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I. DOROGI

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INFLATABLE RUBBER ARTICLES PROVIDED WITH FIBER
COVER AND PROCESS FOR THEIR PRODUCTION
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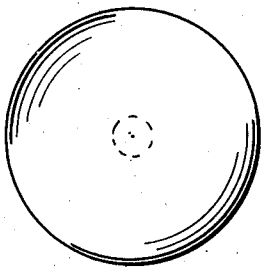


Fig. 1.

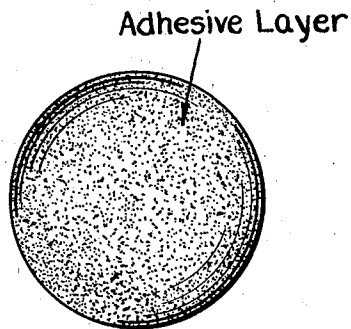


Fig. 2.

Long Silk Fibres

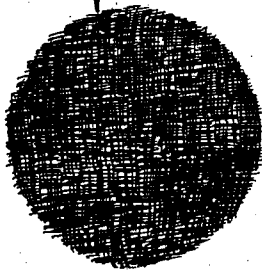


Fig. 3.

Short Cotton Fibres

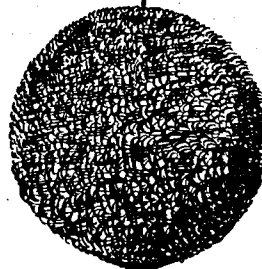


Fig. 4.

INVENTOR.

Istvan Dorogi

BY

Mock & Blum

ATTORNEYS.

UNITED STATES PATENT OFFICE

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INFLATABLE RUBBER ARTICLE PROVIDED
WITH FIBER COVER AND PROCESS FOR
THEIR PRODUCTION

István Dorogi, Budapest, Hungary, assignor, by
direct and mesne assignments, to Hungarian
Rubber Goods Factory Limited, Budapest,
Hungary

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7 Claims. (Cl. 46—37)

Herefore the known rubber articles provided with fiber covers, such as toys, air cushions etc. were coated with fibers of one and the same species, f. i. either with cotton fibers or with wool fibers. This involved several disadvantages; e. g. imitation skins made with fibers of one and the same species were far from being perfect. In view of the fact that most of the skins have two kinds of fibers, viz. the short and curly wool-fibers and longer straight fibers, the so-called felt-fibers, the real character is in many cases given to the skins by these latter fibers. For the imitation of such "felt-fibers", only glossy fibers, such as silk or artificial silk fibers are suitable; however the sole use of such fibers would render the coating of toys with a fiber cover too expensive.

This invention aims at eliminating the above mentioned disadvantages in that the rubber article is coated with a fiber cover, consisting of a mixture of fibers of at least two kinds. For example a mixture of short and curly motion fibers and of longer and substantially straight artificial silk fibers, gives to the fiber-cover a plush or skin-like appearance, which, similar to most skins, mainly shows the character of the long "felt-fibers". By mixing the cotton and artificial silk fibers in a suitable proportion it is possible to obtain a rubber article having an appearance simulating that of pure artificial silk fiber-cover, without being compelled to apply expensive artificial silk fibers only.

It is advisable to apply the different kinds of fibers having the same colour, except when contrasting colour effects are to be obtained at certain places. It is possible to produce the fiber cover, if required, with spots or patterns, by using two kinds of fibers, the colours of which differ only in shade. The felt-fibers in most of the natural skins are darker than the short wool fibers, and in use the worn appearance is caused by the lighter wool fibers becoming visible through the dark colour of the long fibers, which have been diminished in number. According to the invention the wearing out of the fiber cover, is compensated because the colour of the short fibers is made the same or preferably somewhat darker than that of the long fibers. The appearance of the cover is not materially changed even if the longer fibers have partially fallen out.

In most cases it is sufficient to employ two kinds of fibers, namely cotton and artificial silk or wool, and silk or cotton and animal hair, etc. Naturally in some cases more than two kinds of fibers may be used, particularly for obtaining certain local effects.

The sticking of the fibers to the article can be effected in several ways, preferably by applying a fiber cover consisting of the mixture of two or more species of fibers. However experience has shown that by using such mixture certain kinds of fibers, such as for example wool, stick to the adhesive layer in greater proportion than other fibers, as for example artificial silk fibers. Consequently by using a mixture of these two fibers the coated article obtains a character corresponding almost exclusively to one species of fiber, while the effect of the other will be negligible or will be apparent only to a small extent. For this reason the different fibers must be applied in such cases, in suitable succession and proportion. For example, when using cotton and artificial silk fibers, a certain amount of artificial silk is stuck on at first and the cotton fibers are applied only thereafter.

An example of the method of carrying out the invention is described hereafter.

The invention is illustrated in a diagrammatic drawing in which Fig. 1 shows an inflated rubber sphere.

Fig. 2 is a view similar to Fig. 1, having an adhesive layer added thereto.

Fig. 3 is a view similar to Fig. 2, having long silk fibers adhered thereto.

Fig. 4 is a view similar to Fig. 3, having short fibers adhered thereto.

