

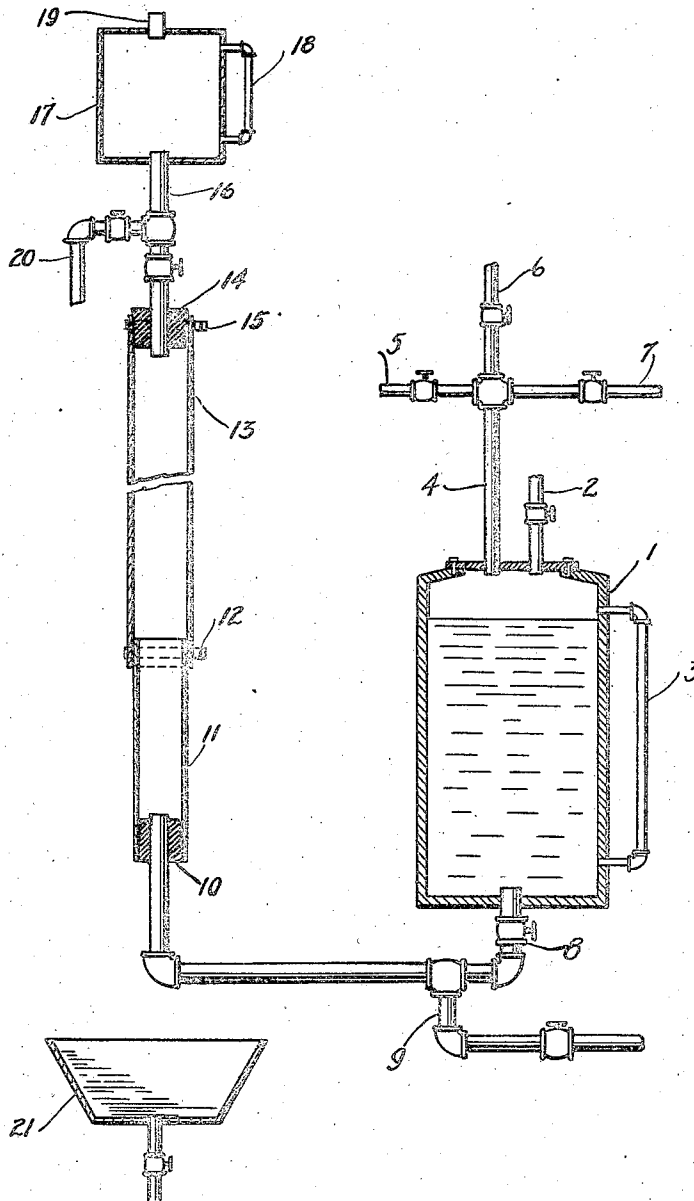
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METHOD OF MAKING ARTICLES OF RUBBER AND FIBROUS MATERIAL AND PRODUCT

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METHOD OF MAKING ARTICLES OF RUBBER AND FIBROUS MATERIAL, AND PRODUCT

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This invention relates to a method of making articles of rubber and fibrous material, more particularly to a method of making articles of this character in which the rubber portion thereof is formed directly from an aqueous dispersion of rubber, and it also comprehends articles formed by the method.

Heretofore it has been proposed to manufacture articles of rubber and fabric in various ways, but generally all of these have comprehended the separate manufacture of the fabric and the rubber composition, and subsequent union of these to make up the complete built-up articles. The present invention aims primarily to build the rubber directly from a water dispersion on to the fabric or strain-resisting portion of the article. It further contemplates an improved method of making rubber coated fabric hose. It also contemplates the manufacture of an improved construction by reason of the utilization of rubber in its unmilled form as distinguished from old processes where the coagulated rubber has been broken down and otherwise deteriorated. It further aims to provide a textile hose of superior quality.

The present invention avoids such operations as coagulating the latex, washing and drying the coagulum, mixing and calendering, cutting, cementing, extruding, dissolving, alternate dipping and drying, and others now commonly used in making articles of the character specified.

These are some of the objects of the invention and others will appear in connection with the detailed description.

