UNITED STATES PATENT OFFICE.

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SUBSTITUTE FOR INDIA-RUBBER OR GUTTA-PERCHA AND PROCESS OF MAKING SAME.

SPECIFICATION forming part of Letters Patent No. 688,350, dated December 10, 1901.

Application filed January 14, 1901. Serial No. 43,194. (No specimens.)

To all whom it may concern:

Be it known that we, MARK SHERWIN, a citizen of the United States, and HANS MATHIAS MATHIESEN, a subject of the King of Sweden and Norway, both residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Substitutes for India-Rubber or Gutta-Percha and Processes of Making the Same; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention has for its object the production of solid or semisolid compounds to be used as substitutes for india-rubber and gutta-percha, the compounds having the property of elasticity and being of a fibrous nature and possessing a uniform color or shade of color, which is imparted to it previous to the completion of the product, the product being designed for use by manufacturers in making various rubber or gutta-percha goods or articles, the manufacturers adding to the product such materials or substances as are best adapted for the particular use to which they apply the product.

Our invention consists in the product and also in the process of making the same, as will hereinafter more fully appear.

We will first describe in a general way the materials employed and the manner of using the same in making the product, and will then for purposes of illustration give a detailed description of the manner of making the product in accordance with our invention.

The ingredients employed in making the product or compounds are the following: First, fatty oils in a pure state or fatty oils mixed with varying quantities of gums, resins, waxes, asphalts, pitch, tar, or kindred substances; second, sulfur or sulfur chlorid or sulfur and sulfur chlorid; third, a coloring-matter to produce any shade of color desired in the finished products; fourth, volatile solvents, as the volatile part of the petroleum products, the coal-tar naphthas, turpentine, bisulfid of carbon, or equivalent solvents for the purpose. Of the fatty oils it is preferred to use a vegetable oil—such as linseed-oil, rape-seed oil, cotton-seed oil, corn-oil, cocoanut-oil, or palm-oil; but animal oils may be used—as, for instance, lard-oil or fish-oils—instead of vegetable oils. Besides using these oils in the pure state we may also mix with them from five to twenty-five parts of gums, resins, resin-oils, waxes, asphalts, pitch, tar, crude turpentine, or Venice turpentine to one hundred parts of oil to give the finished products properties suitable to different uses. Different methods may be employed by which these oils or mixtures of oils with gums, resins, waxes, asphalts, pitch, tar, and the like can be converted into semisolid or solid compounds—as, for instance, (*a*) by the addition of sulfur and heating the oil or mixture; (*b*) by the addition of sulfur chlorid; (*c*) by the addition of sulfur and heating the oils or mixtures, then cooling and adding a small amount of sulfur chlorid; (*d*) by oxidation and the addition of sulfur chlorid. In most cases we prefer to use one of the first two mentioned methods. The quantities used of these reagents may be changed considerably. For sulfur alone we use from fifteen to twenty parts of the sulfur to one hundred parts of oil or oil mixed with gums, resins, waxes, asphalts, pitch, tar, and the like. For sulfur chlorid alone we use from twenty to thirty parts of sulfur chlorid to one hundred parts of oil or oil mixed with gums, resins, waxes, asphalts, pitch, tar, and the like. For sulfur used in connection with sulfur chlorid we add ten parts of sulfur to one hundred parts of oil or mixture of oil with gums, resins, waxes, asphalts, pitch, tar, and the like. Then heat this mixture for about two hours. Then cool it and add ten parts of sulfur chlorid and agitate to thoroughly incorporate the ingredients. As the amount of thirty parts of sulfur chlorid to one hundred parts of oil might seem too high according to some technical literature on the subject, we will call attention to the fact that some of the coloring-matters used combine with a considerable part of the sulfur chlorid. To produce the different varieties of colors desired, we add to the partly-thickened oil or mixture of oil with gums, resins, waxes, asphalts, pitch, tar, or the like a coloring agent—such as a dry metallic pigment, a dry anilin color, or any col-

