

June 13, 1933.

I. MEURLING

1,914,273

SPINNING BOX

Filed Dec. 23, 1930

2 Sheets-Sheet 1

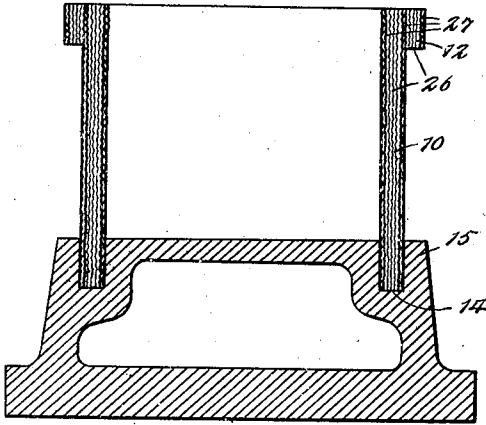


Fig. 1.

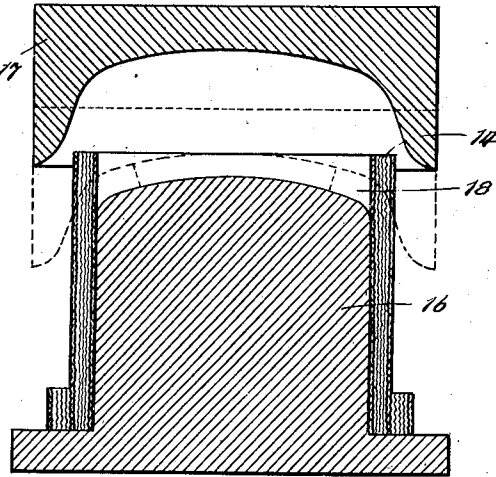


Fig. 2.

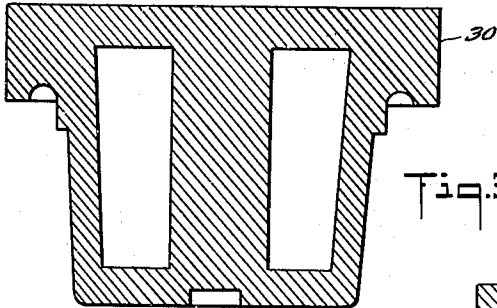
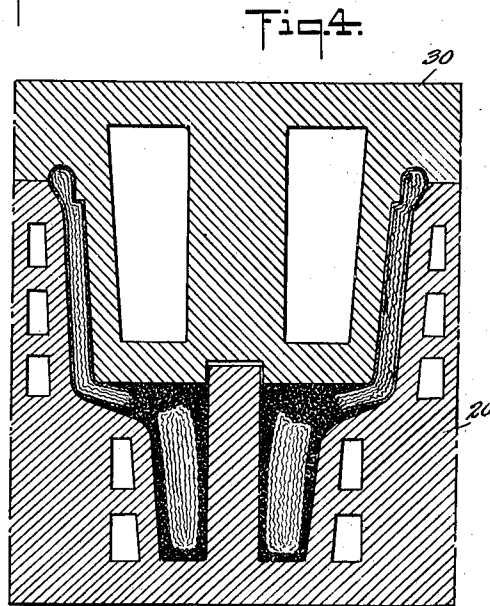
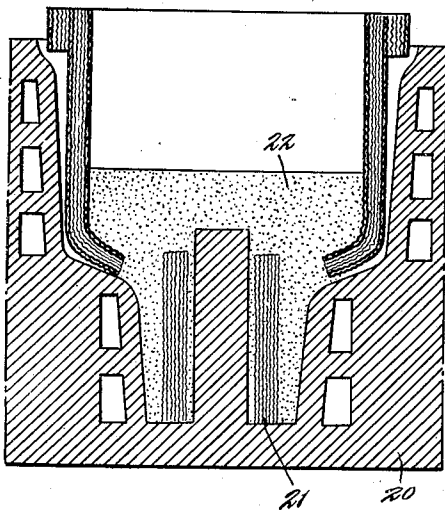


Fig. 3.



