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METHOD OF TREATING FABRICS.

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This invention relates to the treatment of fabrics to prevent acid deterioration thereof and to acid resisting fabrics.

It is a well-known fact that vegetable fabrics, particularly cotton, are rapidly deteriorated by exposure to small amounts of acids either in solution or in gaseous form. This is particularly noticeable in the rubber industry where certain articles such as hose, tubes and thread sheets are wrapped with fabric strips prior to vulcanization. In the case of thread sheets vulcanization is carried out under water, and the deterioration of the fabric wrapper is greatly accelerated by the formation of small amounts of acid in the water. The same deterioration although not as rapid is found where wrapped goods are vulcanized in open steam. It has been suggested that the formation of the acid responsible for such deterioration can be traced to the sulphur which appears to react with the water at the vulcanizing temperature to form acids. There may, however, be other sources of acid. Nevertheless the result is that fabric wrappers cannot be used a great number of times, and the replacement of the wrappers leads to quite an expense.

The present invention has for its object the reduction of this fabric deterioration by means of a suitable chemical treatment. A further object of the invention is to increase the resistance of fabrics to acid deterioration by treating the fabric with a solution adapted to neutralize the small amounts of acids as they are formed. Such neutralizing solutions can be described as buffer solutions by which term is meant those solutions to which and appreciable amount of acid or base can be added without changing the hydrogen ion concentration of the buffer solution to a material extent.

With a particular embodiment in mind but without intention to limit the invention beyond what is required by the prior art, the invention accordingly comprises treating vegetable fabrics with a buffer solution or a dilute alkaline solution which is capable of neutralizing small amounts of acids. It also includes treating the fabric with a buffer solution which is inert both towards the fabric and towards the uses to which the fabric is put. The invention also includes the preparation of wrapper fabrics to be used in the rubber industry, such wrapper fabrics having an increased resistance towards the acid deterioration encountered in wet steam or water vulcanization.

As an example of the buffer solution, a 2% solution of a mixture of 1 part of hydrated primary sodium phosphate and 3 parts of hydrated secondary sodium phosphate is prepared. If it be desired to treat ordinary cotton sheet fabric, the fabric is impregnated with this buffer solution and then allowed to dry, or it may be used wet, depending upon the particular use to which the fabric is to be put. Referring to the use of fabric in the so-called wrapper cures of the rubber industry, the wrapper fabric strips may be soaked in the buffer solution just before they are applied to the rubber article to be vulcanized. Where, however, vulcanization is carried out under water, as in the case of thread sheets, it will be found advisable to use the buffer solution as the medium in which the cure is carried out. In this case it is also advisable to use the buffer solution in wetting the wrapper, to facilitate a tight wrapping.

Where cures are carried out in open steam, in which instance the wrapper fabrics are very often permitted to dry before they are again used, it is desirable to wet the fabrics with the buffer solution before each use. Where vulcanization is carried out under water, it will be found that a number of cures can be run without renewing the buffer solution in which the vulcanization is carried out. The buffer solution mentioned in the example above has a hydrogen ion concentration of approximately $3X10^{-8}$. It will give a definitely alkaline reaction with methyl orange or methyl red, but will give an acid reaction with phenolphthalein. This particular solution is alkaline enough to absorb the acid products or acid-forming products which are given off during vulcanization, but has at the same time no effect upon the rate of vulcanization. A mixture of primary, secondary and tertiary sodium phosphates may be employed as the buffer solution, or in general the ordinary alkaline solutions may be used at about the same hydrogen ion concentration. When vulcanization is carried out under water, the buffer solution forming the vulcanization medium

should be titrated at intervals and should be completely renewed when the titer with methyl red as an indicator falls below 20 cc. of tenth normal hydrochloric acid per 100 cc. of buffer solution. The original titer of the buffer solution should be approximately 37 cc. of tenth normal hydrochloric acid per 100 ccs. of solution. The improving effect of the treatment does not show forth as clearly during the first few exposures to vulcanizing conditions as it does after a number of such exposures. For example with the buffer solution mentioned above, no marked retardation of the deterioration could be observed for the first few exposures until six exposures had been made. After eighteen exposures the fabric treated with buffer solution was as strong as the untreated fabric after six exposures, the untreated fabric being completely useless after the eighteen exposures. The treated fabric after this prolonged usage shows so small a rate of deterioration that it could easily be used many more times, the percentage of increased usage being approximately 300%.

In using buffer solution it is necessary to uniformly wet the fabric with the buffer solution prior to its use, the wetting being done either by dipping into the solution or in cases where the wrapped article is submerged in water, the wrappers must be completely covered by the buffer solution. It is to be understood that the invention is not intended to be limited to the treatment of fabric wrappers for use in the rubber industry, for the invention is equally applicable to all fabrics which are deteriorated by exposure to small amounts of acid gases or solutions of acids. Depending upon the strength of the acid in question and upon the nature of the articles with which the fabric is in contact, the strength of the buffer solution may be varied.

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

1. The method of prolonging the life of vegetable fabric used in the repeated vulcanizations of rubber which comprises treating the fabric with a reagent adapted to neutralize acids developed during the vulcanizations.

2. The method of prolonging the life of vegetable fabric used in the repeated vulcanizations of rubber which comprises treating the fabric with a reagent adapted to neutralize acids developed during the vulcanizations, which reagent has no effect upon the rate of vulcanization.

3. The method of treating fabric used in the repeated vulcanizations of rubber which comprises treating the fabric before vulcanization with a reagent adapted to neutralize acids developed during several vulcanizations and treating the fabric with additional reagent after several vulcanizations whereby the number of times that the fabric can be used is greatly increased.

4. A method of increasing the resistance of vegetable fabrics to deterioration by acids developed during repeated vulcanizations of rubber which comprises maintaining in said fabric a condition of alkalinity in excess of the acidity produced by the vulcanizations, said condition of alkalinity being imparted by a reagent substantially inert towards the fabric.

5. A method of increasing the resistance of vegetable fabrics to deterioration by small amounts of acids developed in repeated vulcanizations of rubber which comprises maintaining in said fabric during its use a condition of alkalinity greater than can be neutralized by adding 20 cc. of tenth-normal hydrochloric acid to 100 cc. of a solution of said alkali.

6. A method of increasing the resistance of vegetable fabrics to deterioration by small amounts of acids which comprises treating said fabric with a buffer solution of sodium phosphates.

7. A method of increasing the resistance of cotton fabrics to deterioration by acids which comprises treating said fabric with a two percent solution of a mixture of one part hydrated primary sodium phosphate and three parts of hydrated secondary sodium phosphate.

8. A method of preventing acid deterioration of the fabrics used in wrapped cures in the rubber industry which comprises treating said fabrics with a solution of hydrated sodium phosphates, said solution possessing a hydrogen ion concentration of approximately $3X10^{-8}$.

9. As a new article, vegetable fabric impregnated with a buffer solution of hydrated sodium phosphate.

Signed at New York, New York, this 2nd day of March, 1925.

SIDNEY M. CADWELL.

Signed at New York, New York, this 5th day of March, 1925.

OMAR H. SMITH.