With the preferred embodiment of the invention in mind, but without intention to limit its scope more than is required by the prior art, it consists essentially in providing a strain-resisting body of fibrous elements (cords, threads, yarns, etc.) in desired form of woven or knitted or parallel cord layers, or otherwise fabricated, and subsequently coating one or more surfaces of the same with insoluble constituents from a water dispersion of rubber, by direct and preferably continuous deposition of said constituents to a suitable thickness thereon, and finally drying and in some cases vulcanizing. This dispersion may

be a natural latex having a natural, decreased or increased rubber content, and if desired partially or completely vulcanized; or there may be used an artificial latex formed by making a dispersion of any suitable solid unvulcanized or vulcanized rubber. The latex may be, and preferably is, compounded to yield a rubber composition having suitable strength, resistance to abrasion, and other qualities requisite to satisfy the requirements of the finished product, and if unvulcanized may contain suitable accelerating and vulcanizing ingredients. The term "latex" is therefore employed in the claims with the above definition in mind. The latex is also preferably treated in such manner that its water content may be more readily withdrawn and its insoluble constituents will more readily deposit from the dispersion on to the desired fabric surface.

For a detailed disclosure of the nature and objects of the invention reference is had to the accompanying specification and to the drawing illustrating one form of an apparatus for carrying out an embodiment, in which drawing the figure discloses apparatus for directly applying a coating of rubber from latex to the interior of a length of hose.

Referring to the drawing, the numeral 1 designates a supply tank for latex provided with a valve controlled filling opening 2 and a sight glass 3 for indicating the depth of the latex in the tank. The tank is also preferably provided with a four way connection, one arm 4 of which leads into the tank, a second valve controlled arm 5 is connected to a source of air under pressure, a third valve controlled arm 6 is open to the atmosphere, and a fourth valve controlled arm 7 is connected to a suitable means for producing a vacuum in the tank. Leading from the bottom of the tank is a valve controlled pipe 8 into which opens a valve controlled pipe 9 for supplying steam, hot air, or both, when desired. The pipe 8 leads through a plug 10 into a short vertical section of pipe 11 of suitable diameter, the upper end of which is provided with a clamp 12 for clamping the end of a tubular piece of fibrous material 13 over the pipe. This tubular piece may be

formed of woven or knitted fabric, or of layers of parallel cords, or in any other suitable manner that will produce a permeable tube of the required strength and flexibility, depending upon the purpose for which the hose is to be used and other variables. It may be of any desired length, such as fifty feet, which is a standard length used in making hose, and at its upper open end there is inserted a plug 14, the end of the fibrous material being clamped around this plug by a clamp 15, and inserted in the plug is a valve controlled pipe 16 leading from an elevated tank 17 provided with a sight glass 18. The tank 17 is provided at its top with an opening 19 which may act as a vent or through which latex can be introduced when desired. Also disposed in the pipe 16 above its controlling valve is a valved drain pipe 20. Below the tubular fibrous piece 13 and pipe 11 there may be disposed a serum collector 21.

In carrying out the method latex is first supplied to the tank 1 through the opening 2. As before stated the latex is preferably treated before introduction into the tank 1 to increase its filterability, that is to cause it to deposit at a greatly increased rate on the surface of a permeable material with which it may be in contact. The specific process by which this increased filterability is secured forms no part of the present invention. As examples of compounds having increased filterability the following are given. Ordinary ammonia preserved latex is freed of its ammonia content and to the latex is then added $\frac{1}{2}\%$ phenol and .06% trisodium phosphate. Using the above treated latex the following compound is then made up,

100 parts rubber as latex
1 part zinc oxide
2 parts precipitated sulphur
 $\frac{1}{2}$ part oxy normal butyl thiocarbonic acid disulphide
 $\frac{1}{4}$ part dibenzylamine
 $\frac{13}{4}$ parts glue
 $1\frac{1}{2}$ parts solvent naphtha.

