

UNITED STATES PATENT OFFICE.

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MANUFACTURE OF ARTICLES EMBODYING FIBROUS FILAMENTS AND VULCANIZABLE PLASTICS.

1,211,228.

Specification of Letters Patent.

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No Drawing.

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To all whom it may concern:

Be it known that I, RAYMOND B. PRICE, a citizen of the United States, residing at New York, county of New York and State of New York, have invented certain new and useful Improvements in the Manufacture of Articles Embodying Fibrous Filaments and Vulcanizable Plastics, of which the following is a full, clear, and exact description.

This invention relates to the manufacture of articles embodying fibrous filaments and vulcanizable plastics and has for an object to provide a process whereby a predetermined initial relationship given the plastic and each filament will be maintained during subsequent manipulation of the materials and will be fixed in the product. In the manufacture of articles of this class, it is highly desirable that each fibrous filament or strain resisting element, and the plastic or cushion element, be initially assembled in definite relationship, and that this relationship be maintained and fixed in the product. This initial relationship is preferably such that the fibrous filament is inclosed by the plastic, and in the product each fibrous filament should be separated throughout from its neighbor by an adequately intervening layer of plastic. This desired initial relationship can be intentionally produced at the initial application of the plastic to each fibrous filament, but distortion from this relationship occurs at every subsequent manipulation of the plastic treated filament under conditions inherently productive of relatively displacing the filament and plastic. For example, when fibrous filaments, initially assembled with vulcanizable plastic in a predetermined relationship, are twisted together to form a filamentary article of larger dimension, and the article subsequently vulcanized, the plastic on adjacent fibrous surfaces is found at places to be displaced leaving said surfaces contacting. This is due partly to the squeezing pressure of the twisting manipulation, and partly to the shrinkage and the tendency of the filaments to untwist, particularly under the vulcanizing heat. Again, in the manufacture of such articles as tires, of either the fabric or cord type, the tire is built to embody plies of fibrous filaments, assembled with vulcanizable plastic in a predetermined relationship,

and either woven into fabric, or not. Final formation is usually given to the tire by vulcanizing the same under squeezing pressure. In the finished article the plastic and fibrous filaments will be found distorted and strained from their initial predetermined relationship. Distortion occurs to an appreciable extent during manipulation of the material prior to or in building the tire, and to a greater extent during vulcanization thereof because the plastic under heat flows and allows the fibrous filaments to escape from place, which condition is enhanced by the squeezing pressure of the wrappings, or mold. In all instances, as a result of this distortion of the plastic and fibrous filaments, the life of the article is shortened because wherever fibrous surfaces are exposed and contact, or are not protected by an adequately intervening layer of plastic, they rub upon each other during flexing of the article in service with resultant friction and heating whereby the fibrous filaments are reduced to powder thereby producing breaks and punctures.

The present invention obviates such distortion of the plastic and each fibrous filament from their initial predetermined relationship.

To obtain this result the invention resides in first assembling each fibrous filament with vulcanizable plastic in a predetermined relationship, to produce the material from which a subsequent article is to be built, and then fixing said relationship of the filament and plastic by converting the plastic into partially vulcanized plastic having such consistency as to resist displacement and hold the filament in place during any subsequent manipulations of the plastic treated filament under conditions inherently productive of relatively displacing the filament and plastic.

In carrying out the invention, I assemble each fibrous filament with a vulcanizable plastic in a predetermined relationship, which preferably is such that the filament is inclosed by the plastic. This operation may be performed by coating, calendaring, embedding, solutioning, or by any other usual or preferred operation. I then fix said relationship by subjecting the product to a preliminary partial vulcanization which may be effected by steam, open heat, inert or active

