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UNITED STATES PATENT OFFICE.

ERNEST HOPKINSON, OF NEW YORK, N. Y.

PROCESS FOR OBTAINING RUBBER-CONTAINING OR SIMILAR MATERIALS.

No Drawing. Application filed September 25, 1919. Serial No. 326,276.

To all whom it may concern:

Be it known that I, ERNEST HOPKINSON, a citizen of the United States, residing at New York city, county of New York, and State of New York, have invented certain new and useful Improvements in Processes for Obtaining Rubber-Containing or Similar Materials, of which the following is a full, clear, and exact description.

This invention relates to processes for obtaining combinations of fibrous or filamentary material and rubber, and to the products obtained thereby.

The primary object of the invention is the direct utilization of rubber latex in the manufacture of products and materials, particularly sheet material, containing fibrous or filamentary elements. Another object of the invention is to obtain such products or materials by a simple and rapid process, or processes. It also aims to provide superior products or materials by reason of the improved character of the rubber obtained directly from latex, and combined with, or binding, the fibrous or filamentary material. Another object of the invention is to provide a process of admixing which shall be continuous and in which the fibers, or the like, are thoroughly incorporated with the rubber latex without undesirable twisting or gnarling thereof. A further object of the invention is to provide an admixture of rubber, or the like, with filamentary or fibrous materials which, while possessing resiliency, shall possess a stiffness greater than of rubber as such, which shall possess improved resistance to tearing, and which is substantially homogeneous.

With specific embodiments in mind and without intention to limit more than is required by the prior art, the invention, briefly stated, consists in, mixing rubber-latex as such with, or applying it in a finely divided condition to, a mass of filamentary or fibrous materials, such as cotton, wood pulp, or other cellulose material, wool or other textile fibers or filaments of these or various other materials.

The rubber-latex which is to be combined with the fibers, may be employed in its natural condition, in which it ordinarily contains around 30% rubber, or in a more or less diluted or concentrated condition suited to the character of the fibers, or of the end product or material desired, whose physical characteristics, of course, may vary widely. It may, or may not, contain a preservative, such as ammonia, or other agent for preventing premature coagulation. Such an agent is ordinarily necessary for the preservation of the latex in transport from the plantations, or when it must needs stand a long time before use. And it may, or may not, contain fillers, or other compounding ingredients and vulcanizing agents, as the products, or sheet material, may require.

Any vegetable, animal and mineral fibers, alone or mixed together, and of short or long staple, such for instance as cotton, asbestos, wool, wood pulp, hemp and similar fibers, chemical paper pulp, straw pulp, and mechanical wood pulp, may be combined with the rubber-latex according to the invention, and formed into widely different products, or sheet materials. The processes may vary in details to meet the requirements of different fibers and to yield the desired end product, and the invention, in its broadest aspects at least, is not intended to be limited to details peculiar to particular fibrous or filamentary materials, and to particular end products or sheets.

By way of illustration, however, and with the manufacture of sheet material from cotton fibers and rubber-latex in mind, the following processes are set forth.

Upon a belt, preferably of metal having a polished surface, an initial coating of rubber-latex combined with sulphur, or other vulcanizing ingredient, is placed, and upon it is fed from a carder, a web of cotton which has been preferably reduced to extreme tenuousness by providing a draw ratio in the carder of approximately 1:36, or the carder may be eliminated and instead the fibre scraped from the bat of the "licker-in roll" may be blown off by a blast of air delivered at any desired point on the periphery of the roll. This material may then be passed on to the belt.

This web is fed on to the upper surface of the applied latex and during or after said application is sprayed with latex provided with sulphur or other vulcanizing agent or

compound if desired. The traveling belt continually carries the admixture forward in sheet form, passing it through a heated chamber or across any desired heating area such as coils beneath the belt to a rolling-up device which may consist of a roll which strips the sheet of dry rubber and fiber from the belt, or the strip may be allowed to remain on the moving belt traveling again beneath the web delivery, receiving another layer of web which in turn receives a coating of latex. This procedure may be repeated until a plied material of desired thickness has been built up. The temperature of drying is approximately 210° F. and the speed of the admixed sheet described is adjusted so that drying may take place in any desired time preferably during one revolution of the belt where the material is allowed to build up on the belt. Where a winding-up roll is used, the latter strips the sheet from the belt at the end of the process. Sheets as thin as .003" may be formed if desired. The plied sheets may be fabricated to form tires, hose, etc., and vulcanization may then be carried out.

