J. H. KETCHESON.

METHOD OF TREATING FIBROUS OR CELLULOSE MATERIALS.

APPLICATION FILED MAY 22, 1908. RENEWED DEC. 20, 1909.

987,629. Patented Mar. 21, 1911.

Fig. 1.

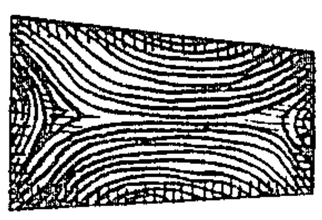
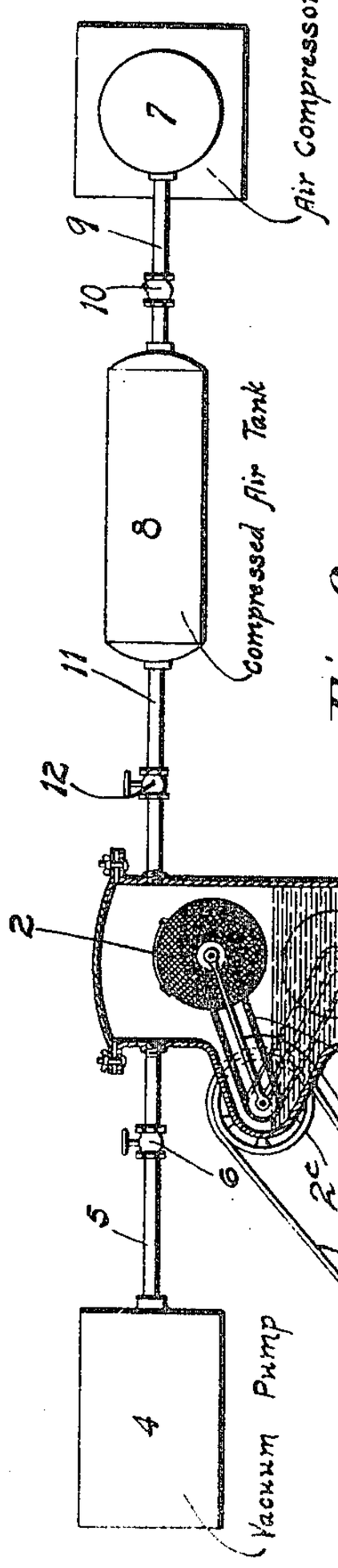


Fig. 2.



WITNESSES

Wm. Jarvis.

E. M. Harrington

INVENTOR

JOHN H. KETCHESON

BY F. R. Cornwall.

ATTY.

UNITED STATES PATENT OFFICE.

JOHN H. KETCHESON, OF ST. LOUIS, MISSOURI, ASSIGNOR TO UNITED STATES FIBRE STOPPER COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF SOUTH DAKOTA.

METHOD OF TREATING FIBROUS OR CELLULOSE MATERIALS.

987,629. Specification of Letters Patent. Patented Mar. 21, 1911.

Application filed May 22, 1908, Serial No. 434,403. Renewed December 20, 1909. Serial No. 534,161.

To all whom it may concern:

Be it known that I, JOHN H. KETCHESON, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Methods of Treating Fibrous or Cellulose Materials, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a sectional view taken through the center of a bottle stopper treated in accordance with my improved method; and Fig. 2 is a diagrammatic view illustrating a simple form of apparatus for practicing my improved method.

This invention relates to the manufacture of fibrous or cellulose materials and articles.

The main object of my invention is to provide a method of treating fibrous or cellulose materials that will produce a material which is impervious, insoluble, and also tough and resilient.

Briefly described, my method consists in coating fibrous or cellulose material with a solution containing rubber or some other suitable substance and thereafter forcing the rubber or similar substance in said coating into the pores of the material by means of air under pressure. After the material has been thoroughly impregnated with the rubber in the solution it is dried and then vulcanized so as to make it insoluble, and, if desired, the material can be burnished to impart a smooth and polished surface thereto. This method can be used for treating any material that is more or less porous, such, for example, as woven or felted fabrics or articles made from such fabrics, pulp fiber materials or articles, asbestos fabrics or articles, and cellulose articles or fabrics.

I, of course, realize that numerous other materials than those mentioned can be treated according to my method and while I have not specifically referred to such materials, I do not wish it to be understood that I consider my method limited to the treatment of the materials and articles herein specified.

