June 20, 1944. T. W. ELKIN, JR., ET AL 2,352,148

SHOE AND SHOE PRODUCT

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FIG. 1

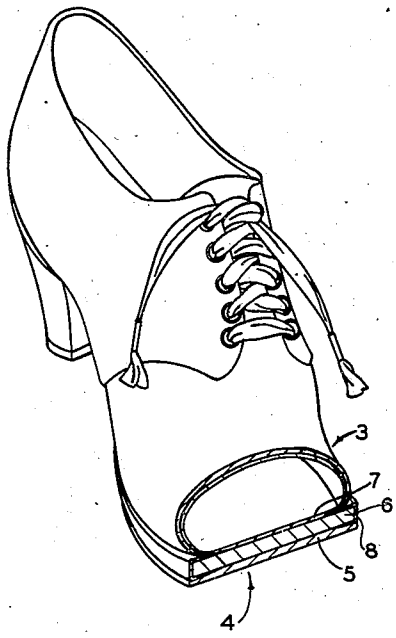
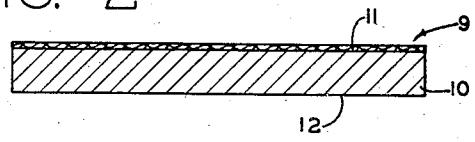


FIG. 2



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SHOE AND SHOE PRODUCT

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11 Claims. (Cl. 36—30)

This invention relates to improvements in shoes and more particularly, to a shoe having one or more resilient and flexible intermediate sole elements, such as an insole, midsole, platform sole, or the like and to an improved intermediate sole element.

Shoes generally consist of an upper, an outsole, and an insole which is adjacent the foot of the wearer. In some styles and types of shoes a midsole or platform sole is provided between the outsole and the insole. The term "intermediate sole element" is used to include all sole elements which are disposed between the outsole and the foot of the wearer, thus including insoles, midsoles, platform soles, and the like.

Attempts have been made in recent years to increase the comfort of shoes without unduly increasing their cost by the use of resilient intermediate sole elements of cork and rubber, felted fibrous materials, and relatively soft grades of leather to accomplish the purpose of cushioning the foot of the wearer. Some of the fibrous materials which have been used have been found to be so hard and stiff as not to readily flex or absorb shocks when constructed to have sufficient strength to wear properly. The relatively soft grades of leather are readily affected by water and are not sufficiently resilient to impart any real cushioning effect. The rubber type cushion platform soles are now unobtainable because of governmental restrictions and many wearers object to the use of rubber adjacent the foot claiming that it has a tendency to "draw" and "heat." Others of the materials which have been used are relatively expensive and unduly increase the cost of the final product.

A primary object of this invention is to provide an improved shoe construction in which a relatively soft cushioning effect is obtained with the use of an inexpensive material, not affected by water, completely flexible in all directions, and sufficiently strong to ideally serve for the intended purpose; which may be readily fabricated, and which will receive and hold nails or staples in assembly or may be readily cemented in place.

This object is accomplished by providing a shoe constructed with one or more intermediate sole elements, each comprising a layer of cured and vulcanized siccative oil-resin gel containing a reinforcing pigment and preferably containing cork particles.

The following typical examples, in which the parts are by weight, illustrate our invention but are not intended to limit it to the exact proportions or ingredients set forth:

Example 1

	Parts
Siccative oil-resin gel (75 parts linseed oil and 25 parts rosin)	100
Carbon black	20
Sulfur	1.2
12–40 cork particles	70

Example 2

	Parts
Siccative oil-resin gel (75 parts soya bean oil and 25 parts rosin)	100
Sulfur	4
Hexamethylenetetramine accelerator	1
Carbon black	40
Plasticizer (light mineral oil)	10
Stearic acid	2
Paraffin	2
12–40 cork particles	50

Example 3

	Parts
Siccative oil-resin gel (75 parts linseed oil and 25 parts rosin)	100
Sulfur	4
Hexamethylenetetramine accelerator	1
Carbon black	80

In preparing the oil-resin gel, linseed, soybean, China-wood, or menhaden oil or mixtures thereof may be used. Other drying oils or mixtures thereof or semi-drying oils or mixtures thereof may be used. Also mixtures of drying and semi-drying oils may be employed. The preferred resin is rosin because of its cheapness and ready availability. Other resins, such as the naturally-occurring or fossil resins, may be used if desired. A reinforcing pigment like a carbon black, such as lamp black or channel black, is incorporated in the mass to increase the toughness and strength of the product. In order to effect vulcanization or curing, sulfur is preferably employed and an accelerator, such as the hexamethylenetetramine of Examples 2 and 3 above, is incorporated to accelerate the vulcanizing action.

