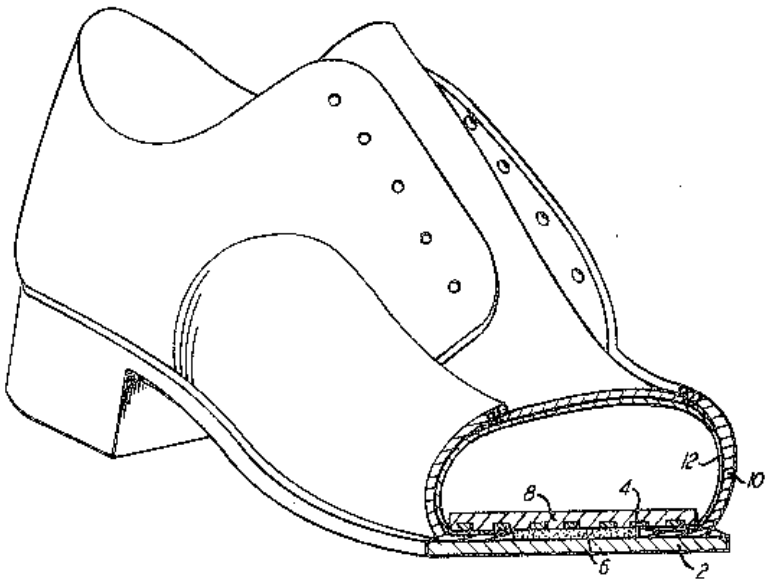
3,186,113	6/1965	Radcliffe et al	36/43
3,221,353	12/1965	Greene	12/142 R
3,493,986	2/1970	Erwin	12/142 R
2,860,416	11/1958	Pfund	36/43 X
3,407,406	10/1968	Werner et al	36/2.5 AL
3,521,385	7/1970	Dalebout	36/2.5 AL

Primary Examiner—Patrick D. Lawson

[57] ABSTRACT

The invention concerns a shoe whose bottom has a layer of thermoplastic material in it and which has embodied in its bottom electromagnetic energy absorbing material which can be heated by alternating magnetic flux, thus activating the layer of thermoplastic material which then can be molded according to the contour of a human foot.

8 Claims, 3 Drawing Figures



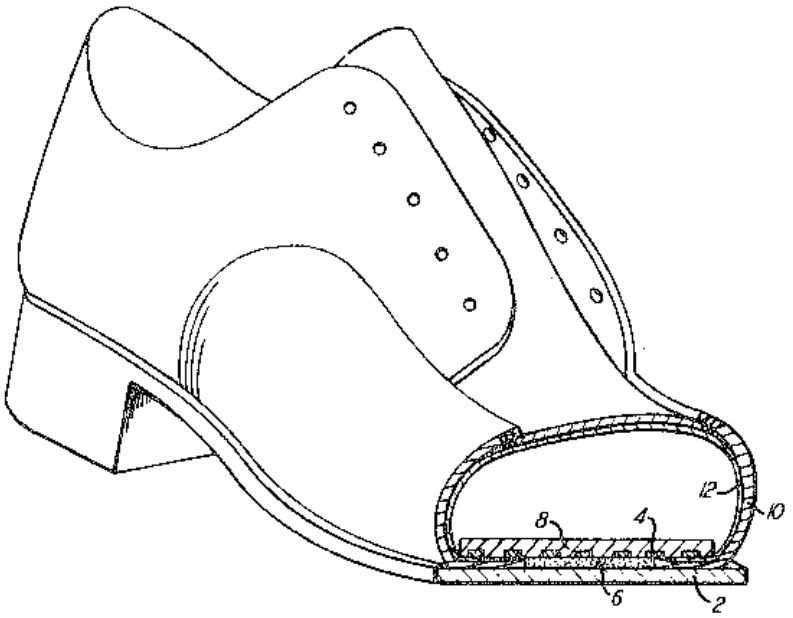


FIG.-1

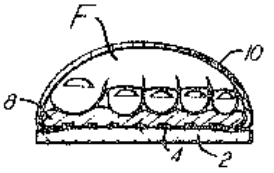


FIG.-2

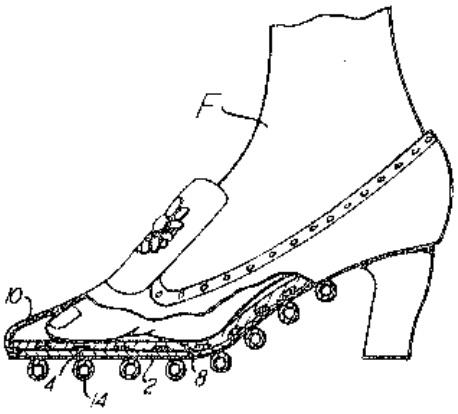


FIG.-3

INVENTOR.
Elisabeth von den Benken

SHOE MOLDED BY INDUCTION HEATING

BACKGROUND OF THE INVENTION

This invention relates to footwear of any kind, as boots, sandals, shoes, etc. . . However, henceforth the word shoe will be used only. Human feet vary in length, width and contour. There is even a difference between the left and the right foot of the same person, due to gait and walking habits. In a shoe factory, the shoes are made over lasts which are to represent human feet. These lasts take into consideration the various lengths and widths, but as to the contour of a foot, they are a compromise only.