Instead of the application of latex to the fibrous material as indicated above, a process may be carried out as follows: A mass of cotton or other fibrous or filamentary material is introduced into a chamber and evacuated. Latex is then introduced in the chamber into contact with the cotton by which it is absorbed. The latex may contain sulphur or other vulcanizing ingredient or compounding materials if desired. When impregnation is complete, during which it has been found that the capillary tubes of the cotton fibres themselves are filled with latex, the material is dried and may be then vulcanized in any well-known manner. Prior to vulcanization, the material may be shaped to the form of any desired article.

As an alternative method to those described above, the following procedure may be also carried out in effecting admixture of filaments of rubber or the like:

A thin web is prepared as described above by a carding machine and the fibres are evacuated by the application of vacuum to such web and are then run into a bath of latex being suitably supported in their travel through such bath by a wire screen running over idler rolls immersed in the latex. After emerging from the latex the web may be led over suitable drying rolls and wound up on receiving rolls in sheet form. They may thereafter be manipulated to fabricate various rubber articles as desired. It will be observed in this process that the fibres passing directly from the vacuum chamber into the bath are readily impregnated in the absence of air. If desired the vacuum chamber may be eliminated in this process and instead the web may be passed from the cards supported by a wire screen as before, through a series of squeeze rolls immersed in a bath of latex which serve to remove the air and thus to permit penetration of the fibre by the latex.

In each of the procedures just given vulcanizing agents may be applied before or after fabrication and vulcanization accomplished. In general, these various procedures result in a compacting or matting of the fibers, the liquid content of the latex effecting this matting especially when pressure is applied to the latex-treated mass of fibers.

The material produced by the above process possesses among others the desired characteristics sought for in the objects of the invention mentioned above. In accordance with the content of rubber with respect to the cotton fibre or other filamentary or fibrous material employed, the resulting products will more or less nearly resemble rubber as such. It is found with increasing admixture of fibre that the stiffness of the resulting compound is increased while the resiliency is maintained and at the same time the resistance to tearing becomes greater. With the content of rubber equal approximately to six times that of the fibre present, a material is provided which in its physical properties resembles closely the rubberized cord material of cord tires. It has stiffness, resiliency and great resistance to abrasion, and upon examination of the material it is found that the fibres are substantially uniformly distributed throughout the mass of rubber.

The admixture of chemical paper pulp in rubber-containing latex or the like may be effected as heretofore described in connection with cotton fibres or the latex may be mixed with a partially dried pulp and allowed to coagulate either naturally or by the introduction of an artificial coagulant. The products obtained by such admixture include, among others, substantially waterproof papers and plastic compositions having moldable properties. An increase of the rubber content will serve to provide products varying from such waterproof paper and their properties to those having molding properties more closely resembling those of rubber. Moldable compositions made from the admixture of paper pulp with latex upon vulcanization provide a material capable of being manufactured into various devices such as toilet articles, trunks, pottery substitutes such as cups and saucers, beer bottle caps, etc. It will be observed in this connection that in carrying out the invention herein set forth, the latex may be bleached by a suitable oxidizing agent such as sodium bisulphite to cause a whitening thereof.

Straw pulp or mechanical wood pulp may

be employed in the manner recited above for chemical pulp, and thereby cardboard and similar materials may be fabricated. A waterproof and weatherproof coating may also be provided on hemp and similar fibers that are employed in the manufacture of rope, twine, etc.

It will be observed that the addition of a vulcanizing agent and subjection of the material to the vulcanization process are set forth in connection with the procedures given above. In some circumstances, however, the preparation of the material without a vulcanizing agent and without subjection to the vulcanizing process may be carried on. Where vulcanizing agents are used, various types may be employed, such as sulphur, nitro organic compounds and the like, as well as materials including sulphur, such as hydrogen sulphide and sulphur dioxide.

