Feb. 15, 1955 G. L. DENISTON 2,702,231

DEXTRAN FILAMENT MANUFACTURE

Filed Aug. 21, 1951

FIG-1

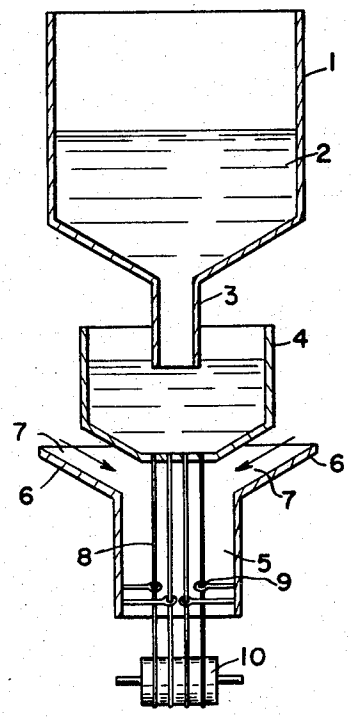
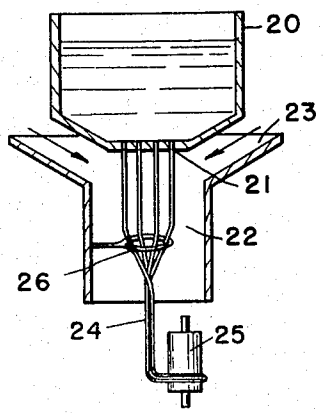


FIG-2



INVENTOR
GEORGE L. DENISTON
BY Toulmin & Toulmin
ATTORNEYS

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DEXTRAN FILAMENT MANUFACTURE

George L. Deniston, Dayton, Ohio, assignor to The Commonwealth Engineering Company of Ohio, Dayton, Ohio, a corporation of Ohio

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20 Claims. (Cl. 18—54)

This invention relates to the manufacture of filaments and more particularly to the manufacture of a stable fiber having as a basic constituent a dextran ether. The invention also relates to compositions suitable for the production of such fibers.

This application is related to application Serial No. 240,829, filed August 8, 1951, and assigned to the same assignee as the present application.

The present invention contemplates the provision of a new and novel fiber having as the basic material an ether of a polysaccharide. The invention further contemplates the provision of a new and novel process utilizable for the attainment of the fiber of invention.

More particularly the invention conceives the incorporation of a nitrocellulose lacquer and a dextran ether in a common solvent or solvents to form a viscous mass, which mass may be extruded in the standard spinnerets and the fibers having a diameter in the range of about .002 to .004 inch, which fibers may be formed into a tow before winding or which may be wound separately and later twisted and woven or interlaced into yarns and fabrics.

The dextran ether may be produced by the method described in U. S. Patent 2,239,980 and should be of the type which is insoluble in water as set forth in Example I of that patent. An ethyl ether of dextran also insoluble in water as described in U. S. Patent 2,344,179 may also be used in the practice of the invention.

The preferred nitrocellulose lacquer contains low viscosity nitrocellulose and is soluble in cellosolve, ethyl acetate, butyl acetate, cyclohexanol acetate and amyl hexanone acetate.

In order to carry out the invention more suitably the dextran ether should be present in the dextran ether-nitrocellulose lacquer composition to the extent of not less than about 80% by weight. The composition may also contain suitable plasticizers which are particularly effective in connection with nitrocellulose lacquer such as castor oil, camphor, diethyl phthalate, tricresyl phosphate, tributyl phosphate, dibutyl phthalate, diamyl phthalate, butyl stearate. However, in the practice of this invention castor oil is to be preferred as the plasticizing agent.

Diluents which are non-solvents for the dextran ether and the nitrocellulose lacquer but which are miscible with the solvents may also be employed. Toluene, benzene and the petroleum naphthas are effective for the practice of the invention.

In the practice of the invention the composition of dextran ether, nitrocellulose lacquer, plasticizer and diluent is first prepared and then extruded through the fine holes of a spinneret and the extruded filaments are hit with a hot air blast having a temperature in the range of about 135° to 400° F. which dries the filaments. The filaments are then wound up on a drum rotating at a speed of approximately 3000 to 5000 feet per minute.

In one embodiment of the invention the filament extruding from the spinneret may be passed through guides and individually wound on a bobbin. In the second embodiment of the invention the filaments extruded from the spinneret may be twisted together prior to winding on the bobbin.

The invention will be more fully understood by reference to the following specific examples and to the accompanying drawings wherein:

Figure 1 is a schematic illustration of the apparatus utilized in the preferred embodiment of the invention; and

Figure 2 is a schematic illustration of the apparatus utilized in another embodiment of the invention.

Example I

There is shown in Figure 1 a tank **1** containing a viscous mass **2** the solids of which mass consist by weight of:

80% of water insoluble benzyl ether of dextran
20% by weight of low viscosity nitrocellulose

The mass also contains cellosolve which is the monoethyl ether of glycol, this glycol ether being present to the extent of about 30% by weight of the solids.

As shown at **3** in Figure 1 the viscous mass may be passed into spinneret **4** and is extruded therefrom in separate or individual filaments into a chamber **5** which at its upper end **6** is provided with a channel **7** for the admission of hot air to the filaments. This hot air blast has a temperature in the range of 300–400° F. and is regulated so that the filaments **8** are not placed in contact but are dried as they pass down the chamber **5** and through filament guides indicated generally at **9** to the rotating drum **10** upon which the individual dried filaments are wound.