The siccative oil-resin gel is preferably produced by mechanically oxidizing the oil in the presence of the resin by the use of a mechanical oxidizer, such as the Bedford oxidizer. This produces a tough, elastic oil-resin gel in which substantially all of the oil is oxidized. Such a gel may be effectively vulcanized. The oil may, however, be oxidized by the so-called "scrim"

process where the oil is trickled over sheets of scrim cloth hanging in a heated chamber and oxidation and gelation of the oil occurs. The resin is then incorporated with the oil gel by the use of a heated mixer.

A substantially completely oxidized oil-resin gel produced by mechanically oxidizing a mixture of from 70 to 80 parts linseed oil and from 30 to 20 parts rosin in a Bedford oxidizer forms a satisfactory binder or matrix when cured and vulcanized.

The oil-resin gel as discharged from the oxidizer is preferably allowed to cool to produce a tough, relatively stiff, rubber-like mass. This is then broken down and the reinforcing pigment, vulcanizing agent, and cork particles or other fillers are mixed in a heated mixer to uniformly distribute the binder over the reinforcing pigment, cork particles, and filler. The mass is then fed to a calender and a sheet of the desired thickness is is formed. During calendering, a facing of cotton fabric or other suitable material may be applied to one or both faces of the sheet to increase the strength of the finished product and provide for the retention of staples, stitching and the like. The calendered sheet is preferably hung in a heated curing stove to cure and vulcanize the siccative oil. A typical curing cycle for the material described in Example 1 above is as follows: 48 hours at normal room temperature; 48 hours at about 150° F., immediately followed by from 48 to 72 hours at 195° F., depending upon the thickness of the sheet. In Examples 2 and 3, where an accelerator is employed, the curing time may be decreased. This will be apparent to the compounder.

If desired, the mixture may be cured and vulcanized under pressure. In order to do this, however, it has been found necessary to first subject the mixture to a de-gassing treatment to prevent foaming and the formation of gas cells during the molding operation, unless, of course, a porous or cellular structure is desired. This de-gassing treatment may be accomplished in a number of ways. By one method the ingredients are incorporated on a two-roll mill and the mixture is then placed in an oven heated to a temperature of about 300° F. The material remains in the oven for about thirty minutes. This results in a spongy mass which is then sheeted on milling rolls. The formed sheet may be then cured and vulcanized under heat and pressure. For a sheet 0.75 inch thick, the molding may be effected at a temperature of about 285° F. to 290° F. in about twenty-five minutes. In another and preferred de-gassing treatment, the siccative oil-resin gel, sulfur, and accelerator, if any, are mixed in a heated mixer of the Baker-Perkins or Banbury type to elevate the temperature of the mass to about 300° F. This treatment is continued for about thirty minutes. This not only accomplishes a de-gassing of the mixture necessary for press curing, but also reduces the tackiness and makes the performance of subsequent operations easier. The channel black, cork, and any other ingredients to be incorporated are milled into the de-gassed mixture on a two-roll mill. The sheet so prepared may be cured and vulcanized in a heated press without difficulty.

We have found that the use of a reinforcing pigment is necessary for it increases the toughness and strength of the product to the degree necessary to provide the proper physical characteristics for an intermediate sole element. From 20 to 80 parts by weight of reinforcing pigment for each 100 parts of siccative oil-resin gel are preferably employed. Other amounts may be used depending, in part at least, upon the quantity of cork particles incorporated in the product. Larger amounts of carbon black are normally employed where no cork is used. Other pigments and fillers, such as whiting, may be used, but an amount of reinforcing pigment sufficient to impart the desired toughness and strength should be incorporated in all instances.

Cork particles are preferably incorporated to impart resiliency and insulating qualities to the intermediate sole element. These properties materially enhance the comfort of the shoe. Amounts of cork ranging from 50 to 130 parts by weight of 100 parts of oil-resin gel have been found satisfactory. The cork particles may vary in size depending upon the thickness of the sheet. Preferably cork particles of from 10 to 40 mesh United States standard screen size, herein designated as 10/40, are used with the thicker intermediate sole elements, such as midsoles, and platform soles, but 12/20 cork has also been used for this purpose. With the thinner elements, such as insoles, 14/40 or 20/40 cork is generally employed.