In the past, when shoes were handmade and leather was the only material used, they could be fitted to the overall contour of each individual foot. Moreover, a leather shoe has the outstanding feature of gradually shaping itself to the contour of a human foot. The advantages of handmade leather shoes have been lost to a great extent in present-day mass production. In particular, leather is replaced by synthetic material which does not possess the feature of shaping itself to the contour of a human foot. For this reason, it is hard to break in new shoes made of synthetic material.

SUMMARY OF THE INVENTION

It is the main objective of this invention to provide a finished shoe whose bottom can be quickly molded according to the bottom contour of a human foot at any time after the shoe has left the factory. This does not only eliminate the long break-in time and the disadvantages of mass-produced shoes, but also can be of particular importance for people who have crippled or abnormal feet.

Shoes, according to the invention, have a layer of thermoplastic material which in many cases will be the insole. In the bottom of the shoe, close to the layer of thermoplastic material, is embodied electromagnetic energy absorbing material such as small parts of steel, aluminum, copper, graphite, etc. . . These parts can be heated by exposure to an alternating magnetic flux. This method of heating is known as induction heating. Induction heating machines are commercially available, and they will be referred to in conjunction with this invention only. When the thermoplastic material is activated, and a person lets the weight of his body rest on the bottom of the shoe, the imprint of the foot will be in the shoe in less than a minute.

DESCRIPTION OF THE DRAWINGS

The invention will now be described by way of example, with reference to the drawings.

FIG. 1 is a perspective view of a shoe with a transverse section through the forepart area.

FIG. 2 is a transverse section of a shoe showing the insole contoured according to the toes of a foot.

FIG. 3 is a perspective view of a shoe with a foot in it and a cutaway view of the bottom area. The shoe is resting on coils of an induction heating machine.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 is shown a cement-lasted shoe. However, it should be understood that this invention is applicable to any kind of shoe construction. The insole 8 is made of thermoplastic material, for instance thermoplastic foam made of polyethylene, polypropylene, polyvinyl cloride, etc. . . Adjacent to the insole 8 are located electromagnetic energy absorbing discs 4 which are shown somewhat enlarged for the sake of illustration. The electromagnetic energy absorbing discs can be made of any conducting material such as steel, copper, aluminum, graphite, etc. . . Also, the shape of the material 4 is functionally unimportant. Furthermore, the location of the electromagnetic energy absorbing material 4 in the bottom of the shoe might vary with each type of shoe. For instance, it could very well be part of the filler material 6. In some cases it might be attached to the outsole 6. The upper 10 and its lining 12 are made of a material which can withstand the activation temperature of the thermoplastic insole 8.

In FIG. 2 is shown a thermoplastic insole 8 which has been activated and molded according to the contours of the toes of the foot F.

In FIG. 3, the foot F with shoe rests on the coils 14 of an induction heating machine. In this illustration, the thermoplastic insole 8 is shown prior to activation and molding. Shoes which have been made with electromagnetic energy absorbing material 4 located in an appropriate bottom area according to the construction of the shoe, are shipped to a retail store as usual.

A retail store has to be equipped with an induction heating machine (not shown in the drawing). After a customer has selected a pair of shoes she puts them on and stands on the coils 14 of an induction heating machine. When the induction heating machine is turned on, an alternating electromagnetic field surrounds the coils 14 and transfers part of its energy to the electromagnetic energy absorbing material 4. In the material 4 the electromagnetic energy is changed into heat. Then, this heat activates the thermoplastic insole 8 or a similar layer of plastic material in the bottom of the shoe. Under the weight of the body, the activated thermoplastic insole 8 will mold according to the contour of the bottom of the customer's foot. Of course, the activation temperature of the thermoplastic material is such that the foot does not suffer from burns. Also, the frequencies of an induction heating machine are not in any way dangerous to human health.

The construction of the shoe, the kind of thermoplastic material, and the shape and kind of electromagnetic energy absorbing material will necessitate various embodiments without departing from the character of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A shoe of any make having located in its bottom area electromagnetic energy absorbing particles and a layer of moldable material which can be heat activated by said electromagnetic energy absorbing particles when the shoe is exposed to the alternating electromagnetic field of an induction heating machine.

2. A shoe of any make according to claim 1 in which the electromagnetic energy absorbing particles and the layer of moldable material are integral parts of factory-finished shoes.

3. A shoe of any make according to claim 1 in which the layer of moldable material can be softened to such a degree as to receive the imprint of a human foot.

4. A shoe of any make according to claim 1 in which the layer of moldable material consists of one or several thin sheets of plastic material.

5. A shoe of any make according to claim 1 in which the electromagnetic energy absorbing particles consist of electrically conductive material which is arranged in the shoe bottom in such a manner as to uniformly heat activate the layer of moldable material when the shoe bottom is to receive the imprint of a human foot.

6. A shoe of any make according to claim 1 in which the electromagnetic energy absorbing particles and the layer of moldable material are combined with the shoe insole.

