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F. S. KOCHENDORFER

FIBROUS ARTICLE AND METHOD FOR PRODUCING SUCH ARTICLES

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Fig. 1.

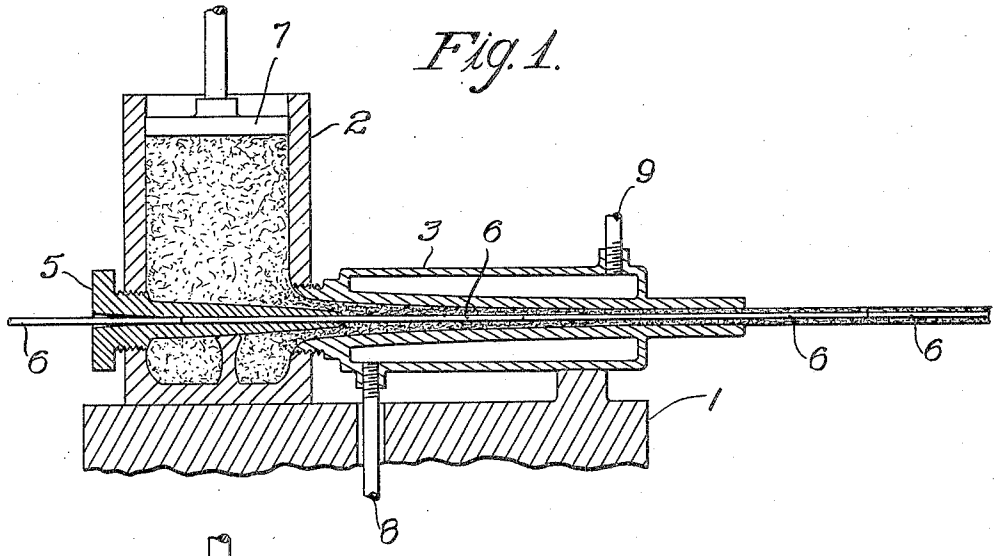
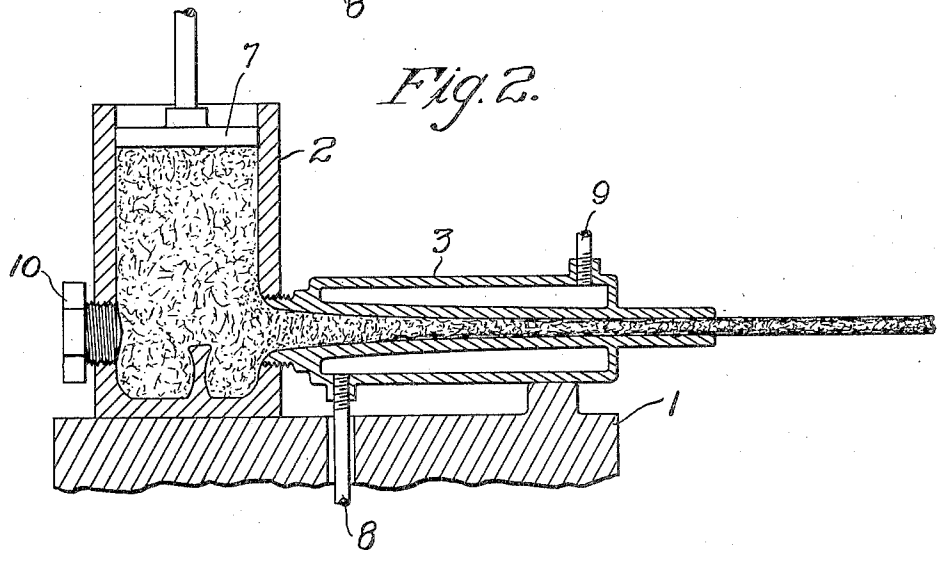


Fig. 2.



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FIBROUS ARTICLE AND METHOD FOR PRODUCING SUCH ARTICLE.

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This invention relates to improvements in fibrous articles and methods and means for producing such articles.