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2 Sheets-Sheet 2

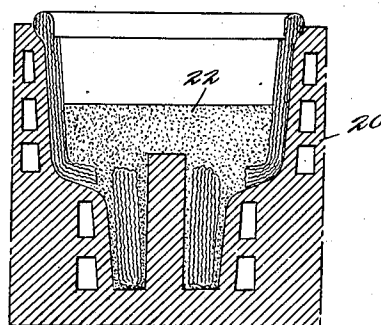
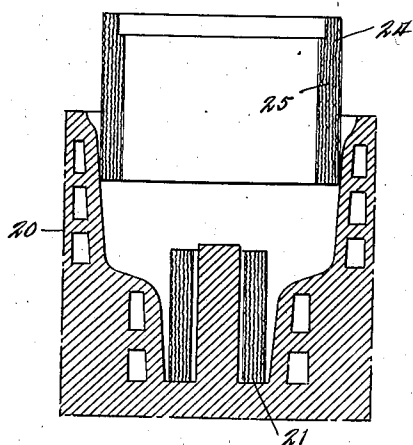
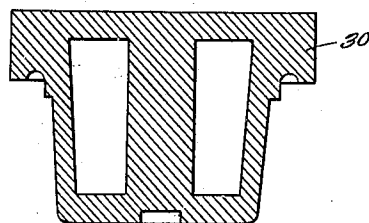
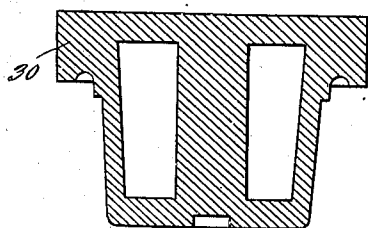
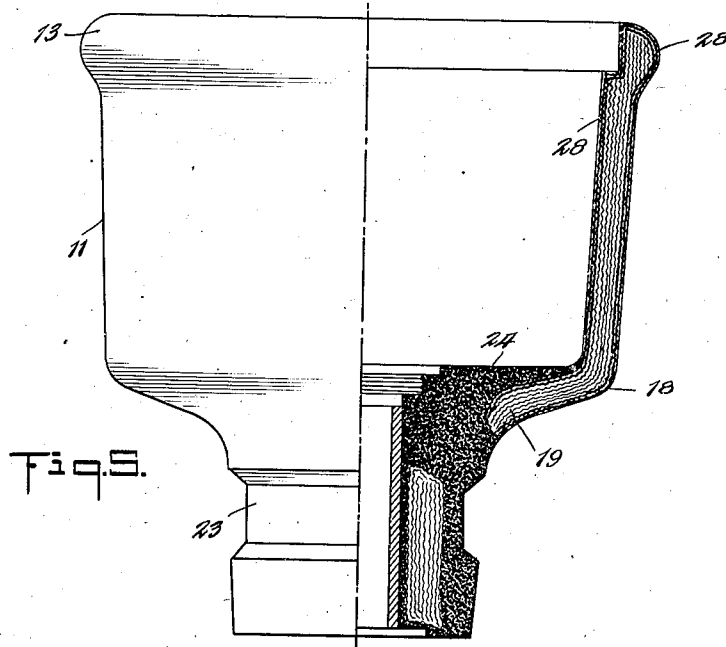


Fig. 6.

Fig. 2.

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UNITED STATES PATENT OFFICE

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SPINNING BOX

Application filed December 23, 1930. Serial No. 504,397.

The present application is in part a continuation of my application Serial No. 285,587, filed June 15, 1928.

This invention relates to spinning boxes for use in the manufacture of artificial silk and the like. The principal object of my invention is to provide a spinning box of low initial cost which at the same time will have sufficient strength to stand up under continued revolution at high speed.

Figure 1 is a vertical section through a heating device, showing the laminated sheet material of which the box is partly composed, ready for preliminary heating;

Figure 2 is a cross-section of a pair of crimping molds showing the laminated sheet material ready to be premolded; and in dotted lines showing the laminated sheet material after it has been pre-molded;

Figure 3 is a vertical section through the final molds, showing the pre-molded laminated sheet material and the powdered phenolic condensation product therein.

Figure 4 is a similar view showing the box after the upper mold has been depressed and the article cured;

Figure 5 is an elevation partly in section of a finished box;

Figures 6 and 7 show a modified process of pre-molding the box.

