

UNITED STATES PATENT OFFICE.

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FABRIC OR CLOTH.

1,020,499.

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, ALBERT H. HENDERSON, a citizen of the United States, residing at Baltimore, State of Maryland, have invented new and useful Improvements in Fabrics or Cloths, of which the following is a specification.

My invention relates to an improved fabric or cloth combining great strength and durability with extreme flexibility and adapted for use in the various arts, or more especially in the manufacture of inner tubes of automobile tires, invalid beds, cushions, seats, life preservers, and other articles designed for relief, comfort or safety.

In carrying out my invention, in which rubber is an element, I employ in part the material known as "mercerized" under which term is included, generally speaking, a woven cloth or other fabric or textile body subjected to alkaline and acidulating processes and other treatment, as with glycerin, oil, etc., usually while in a state of tension, the mercerizing liquid or agent being absorbed by the fiber and subsequently washed out preferably while the material is still distended. Of the results of this process, as variously conducted and modified, are the prevention of shrinkage, and the production of a firm and durable material of great strength and high luster.

My object in employing mercerized fabric is because it has many points of advantage over unmercerized material. For example, on account of the chemical treatment to which it has been subjected, the mercerized fabric, while much strengthened, is made more absorbent than a similar fabric not mercerized, a fact of great importance to my invention in that the fiber is the more readily saturated with rubber solutions, etc. Furthermore, the mercerized fabric is more flexible, and may be thinner and lighter for a given strength and has greater durability and toughness than an unmercerized fabric. The increase in strength is from five to fifteen times, and for this reason such mercerized material is in extensive use in the various arts, for instance, in the manufacture of hosiery largely advertised for its elasticity and durability. Therefore it is apparent that such a material, having great porosity at no sacrifice of strength, and high flexibility and toughness,

is well adapted for saturation with rubber, and for the general purposes of my invention.

Natural cotton fiber consists of cellulose filaments which are more or less coated with oil wax, gums, resin and impurities. Some of these gums and impurities may be removed by boiling in pure water, while resin and oil require for their removal the use of an alkali or a volatile solvent. The use of alkali is the usual method in trade. The material, whether in the form of thread or a woven body, is almost invariably treated in this manner in order to make the fiber more absorbent for dyeing and sizing purposes, and this process is, in a mild sense, a mercerizing treatment. Such treatment, however, is not sufficient for the purpose of my invention. Furthermore, cloth or thread under tension, in order to prevent shrinkage in length, has been treated with a concentrated solution of caustic soda, but this tension causes the threads to be drawn out to reduced diameter. In such mercerizing, an entirely new surface is created, for all the oil wax, gums, etc. are removed, leaving a porous fiber which offers the best possible surface and interior for treatment.

Another important feature of advantage in the use of mercerized fabric arises from the uniformity of its character which greatly increases its strength whether considered with respect to the individual fibers or to the weave as a whole. Again, the fibers being smaller than those not mercerized, a greater number of them can be put in the same space than is practicable with unmercerized fibers. Hence the woven material necessarily offers a much greater fiber surface for the absorption of or incorporation or union with rubber, and this is true of the outside as well as of the inside of the fiber. In other words, applicant has availed himself of the chemical change effected by mercerization whereby it is specially adapted to a coating or a more intimate incorporation with rubber, it having been found that the mercerized material and the rubber have a special affinity for each other, and that the combination of the fabric with rubber produces an article of manufacture useful in the arts. I believe myself to have been the first to discover that such chemical change effected in a fabric by mer-

cerization specially adapts it for a coating, union or other incorporation with rubber, which latter may be vulcanized at any stage during the bringing together of the two bodies or after the union has been fully and finally effected.

By the term mercerizing or mercerization as used herein is meant an action upon the fabric or fibers whereby the oils, waxes and resins have been treated under the process usually known as mercerization. It will be understood that the interiors of the fibers are so prepared under this process that they offer a cylindrical receptacle for the rubber reaching such interiors, and that when such fibers are woven together to constitute a complete fabric the rubber is understood to fill the interstices existing between the juxtaposed fibers. This penetration of the rubber to the interior of each individual fiber and the filling of the interstices existing between the fibers when constituting a weave is what I term the impregnation or saturation of the entire fabric with rubber. So far as I am advised, such complete saturation of a mercerized fabric was never accomplished before my invention.

My invention differs from such instances in which cloth has been coated with rubber, the latter being made adhesive by heat or otherwise and spread over and pressed upon the former outside of the cloth; or in which fabrics composed of fibrous strands have been coated with other fibrous and flexible bodies and adhesive and vulcanizable materials; or in which inner inflatable rubber tubes have been combined with a surrounding cover of canvas.