7. A shoe of any make according to claim 1 in which the electromagnetic energy absorbing particles and the layer of moldable material are already combined with the sheet out of which the shoe soles are to be cut.

8. A shoe of any make according to claim 1 in which the layer of moldable material consists of plastic foam.

* * * * *

United States Patent [19]

Von Den Benken

[11] 4,675,001

[45] July 30, 1987

[54] SHOE MOLDED BY INDUCTION HEATING

[76] Inventor: Elisabeth Von Den Benken, 2212 Centre St., West Roxbury, Mass. 02132

[22] Filed: Mar. 29, 1973

[21] Appl. No.: 346,428

Related U.S. Application Data

[60] Continuation of Ser. No. 148,312, May 26, 1971, which is a division of Ser. No. 883,952, Dec. 10, 1969, Pat. No. 3,641,688.

[52] U.S. Cl. ..... 12/142 R

[51] Int. Cl. A43d 9/00

[58] Field of Search ..... 36/2.5 R, 2.5 AL, 45; 12/142 R, 142 P

[56] References Cited

UNITED STATES PATENTS

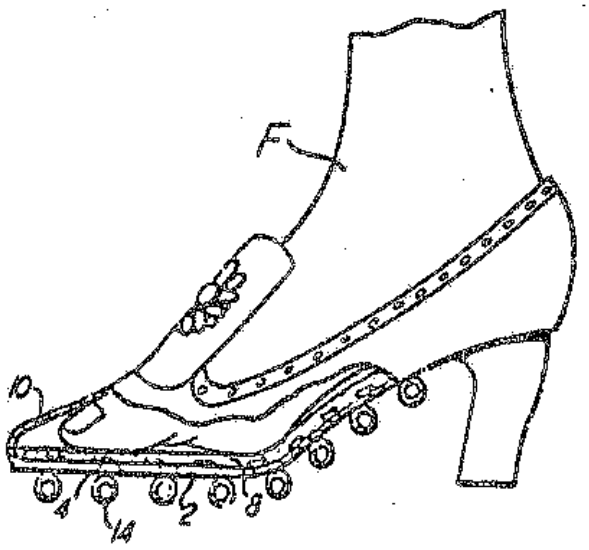
3,221,353	12/1965	Greene	12/142 R
3,493,986	2/1970	Erwin	12/142 R
3,521,385	7/1970	Daiebout	36/2.5 AL

Primary Examiner—Patrick D. Lawson

[57] ABSTRACT

The invention concerns a shoe whose bottom has a layer of thermoplastic material in it and which has embodied in its bottom electromagnetic energy-absorbing material which can be heated by alternating magnetic flux, thus activating the layer of thermoplastic material which then can be molded according to the contour of a human foot.

