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M. SCHNEIDER
MANUFACTURE OF SPINNERETTES

2,239,979

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Fig. 1.

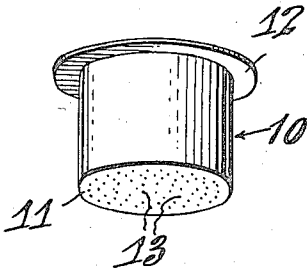


Fig. 2.

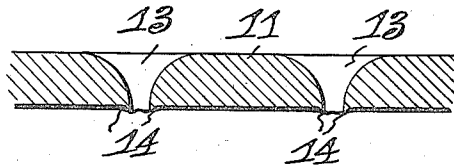


Fig. 3.

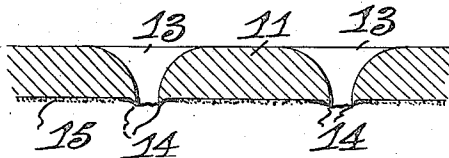


Fig. 4.

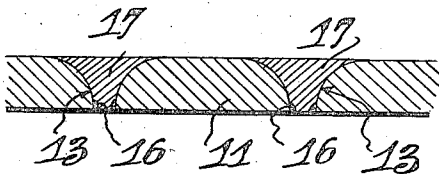


Fig. 5.

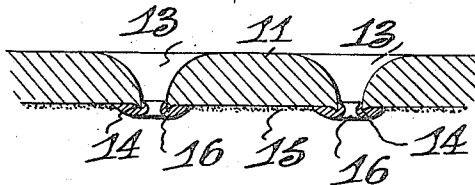
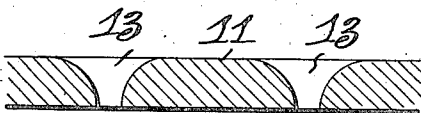


Fig. 7.

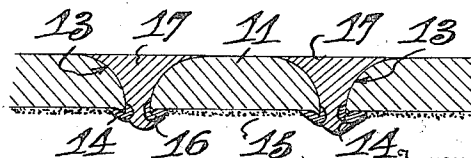


Fig. 8.

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UNITED STATES PATENT OFFICE

2,239,979

MANUFACTURE OF SPINNERETTES

Max Schneider, deceased, late of Elizabethton, Tenn., by Emma Schneider, administratrix, Elizabethton, Tenn., assignor to North American Rayon Corporation, New York, N. Y., a corporation of Delaware

Application January 11, 1938, Serial No. 184,425

3 Claims. (Cl. 204—16)

This invention is directed to the preparation of perforated plates and a specific example being the preparation of spinnerettes for use in the production of cellulosic filaments of artificial origin. It is particularly concerned with the procedure whereby the polishing of the plate or spinnerette may be expedited.

In the spinning of artificial silk, the cellulosic solution is extruded through a spinnerette, containing many extremely fine holes into a spinning bath, the filaments thus precipitated being combined to form the artificial silk threads.

It is common practice to use precious metals or alloys of precious metals as the material of which the spinnerette is made. An alloy of platinum and gold (70% gold and 30% platinum) is one that is commonly used in the manufacture of spinnerettes for use in the production of artificial silk by the viscose process.

In the production of such spinnerettes, it is the practice to punch out the draw plate in such a manner as to provide many imperforate projections, corresponding to the number of spinning holes desired. The outer ends of the nibs or tips or imperforate projections are then ground off with a mild abrasive, in order to provide openings in the draw plate. A needle is then forced into each opening in order to give them an accurate circular shape and a uniform diameter.

Such a procedure leaves a slight burr at the outer surface of each opening, and in view of the nature of the alloy and the extremely small size of the openings considerable difficulty is encountered in removing this burr without altering the shape of the opening. It is the practice to remove this burr by polishing the outer surface of the draw plate.

It is an object of the present invention to provide an improved procedure whereby the burr may be removed from these and similar openings without injury to the shape or size of the openings. A further object is to provide a procedure by which spinnerette openings of the desired shape and size may be prepared. Other objects will become apparent.