An inflatable animal figure produced by stamping from thin rubber sheets is provided after vulcanization in its inflated state by dipping with a thin adhesive layer. Preferably, a solution of a vulcanizable material is used for this purpose and particularly good results have been attained with a benzoin solution of 20-25% concentration of rubber products obtained in known manner by heating without melting. After the evaporation of the solvent, artificial silk fibers of an average length of 5-6 mm. are strewn on the rubber article while it is kept in an inflated state, and about 50 gms. of fiber should be provided for an area of 1 m². After removing the fiber lumps and the excess fibers, the rubber article is placed within a rotating drum which contains cotton fibers, and the article is coated until its surface is covered with fibers. In addition to the above mentioned artificial silk fibers, about 40 gms. of the short cotton fibers of 2-3 mm. length are required, per 1 m² surface, for this purpose. The excess of fibers, which adhere only by loose felting are then removed from the adhering fibers by means of brushing, or by a blast of compressed air. The rubber article is then vulcanized in the inflated

state, for example, by using the vapour of sulphur-chloride, in order to firmly affix the fibers.

In order to produce a completed product which is durable and which has a suitable and ornamental appearance, the following method may be utilized.

The rubber article is coated with the fibers while the article is in the inflated state in order that the solvent may easily evaporate at all parts of the article, and so that the adhesive layer should, as far as possible, be distributed uniformly on the whole surface of the rubber. By spreading the fibers and by the treatment in the drum, the fibers are easily applied to the whole surface of the article and the excess can be removed without difficulty. The amount of the applied fibers corresponds to the outer surface area of the inflated article, so that the increase of the outer surface area which may be caused by inflation, does not involve the least diminution in the density of the fiber-cover. In the sulphur-chloride-vapour-process, which is the most suitable for vulcanizing the layer holding the fiber-cover, the inflated state of the article enables a uniform and quick vulcanization, whereas in the uninflated state—especially in the case of rubber articles consisting of two or more sheets—it is difficult to vulcanize satisfactorily, during the normal time of vulcanization, those parts of the sheets which contact with each other. Between the various operations of the fiber coating process, the rubber articles may be stored in their inflated state without danger of deterioration, while they would stick to each other at their adjoining parts very easily, if they were not inflated. Moreover the fiber cover may deteriorate, it may lose its uniformity, etc.

A vulcanizable rubber-like material is preferably used as the adhesive. Thereby the adhesive layer, although it has great adhesive properties, is not tacky on the completed article; it therefore holds the fibers. Besides this adhesive—due to its rubber like properties—does not become rigid after vulcanization, but remains elastic similar to vulcanized rubber; furthermore it does not prevent the easy and independent movement of the fibers when the rubber article is extended by inflation. The products obtained from rubber by heating without melting, and by vulcanization with sulphur chloride answer all these requirements and are therefore, as mentioned above, very suitable for forming the adhesive layer on the fiber cover according to the invention.

During the coating in the drum, which is effected in the known manner by simultaneously coating several pieces, friction occurs on the one hand between the fibers themselves and on the other hand between the fibers and the rubber. This friction, and the statical electricity resulting from such friction, apparently influence the correct position of the fibers in the adhesive, so that only a part of the fibers are located in the layer of binding material. This effect is particularly apparent in connection with the longer, less curly fibers, f. i. with artificial silk, animal hair, etc. and assists in obtaining the plush- or skin-like appearance by means of these fibers.

The above described details of the fiber coating process are of course not indispensable for carrying out this operation. Other methods may also be devised without departing from the scope of the invention; thus quite simple articles may be treated in their uninflated state, or the rubber articles may be inflated during certain operations

only. In such cases naturally simple strewing and brushing may be used for applying all the fibers instead of partially coating in the drum. Instead of cold vulcanization, heat vulcanization may also be used when applying suitable adhesive, or vulcanization may be eliminated. In other words in following more or less the directions of the above example, the coating process may be regulated in accordance with the requirements to which the articles to be provided with 10 fiber cover have to answer.

Any kind of vegetable, animal or mineral fibers may be used for forming the fiber cover. The amount, length and colour of the different kinds of fibers should be chosen according to the requirement previously stated. The rubber articles, provided with the fiber covers may be subjected before or after vulcanization to an additional painting operation in known manner.

I claim:

1. An inflatable rubber article having a coating of fibers, said fibers being composed of at least two different materials, the fibers of one material being longer than the fibers of another material of said mixture, the major part of said coating being composed of the relatively long fibers.

2. An inflatable rubber article having a coating of fibers, said fibers being composed of at least two different materials, the fibers of one material being longer than the fibers of another material of said mixture, the major part of said coating being composed of the relatively long fibers, the relatively short fibers being curly, and the relatively long fibers being substantially straight.

3. An inflatable rubber article having a coating of fibers, said fibers being composed of at least two different materials, the fibers of one material being longer than the fibers of another material of said mixture, the major part of said mixture being composed of the relatively long fibers, the relatively short fibers being made of textile material.

4. An inflatable rubber article having a coating of fibers, said coating comprising fibers of two different materials and the fibers of said materials being of different lengths, the fibers of one material being located between the fibers of the other material, the major part of said coating being composed of the relatively long fibers.

5. A rubber article having a coating of fibers, said fibers being composed of at least two different materials, the fibers of one material being longer than the fibers of another material of said mixture, the longer fibers having only portions thereof connected to said article.

6. A rubber article having a coating of fibers, said fibers being composed of at least two different materials, the fibers of one material being longer than the fibers of another material of said mixture, the longer fibers having only portions thereof connected to said article, said fibers being connected to said article by vulcanized rubber binding material.

7. A rubber article having a coating of fibers, said fibers being composed of at least two different materials, the fibers of one material being longer than the fibers of another material of said mixture, said fibers having only portions thereof connected to said article, the relatively short fibers being curly and wool-like.