The first part of my invention consists in the method or process under which my improved material is made, and secondly in the material itself, and for convenience I will first describe the latter. Referring thereto, the invention relates broadly to a mercerized fabric combined with rubber, which fabric may or may not be brought to tube shape in lengths and widths as desired. I may employ reverse weaving, that is to say, a weft on one surface the reverse of that on the other surface.

The fabric or cloth is first saturated with a solution of rubber, after which it is coated on one or both sides with rubber by the application of heat. The coating may, however, consist of a cold liquid solution which will not only penetrate the fabric but cover the permeated article. If the fabric is formed as a tube, it is coated on each side by being turned inside out by means known to the art and which need not be here described. Such a tube may be knitted in circular form from mercerized threads. The coating, when of a plastic nature, or capable of being spread, will consist of rubber, or rubber substitutes or reclaimed rubber which

will unite or combine with the mercerized fabric or cloth, and the combination will be made permanent by the application of heat or pressure in any manner known to the rubber trade.

To increase its porosity in order that it may the better receive the india rubber, or a solution thereof, the fabric may be treated by an agent, preferably one miscible with either oil or water either with or without heat, after which this swelling agent may be removed by a solvent such as petroleum benzin or coal tar naphtha, after which the solvent may be removed by suitable means, and the rubber in the form of a solution or that of a heated and fluid mass applied thereto. Of agents miscible with oil or water may be mentioned as effective for the purpose ricin-oleic acid or any sulph-oleic acid made from any suitable oil and known to commence as Turkey red oils.

A further feature of my invention consists in combining with a mercerized fabric or cloth thus treated layers or sheets of previously prepared rawhide permeated with rubber. This rawhide when in either fragmentary or granular form has been expanded or swollen by an agent preferably miscible with either oil or water, and with or without heat, after which this swelling agent has been removed as above stated, a drying action effected, and rubber introduced to the interstices in the form of a solution or that of a heated and fluid mass. I therefore unite with the woven mercerized fabric treated and impregnated with rubber as above, sheets formed by the union by compression of fragmentary rawhide similarly treated and impregnated, the combination being effected under the influences of heat and pressure which shall cause the adhesion of the rubber in each of the two bodies, whereby a unified and solidified mass is produced for purposes of commerce. I prefer to use an agent miscible with both oil and water, for where plain water is used for the purpose of increasing the porosity of the mercerized fabric or for swelling rawhide it is difficult to expel the water and replace it with either oil or rubber solutions, whereas by using a swelling agent miscible with either oil or water the displacement is more readily accomplished on account of the mutual solubilities. For example, when the water is removed by evaporation or heat the remaining oil is soluble in many rubber solvents which will allow an interchange of solutions of rubber and oil.

The method under which my improved article is produced, and as hereinafter claimed, will be readily understood from the foregoing, and, as will be seen, consists generally in combining with a mercerized fabric rubber solutions or coatings and the application of heat and pressure; and, furthermore,

in combining such mercerized fabric or cloth thus rubber-impregnated or impregnated and coated, with rawhide suitably treated with rubber, all as hereinabove more particularly set forth.

In the practice of my invention I do not restrict myself to the amount of rubber applied to any specified body of fabric or body of rawhide; or to any specified relations as to quantity existing between the fabric and the rawhide irrespective of the rubber.

It is to be understood that wherever rubber is herein mentioned, and especially in the claims, I wish to include rubber substitutes or reclaimed rubbers as equivalents thereof. Among the rubber substitutes is an important and growing class of compounds, artificial in character, while others are natural products. Furthermore with the rubber, however used, any of these substitutes or reclaimed rubbers, in smaller or larger quantities may be employed.

It is also to be understood that under either form of my invention the rubber may be vulcanized at any stage during the union of the several bodies or after the union has been accomplished.

Having thus described my invention, I claim:—

1. The herein described method of treating fabrics from which the oils, waxes and resins have been removed by mercerization, consisting in filling the interiors of the fibers and the interstices existing between the juxtaposed fibers with a solution of rubber.

2. The herein described method of treating fabrics from which the oils, waxes and resins have been removed by mercerization, consisting in filling the interiors of the fibers and the interstices existing between the juxtaposed fibers with a solution of rubber and thereafter coating the surfaces of such fabrics with rubber.

3. The herein described method of treating fabrics from which the oils, waxes and resins have been removed by mercerization, consisting in filling the interiors of the fibers and the interstices existing between the juxtaposed fibers with a solution of rubber and thereafter coating the surfaces of such fabrics with rubber under the influences of heat and pressure.

4. The herein described method of treating fabrics from which the oils, waxes and resins have been removed by mercerization, consisting in filling the interiors of the fibers and the interstices existing between the juxtaposed fibers with a solution of rubber, and vulcanizing the latter.

5. The herein described method of treating fabrics from which the oils, waxes and resins have been removed by mercerization, consisting in filling the interiors of the fibers and the interstices existing between

the juxtaposed fibers with a solution of rubber and thereafter coating the surfaces of such fabrics with rubber, and vulcanizing the latter.