In describing the invention, reference will be made to the drawing in which Figure 1 is a perspective view of a finished spinnerette.

Figure 2 is a greatly enlarged fractional section showing two of the holes in the draw plate after the initial forming operations.

Figures 3 to 7 are views similar to Figure 2, during various steps in the preparation of the spinnerette.

During the initial punching operation, the spin-

nerette 10 is given the general configuration shown in Figure 1 with the integral draw plate 11 and the integral outwardly extending flange 12. By the subsequent steps hereinbefore referred to, the openings are formed as illustrated in Figure 2, the openings being illustrated at 13 and the burr at the lower end of each opening being illustrated at 14.

A film-forming coating composition 15 is then applied to the lower surface of the draw plate between the openings, but leaving the portion of the metal around each opening exposed. This coating composition is applied to prevent the electrolytic deposition of metal to the spinnerette, in the steps hereinafter described, except around each hole. It should be capable of forming a continuous nonporous film that is adherent to the metal of the draw plate and that is not affected by the electrolyte or the electrolytic action.

A film of paraffin may be used for this purpose or some other coating composition that will adhere to the metal. A suitable composition is one containing a low viscosity nitrocellulose ($\frac{1}{2}$ sec. R. F. gun cotton) together with the solvents for the nitrocellulose and solvent softeners or plasticizers that are commonly used in the preparation of nitrocellulose paints and lacquers. For example, solvents such as ethyl acetate, butanol, toluol, or acetone oil, etc., and solvent softeners or plasticizers such as dibutyl phthalate, tricresyl phosphates, castor oil, etc., and resins such as shellac, etc., may be incorporated to give the desired characteristics to the coating composition.

In some instances it may be desirable to use a coating composition that will adhere to the metal during the subsequent heating. If such a coating composition is used it may, if desired, be colored to give it a color distinctly different from that of the metal of the draw plate so that it will serve as a guide in the subsequent polishing operation. Dyes or pigments may be added to a suitable lacquer or coating composition in order to give the desired color.

When the coating composition has been applied to cover all portions of the spinnerette which are to be immersed, except around the openings, the spinnerette (which preferably has been previously subjected to a cleaning solution to obtain a surface free from contamination) is placed in a suitable electroplating bath and the openings in the drawplate are plated with a metal, such as nickel, chromium or copper. Nickel is the preferred metal for this purpose but copper and chromium may also be used. Copper may have

the drawback of being not quite hard enough with some alloys.

By this operation, a plug or rim of metal 16 is deposited at each hole. Due to the small size of the openings, the plating will not extend very far within the hole. It is preferably discontinued before the hole is entirely closed, as illustrated in Figure 4.

Each hole is then filled with a plug 17 of resinous or other suitable material. This material should be sufficiently hard to reinforce the hole and prevent it from being deformed during the polishing action. It should have a melting point and/or hardening point below the temperature at which the alloy of the spinnerette would lose its temper. For a platinum-gold alloy as described above, it should have a melting point below 500° C.

A phenol-formaldehyde resin which will harden on baking at temperatures below the temper point of the metal or alloy of the spinnerette, for example, below 500° C. and preferably at about 150 to 200° C., may be used for this purpose. In using such a resin it may be poured or forced into the holes in a liquid or plastic state so as to completely fill the opening in the draw plate and in the rim 16. It is then baked (for example, at about 150 to 200° C., for about 3 hours with the above described resin) to harden it sufficiently to give the desired reinforcing. If a phenol formaldehyde resin is used for this purpose, it may be one which is liquid in the A state of polymerization and which will be converted to the B state on heating to the temperatures described.

Other resins or other materials may be used in place of the Bakelite resin. Such materials should be such as to not contract on hardening and as to not expand upon hardening so as to apply pressures that would deform the openings. Materials which will harden on cooling and without baking may be used in place of bake plug. Plug materials which are too brittle, such as Wood's metal (antimony-zinc alloy) and plug materials which are too soft and which smear, as wax, are not suitable for use in this procedure but various substances intermediate between these may be used.