In accordance with one method of manufacture at present generally followed, vulcanized fiber tubes are formed by heating a sheet of cellular fiber paper treated with a solution of zinc chloride and then winding it under proper tension around a mandrel. The wrapped mandrel is then washed in water for a short time after which the mandrel is removed and the tube is washed until substantially all of the zinc chloride is removed. The mandrel is then replaced and the tube is dried and passed through suitable forming and polishing rolls, after which the mandrel is again removed. Fiber rods have been made in a somewhat similar manner except that the mandrel or drum around which the fiber paper is wrapped is of considerably greater diameter and after the fiber tube or cylinder is removed therefrom, the wall is divided into longitudinal strips or sections which are machined to provide a laminated rod.

One object of the invention is to improve and simplify the methods of producing articles composed of fibrous material.

Another object is to produce a homogeneous vulcanized fiber cylinder the material of which is of uniform strength in all directions.

In order to accomplish these objects in accordance with features of the invention, vegetable or other cellular fibers, either before or after they are formed into paper pulp, are treated with zinc chloride or some other suitable chemical and moisture. The treated mass is extruded and simultaneously heated, thereby converting by a chemical action portions such as the surfaces of the fibers into a suitable adhesive or binder and forming them into a homogeneous mass. The extruded article may take the form of a rod, a tube or any other article, depending upon the shape of the extruding die. The articles thus produced are washed to remove substantially all of the converting agent and are then passed through forming or polishing rolls, as in the manufacture of tubes and rods by the above mentioned wrapping method. In this manner fiber tubes and rods may be manufactured from material possessing the same strength in each direction since the fibers extend equally in all directions instead of being confined within laminations as in the case of similar articles formed by wrapping sheets of paper.

These and other features not specifically mentioned will be apparent from the following description of the invention and the accompanying drawings, in which

Fig. 1 shows a longitudinal cross section in elevation of a preferred machine for manufacturing tubes in accordance with the invention, and

Fig. 2 shows a similar view of such a machine modified to produce rods.

In the drawings wherein like reference numerals are employed to denote similar parts in the various figures, a base plate 1 supports a receptacle or chamber 2 filled with a supply of the treated fibrous or pulpous material and a jacketed die member 3 threaded into the wall of such chamber. Threaded into the chamber wall, opposite to and extending partially into the die member 3, is a hollow truncated cone 5 adapted to receive a series of rods or mandrels 6. A plunger 7 actuated by hydraulic or any other suitable power means serves to extrude the material from the chamber 2 through the die member 3 around the end of the core member 5 and over the rod 6. Steam or some other suitable heating agent may be passed through the jacket of the die member 3 by means of the entrance and exit pipes 9 and 8 respectively, so that the material passing from the chamber 2 may be subjected to a substantially constant predetermined temperature while in the die member 3. To assist in compressing the fibrous material, thereby binding the fibers thoroughly together by the cementing action of their converted portions, the diameter of the opening through the die member decreases gradually from the wall of the chamber 2 until a point near the other end of the die is reached, when it becomes constant.

When the machine is modified for manufacturing rods instead of tubes or other hollow articles, as shown in Fig. 2, the hollow

core member 5 is omitted and the opening in the chamber wall therefore is closed by a threaded plug 10 and the material enters the die member as a homogeneous cylindrical member without a central opening.

In the manufacture of articles in accordance with the preferred embodiment of the invention, cotton or other vegetable fibers, preferably in dry pulp form, are mixed with dry zinc chloride or other chemical in an ordinary ball mill or otherwise. When a thorough mixture is obtained, air containing a high percentage of moisture is introduced into the mixture and the mixing is continued until a mass having a suitable density for extrusion purposes is obtained. The use of moisture laden air insures that all particles of the chemical are moistened uniformly at the same time. The mass is then placed in the chamber 2 of the extruding machine and the plunger 7 is operated to force the mass through the die 3. The zinc chloride or other chemical used, assisted by the heat produced by the steam in the jacket around the die, converts portions of the fibers into a suitable binder and the pressure exerted thereon by the plunger, as well as due to the decreasing internal diameter of the die, serves to cement together into a homogeneous fibrous mass the unconverted portions of the fibers. In the manufacture of tubes, rods or mandrels 6 are fed through the machine in a continuous series at a rate consistent with the extrusion of the material. As the coated rods leave the machine, the coating is severed at the junction points between the adjacent rods, and the coated rods are then washed in water in the manner followed in making fiber tubes in accordance with the present method, outlined above, until substantially all of the zinc chloride or other chemical is removed. After the termination of the washing process the coated rods are properly dried and passed through forming or polishing rolls and the rods are then removed, leaving a tube the material of which possesses substantially uniform strength in all directions.