In the foregoing, it has been endeavored to illustrate with specific examples, the breadth and scope of the invention, which is intended to comprehend the application of rubber-latex in a natural or modified form to a wide variety of fibers, with or without compounding and vulcanizing ingredients. The rubber-latex may be applied in any manner suited to the requirements of the particular fibers and their condition or arrangement. And their vulcanization, if required or desired, may be carried on or effected as convenient.

As many apparently widely different embodiments of this invention may be made without departing from the spirit thereof, it will be understood that I do not intend to limit myself to the specific embodiment herein set forth except as indicated in the appended claims.

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

1. A process for treating rubber-containing latex or similar material which comprises, converting the latex into a finely divided condition bringing the so-divided latex into contact with a cellulose fibrous material and drying the mass.

2. A process for treating rubber-containing latex or similar material which comprises, spraying the latex upon a web of cotton and drying the mass.

3. A process for treating rubber-containing latex or similar material which comprises, spraying the latex upon a continuous moving web of cotton and changing the fluid content of the mass.

4. A process for treating rubber-containing latex or similar material which comprises, converting the latex containing a vulcanizing agent into a finely divided condition, combining the so divided latex with filamentary substances, drying the combined mass and subjecting the products so obtained to a vulcanizing action.

5. A process for treating rubber-containing latex or similar material which comprises, spraying the latex upon a continuously moving web of cotton, substantially completely drying the latex so as to bond the mass of cotton fibers together and form a sheet, manipulating the sheet material to form a tire carcass and vulcanizing the carcass.

6. As a new product, an altered rubber-containing latex or similar material which comprises a filamentary substance combined with finely divided comminuted latex.

7. As a new product, an altered rubber-containing latex or similar material which comprises a filamentary substance combined with finely divided comminuted latex and a vulcanizing agent.

8. A process of making sheeted fabric consisting in forming an initial coating of latex combined with sulphur on a moving metal belt, feeding a web of filamentary material to the surface of the latex, spraying the web with latex containing sulphur, drying and stripping off the sheet and vulcanizing it.

9. That method of manufacturing sheet material which consists in, continuously prearranging fibers to form a sheet of any desired length, continuously treating the sheet of fibers directly with rubber-containing latex, and drying the treated sheet of fibres to obtain a sheet material in which the bond between the fibers consists of solid constituents of latex.

10. That method of manufacturing sheet material which consists in, continuously collecting fibers in an unbroken layer to form a sheet of any desired length and thickness, matting the fibers together with rubber-containing latex while continuously moving the sheet thereof, and substantially completely drying the mass and bonding the fibers together with the solid constituents of the latex.

11. That method of manufacturing sheet material which consists in, continuously collecting the fibers in an unbroken layer to form a sheet of any desired length and thickness, matting the fibers together with rubber-containing latex while continuously moving the sheet thereof, substantially completely drying the mass and bonding the fibers together with the solid constituents of the latex, and finally vulcanizing the bonded-together fibers to form a compact sheet material.

12. That method of manufacturing sheet material which consists in, continuously depositing a mass of cotton fibers on an endless moving belt, and successively and simultaneously treating the supplied mass of fibers with rubber-containing latex and drying the

same whereby a sheet material of any desired thickness and substantially uniformly bonded together with dried latex may be obtained.

13. That method of manufacturing sheet material which consists in, continuously forming a web of fibrous material and rubber-latex of any desired length, width and thickness, and drying the same so as to form a sheet bonded together with solid constituents of rubber-latex.

Signed at New York, N. Y. this 24th day of September, 1919.

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Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,526,984, granted February 17, 1925, upon the application of Ernest Hopkinson, of New York, N. Y., for an improvement in "Processes for Obtaining Rubber-Containing or Similar Materials," errors appear in the printed specification requiring correction as follows: Page 1, line 36, after the word "than" insert the word *that;* page 3, line 10, for the word "vulcanization" read *vulcanizing;* same page, lines 58–59, claim 3, strike out the words "changing the fluid content of" and insert the word *drying* instead; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of May, A. D. 1925.

[SEAL.]

KARL FENNING,
Acting Commissioner of Patents.

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