In mixing the above compound the various ingredients added to the latex are all incorporated in the form of emulsions. The zinc oxide and sulphur are mixed with water to make a thick mush and then added to a water solution of glue and run through a paint mixer. The oxy normal butyl thiocarbonic acid disulphide is mixed in some solvent naphtha and then emulsified with a water solution of glue to which a small amount of sodium oleate has been added. The dibenzylamine is emulsified in the same manner as the oxy normal butyl thiocarbonic acid disulphide. After mixing up the compound it is allowed to stand at room temperature for about one month. At the end of this time such a mixture is vulcanized, thickens somewhat, and its filterability is markedly increased. For example when filtered through

fabric such as underwriters hose fabric the vulcanized latex gave a deposit of .082 inches overnight. The above illustrates one method of increasing filterability of latex by vulcanization in a specific manner.

Another example in which latex is treated to increase its filterability is as follows: Latex is first treated to remove a large part of its water soluble constituents and the following compound then made up.

100 parts rubber as latex containing 33% solids

80 parts Gilder's whiting
20 parts mineral flour
 $3\frac{1}{2}$ parts colloidal sulphur
1 part zinc oxide
1 part glue
 $\frac{1}{2}$ part zinc dimethyldithiocarbamate.

The fillers are added in the form of a water paste and enough concentrated ammonia is added to the mix to make 1% of the ammonia. Enough water is added to make a total of 145 parts water. Such a compounded latex in two hours deposited a layer .069 inches thick. In this case the filterability of latex is increased by the addition of fillers.

After introduction of the latex into the tank 1 it is placed under a vacuum for a time by opening the valve in pipe 7 in order to withdraw air from the body of the latex. The tank is then placed in communication with the pipe 5 leading to a source of air under pressure and the latex is thereby forced through pipe 8 and pipe 11 up into the tubular section 13 of fibrous material, the latex being supplied until it has passed up into the tank 17, when the supply is shut off. The water and any water soluble constituents of the latex then permeate the tube 13 and drip down into the collector 21 leaving on the inner wall of the tube 13 a deposit of the insoluble constituents of the latex, and the supply of latex in the tube is kept up from the tank 17. The process is continued until the desired thickness of deposit has been obtained on the inner wall of the tube 13, when the tube is then emptied, its exterior washed down to remove serum, the tube dried, and vulcanized when necessary, or instead it may be removed for drying and vulcanization when desired. The tank 17 not only acts as an overflow receptacle when filling the tube 13, but by noting the drop in the liquid level in the tank through sight glass 18 it can readily be determined when enough latex has been used to give the desired thickness of deposit on the inner wall of the tube 13. By the incorporation in the latex of suitable low temperature vulcanization accelerators the vulcanization may be partly or wholly accomplished at ordinary temperature while the tube 13 is still in position in the apparatus, or the usual heat vulcanization may be given by supplying a heated medium

through pipe 9. Vulcanization, however, may be accomplished in any suitable manner either before or after removing the hose from the impregnating apparatus, or as previously stated vulcanized latex may be used.

5 If desired the outer surface of the hose may be covered with a deposit of latex in a similar manner by surrounding the fibrous tube with a tube containing latex, and this latex

10 may be of the same character as that used for the inner wall, or both the inner and outer walls may be so coated. Instead of using an outer covering of the same latex used for the inner wall the outer surface of the

15 hose may be merely impregnated with ordinary latex, or with latex treated in known ways, as with a polar compound such as a sulphonated oil, etc., to increase its penetrability, in order to increase the strength

20 and resistance to abrasion of the hose. If desired the outer surface of the hose may also be covered with any suitable calendered sheet rubber stock as is commonly practiced with some kinds of hose. While in the apparatus disclosed but a single length of hose

25 is shown as being coated it is obvious that in the commercial practice of the invention latex will be supplied to a plurality of tubular fibrous elements at one time, and the process is of course not limited to the use of the specific apparatus shown. By varying the apparatus used the method can be applied to the coating of variously shaped articles of fibrous material, such as sheets, etc.

30 It will be seen that by the invention various articles of fibrous material, such as the ordinary knitted or woven fabric hose, may be provided with a coating on one or more surfaces of rubber deposited directly from latex, and in the case of hose such coating

35 or lining will be without any joints tending to weaken it and formed of unmilled rubber, it will be of uniform thickness throughout, and will provide a smooth and substantially

40 frictionless water passageway in the hose. The invention is particularly applicable to the making of high grade hose such as fire hose, where a product of great strength, durability, and reliability is required, but of course

45 it will be understood that the principle of the invention may be applied in any structure made of rubber and fibrous material to which the process may lend itself.

