Sept. 16, 1930. A. E. P. GIRARD ET AL 1,776,073

VARNISHING CORDS

Filed June 10, 1926

Fig. 1.

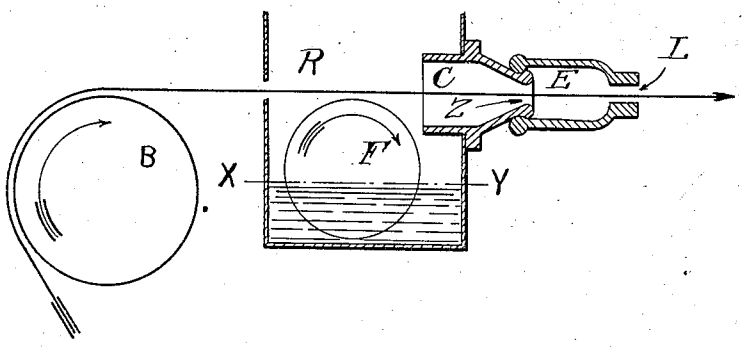


Fig. 2.

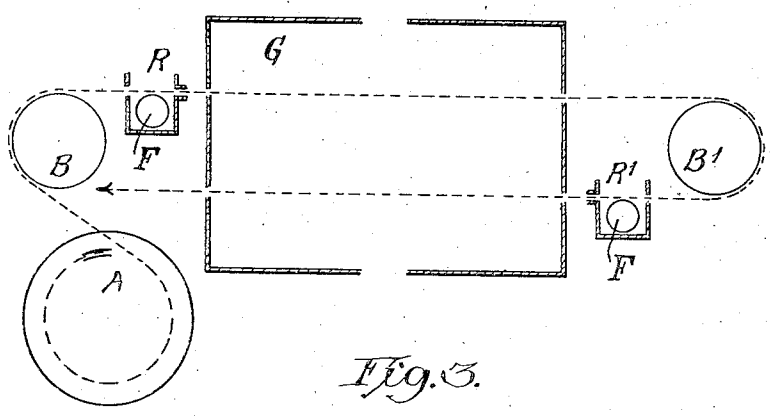
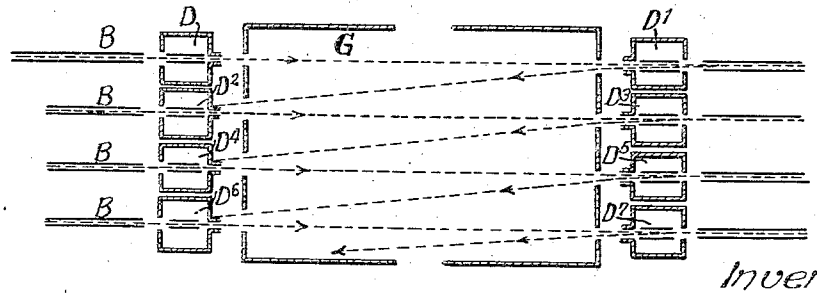


Fig. 3.



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UNITED STATES PATENT OFFICE

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VARNISHING CORDS

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The present invention relates to an improved process, as hereinafter described, for the purpose of permitting cords to be varnished by means of compounds of cellulosic base, regardless of whether the cord is composed exclusively of textile fibers or comprises a metal core covered with textile fibers.

The invention is especially characterized by:

(*a*) The composition of the special coatings to be used;

(*b*) The method of applying such coatings;

(*c*) The provision of a machine or apparatus permitting the said special coatings to be used, and to be applied according to our improved method.

(*a*) *Special coatings.*—The special coatings to be used according to the invention are collodions with a base either of nitro-cellulose, or, more particularly, of acetate of cellulose, or, lastly, with a base consisting of a mixture of those two cellulosic compounds.

The composition of the said collodions is as follows:

1. Coatings for cords of small diameters

	Per cent
Cellulose acetate cops or waste	8 to 10
Methyl acetate, acetone, etc	20 to 30
95° alcohol	15 to 20
Crystallizable benzene	15 to 20
Plastifier	15 to 20

2. Coatings for cords of large diameters

	Per cent
Cellulose acetate cops or waste	10 to 15
Methyl acetate, acetone, etc	20 to 25
95° alcohol	10 to 15
Crystallizable benzene	10 to 15
Plastifier	15 to 30

The novel characteristics of the foregoing coatings consist in:

1.—The amount of plastifier used.

2.—The amount of cellulose acetate.

3.—Omission of antitarnish.