In the drawings I have shown a bottle stopper made from molded pulp fiber and treated according to my method, but it will, of course, be obvious that this same method can be employed for treating any article made from any fibrous or cellulose material. I prefer to treat the material after it has been shaped or formed into an article, but, if desired, the material could be treated first and then shaped or formed into an article.

In Fig. 2 I have diagrammatically illustrated a simple form of apparatus for practicing my improved method, said apparatus comprising a tank 1 adapted to receive the filling solution and in which tank is arranged a rotary container 2, preferably constructed of reticulated material, and which container is carried by an arm 3 which can be raised and lowered in order to dip the container and its contents in the solution contained in the tank 1.

While the container 2 is being raised and lowered to dip the articles in the impregnating liquid, said container is rotated by means of a sprocket-chain 2^a operating on suitable sprocket wheels and which rotating means is driven in any suitable manner, preferably by means of a belt 2^b operating on a belt-wheel 2^c located on the shaft which carries one of the sprocket wheels.

4 designates a vacuum pump, and leading therefrom to the tank 1 is a pipe 5 in which is located a valve 6.

7 designates an air compressor, and leading therefrom to a compressed air-tank 8, is a pipe 9 in which is located a check valve 10. Leading from the tank 8 to the tank 1 is a pipe 11 in which is located a valve 12.

The first step of the method consists in coating the article or the material from which the article is formed with a solution containing rubber. I prefer to coat a number of articles simultaneously, and this can be accomplished easily by placing the articles in the container 1 of skeleton construction, or one made from perforated material, and then immersing the receptacle in the rubber solution. This solution consists of india rubber in a solvent such, for example, as bi-sulfid of carbon, naphtha, benzol, or any other suitable medium that india rubber is soluble in, it being immaterial what medium is used so long as the solution containing rubber is produced.

The articles are left in the solution for a short period and are then drawn out of same, and prior to the time they are immersed, during the time they are in the solution, and after they have been withdrawn from the solution, they are subjected to a

partial vacuum created within the tank 1 by means of the vacuum pump 4. This vacuum extracts the air from the pores of the material so that the solvent will penetrate thoroughly into the material during the time the articles are immersed, and the vacuum also tends to convert the solvent into a gas and extract a portion of it from the articles after they are withdrawn from the solution, thus leaving a soft coating of rubber on each article. Practically the same degree of partial vacuum is maintained within the tank 1 prior to the time the articles are immersed, during the time they are immersed and after they have been withdrawn from the solution; and during the time they are out of the solution, the container or reticulated receptacle 2 is being slowly rotated, therefore, agitating the entire mass of articles, and the partial vacuum created and maintained in the tank 1, tends to volatilize a portion of the solvent and the resultant gases are withdrawn from said tank 1 through the pipe 5 and open valve 6. Thereafter, the articles are subjected to a blast of air, gas or vapor under pressure, created by means of the air compressor 7 and which blast or pressure forces the coating of rubber into the pores of the material from which the articles are formed. This operation of alternately subjecting the articles to a vacuum and air pressure and dipping them in the solution is repeated a number of times until the articles or the material from which they are formed is thoroughly impregnated with rubber.

The articles can be subjected to a vacuum and to a blast of air or gas in numerous ways, but I prefer to place the receptacle in which the articles are arranged inside of an air-tight tank containing a quantity of the solution previously referred to, then extracting the air from the tank so as to create a vacuum therein, and immerse the receptacle containing the articles in the solution.

The receptacle in which the articles are arranged is immersed in the solution and withdrawn therefrom by means located outside of the tank, and the vacuum is maintained prior to the immersion of the receptacle, during the time that it remains immersed, and also for a short period after it has been withdrawn from the solution, thus volatilizing the solvent in the solution and leaving a coating of rubber on each article, as previously stated. I prefer to agitate the articles during the time they are immersed so that each article will be completely coated with the solution. A blast of air or gas under pressure is admitted to the tank to destroy the vacuum after the articles have been drawn out of the solution, and this blast of air forces the rubber into the pores of the articles so as to thoroughly impregnate same. By slowly rotating the container 2 after it has been withdrawn from the solution, and while the partial vacuum is maintained in the tank 1, the entire mass of articles within said container is agitated, thereby causing the solution to be evenly distributed over the surfaces of the articles, and said solution will drain equally and evenly from said articles. After the operations above referred to have been repeated a number of times so as to fill the pores of the articles with rubber, the articles are removed from said tank and dried by any suitable means. I prefer to partially dry the articles by subjecting them to a vacuum, then coat them with a powder which takes up the surface moisture, and finally complete the drying operation in a drying oven. If desired, however, the articles can be subjected to a vacuum for a long enough period to dry them completely and thus eliminate the operation of placing them in a drying oven. After the articles have been dried, they are vulcanized so as to make them insoluble in any solvent. Heat may be employed for vulcanizing the articles or they may be vulcanized by the cold process; namely, placing them in a receptacle that is charged with gas formed from chlorid of sulfur or by immersing them in a diluted solution of chlorid of sulfur. The final step of the method is to burnish the articles so as to impart a smooth and finished surface thereto, this being accomplished by any suitable kind of burnishing mechanism.