2 Claims, 3 Drawing Figures



PATENTED July 30, 1957

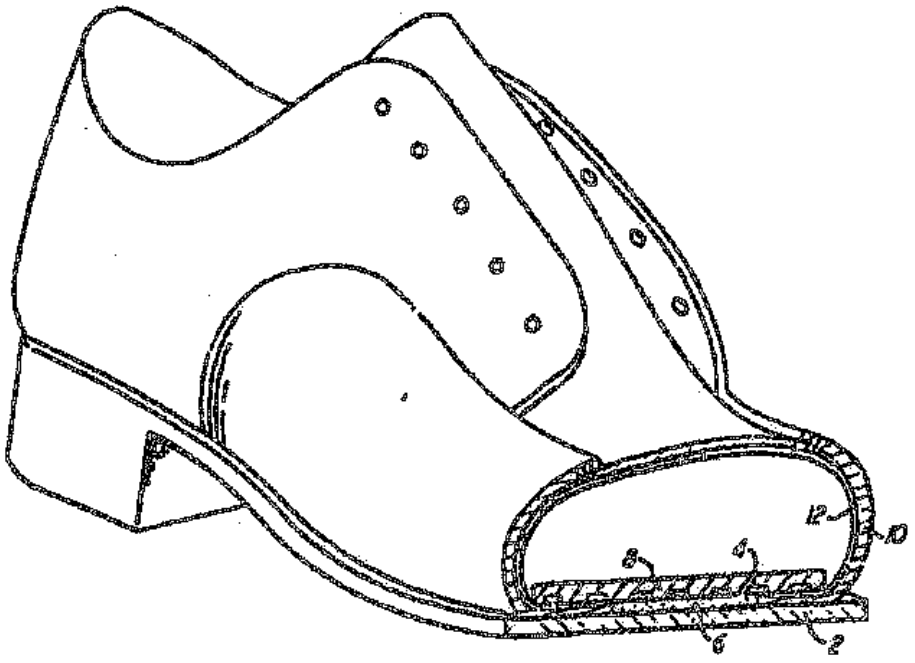


FIG.-1

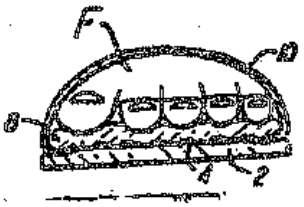


FIG.-2

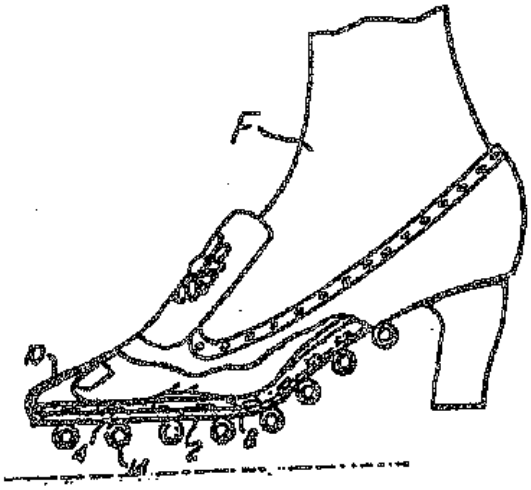


FIG.-3

SHOE MOLDED BY INDUCTION HEATING

BACKGROUND OF THE INVENTION

This is a continuing application of divisional application Ser. No.: 146,312, filed May 24, 1971; said divisional application is a division of application Ser. No.: 883,952, filed, Dec. 10, 1969; now U.S. Pat. No.: 3,641,688.

This invention relates to footwear of any kind, as boots, sandals, shoes, etc... However, henceforth the word shoe will be used only. Human feet vary in length, width and contour. There is even a difference between the left and the right foot of the same person, due to gait and walking habits. In a shoe factory, the shoes are made over lasts which are to represent human feet. These lasts take into consideration the various lengths and widths, but as to the contour of a foot, they are a compromise only.

In the past, when shoes were hand-made and leather was the only material used, they could be fitted to the overall contour of each individual foot. Moreover, a leather shoe has the outstanding feature of gradually shaping itself to the contour of a human foot. The advantages of hand-made leather shoes have been lost to a great extent in present-day mass production. In particular, leather is replaced by synthetic material which does not possess the feature of shaping itself to the contour of a human foot. For this reason, it is hard to break in new shoes made of synthetic material.

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In FIG. 2 is shown a thermoplastic insole 8 which has been activated and molded according to the contours of the toes of the foot F.

In FIG. 3, the foot F with shoe rests on the coils 14 of an induction heating machine. In this illustration, the thermoplastic insole 8 is shown prior to activation and molding. Shoes which have been made with electromagnetic energy-absorbing material 4 located in an appropriate bottom area according to the construction of the shoe, are shipped to a retail store as usual.

A retail store has to be equipped with an induction heating machine (not shown in the drawing). After a customer has selected a pair of shoes she puts them on and stands on the coils 14 of an induction heating machine. When the induction heating machine is turned on, an alternating electromagnetic field surrounds the coils 14 and transfers part of its energy to the electromagnetic energy-absorbing material 4. In the material 4 the electromagnetic energy is changed into heat. Then, this heat activates the thermoplastic insole 8 or a similar layer of plastic material in the bottom of the shoe. Under the weight of the body, the activated thermoplastic insole 8 will mold according to the contour of the bottom of the customer's foot. Of course, the activation temperature of the thermoplastic material is such that the foot does not suffer from burns. Also, the frequencies of an induction heating machine are not in any way dangerous to human health.

The construction of the shoe, the kind of thermoplastic material, and the shape and kind of electromagnetic energy-absorbing material will necessitate various embodiments without departing from the character of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A method of shaping the bottom of a shoe according to the contour of a foot, the method comprising the steps of:

- providing a shoe with a layer of thermoplastic material with electromagnetic absorbing discs in the bottom area of the shoe to a user;
- pressing a foot of said user on the bottom of the shoe while exposing the shoe to an alternating electromagnetic field of an induction heating machine, thereby heating the layer of thermoplastic material to a temperature at which said layer becomes soft and moldable such that an imprint of the foot is made in the bottom of the shoe;
- cooling the layer of thermoplastic material thereby hardening said layer and maintaining the imprint in it.

US005555584A

United States Patent [19]

Moore, III et al.

[11] Patent Number: 5,555,584

[45] Date of Patent: * Sep. 17, 1996

[54] METHOD OF PRODUCING CUSTOM-FITTING ARTICLES AND COMPOSITION FOR THE USE THEREWITH

[75] Inventors: **Dan T. Moore, III**, Cleveland Heights; **Deborah L. James**, Cleveland; **Maurice E. Wheeler**, Ashtabula; **William H. Weber**, Novelty; **James W. Hoover**, Akron, all of Ohio

[73] Assignee: **Polymer Innovations, Inc.**, Cleveland, Ohio

[*] Notice: The portion of the term of this patent subsequent to Jan. 8, 2013, has been disclaimed.

[21] Appl. No.: **93,282**

[22] Filed: **Jul. 16, 1993**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 2,281, Jan. 8, 1993, abandoned, which is a continuation-in-part of Ser. No. 972,237, Nov. 5, 1992, abandoned.