oring-matter dissolved in a suitable solvent. Preferably we use either zinc-white, white lead, chalk, red lead, umber, chrome-yellow, or chrome-green on account of their cheapness. If the oil is mixed with asphalts, black pitch, or tar, these ingredients will act strongly as coloring-matter, and the addition of coloring-matter may in such case be omitted. The amount of coloring-matter added may vary from five to fifty parts to one hundred parts of oil or mixture of oil with gums, resins, waxes, asphalts, pitch, tar, and the like. As examples we will mention that on the basis of one hundred parts of oil or mixture of oil with gums, resins, &c., ten parts of zinc-white will give a bluish-white color which changes to cream color, ten parts of white lead or thirty parts of chalk will give a yellowish-white shade, ten parts of red lead will give a bright red, ten parts of chrome-yellow will give a light yellow, and ten parts of chrome-green will give a greenish blue. Of the solvents mentioned we prefer to use the volatile petroleum and coal-tar oils. These solvents are used chiefly to reduce solid or very thick bodies, as gums, resins, asphalts, pitch, and the like, so that they can be easily mixed into the oil. These solvents also help to retard the action, thus preventing an injurious rise of the temperature. We therefore sometimes mix them with the sulfur chlorid.

As an illustration of the manner of practicing the process and assuming that there is to be made a greenish-yellow compound or product with zinc-white as a pigment the following will enable the process to be practiced: Take five parts of colophony, five parts of resin-oil, and five parts of Venice turpentine reduced by light naphtha and mix with eighty-five pounds of suitable oil—for instance, linseed-oil—in a tank of about twenty-five gallons capacity. Then weigh off in a bottle or otherwise seventeen pounds of sulfur chlorid and gradually add it to the oil-and-gum mixture, which is constantly stirred while adding the sulfur chlorid. The sulfur chlorid should be added gradually in parts at intervals of about four hours, more or less, so as to prevent the temperature rising and the mixture from foaming. The mixture is then agitated for about twenty-four hours, more or less. Ten pounds of zinc-white as the coloring-matter is then thoroughly incorporated with the mixture, after which six pounds of sulfur chlorid diluted with six pounds of a suitable naphtha is added while the oil and gum mixture is agitated. In a few hours the compound is solid and ready for the market.

The product of our process is either in a solid or semisolid condition, dependent upon the proportion of sulfur chlorid used. It is of an elastic, fibrous, and tenacious character and has the uniform color or shade of color throughout its entire body. By the addition of the pigment or coloring agent after the treatment with the sulfur chlorid and then applying a diluted sulfur chlorid after the incorporation of the coloring agent such coloring agent not only imparts a uniform color or shade of color, but it also enters into a chemical union with the other ingredients and serves to prevent injury and to preserve the fibrous and elastic nature of the compound and impart to the product characteristics distinguishable by the chemical reaction which takes place from a product in which the coloring agent, added after the completion of the treatment described, would form only a mechanical mixture. The product in its solid or semisolid state and of a uniform color or shade of color is furnished to the manufacturer in that form or condition ready to be mixed by him with such other ingredients as he may desire from which to make the rubber or gutta-perch goods or articles. By adding the coloring agent to our compound before the final treatment with sulfur chlorid the color is so set that when the product or compound has the other ingredients worked into it by the manufacturer of rubber goods and is then vulcanized the finished goods will have the same color or shade of color as possessed by our compound or product.

Having described our invention and set forth its merits, what we claim is—

1. The process of forming a substitute for india-rubber and gutta-percha consisting in forming a mixture of fatty oils, and a gum or its equivalent reduced by a solvent; then gradually adding sulfur chlorid to the mixture; then adding a coloring agent; and then adding sulfur chlorid, substantially as described.

2. The process of forming a substitute for india-rubber or gutta-percha consisting in subjecting fatty oils to the action of sulfur or sulfur chlorid; then incorporating a coloring agent therewith before solidification; and then adding diluted sulfur chlorid, substantially as described.

3. The product of the within-described process, said product being a solid or semisolid body, elastic and tenacious, and containing sulfur or sulfur chlorid, treated fatty oils and gums, and a coloring agent forming a chemical union with the ingredients, substantially as described.

In witness whereof we have signed our names in the presence of two witnesses.

MARK SHERWIN.
HANS MATHIAS MATHIESEN.

Witnesses to the signature of Mark Sherwin:

CHESTER A. BAKER,
GEO. W. REA.

Witnesses to the signature of Hans Mathias Mathiesen:

JULIUS MEYERS,
J. H. SHUCKROWE.