The combination of these three features results in the production of an exceedingly viscous collodion which will bleach or whiten when exposed to air, which is incapable of acting to stretch canvas and therefore cannot be applied either with a brush or with a gun, and which in short cannot be employed in accordance with any of the methods usual for analogous products. These hitherto objectionable features, which become valuable properties owing to the hereinafter set forth methods of application, render the collodions made according to the above disclosed formulas an entirely new product.

(*b*) *Method of application.*—Obviously, the end sought is to produce a varnishing that will wear well and adhere firmly. Such a result can only be obtained through as deep as possible an impregnation of the textile fibers. The problem is all the more complicated owing to the fact that on account of their own constitution, collodions are products that will dry rapidly and form only a very thin film on the surface of objects coated therewith.

The method which is the object of our invention includes the provision of an apparatus for permitting impregnation to be effected automatically and under pressure. Furthermore, in order to render the impregnation thorough, said method provides for proceeding with thin and as numerous as practicable layers, each layer being dried in a drying-oven or such like at a temperature between 60° and 120° C. according to the diameter of the cords to be varnished. Such drying permits quicker work and the use of varnishes free from antitarnish.

(*c*) *Performance.*—Utilization of the special products compounded as per (*a*) is permitted, and the method of application thereof as per (*b*) is performed in a practical manner by means of the apparatus which will now be described and which is one of the objects of the invention.

In the accompanying drawing:

Figure 1 is a longitudinal section of a detail comprised in the apparatus.

Figure 2 is a diagrammatic side view, and Figure 3 a top plan view of the apparatus.

In all the figures the same reference letters denote the same parts.

A is a drum or reel, of any suitable shape, around which the cord or thread to be varnished is wound.

B is a simple guide pulley.

R is a coating container, the level of the coating being somewhere at X Y (Fig. 1).

F is a grooved wheel which is positively driven by a suitable device independent of the general motion.

C is a conical metal nozzle.

E is an india-rubber nozzle adapted to fit on metal nozzle C.

The feeding direction of the cord or thread is indicated by arrows, said feeding being effected by any suitable mechanical means known in the prior art.

Guided by pulley B, to which it passes from drum A said thread enters the coating box or container R and engages into the groove of wheel F.

Due to viscosity of the coating material and to rotation of the wheel, said groove is constantly filled with coating so that the thread, during its travel in the groove, becomes loaded with a considerable amount of the material, which it carries with it first into and through the metal nozzle and next through the rubber tip. The bore L of the rubber nozzle is so gauged that the thread will pass through with considerable friction, and it hardly need be said that said bore should be gauged according to the section of the thread to be varnished. The excess coating carried by the thread is wiped off, or, as it were, laminated on its passing through the bore, the layer of coating being thereby distributed very evenly over the surface of the thread. At the same time, this excess coating tends to return to the container R such said return, however, being retarded on the one hand by the viscosity of the coating itself and, on the other hand, by a choke Z. In this region a pressure is thus set up that forces the coating into the component textile fibers of the thread or cord and thereby thoroughly impregnates them.

After issuing from the rubber nozzle, the thread is passed through a drying oven G. Said oven is heated up to a temperature comprised between 60° and 120° C. The exact temperature to be provided is governed by the volume of solvent to be evaporated, which volume is itself a function of the diameter and of the composition of the thread or cord intended to be varnished.

After coming out of the drying oven and passing over another guide-pulley B_1, the thread passes through a second varnishing box R_1, identical with the box or container R. By passing through this second box the thread takes on a second coat.

If, therefore, the complete device or unit—i. e.—the guide pulley, the varnishing box and its inner wheel or pulley—be designated D,—and if said unit be repeated in a plane as indicated by the drawing at D, D_1, D_2, D_3, etc., the thread or cord following the path indicated by the arrows will take on as many coats as there are units. The number of units is unlimited, varying, according to the result desired to be obtained, between four and thrity-five.

Designed in a practical and mechanically sound manner, the improved thread or cord varnishing apparatus constitutes, together with the special coating units or devices which it embodies, a perfectly handy and perfectly tuned up contrivance.

The threads obtained therewith are suitable for hosiery, lace-work, embroidery and a wide variety of other purposes. When provided with copper cores, they constitute perfectly insulated electric conductors, and, moreover, they are proof against diluted acids and against alkalis. Being waterproof, they possess all the qualities appertaining to coatings having collodion bases; that is to say, they are uninflammable and will absolutely withstand oil, petrol and gasoline, grease and all fatty solvents.