The mixture is vulcanized in all instances to increase the toughness and elasticity of the product. In general, those vulcanizing agents employed for vulcanizing rubber, such as sulfur, sulfur chloride, and the like may be used. A vulcanizing accelerator, such as hexamethylenetetramine, mercaptobenzothiazole, "Tuads," technically, tetramethylthiuramdisulfide, or other similar material may be used to reduce the curing and vulcanizing time.

The attached drawing illustrates a typical platform shoe of the cemented type embodying this invention, in which

Figure 1 schematically shows a shoe having its forward portion cut away to disclose the construction of the sole; and

Figure 2 is an enlarged sectional view of an intermediate sole element, such as a midsole, platform sole, or insole.

Referring to the drawing, the shoe consists of an upper 3 and a sole 4. The sole 4 includes an outsole 5, a platform sole 6, and an insole 7. The platform sole 6 is provided with a facing or binding 8. The sole elements are held together and fastened to the upper 3 by cement in the type of shoe construction illustrated. Other means for securing the sole upper, such as staples, nails or stitching may be employed with other types of shoes.

Figure 2 illustrates an intermediate sole element 9 which comprises a layer of resilient and elastic material 10 of the vulcanized siccative oil-resin-gel type referred to above, faced with fabric 11. The other surface 12 of the layer 10 may also be faced with fabric or in some instances the fabric may be eliminated entirely.

In the shoe shown in Figure 1, both the insole 7 and the platform sole 6 are formed of our material. In some instances, it may be desirable to form only one of the intermediate sole elements of such material.

While we have illustrated and described certain preferred embodiments of our invention, it will be understood that the same may be otherwise embodied and practiced within the scope of the following claims.

We claim:

1. In a shoe having an upper and an outer sole, an intermediate sole element comprising a flex-

ible and resilient matrix of cured and vulcanized siccative oil-resin gel having incorporated therein a reinforcing pigment to toughen and strengthen the same.

2. In a shoe having an upper and an outer sole, an intermediate sole element comprising a flexible and resilient matrix of cured and vulcanized oxidized siccative oil gel having incorporated therein a resin and a carbon black reinforcing pigment to toughen and strengthen the same.

3. In a shoe having an upper and an outer sole, an intermediate sole element comprising a flexible and resilient matrix of cured and vulcanized substantially completely oxidized siccative oil-resin gel having incorporated therein a reinforcing pigment to toughen and strengthen the same, and cork particles to enhance the resilience and heat insulating properties of the element.

4. In a shoe having an upper and an outer sole, an intermediate sole element comprising a flexible and resilient matrix of heat-cured siccative oil-resin gel, sulfur, and a reinforcing pigment.

5. In a shoe having an upper and an outer sole, an intermediate sole element comprising a flexible and resilient matrix of a heat-vulcanized mixture of substantially completely oxidized siccative oil and resin, sulfur and hexamethylenetetramine, said matrix having incorporated therein a carbon black reinforcing pigment to toughen and strengthen the element.

6. In a shoe having an upper and an outer sole, a midsole or platform sole comprising a flexible and resilient matrix of cured and vulcanized siccative oil-resin gel having incorporated therein a carbon black reinforcing pigment to toughen the same and cork particles to impart resilience and heat insulating properties thereto.

7. In a shoe having an upper and an outer sole, an insole comprising a flexible and resilient matrix of cured and vulcanized substantially completely oxidized siccative oil and resin in gel form, said matrix having incorporated therein a reinforcing pigment to toughen and strengthen the same.

8. A flexible and resilient product in sheet form suitable as an intermediate sole element comprising a matrix of cured and vulcanized siccative oil-resin gel having incorporated therein a carbon black reinforcing pigment to toughen and strengthen the matrix and cork particles to increase the resilience of the product and enhance its insulating value.

9. A resilient and elastic product as defined in claim 7 having a reinforcing layer of fabric on at least one surface of said sheet.

10. An intermediate sole element comprising a matrix of cured and vulcanized substantially completely oxidized siccative oil and resin in gel form having incorporated therein a reinforcing pigment to toughen and strengthen the matrix.

11. An intermediate sole element comprising a flexible and resilient matrix of cured and vulcanized substantially completely mechanically oxidized oil and rosin in gel form, having incorporated therein a carbon black reinforcing pigment to toughen and strengthen the matrix and cork particles to increase the resilience of the element and enhance its insulating value.

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