gas, liquid or other usual or preferred heat medium. The heat medium is raised to the vulcanizing temperature and applied to the product for a sufficient period to effect the desired degree of partial vulcanization. 5 Partial vulcanization may also be effected by treating the product with sulfur chlorid. This partial vulcanization is performed in the absence of any condition that would tend to materially distort the plastic and filament 10 from their predetermined initial relationship, and as a result the plastic and filament become set or fixed in said relationship. After this preliminary partial vulcanization, the product is built into the desired article, by twisting, weaving, braiding, knitting, laying under tension upon a form or other manipulation. Subsequently the article is given final formation by vulcanization with or without squeezing pressure. 20 Articles constructed in the above described manner to embody fibrous filaments each assembled with vulcanizable plastic in a predetermined relationship, and fixed in said relationship by partial vulcanization prior to building up and final vulcanization of the article, have enhanced strength over articles not so constructed, by virtue of the fibrous filaments and plastic 25 of the finished article retaining their initial predetermined relationship, which is such that each fibrous filament is with certainty separated from its neighbor by an adequately intervening layer of plastic. Furthermore such articles may be subjected to 30 higher compacting or squeezing pressure than ordinarily during final vulcanization, since the fibrous filaments are protected by the partially vulcanized plastic which during the preliminary partial vulcanization takes such consistency as to resist distortion. Such articles will be more uniformly compact, integral, and unitary throughout than 35 ordinarily since that part of the squeezing pressure of the final cure or incident to manipulating the material and hitherto expended deleteriously in displacing the mobile plastic, is now advantageously utilized in further compacting the resilient cushion 40 of partially vulcanized plastic.

When in the following claims I use the term filament, I mean the same to mean the unit fiber, strand, thread, cord, or cable, which enters into the construction of an article. And when I use the term vulcanizable plastic, I mean the same to include 55 not only rubber and allied gums but also gutta-percha and balata, which although not actually vulcanizable are capable of a setting.

Having thus described my invention, what I now claim as new and desire to protect by Letters Patent is:

1. The process of manufacturing articles 65 embodying fibrous filaments and vulcanizable plastic, consisting of inclosing each filament with vulcanizable plastic, fixing the relationship of the plastic and filament by partially vulcanizing the plastic in the absence of materially distorting conditions, building the article to include this partially vulcanized material, and giving final formation to the article by completing the desired vulcanization of the plastic.

2. The process of manufacturing articles 75 embodying fibrous filaments and vulcanizable plastic, consisting of inclosing each filament with vulcanizable plastic, fixing the relationship of the plastic and filament by subjecting the product to heat at the vulcanizing temperature under conditions which will not materially distort the predetermined relationship of the plastic and filaments to each other until the plastic is partially vulcanized, building the article to include this partially vulcanized material, 80 and giving final formation to the built article by completing the desired vulcanization of the plastic.

3. The process of manufacturing articles 85 embodying fibrous filaments and vulcanizable plastic, consisting of inclosing each filament with vulcanizable plastic, fixing the relationship of the plastic and filament by partially vulcanizing the plastic in the absence of materially distorting pressure, building the article to include this partially vulcanized material, and giving final formation to the built article by completing the desired vulcanization of the plastic under squeezing pressure. 90

4. The process of manufacturing articles 95 embodying fibrous filaments and vulcanizable plastic consisting of inclosing each filament with vulcanizable plastic, fixing the relationship of the plastic and filament by subjecting the product to the action of heat raised to the vulcanizing temperature under conditions which will not materially distort the predetermined relationship of the plastic and filament to each other until the plastic is partially vulcanized, building the article to include this partially vulcanized material, and giving final formation to the article by completing the desired vulcanization of the plastic under squeezing pressure. 100

5. The process of manufacturing articles 105 embodying fibrous filaments and rubber consisting of inclosing each filament with raw rubber, fixing the relationship of the rubber and filament by partially vulcanizing the rubber in the absence of materially distorting conditions, building the article of this partially vulcanized material, and giving final formation to the built article by completing the desired vulcanization of the rubber. 110

6. The process of manufacturing articles 115 embodying fibrous filaments and rubber, consisting of inclosing each filament with raw

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rubber, fixing the relationship of the rubber and filament by subjecting the product to the action of heat raised to the vulcanizing temperature under conditions which will not materially distort the predetermined relationship of the rubber and filament to each other until the rubber is partially vulcanized, building the article to include this partially vulcanized material, and giving final formation to the built article by completing the desired vulcanization of the rubber.

embodying fibrous filaments and rubber, consisting of inclosing each filament with raw rubber, fixing the relationship of the rubber and filament by partially vulcanizing the rubber in the absence of distorting pressure, building the article to include this partially vulcanized material, and giving final formation to the built article by completing the desired vulcanization of the rubber under squeezing pressure.

Signed at New York, N. Y., November 10th, 1915.

RAYMOND B. PRICE.

7. The process of manufacturing articles