[51] **Int. Cl.**[6] **A43D 9/00**; A61F 5/14; A43B 7/14; C08L 83/00

[52] **U.S. Cl.** ..... **12/142 N**; 12/146 M; 36/88; 36/93; 36/43; 36/71; 36/154; 524/506; 525/100

[58] **Field of Search** ..... 36/88, 93, 8.4, 36/43, 44, 71, 154; 12/142 N, 146 B, 146 M; 99/342; 374/161, 162; 524/506, 314; 525/100; 523/167

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,838,776	12/1954	Tax .	
3,257,742	2/1963	Feinberg .	
3,575,780	4/1971	Trieschmann et al.	273/DIG. 4
3,593,435	7/1971	Lange	36/71
3,641,688	2/1972	von den Benken .	
3,692,023	9/1972	Phillips et al. .	

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

3437786	4/1986	Germany .
WO85/03624	8/1985	WIPO .

OTHER PUBLICATIONS

"Poly(Vinyl Chloride)", *Kirk–Othmer Concise Encyclopedia of Chemical Technology*, (John Wiley & Sons, Inc., 1985), pp. 1230–1233, particularly Table 1.

DuPont Elvaloy 741 742, technical data brochure, 7 pages (The DuPont Company, approx. 1983).

Dow Corning STI Technical Information, Silastic Q4–4758 & Q4–4768 Silicone Rubber, 4 pages (Dow Corning STI, 1991).

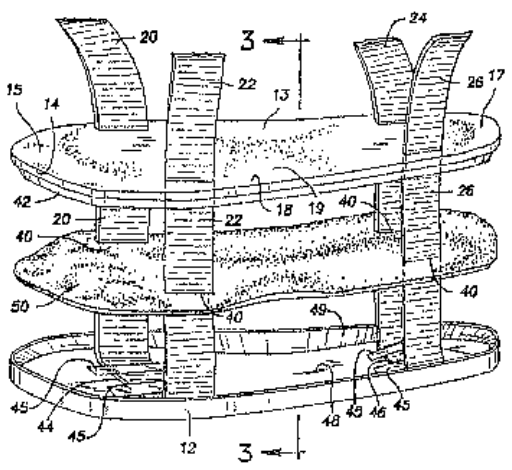
Dow Corning STI Technical Information, STI (Type) T Catalyst, 4 pages (Dow Corning STI, 1991).

Primary Examiner—Paul T. Sewell
Assistant Examiner—Marie Denise Patterson
Attorney, Agent, or Firm—Pearne, Gordon, McCoy & Granger

[57] **ABSTRACT**

A method of producing a custom-fitting article such as a custom-fitting footbed (for example, a removable insole), a custom-fitting hand grip, a custom-fitting body pad, and a custom-fitting orthopedic cast. A member for producing same and a composition for use in connection therewith are also provided. A member, such as a gel pad or gel-filled envelope, is provided which comprises a body of formable material having a minimum setting temperature greater than 130° F. and being setable by heating for a period not exceeding 30 minutes and subsequent cooling. The member is conformed by biasing it against a body part of a person or mammal with sufficient pressure to conform the member to the shape of the body part. The member is then heated for a period not exceeding 30 minutes and thereafter cooled so that the formable material is set and the member remains flexible while resiliently retaining an impression of the body part. The composition preferably comprises uncured silicone rubber, an effect amount of crosslinking agent, and effective amounts of a) fine powder ethylene copolymer or terpolymer or a mixture thereof and b) liquid plasticizer.

