May 16, 1939. E. F. ROBERTS ET AL 2,158,153

METHOD OF MAKING AN ARTICLE OF FOOTWEAR

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Fig. 1.

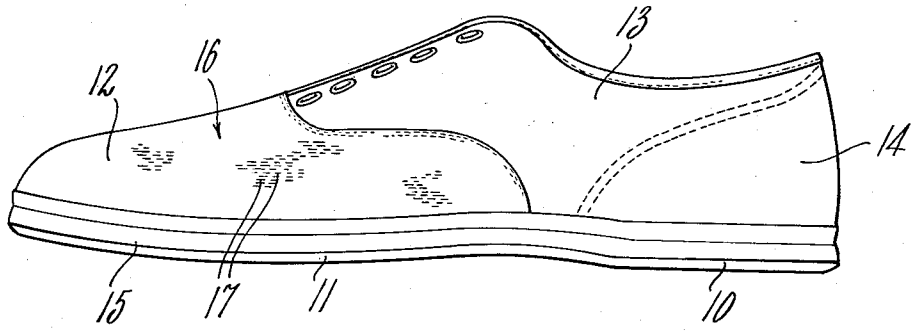
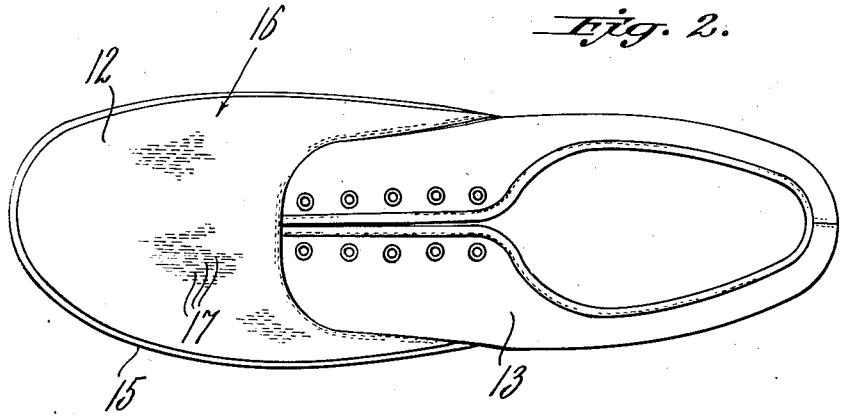


Fig. 2.



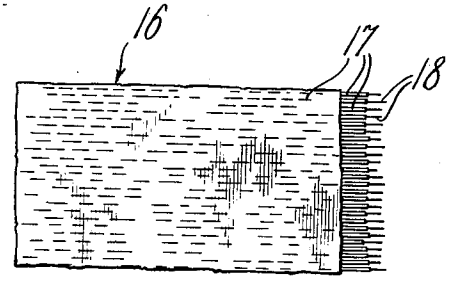


Fig. 3.

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METHOD OF MAKING AN ARTICLE OF FOOTWEAR

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2 Claims. (Cl. 12—142)

This invention relates to articles of footwear of the type which are formed by a vulcanizing operation and to the method of making the same, and more particularly to improvements in tennis or athletic shoes having a portion of the shoe upper made of elastic fabric adapted to stretch with the foot movement.

It has been proposed heretofore to provide leather or cloth top shoes with elastic gores or elastic inserts provided in certain areas of the shoe upper. In these shoes however, no vulcanizing operation is involved and the elastic inserts are secured in place by a sewing operation.

It has also been proposed heretofore to make overshoes involving a vulcanizing operation and having the upper portion thereof formed at least in part of elastic material. These elastic materials, however, when employed in a vulcanized shoe were not constructed of elastic threads the rubber cores of which need to be vulcanized before the fabric can be formed and therefore may be injured by the subsequent shoe vulcanizing operation.

The present invention contemplates articles of footwear either of the shoe or overshoe type formed by a vulcanizing operation and having certain portions of the upper thereof formed of elastic fabric constructed of elastic threads.

The construction of such articles of footwear involved certain definite problems which it is believed were new in the footwear industry.

These problems resulted from the fact that if an article of footwear of the type that requires to be vulcanized embodies in any portion thereof a piece of elastic fabric which is constructed of vulcanized rubber threads, the elastic properties of such threads will be injured by the shoe vulcanizing operation unless special provision is made to prevent this.

A primary feature of the present invention therefor resides in an article of footwear of the type which is required to be vulcanized and having in its construction elastic fabric formed of elastic threads, which elastic threads are so constructed that when embodied in the fabric they will not be injured by the subsequent vulcanizing operation involved in the forming of the article of footwear. As a result of this invention it is possible to form any desired portion of the upper of an article of footwear of elastic fabric embodying rubber threads in its construction, and the fabric may be secured directly to the lower rubber portion of the footwear by a vulcanizing operation without injuring the elastic properties of the rubber threads in such fabric.

Another feature of the present invention resides in a tennis or athletic shoe having the fore portion thereof formed of elastic fabric, which elastic fabric is secured to the lower portion of the shoe by a vulcanizing operation. In this manner a tennis or athletic shoe is produced which closely resembles the ordinary tennis or athletic shoe in appearance, but which differs therefrom in that its fore portion embracing the toes is free to stretch to relieve the pressure upon the toes and to accommodate the foot movement.