The process of manufacturing fiber rods employing the machine shown in Fig. 2 is similar to that described in connection with the manufacture of the tubes except that no core or rod is employed, and a solid, homogeneous, fibrous rod is produced which may be cut into suitable lengths as it leaves the machine.

It has been found that rods and tubes manufactured in accordance with this process may be suitably threaded or otherwise machined in a manner similar to that employed with metallic articles. Since the zinc chloride or other converting agent is effective only while it is properly heated, such conversion may be carried to any desired degree. By heating the mass as it passes through the die member and properly limiting the period to which it is subjected to the heat treatment, the fibrous character thereof may be retained in the finished article.

In some instances unevenly surfaced rods and tubes are produced by the above mentioned wrapping method due to wrinkles in the paper or other inequalities in wrapping thus requiring an increased amount of polishing to obtain a satisfactory surface. However, no such variations in polishing are needed in connection with articles manufactured in accordance with this invention since the surfaces are always uniform in character.

What is claimed is:

1. A method of manufacturing fibrous articles, which comprises generating an adhesive from material in the surface layers of unfabricated fibers, extruding the fibers to form a cohesive mass and removing the surplus generating agent.

2. A method of manufacturing fibrous articles, which comprises subjecting surface layers of unfabricated fibers to a chemical action for rendering them adhesive, extruding the fibers to form a cohesive mass and stopping the chemical action.

3. A method of manufacturing fibrous articles, which comprises subjecting unfabricated fibers to an agent for converting portions thereof into a binder, extruding the fibers to form a cohesive, homogeneous mass, and removing the surplus converting agent.

4. A method of manufacturing fibrous articles, which comprises treating unfabricated fibers with zinc chloride for converting portions thereof into a binder, extruding the fibers to form a cohesive, homogeneous mass, and removing the surplus converting agent.

5. A method of manufacturing fibrous articles, which comprises treating unfabricated fibers with zinc chloride for converting portions thereof into a binder, extruding the fibers to form a cohesive, homogeneous mass, heating the treated fibers, and removing the surplus converting agent.

6. A method of manufacturing rigid fibrous tubes, which comprises subjecting unfabricated fibers to an agent for converting the surface portions thereof into a binder, simultaneously extruding and heating the fibers to form a cohesive mass around a core, removing the surplus converting agent from the coating, and removing the core from the coating.

7. A method of making fibrous articles possessing the same cross-sectional strength in all directions, which comprises subjecting unfabricated fibers to an agent for converting the surface portions thereof into a binder, extruding the fibers to form a cohesive, homogeneous mass, and removing the surplus converting agent.

8. A method of making articles, which

comprises treating the material in the surface layers of the unfabricated cellular fibers with a softening agent, heating the treated fibers to accelerate the softening action, extruding the heated mass through a die, and removing the remaining softening agent.

9. A method of making tubes, which comprises mixing pulpous material with dry zinc chloride, introducing moist air into the mixture, extruding the moistened mixture through a die and over a mandrel, washing the coated mandrel, removing excess zinc chloride therefrom, drying the coated mandrel to remove the moisture therefrom, and removing the mandrel from the coating.

10. A method of manufacturing fibrous articles, which comprises mixing unfabricated fibers with a chemical, introducing moisture laden air into the mixture to furnish moisture uniformly to all particles of the chemical, heating the moistened mass to cause the chemical to generate an adhesive from the fibers, and extruding the mass to cause the cohesion of the fibers into a homogeneous mass.

11. As a new article of manufacture a fibrous article manufactured from unfabricated fibers treated with an agent for generating an adhesive from the surface layers thereof and extruded through a die.

12. As a new article of manufacture a fibrous article having uniform cross sectional strength in all directions, manufactured from unfabricated fibers, treated with an agent for generating an adhesive from the surface layers thereof, and extruded through a die.

13. As a new article of manufacture, a fibrous article having uniform cross sectional strength in all directions, manufactured from unfabricated fibers, chemically treated to convert the surface portions thereof into a binder and extruded through a die.

In witness whereof, I hereunto subscribe my name this 24th day of January, A. D. 1923.

FREDERIC SHIELDS KOCHENDORFER.