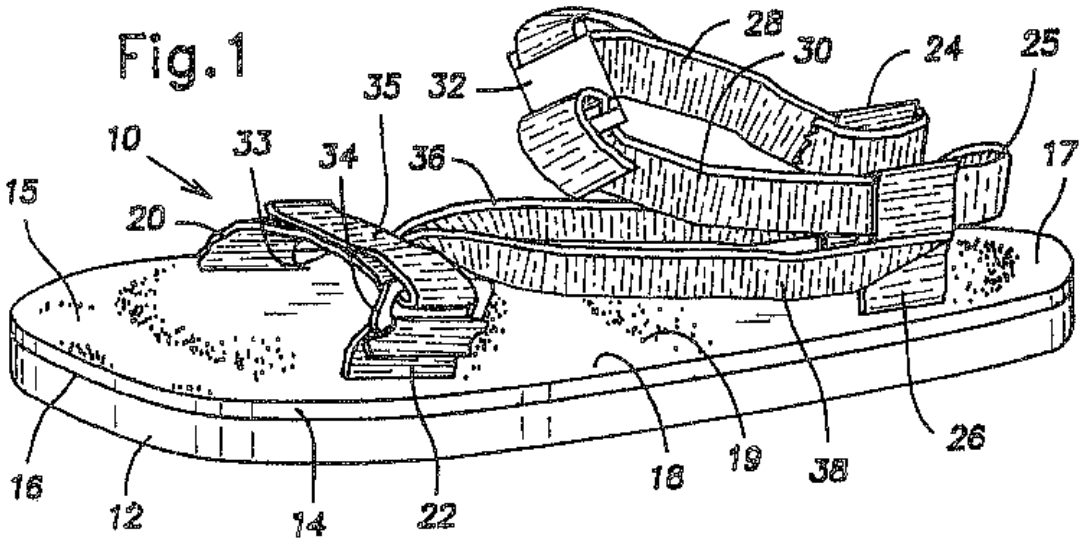
27 Claims, 5 Drawing Sheets



U.S. PATENT DOCUMENTS

3,730,169	5/1973	Fiber .	
3,782,390	1/1974	Johnson .	
3,895,405	7/1975	Edwards .	
3,905,376	9/1975	Johnson et al. .	
3,968,577	7/1976	Jackson .	
3,977,033	8/1976	Tabroff	12/54.3
3,981,037	9/1976	McCroskey, Sr. .	
4,006,542	2/1977	Larson .	
4,105,025	8/1978	Wang et al. .	
4,108,928	8/1978	Swan, Jr. .	
4,120,064	10/1978	Salomon .	
4,128,951	12/1978	Tansill .	
4,229,546	10/1980	Swan, Jr. .	
4,272,898	6/1981	Tansill	36/44
4,275,181	6/1981	Hoh	525/189
4,309,585	1/1982	Doi et al.	99/342
4,413,429	11/1983	Power .	
4,433,494	2/1984	Courvoisier et al. .	
4,483,333	11/1984	Wartman .	
4,503,576	3/1985	Brown .	
4,520,581	6/1985	Irwin et al. .	
4,617,921	10/1986	Seeler .	
4,671,267	6/1987	Stout .	
4,770,648	9/1988	Gillis .	
4,821,708	4/1989	Guignard et al. .	
4,888,225	12/1989	Sandvig et al. .	
4,901,390	2/1990	Daley .	
4,933,525	6/1990	St. Phillips	374/161
5,003,708	4/1991	Daley .	
5,015,427	5/1991	Sosnow	36/71
5,027,801	7/1991	Grim .	
5,051,463	9/1991	Yukimoto et al.	524/506
5,067,257	11/1991	Coomer .	
5,101,580	4/1992	Lyden	36/93
5,138,774	8/1992	Sarkozi	36/164
5,150,490	9/1992	Busch et al. .	
5,258,212	11/1993	Tomaru et al.	206/524

Fig. 1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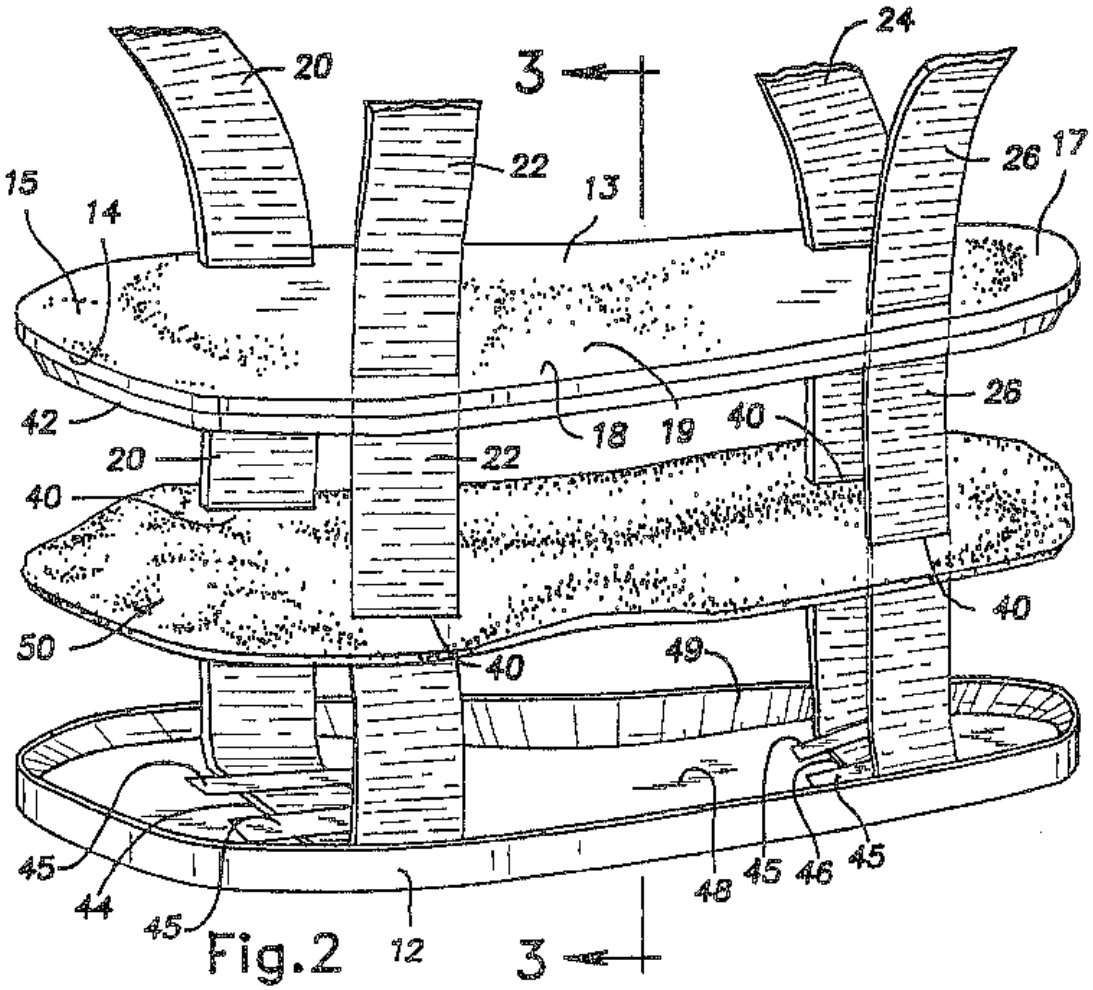
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Fig. 2