After the plug has hardened, the draw plate is subjected to a polishing operation whereby it is polished down to its natural surface. In this operation any of the film-forming substance 15 remaining is completely removed and, if colored, serve as a guide to indicate when the polishing is completed.

In the novel process it is not essential that the film act as a visual indicator of the completion of the polishing operation inasmuch as the deposited metal surrounding the openings will serve the same purpose. It may serve this purpose by either being a different color or if the same color by reason of the plated portion extending above the surface of the plate.

Figure 6 shows the plate after the polishing operation. The spinnerette is then placed in a solvent for the resin or other plug material, whereby the remaining portion of the plug 17 is removed. If a Bakelite resin as described above is used, hot concentrated sulphuric acid may be used as the solvent.

If the openings in the draw plate are small enough (as in the spinnerettes used in preparing viscose artificial silk), the plating 16 will not extend within the opening beyond the line of the face of the draw plate. In that event, it will be entirely removed with the burr. If it is not en-

tirely removed, the spinnerette may be placed in an acid, such as hot concentrated nitric acid, or other suitable solvent for the plated metal, but which will not attack the metal or alloy of the spinnerette. Obviously other solvents for the plug or for the plated metal may be used, if desired.

The plating 16 at the rim of each hole prevents the irregular breaking off of the burr at the edge of the hole during the polishing operation. The plug of resinous material reinforces the inside of the opening and assists in preventing a breaking off of the burr. It also prevents the portions of the burr or of the plating material, which are removed during the plating, from being forced into the openings and plugging them.

The finished draw plate, as illustrated in Figure 7, has perfect openings which are of the same shape and diameter as the holes formed by the needle.

It is apparent that the invention may have many and varied applications and it is not intended to restrict it to the particular use or embodiment described above. In making other uses of it, certain variations may be required or desirable in the materials used or in the particular sequence of steps or to the other details of operation described. The terms used have been used as terms of description and not terms of limitation and it is intended that all equivalents thereof be included within the scope of the appended claims.

What is claimed:

1. In the preparation of spinnerettes, the steps comprising providing a plurality of holes of the desired size and shape in the draw plate, applying a nitrocellulose coating composition of a color different from that of the metal of the spinnerette to prevent the electrodeposition of metal except on and around any metal projecting beyond the surface of the draw plate, electrodepositing a metal upon the inner and outer surfaces of any metal projections, filling said holes with a phenol formaldehyde resin that is liquid at about normal room temperatures and which solidifies on baking at about 150 to 200° C., baking to solidify the resin, polishing the surface of the draw plate to remove any metal projections and the metal plated thereon and the coating composition, and dissolving the resin from the holes.

2. In the preparation of spinnerettes, the steps comprising providing a plurality of holes of the desired size and shape in the draw plate; applying a film-forming organic insulating coating composition of a color different from that of the metal of the spinnerette to prevent the electrodeposition of metal except on and around any metal projecting beyond the surface of the draw plate; electro-depositing a metal upon the inner and outer surfaces of any metal projections; filling said holes with a resinous material, said material being liquid at normal room temperatures and having a melting point below the temperature at which the metal of the spinnerette would lose its temper; baking to solidify the resinous material, polishing the surface of the draw plate to remove any metal projections as well as the metal plated thereon and the coating composition; and dissolving and removing the resinous material from the holes.

3. In the preparation of spinnerettes composed of a platinum-gold alloy, the steps comprising providing a plurality of holes of the desired size and shape in the draw plate; applying a film-forming organic insulating coating composition

of a color different from that of the alloy of the spinnerette to prevent the electro-deposition of metal except on and around any alloy projecting beyond the surface of the draw plate; electro-depositing a metal upon the inner and outer surfaces of any alloy projections; filling said holes 5 with a resinous material, said material being liquid at normal room temperatures and having a melting point below 500° C.; baking to solidify

the resinous material, polishing the surface of the draw plate to remove any alloy projections as well as the metal plated thereon and the coating composition; and dissolving and removing the resinous material from the holes.

EMMA SCHNEIDER,
Administratrix of the Estate of Max Schneider,
Deceased.