These peculiar qualities enable the improved process to be used for protecting electric wires or cables previously covered with one or several layers of braided or whipped cotton and intended for motor-car or aeroplane equipment, or for any other purposes.

To call attention to the thoroughness of the pressure impregnation achieved with the present process, it may be stated that it is possible to impregnate to the core electric cables covered with several cotton braids. To achieve this, it was necessary merely to lengthen the conical metal nozzle C with a tube 10 to 15 centimeters long, such tube carrying at one end a rubber nozzle and at the other end a choke having a diameter of 3 to 4 millimeters. By means of this arrangement, the pressure becomes established for the whole length of the tube and complete and uniform impregnation occurs.

As will be noted from Fig. 1, the active portion of the drawing assembly is composed of a chamber having elastic lateral walls (nozzle E), said chamber having a first end wall provided with a relatively large orifice therethrough (the small extremity of nozzle C) and a second end wall (the outlet end of nozzle E) with a relatively small orifice therethrough. Obviously, the invention is not limited to a drawing structure composed of a pair of interfitting nozzles the function of the latter being merely to limit a chamber having inlet and outlet orifices formed in the ends thereof and provided with lateral elastic walls functioning to drive the coating into the article to be coated.

We claim as our invention:

1. A process of varnishing cords, comprising the steps of passing a cord repeatedly through a heating chamber in opposite directions; applying viscous cellulosic material to the cord before it enters said chamber in either direction; and subjecting the material

on the cord, immediately after each application thereof, to pressure imposed circumferentially on and around it so as to drive it into the body of the cord.

2. A process of varnishing cords, comprising the steps of passing a cord repeatedly through a heating chamber in opposite directions; coating the cord, before it enters said chamber in either direction, with a viscous solution having a cellulosic base; and subjecting the viscous coating on the cord, immediately after each application thereof, to pressure imposed circumferentially on and around it so as to drive it into the body of the cord.

3. A process of varnishing cords, comprising the steps of passing a cord repeatedly through a heating chamber in opposite directions; coating the cord, before it enters said chamber in either direction, with collodion; and subjecting the collodion on the cord, immediately after each application thereto, to pressure imposed circumferentially on and around it so as to drive it into the body of the cord.

4. Apparatus for varnishing cords, comprising a tank to contain coating material and through which a cord is adapted to travel; a movable coating device therein to engage and coat the cord; and interfitting inner and outer nozzles on the exit side of the tank through which the cord passes on leaving the coating device, the inner nozzle being provided at its outlet end with a choke for imposing pressure circumferentially on and around the material on the cord so as to drive it into the body of the cord.

5. Apparatus according to claim 4, in which the inner nozzle is constructed of metal, and the outer nozzle of rubber.

6. Apparatus for coating cords, comprising a chamber provided with a pair of drawing orifices of different diameters, said chamber having lateral elastic walls, and means for applying coating material to a cord prior to the passage of the latter through the drawing orifice of larger diameter.

7. Apparatus for coating cords, comprising means for applying coating material to a cord, and means for driving said coating material into the body of the cord; the last-named means including a wall having an orifice therethrough, a second wall having an orifice of smaller diameter than the first-named orifice, and an elastic wall limiting at least part of the space between the first and second walls.

8. Apparatus for coating cords, comprising means for applying coating material to a cord, and means for driving said coating material into the body of the cord; the last-named means including a rigid nozzle through which the coated cord is adapted to pass, and an elastic nozzle mounted in series with the rigid nozzle and through which the coated cord is also caused to pass said elastic nozzle having the larger extremity thereof in contact with said rigid nozzle, said nozzles limiting a drawing chamber having a pair of orifices in the ends thereof and provided with elastic lateral walls.

9. An apparatus for coating cords comprising a chamber having a pair of aligned drawing orifices formed in the ends thereof, said chamber having lateral elastic walls, and means for applying coating material to a cord prior to the passage of the latter through said chamber.

10. An apparatus for coating cords comprising a chamber having a pair of aligned orifices of different cross-sections formed in the ends thereof, said chamber presenting a continuous section in planes at right angles to a line passing through said orifices, and means for applying coating material to a cord prior to passage of the latter through the orifices in said chamber.

11. An apparatus for coating cords comprising a chamber having a pair of aligned orifices of different cross-sections formed in the ends thereof, said chamber having lateral elastic walls and presenting a continuous section in planes at right angles to a line passing through said orifices and means for applying coating material to a cord prior to passage thereof through the orifices in said chamber.

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