With the above disclosure numerous modifications will suggest themselves to those skilled in the art, and it is not desired to limit the invention otherwise than as is required by the prior art.

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

1. A process of manufacturing an article composed of fibrous material and rubber which consists in exposing a surface of fibrous material to a water dispersion of rub-

ber, continuously withdrawing the water through said fibrous material until a desired thickness of insoluble constituents of the water dispersion has been deposited on said surface from the water dispersion, and forming an integral fabric and rubber article by drying the deposit on the fibrous material.

2. A process of manufacturing articles of rubber and fibrous material which comprises, providing a tubular body of fibrous material, continuously exposing a surface thereof to a water dispersion of rubber, continuously withdrawing the water through said material until a desired thickness of insoluble constituents has been deposited on said surface from said dispersion, and forming an integral fabric and rubber article by drying the deposit on the fibrous material.

3. A process of manufacturing articles of rubber and fibrous material which comprises, providing a tubular body of fibrous material, directly exposing a surface thereof to rubber latex treated to increase its filterability, withdrawing water through said material until a desired thickness of insoluble constituents has been deposited on said surface from the latex, and drying the same.

4. A process of manufacturing articles of rubber and fibrous material which consists in providing a strain-resisting body of fibrous elements of predetermined length, continuously depositing water insolubles from latex thereon to a predetermined thickness before drying by withdrawing aqueous matter from the latex through said body, drying the deposit from the latex on the strain-resisting body, and permanently uniting the fibrous elements and deposit by ultimately vulcanizing the article so formed to the desired extent.

5. A process of manufacturing articles of rubber and fibrous material which consists in providing a strain-resisting tubular body of fibrous elements of predetermined length, continuously depositing on the inside of the strain-resisting body water insolubles from latex to a predetermined thickness by withdrawing aqueous matter from the latex through said body, drying the deposit from the latex on the strain-resisting body, and permanently uniting the fibrous elements and deposit by ultimately vulcanizing the article so formed to the desired extent.

6. A process of manufacturing articles of rubber and fibrous material which consists in providing a strain-resisting tubular body of fibrous elements of predetermined length, continuously depositing water insolubles from latex on the inside and on the outside of the strain-resisting body, drying the deposit from the latex on the strain-resisting body, and permanently uniting the fibrous elements and deposit by ultimately vulcanizing the article so formed to the desired extent.

7. A process of manufacturing articles of rubber and fibrous material which consists in providing a strain-resisting tubular body of fibrous elements of predetermined length, depositing water insolubles from latex on the inside of said body to a predetermined thickness, applying to the outside of said body latex treated to increase its penetrability, drying the article and vulcanizing to the desired extent.

8. A process of making articles of rubber and fibrous material which comprises, providing a tubular body of textile material, introducing into the interior of said body rubber latex treated to increase its filterability, withdrawing water from the latex through said material to thereby deposit a layer of the insoluble constituents of the latex on the inner surface of said body, and drying the article.

9. A process of making articles of rubber and fibrous material which comprises providing a strain-resisting element of fibrous material, exposing a surface thereof to latex treated to increase its filterability, whereby water may be withdrawn from the latex through the fibrous material, continuing said exposure until a deposit of water insolubles from the latex has accumulated on said surface to the desired thickness, and drying.

10. As a new article, hose formed of fibrous material in tubular form and provided with an integrally united coating comprising a deposit of latex solids having the colloidal structure of unmilled rubber.

11. As a new article, textile hose provided with a smooth, seamless, uniform, integrally united inner wall comprising a vulcanized deposit of latex solids having the colloidal structure of unmilled rubber.

12. As a new article, textile hose having inner and outer coatings of vulcanized latex solids having the colloidal structure of unmilled rubber.

Signed at New York, New York, this 21st day of May, 1925.

ERNEST HOPKINSON.

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

WILLIS A. GIBBONS.