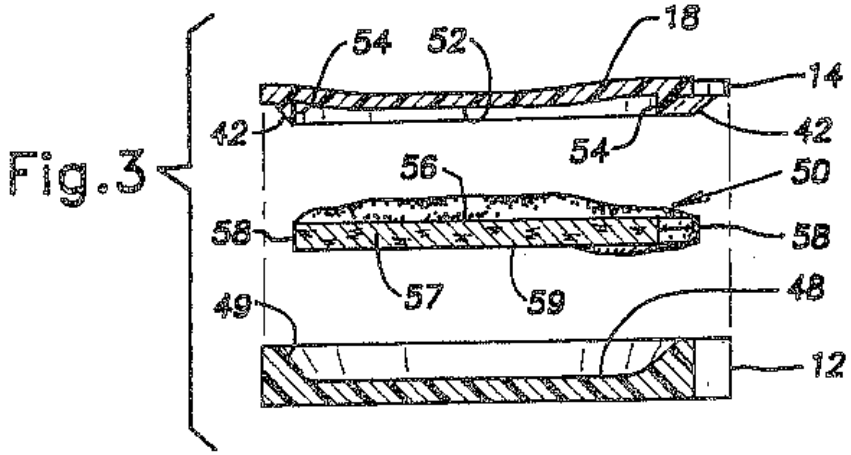

Fig.3

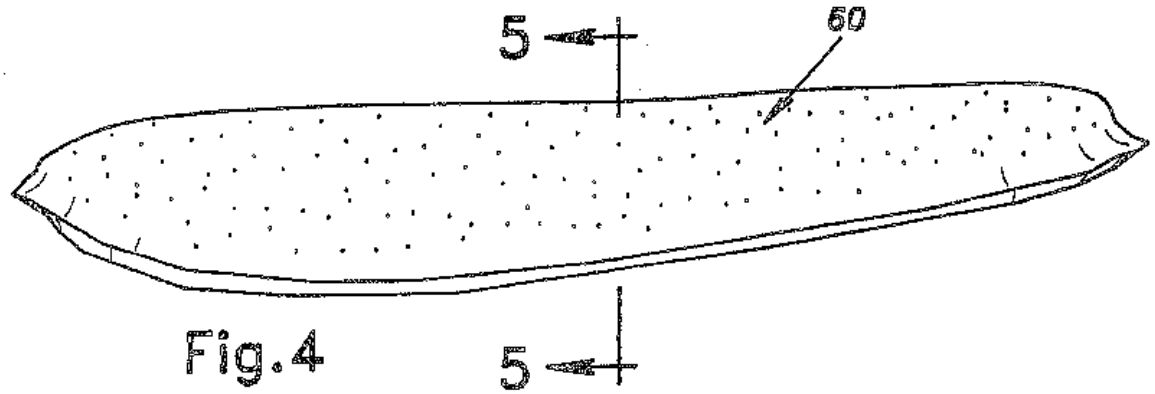

Fig.4

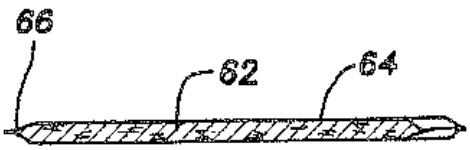

Fig.5

METHOD OF PRODUCING CUSTOM-FITTING ARTICLES AND COMPOSITION FOR THE USE THEREWITH

This application is a continuation-in-part of application Ser. No. 08/002,281, filed Jan. 8, 1993, now abandoned which is a continuation-in-part of application Ser. No. 07/972,237, filed Nov. 5, 1992, now abandoned.

BACKGROUND OF THE INVENTION

This invention relates in general to custom-fitting articles and compositions useful in making same and in particular to custom-fitting articles which conform to the shape of a body part of a mammal, particularly a person.

DESCRIPTION OF RELATED ART

Many articles which are intended to conform to the shape of a body part of a mammal, such as a person, for example, certain footbeds for footwear, hand grips, protective pads and padding, and medical and veterinary appliances, are not custom-fitted. It has long been recognized that it is advantageous to custom fit articles of these types to the particular conformation and shape of the body so that the article is more comfortable to wear and the weight and pressure is distributed more evenly.

With regard to custom-fitting footwear, there have been a number of approaches. In one approach, a chemical reaction is initiated in a formable material in a footbed, the person then steps into the footwear or shoe and forms an impression and the material is allowed to cure before the footbed is used. See U.S. Pat. Nos. 4,520,581; 4,128,951; 2,838,776; and 4,888,225. U.S. Pat. No. 3,968,577 illustrates a system in which an impression of the foot is made, and the material is cured or set either pursuant to room temperature vulcanizing or by being heated in an oven for an unreasonably long period of time.