The above and other features of the present invention and method of carrying out the same will be more fully understood from the following description when read in connection with the accompanying drawing wherein

Fig. 1 is a side elevation of a tennis or athletic shoe constructed in accordance with the present invention;

Fig. 2 is a top plan view of Fig. 1 and

Fig. 3 is a plan view of a piece of woven elastic fabric adapted for use in the fore portion of the shoe of Fig. 1.

The shoe illustrated in Figs. 1 and 2 has a rubber lower portion of usual construction, consisting of the heel 10 and sole 11, and an upper comprising a fore portion 12 and the rear portion including the quarter area 13 and counter area 14, the entire shoe being provided with the usual foxing 15 at the juncture of the lower portion and upper as is usual.

This shoe of the present invention so far as appearance is concerned need not differ in any respect from the shoes of this type employed heretofore, but it differs from the shoes of the prior art in that in the present shoe the entire fore part 12 is or may be made of an elastic fabric, such as the woven elastic fabric 16. This fabric is shown as having the elastic threads 17 extending in one direction and which are interwoven with non-elastic threads extending at right angles thereof. The elastic threads 17 are formed of a vulcanized rubber core 18 having a textile covering thereupon and may well be constructed in accordance with the disclosure of the Adamson Patent No. 1,822,847 granted September 8, 1931.

The elastic fabric 16 is embodied in the shoe illustrated so that the elastic threads 17 extend lengthwise of the shoe. While this arrangement is not necessary in all embodiments of the invention, it is deemed preferable because this

lengthwise stretch of the fabric will serve to relieve the pressure of the shoe upon the toes when the foot is forced forward in the shoe by running or other foot movement, and the non-elastic properties of this fabric transversely of the shoe will prevent the shoe from stretching laterally sufficiently to permit the foot to extend over the side of the sole.

In order to construct the shoe of the present invention in which the woven elastic fabric 16 is secured directly to the lower portion of the shoe by a vulcanizing operation, it was necessary to construct the fabric 16 of elastic threads 17 that would not lose their elasticity or be otherwise injured by the vulcanizing operation to which the entire shoe is subjected in making the same. This was accomplished by making the elastic threads 17 of specially constructed vulcanized rubber cores 18 which would not be injured by the subsequent moderately high vulcanizing temperature.

To accomplish this a rubber compound was employed for the core 18 that was adapted to be vulcanized at a relatively high temperature and which would not be injured by the heat, gases or other conditions involved in the subsequent operation of vulcanizing the shoe.

It has been found that by employing the following formula, a latex rubber compound is secured which when extruded into a thread and vulcanized as hereinafter pointed out will provide a rubber thread or core 18 which has the above mentioned requirements. It will be noted that the sulphur content of the formula is relatively high. This is necessary in order that some free sulphur will remain after the thread is vulcanized to prevent the rubber from softening during the subsequent shoe vulcanizing operation.

Formula

	Dry weight
Latex ---------- parts	100
Heptaldehyde	00.20
Mercaptobenzothiazole	1.50
Sulphur	5.00
Titanium dioxide	10.00
Zinc oxide	5.00
Phenylalphanaphthalamine	1.00

A rubber thread or core having the above mentioned properties may be produced by extruding the rubber compound of the formula through an extrusion nozzle into a coagulant to thereby form an extruded thread of the desired size and shape in cross-section. The rubber thread thus produced may be vulcanized by placing it in a vulcanizer, and then building up the pressure to about 30 pounds per square inch. The temperature is raised in about one hour from about room temperature to approximately 260° F. and is maintained at this temperature for approximately one hour. This completes the operation of vulcanizing the cores 18 which may then be covered with a textile covering to form the thread 17 employed in the fabric 16.

The elastic fabric 16 need not be appreciably heavier or thicker than the ordinary canvas used heretofore in tennis shoes, and it preferably has a sufficiently strong contractive force to maintain the original shape of the shoe except when stretched by the foot movement. The fabric need not have more than about a 60% stretch and the thread 17 may be about .02 of an inch in diameter.

A shoe embodying this fabric 16 in its construction may be vulcanized the same as the ordinary tennis shoe but the vulcanizing temperature should be kept sufficiently below the thread vulcanizing temperature to prevent injuring the latter.

While the present invention has been illustrated and described as applied to a vulcanized shoe of the tennis or athletic type, it will be understood that the invention is applicable to various types of shoes or overshoes formed by a vulcanizing operation and employing in any part thereof an elastic fabric having elastic threads 17 in its construction. It will also be understood that the rubber of the shoe or overshoe may be secured directly to this elastic fabric by a vulcanizing operation.

Having thus described our invention what we claim and desire to protect by Letters Patent is:

1. The process of making an article of footwear having an elastic portion, which comprises providing a rubber bottom, providing an upper that is formed at least in part of a woven elastic fabric embodying in its construction rubber threads which are the product of vulcanization at a temperature of about 260° F. and are capable of withstanding in the fabric exposure to a shoe vulcanizing operation at a lower temperature without injury, and then vulcanizing said rubber bottom and upper including said elastic fabric together to form the article of footwear but at a temperature that is not injurious to said elastic threads.

2. The process of making an article of footwear having an elastic portion, which comprises providing a rubber bottom, providing an upper that is formed at least in part of a woven elastic fabric embodying in its construction rubber threads which are the product of a higher vulcanization temperature than normally used in a shoe vulcanizing operation and having the property of withstanding in the fabric without injury exposure to a normal shoe vulcanizing temperature, and then vulcanizing said rubber bottom and upper including said elastic fabric together to form the article of footwear but at a lower temperature than that at which the elastic threads were vulcanized.

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