The spinning box which, in the making of rayon, is used for the coiling and twisting of the filaments as they come from the setting bath, has of recent years been molded from a powdered phenolic condensation product, and such material has been found suitable for spinning boxes which revolve at a speed under 6000 or 7000 revolutions per minute. It is desirable, however, that the spinning boxes be revolved at as high speed as possible in order to put as much twist as possible into the thread and at the same time have a high output. It has been discovered that the centrifugal force engendered by high speeds tends to crack the phenolic condensation product boxes. According to this invention a cheap and strong spinning box is produced which withstands any desired centrifugal force.

The spinning box is made of a plastic mold-

ing material such as powdered phenolic condensation product in combination with laminated sheet material of tubular form. The laminated sheet material may be cloth impregnated with varnish, such as a varnish composed of phenolic condensation product, though I do not wish to limit myself to the use of cloth nor to the use of the particular form of molding material mentioned.

A critical point of the spinning box is the juncture between the side walls and the bottom of the box. This area is subject to severe strain during the high speed revolution of the box.

In making the box according to this invention the tube of impregnated laminated sheet material is first heated enough to make it somewhat plastic and molded into the general shape of the finished box in order to insure having reinforcing layers extend uniformly from the sides of the box into the bottom of the box. To this partially molded sleeve of laminated material is then added a predetermined charge of a powdered phenolic condensation product and the two are molded together under heat and pressure until they are cured and hardened into the finished spinning box. The steps of premolding and the final molding and curing may be done in a succession of molds, as illustrated in Figs. 1 to 4 inclusive, or the several steps may be done in one mold, as illustrated in Figures 6 and 7 of the drawings, and as described below.

The preferred method of producing the spinning box is illustrated in Figures 1 to 5 inclusive.

A laminated sleeve 10 is provided somewhat longer than the height of the wall 11 of the finished box. The sleeve 10 preferably consists of a plurality of tubes of woven fabric impregnated with a phenolic condensation product. A convenient number of such tubes is about twenty.

A similar but comparatively short sleeve 12, whose internal diameter is about equal to the external diameter of the sleeve 10, may be placed about one end, the top of the sleeve to become the rim 13 of the top of the finished box.

In the preferred process of forming the

box, the bottom 14 of the sleeve 10 is first placed in a heated device 15 (Fig. 1) where the lower portion of the sleeve is heated up to a moderate softening point.

5 Sleeve 10 is then placed in a preliminary crimping mold 16, 17 which may be heated or not as desired. This preliminary mold shapes the softened portion 14 of the sleeve to form the uniform curve 18 and part of the floor 19 of the box, as indicated in dotted lines in Fig. 2.

15 The partially molded sleeve of laminated sheet material is then removed from the crimping mold and weighed in order to determine the charge of powdered phenolic condensation product required to complete the box. The partially molded sleeve is then introduced into the final mold 20. (Fig. 3.) The sleeve may be heated to a somewhat plastic condition either before or after being placed in the final mold, where it is pressed with a plunger 30 of the final mold to within a fraction of an inch of its final position in the mold. The plunger is then raised, and a sleeve 21 and a predetermined weight of powder 22 of a phenolic condensation product are inserted in the mold (see Fig. 3), to form the hub 23 and part 24 of the floor of the finished box (see Fig. 5).

30 The plunger is then reinserted and pressure is applied, which forces the powdered material to fill out any portions of the mold which are not filled by the laminated sleeves (see Fig. 4). The powdered material will force itself into the floor 24 of the box and portions of the interior faces of the walls 11 of the box, assisting in the production of a smooth surface which is important in spinning the rayon. The powdered material also tends to force itself around both the inside and outside of the sleeve 21 forming a layer on the outside of the hub 23 which can then be grooved or cut, as desired in finishing the box, without cutting the fabric tubes.

45 The final molding operation is continued under pressure and with heat until the box is cured or hardened. It will then be found that the powdered phenolic condensation product and the sleeves of laminated sheet material have adhered together very strongly, providing a complete and integral unit of tremendous tensile strength.