Other patents disclose a shoe or sandal having a bottom layer of a thermoplastic material. The thermoplastic material is heated, thus softening it. The person steps into the shoe and makes an impression. The material then cools, retaining the impression of the foot. See U.S. Pat. Nos. 3,641,688; 4,413,429; 4,433,494; 4,503,576; 3,895,405; and 4,901,390. All the foregoing patents are incorporated herein by reference.

These approaches suffer from a number of deficiencies. Once a catalyst is added, the activation may be irreversible and the impression may have to be made quickly. Some catalysts may require kneading, which is difficult with viscous material and time-consuming. Making an impression in hot thermoplastic material may be dangerous to the foot and it is not possible for the customer to feel how the shoe will fit prior to heating.

Most hand grips, such as for bicycles, sports rackets, ski poles, etc., are not custom-fitted; they are made so that one size fits all. Most body pads, such as knee pads, elbow pads, helmet pads, shin guards, etc. are also made so that one size fits all. Many prosthetic or orthopedic casts, splints, and braces do not have, biased against the body part, a custom-fitted flexible yet resilient member conforming to the body part to cushion and more evenly distribute the weight or pressure.

It is an object of this invention to provide a method of producing a custom-fitting article which overcomes these deficiencies, the method being quick and effective and which

the customer can perform at home and producing a member which remains flexible while resiliently retaining the impression of the body part. It is also an object to provide a member or article which the purchaser or user can test for feel and fit before the impression is set.

SUMMARY OF THE INVENTION

A method of producing a custom-fitting article which conforms to the shape of a body part of a mammal is provided. The method includes providing a member comprised of a body of formable material, the body of formable material having a minimum setting temperature greater than 130° F. and being setable by heating for a period not exceeding 30 minutes and subsequent cooling. The member is conformed by biasing the member against the body part with sufficient pressure to conform the member to the shape of the body part. The member is then heated for a period not exceeding 30 minutes and thereafter cooled so that the formable material is set and the member remains flexible while resiliently retaining an impression of the body part. The member is utilizable by the mammal as part or all of the custom-fitting article. A member for use in connection with the method is also provided. A composition is also provided which comprises uncured silicone rubber, an effective amount of crosslinking agent, and effective amounts of a) fine powder ethylene copolymer or terpolymer or a mixture thereof and b) liquid plasticizer to form a gel effective to receive and retain an impression, the composition having a minimum setting temperature greater than 130° F. and being formable and setable to form a flexible and resilient body.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of footwear, specifically a sandal, according to the present invention.

FIG. 2 is an exploded view of the sandal of FIG. 1.

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2.

FIG. 4 is a perspective view of a removable insole in accordance with the present invention.

FIG. 5 is a sectional view taken along line 5—5 of FIG. 4.

What is claimed is:

1. A method of producing a custom-fitting article which conforms to the shape of a body part of a mammal, the method comprising the steps of:

providing a member comprised of a body of formable material sealed inside a flexible container, the formable material being a silicone gel comprising uncured silicone rubber, an effective amount of crosslinking agent, and effective amounts of a) fine powder ethylene copolymer or terpolymer or a mixture thereof and b) liquid plasticizer to form a gel effective to receive and retain an impression, said formable material being capable of remaining at room temperature without curing, the body of formable material having a minimum setting temperature greater than 130.degree. F. and being setable by heating for a period not exceeding thirty minutes and subsequent cooling,

conforming the member by biasing the member against the body part with sufficient pressure to conform the member to the shape of the body part, and

thereafter heating the member for a period not exceeding thirty minutes and thereafter cooling the member so that the formable material is set and the member remains flexible while resiliently retaining an impression of the body part and is utilizable by the mammal as part or all of the custom-fitting article.

2. A method according to claim 1, wherein said fine powder ethylene copolymer or terpolymer or a mixture thereof is ethylene vinyl acetate modified by the addition of carbonyl groups.

3. A method according to claim 1, wherein the custom-fitting article is a custom-fitting footbed which conforms to the shape of the underside of a foot of a person.

4. A member for producing a custom-fitting article which conforms to the shape of a body part of a mammal comprising a body of formable material sealed inside a flexible container the formable material being a silicone gel comprising uncured silicone rubber, an effective amount of crosslinking agent, and effective amounts of a) fine powder ethylene copolymer or terpolymer or a mixture thereof and b) liquid plasticizer to form a gel effective to receive and retain an impression, said formable material being capable of remaining at room temperature without curing, said body of formable material having a minimum setting temperature greater than 130.degree. F. and being setable by heating for a period not exceeding thirty minutes and subsequent cooling, the member being adapted such that when the member is biased against the body part of the mammal with sufficient pressure, the member will conform to

the shape of the body part and the body of formable material is capable of thereafter being set by heating for a period not exceeding thirty minutes followed by cooling so that the member remains flexible while resiliently retaining an impression of the body part and is capable of being utilized by the mammal as part or all of the custom-fitting article.