As preveiously stated, this method is not limited to the treatment of pulp fiber materials or articles, but can be used for treating any kind of material that is porous or cellular enough to be saturated, the material being treated either before it is made into an article, or after the article has been formed. Furthermore, while I have herein shown and described a pulp fiber bottle stopper as the product of my method, I do not wish it to be understood that my broad idea is limited to such an article, and where I have used the term "article" in the claims I mean to include any article that can be produced by the method herein described, the shape, configuration or use of the article being immaterial so far as my invention is concerned.

As stated in the first part of the specification, the solution can contain either rubber or some other suitable substance, so that I do not wish to be understood as limiting my invention to a rubber solution or a rubber coating. I have used the term "rubber" in the claims simply for sake of brevity and mean to include in this term any substance that is similar to rubber.

A bottle stopper of fibrous or cellulose material produced in accordance with my improved method, is disclosed in the patent

issued to me May 24, 1910, No. 959,225. The machine or apparatus for carrying out my improved method is shown and described in the patent issued to myself and Rudolph W. Goeb, September 20, 1910, No. 970,509.

What I claim is:

1. The method of treating a molded body of fibrous or cellulose material which consists in subjecting the body of material to a vacuum in order to extract the air from all of the pores and interstices in the body of material, then dipping the body of material into a solution consisting of rubber and a solvent, and agitating said body while the same is immersed, then subjecting the body of material to a vacuum in order to extract a portion of the solvent from the pores and interstices in the body of material, agitating said body after the same is withdrawn from the solution to cause said solution to spread evenly over the entire surface of said body, and thereafter subjecting the body of material to fluid pressure, in order to force the rubber into the pores and interstices in the body of material.

2. The method of treating a molded body of fibrous or cellulose material which consists in subjecting the body of material to a vacuum in order to extract the air from all of the pores and interstices in the body of material, then dipping the body of material into a solution consisting of rubber and a solvent and agitating said body while the same is immersed, then subjecting the body of material to a vacuum in order to extract a portion of the solvent from the pores and interstices in the body of material, agitating said body after the same is withdrawn from the solution to cause said solution to spread evenly over the entire surface of said body, then subjecting the body of material to fluid pressure, in order to force the rubber into the pores and interstices in the body of material, repeating these operations intermittently so as to thoroughly impregnate the entire body of material with the rubber, then drying the body of material and thereafter vulcanizing it.

3. The method of treating a molded body of fibrous or cellulose material which consists in subjecting the body of material to a vacuum in order to extract the air from all of the pores and interstices in the body of material, then dipping the body of material into a solution consisting of rubber and a solvent and agitating said body while the same is immersed, then subjecting the body of material to a vacuum in order to extract a portion of the solvent from the pores and interstices in the body of material, agitating said body after the same is withdrawn from the solution to cause said solution to spread evenly over the entire surface of said body, then subjecting the body of material to fluid pressure, in order to force the rubber into the pores and interstices in the body of material, repeating these operations intermittently so as to thoroughly impregnate the entire body of material with the rubber, then drying the body of material, then vulcanizing the rubber contained in said body, and then burnishing the surface of said body of material.

4. The herein described method of treating a molded article of fibrous or cellulose material, which consists in subjecting the article to a vacuum to withdraw the air from the air cells and interstices in the body of the article, then coating the article with a solution consisting of rubber and a solvent, agitating said body while the same is being coated, and after the coating has been applied, to cause the solution to be evenly distributed over the entire surface of the body, then subjecting the article to fluid pressure to force the rubber on the surface of the article into the pores and interstices in the body of said article, then repeating these operations until the pores and interstices throughout the entire body of said article are filled with rubber, then vulcanizing the rubber filling the pores and interstices, and then burnishing the surface of the article.

In testimony whereof I hereunto affix my signature in the presence of two witnesses, this 19th day of May 1908.

JOHN H. KETCHESON.

Witnesses:
WELLS L. CHURCH,
GEORGE BAKEWELL.