50 It will be noticed that the box resulting from this process has walls molded to shape which are of integral layers of material extending completely around the box without a break. These layers, it will be noted, also extend from top to bottom of the wall portion of the box, around the curve 18 (Fig. 5), which is the crucial point of maximum strain on the spinning box, and into the floor, providing integrity over the exterior of the portion of the box which is moving at the greatest speed. It will also be noted that the powdered material takes part in forming the

bottom and a portion of the interior of the box.

The pre-molding operation assures a highly satisfactory box construction. It insures uniformly flowing laminated material around the curve 18 of the box where the walls 11 join the floor.

70 The pre-molding and final molding may be successively carried out in one mold, as illustrated in Figs. 6 and 7. In the modified process there illustrated, the sleeve of laminated sheet material may conveniently be formed of a long sleeve 24, of say 12 plies, surrounding a shorter sleeve 25 of about 8 plies. Or the laminated sheet material may be formed in the same way as sleeves 10 and 12 described in connection with Figs. 1-5 inclusive. In this modified process, sleeves 24, 25 are placed in the final mold and at the same time sleeve 21 is placed in the hub portion of the mold. The sleeves are heated to a moderate degree of plasticity either before or after placing them in the mold. Then by bringing down the plunger or upper mold 30 the sleeves can be pre-molded to the desired shape as shown in Fig. 7. The powdered material 22 is then added in the way described above in connection with Fig. 3, and the final molding proceeds in the same manner as described above in connection with Figs. 1-5 inclusive.

95 The method described in connection with the first five figures is somewhat to be preferred, both because it ensures uniform reproducibility of the contour of the fabric sleeve at the curvature 18 and also because of its economical advantages. The final mold is more expensive than the other apparatus and it is therefore advantageous to use it continuously for the final operation for which it is required, while simultaneously using cheaper apparatus for preliminary operations.

100 In a box for spinning rayon, it is important that the surfaces have a high degree of smoothness. The outside of the box should be smooth, because roughness increases the windage and requires more power to drive the box at a given speed. The inside of the box should be smooth for the same reasons as the outside, and for the additional reason that a rough surface would tend to harm the filaments of rayon which are being spun within the box. Spinning boxes made wholly of a phenolic condensation product have a satisfactory smoothness of surface, but as explained above, they have not sufficient strength to endure the centrifugal pressure to which they are subject.

110 Cotton cloth is suggested as one suitable form of laminated sheet material which will give suitable strength to the spinning box. However cotton fibers, when impregnated with a phenolic condensation product, tend to remain rough. The necessary surface smoothness can be secured by coating the outer layers well with a varnish of a phenolic 130

condensation product. However, it sometimes happens that in the course of use or in the process of cleansing the box, the surface coating of varnish on cotton is worn off and the spinning box becomes roughened.

I have discovered that certain fibers, such as animal fibers and cellulose acetate, when impregnated with a phenolic condensation product are more easily fusible in the phenolic condensation product than are cotton fibres. They tend to fuse into a more homogeneous product than do cotton fibers. This homogeneous product is comparatively similar to an unreinforced fused phenolic condensation product in its smoothness. And it does not tend to become roughened by use and cleaning as does a phenolic condensation product reinforced with cotton cloth. Accordingly I prefer to make the layers of sheet material nearest the surface of the box of impregnated cloth formed of such relatively fusible fibers.

In Figures 1 to 5 of the drawings, the sleeves 10 and 12 are composed mainly of layers 26 of cotton cloth impregnated with a phenolic condensation product varnish, in combination with a few layers 27 of similarly impregnated wool cloth, forming the inner and outer surfaces of the tubes or sleeves.

In the finished spinning box (Fig. 5) the wool cloth, which is composed of relatively fusible fibers, forms a smooth layer 28 and is susceptible to a high polish similar to that given to an un-reinforced cured phenolic condensation product. However, I do not wish to limit the invention to the specific forms of laminated sheet material discussed above.

I claim:

1. A spinning box comprising a phenolic condensation product in combination with a reinforcement of laminated sheet material, the surface layers of said sheet material comprising wool fibers.

2. A spinning box comprising a phenolic condensation product in combination with a fabric sleeve reinforcing the side walls, part of the floor and the juncture between said walls and floor of the box, said sleeve comprising inner layers of cotton cloth and surface layers of wool cloth.

In testimony whereof I have signed my name to this specification.

IVAR MEURLING.