UNITED STATES PATENT OFFICE.

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TREATMENT OF FABRICS USED IN CONJUNCTION WITH VULCANIZED INDIA-RUBBER.

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To all whom it may concern:

Be it known that I, WILLIAM EDGAR MUNTZ, a subject of the King of Great Britain, and resident of the Royal Automobile Club, 89 to 91 Pall Mall, London, England, late of His Majesty's Public Works Department, India, have invented new and useful Improvements in the Treatment of Fabrics Used in Conjunction with Vulcanized India-Rubber, of which the following is a specification.

It is accepted by chemists that all rubber, pure or vulcanized, in time oxidizes on exposure to the atmosphere.

During my investigations with the outer covers of pneumatic tires, I found a burst clearly due to perishing of the cotton fabric for which I could not account; but on chemically analyzing the fibers contiguous to the burst, strong traces of SO_2 and SO_3 were found to be present, the latter of which is especially deadly to the strength of any form of cellulose. I have now ascertained that SO_2 and SO_3 are formed after vulcanization presumably by the oxidation of the rubber which sets free the particles of sulfur combined with it in a nascent state and capable of combination with the oxygen or ozone from the air or other source. I propose, therefore, in the manufacture of vulcanized rubbered goods, to remedy this defect by having present in the fabric a substance with a stronger affinity for SO_3 and SO_2 (sulfuric acid and sulfurous acid fumes) than the fabric itself, which substance at the same time must not of itself be injurious to the fabric or the process of vulcanization, especially having regard to the usual heat during vulcanization (280° F.). I therefore propose to use a material which can combine with and neutralize chemically the H_2SO_3 and H_2SO_4 with formation of substances which have no deleterious action on cellulose or rubber. It will be obvious that for this treatment to be efficient, the neutralizing substance must not only cover every fraction of the fiber but must permeate into the interior of the fiber to every place where there is the faintest possibility of the sulfurous or sulfuric acid (anhydrous or otherwise) penetrating. Further to insure the complete penetration of the liquid and even deposition and formation of neutralizing substance the removal of all air from the fibers both inside and outside must be effected preferably by applying the liquid under vacuum or pressure preferably under both in the order named.

To make the treatment properly efficient I find it desirable to follow the application of the first solution, preferably while it is still wet in the fibers, by treatment with a second solution of such a nature that by its interaction with the first solution there is formed in the fabric and on the exterior and in the interior of its fibers a substance, preferably insoluble in water, capable of neutralizing the acids as and when formed. When insoluble in water the substance thus formed has the advantages of not only being a permanent protection against the acids, as it is not easily removed by the subsequent handling of the fabric, but of not being liable to be displaced or dissolved out by water or steam getting in either through cuts in the external rubber coating, or during wet vulcanization. Also the complete penetrating of the fabric by the first solution insures the even deposition, over the interior and exterior surfaces of the fibers, of the neutralizing substance which in practice is so absolutely necessary. It is probable that the proved efficiency of this double treatment process may depend to some extent upon an imperfectly understood mechanical action, due to changes of volume or surface tension or the like, consequent upon mixture of the two solutions within the fibers insuring a more even and perfect deposition.

Among the more important neutralizing substances which may be formed or deposited in and on the fibers of the fabric according to my invention are:—(1) Alkalis, such as sodium carbonate. (2) Alkaline or basic salts, such as borax or basic lead carbonate. (3) Basic oxids or hydroxids, such as lime, baryta, or barium hydroxid. (4) Salts of metallic oxids with weak acids which with H_2SO_4 or H_2SO_3 yield a sulfate or sulfite of the metal and an acid, of which neither should have a bad effect on rubber or fabric, and these salts comprise barium carbonate and zinc acetate.

In carrying out my invention I apply the material to the fabric or to the fiber from which the fabric is made, preferably before the latter is incorporated with the rubber and if after incorporation preferably before vulcanization.

The following is an example of the treat-

ment of fabric for rubbered goods according to my invention:—Cotton cloth, to be used subsequently in the manufacture of tires, is treated in an evacuated vessel with a 3 per cent. solution of barium hydroxid in water for fifteen minutes and is then removed from the vessel, drained for three minutes and immersed in a 3 per cent. solution of ammonium carbonate in water for five minutes, after which it is removed and dried at atmospheric temperature. The barium hydroxid is thus introduced in the state of a solution in water into the interior of the fibers and into the interstices between them, and is there converted into insoluble barium carbonate which will remain in and on the fabric during subsequent treatment, and will neutralize any sulfuric acid or sulfurous acid fumes that may afterward be liberated and prevent the same from damaging the cellulose.

What I claim is:

1. The process of treating fabric to be used in conjunction with vulcanized india-rubber goods, consisting in introducing into intimate contact with the fibers of the foundation fabric used in the manufacture of vulcanized rubber goods, a substance with a stronger affinity for SO_3 and SO_2 than the fabric, and allowing said substance to remain in the fabric for combining with and neutralizing sulfurous and sulfuric acids, H_2SO_3 and H_2SO_4 and their anhydrous and gaseous forms at the time the same are formed, the said introduced substance neither by itself nor its products produced by combining with said acids having any injurious or deleterious effect on the fabric or rubber or on the process of vulcanization, substantially as described.

2. The process of treating fabric to be used in conjunction with vulcanized india-rubber goods, consisting in first impregnating the foundation fabric by introducing into intimate contact with the fibers of the foundation fabric used in the manufacture of vulcanized rubber goods, such a substance as shall be capable of combining with another substance subsequently introduced in a similar manner to form a third substance which shall have a greater affinity for sulfurous and sulfuric acids than the foundation fabric and will combine with and neutralize sulfurous and sulfuric acids and their anhydrous or gaseous forms at the time they are formed, while the substances so introduced neither in themselves nor the products produced in combination with said acids shall have any injurious or deleterious effect on the fabric or the rubber or on the process of vulcanization, substantially as described.

3. The process of treating fabric to be used in conjunction with vulcanized india-rubber, consisting in introducing into intimate contact with the fibers of the foundation fabric used in the manufacture of vulcanized goods, a substance which will combine with and neutralize sulfurous and sulfuric acids and their anhydrous or gaseous forms, while the substance neither by itself nor the products produced by its combination with said acids shall have any injurious or deleterious effect on the fabric or the rubber or the process of vulcanization and using vacuum to assist in the introduction of said substance.

4. The process of treating fabric to be used in conjunction with vulcanized india-rubber, consisting in introducing into intimate contact with the fibers of the foundation fabric used in the manufacture of vulcanized goods, a substance which will combine with and neutralize sulfurous and sulfuric acids and their anhydrous or gaseous forms, while the substance neither by itself nor the products produced by its combination with said acids shall have any injurious or deleterious effect on the fabric or the rubber or the process of vulcanization, and using pressure to aid in the introduction of said substance.

5. The process of treating fabric to be used in conjunction with vulcanized india-rubber, consisting in introducing into intimate contact with the fibers of the foundation fabric used in the manufacture of vulcanized goods, a substance which will combine with and neutralize sulfurous and sulfuric acids and their anhydrous or gaseous forms, while the substance neither by itself nor the products produced by its combination with said acids shall have any injurious or deleterious effect on the fabric or on the rubber or the process of vulcanization and using vacuum and pressure to aid in the introduction of said substance.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM EDGAR MUNTZ.

Witnesses:
P. A. NEWTON,
L. A. NEWTON.