6. The herein described method of treating fabrics from which the oils, waxes and resins have been removed by mercerization, consisting in filling the interiors of the fibers and the interstices existing between the juxtaposed fibers with a solution of rubber and thereafter coating the surfaces of such fabrics with rubber under the influences of heat and pressure, and vulcanizing the rubber.

7. The herein described method of treating tubular fabrics from which the oils, waxes and resins have been removed by mercerization, consisting in filling the interiors of the fibers and the interstices existing between the juxtaposed fibers with a solution of rubber, and thereafter coating the interior and exterior surfaces of such tubular fabric with rubber.

8. The herein described method of treating a tubular fabric from which the oils, waxes and resins have been removed by mercerization, consisting in filling the interiors of the fibers and the interstices existing between the juxtaposed fibers with a solution of rubber, and thereafter coating the interior and exterior surfaces of such tubular fabric with rubber under the influences of heat and pressure.

9. The herein described method of treating tubular fabrics from which the oils, waxes and resins have been removed by mercerization, consisting in filling the interiors of the fibers and the interstices existing between the juxtaposed fibers with a solution of rubber, thereafter coating the interior and exterior surfaces of such tubular fabric with rubber, and vulcanizing the latter.

10. The herein described method of treating a tubular fabric from which the oils, waxes and resins have been removed by mercerization, consisting in filling the interiors of the fibers and the interstices existing between the juxtaposed fibers with a solution of rubber, thereafter coating the interior and exterior surfaces of such tubular fabric with rubber under the influences of heat and pressure, and vulcanizing the rubber.

11. The herein described article of manufacture consisting in a fabric from which the oils, waxes and resins have been removed by mercerization, and the interiors of the fibers of such fabric together with the interstices existing between the juxtaposed fibers thereof have been filled with a solution of rubber.

12. The herein described article of manufacture consisting in a fabric from which the oils, waxes and resins have been removed by mercerization, the interiors of the fibers of such fabric together with the inter-

stices existing between the juxtaposed fibers thereof have been filled with a solution of rubber, and the surfaces of such fabric have been coated with rubber.

5 13. The herein described article of manufacture consisting of a fabric from which the oils, waxes and resins have been removed by mercerization, and the interiors of the fibers of such fabric together with the
10 interstices existing between the juxtaposed fibers thereof have been filled with a solution of rubber and the latter vulcanized.

14. The herein described article of manufacture consisting in a fabric from which
15 the oils, waxes and resins have been removed by mercerization, the interiors of the fibers of such fabric together with the interstices existing between the juxtaposed fibers thereof have been filled with a solution of
20 rubber, and the surfaces of such fabrics have been coated with rubber and the latter has been vulcanized.

15. The herein described article of manufacture consisting of a tubular fabric from
25 which the oils, waxes and resins have been removed by mercerization, the interiors of the fibers and the interstices existing between the juxtaposed fibers of such fabric have been filled with a solution of rubber,
30 and the interior and exterior surfaces of such fabric have been coated with rubber.

16. The herein described article of manufacture consisting of a tubular fabric from which the oils, waxes and resins have been
35 removed by mercerization, the interiors of the fibers and the interstices existing between the juxtaposed fibers of such fabric have been filled with a solution of rubber, the interior and exterior surfaces of such
40 fabric have been coated with rubber, and the latter has been vulcanized.

17. The herein described method consisting in combining a rubber treated mercerized fabric with a body formed of frag-
45 mentary granulated or macerated rawhide

treated with rubber and unifying and solidifying the combined bodies.

18. The herein described method consisting in combining a rubber treated mercerized fabric with a body formed of frag- 50
mentary granulated or macerated rawhide treated with rubber and unifying and solidifying the combined bodies under the influences of heat and pressure.

19. The herein described method consisting in treating mercerized fabric with an agent miscible with either oil or water and removing said agent by a solvent, drying the fabric, and thereafter combining it with
60 rubber.

20. The herein described method consisting in combining a rubber treated mercerized fabric with a body formed of fragmentary granular or macerated rawhide treated with rubber, unifying and solidi- 65
fying the combined bodies under the influences of heat and pressure, and vulcanizing the rubber.

21. The herein described method consisting in combining a rubber treated mercerized fabric with a body formed of fragmentary granulated or macerated rawhide treated with rubber, unifying and solidifying the combined bodies under the influences of heat and pressure, and vulcanizing 75
the rubber.

22. The herein described article of manufacture consisting in a rubber treated mercerized fabric and a body of rubber treated fragmentary, granulated or macerated rawhide, the whole having been united or solidified under the influences of heat and pressure, and the rubber vulcanized. 80

In testimony whereof I affix my signature in presence of two witnesses.

ALBERT H. HENDERSON.

Witnesses:

C. B. BULL,

CHARLES LOWELL HOWARD.