These filaments are suitable for twisting together and weaving into yarns and fabrics.

Example II

The procedure may be the same as set forth in Example I except that the composition contains the benzyl ether of dextran to the extent of about 85% by weight and the low viscosity nitrocellulose to the extent of about 15% by weight, the solvent utilized being ethyl acetate. The acetate may be present to the extent of about 50% by weight and the air blast temperature in the present instance may be in the range of about 135–140° F. which will effect drying of the extruded filaments within about 10 feet of travel at speeds of about 3,000 feet per minute.

Example III

The procedure in the present case is the same as set forth in Examples I and II except that the composition may contain by weight the benzyl ether of dextran to the extent of about 85% by weight and the low viscosity nitrocellulose to the extent of about 10% by weight, and approximately 3% of dibutyl phthalate and 2% castor oil.

The solvent utilized may be butyl acetate to the extent of about 20% by weight of the solids, and a thinner, that is toluene, may also be employed to the extent of about 10% by weight of the solids.

The air blast temperature should in this instance be approximately 150–175° F. in order to effect satisfactory drying of the filaments at a speed of 3,000 feet per minute over a 10 foot distance.

Example IV

The procedure is the same as set forth in the prior examples except that in this instance the ethyl ether of dextran produced as described in U. S. Patent 2,344,179, and assigned to the same assignee as the present invention, is utilized. This ethyl ether of dextran is soluble in the alcohols, cellosolves, and acetones.

The composition of invention in the present instance comprised 88% by weight of ethyl dextran, 10% by weight of low viscosity nitrocellulose, and 2% by weight of castor oil.

The solvent utilized may be ethylene glycol monoethyl ether to the extent of about 20% by weight on the solids present, and the temperature hot air blast in this instance should be in the range of about 300° to 400° F. The other conditions of operation may be the same as set forth in Example I.

Example V

In Figure 2 of the drawings there is illustrated at **20** a spinneret having apertures at **21** and below which is positioned a chamber **22** into which filaments forced from the spinneret **20** pass. Hot air blast **23** similar to that described in connection with Example I forces the filaments as they are dried into a tow as indicated at **24**, the tow then being wound up on a spindle **25**. A guide **26** placed forwardly of the vertical length of the chamber assists the twisting of the filament into the tow condition.

Any of the combinations of invention previously described may be utilized in connection with this apparatus of Figure 2. However, it is preferred that slower drying constituents such as castor oil be avoided or that the drying length be extended for approximately double that described in connection with Figure 1.

It will be understood that the viscosity of the masses which are extruded in the apparatus shown in Figures 1 and 2 may vary slightly and that where more solid solvents are utilized one skilled in the art will readily recognize that the temperature of the air blast should be increased for other fixed apparatus conditions.

It will also be recognized that it is preferable to exhaust the hot air from the bottom of the chambers 5 and 22 or that other suitable means of evacuation part way of the length of the chambers may be readily employed. Also recovery apparatus for the solvents may be effectively employed in the manner known to the art.

It will be understood that while there have been given herein certain specific examples of the practice of this invention, it is not intended thereby to have this invention limited to or circumscribed by the specific details of materials, proportions or conditions herein specified, in view of the fact that this invention may be modified according to individual preference or conditions without necessarily departing from the spirit of the disclosure and the scope of the appended claims.

I claim:

1. A spinnable composition for the production of a fiber comprising 80 parts by weight of a dextran ether selected from the group consisting of water-insoluble benzyl dextran and water-insoluble ethyl dextran, 20 parts by weight of low viscosity nitrocellulose, and 30 parts by weight of a common solvent for the ether and nitrocellulose.

2. A spinnable composition for the production of a fiber comprising 85 parts by weight of water-insoluble benzyl ether of dextran, about 15 parts by weight of low viscosity nitrocellulose, and 50 parts by weight of ethyl acetate.

3. A spinnable composition for the production of a fiber comprising 85 parts by weight of water-insoluble benzyl ether of dextran, 10 parts by weight of low viscosity nitrocellulose, 3 parts by weight of dibutyl phthalate, 2 parts by weight of castor oil, and 20 parts by weight of butyl acetate.

4. A spinnable composition for the production of a fiber comprising 88 parts by weight of water-insoluble ethyl dextran, 10 parts by weight of low viscosity nitrocellulose, 2 parts by weight of castor oil, and 20 parts by weight of ethylene glycol monoethyl ether.

5. A method of producing a fiber comprising the steps of extruding a viscous mass of from 80 to 90 parts by weight of a dextran ether selected from the group consisting of water-insoluble benzyl dextran and water-insoluble ethyl dextran and from 10 to 20 parts by weight of low viscosity nitrocellulose dissolved in a common solvent, through a filament-forming device, and drying the solvent from the extruded fiber by subjecting the fiber to air heated to a temperature of 200 to 400° F. as it proceeds from the filament-forming device.

6. A method of producing a fiber comprising the steps of extruding a viscous mass of from 80 to 90 parts by weight of a dextran ether selected from the group consisting of water-insoluble benzyl dextran and water-insoluble ethyl dextran and from 10 to 20 parts by weight of low viscosity nitrocellulose dissolved in a common solvent, through a filament-forming device, and passing the extruded fiber through a stream of air heated to a temperature of 200 to 400° F. as it proceeds from the filament-forming device to remove solvent therefrom.

7. A method of producing a fiber comprising the steps of extruding a viscous mass of from 80 to 90 parts by weight of a dextran ether selected from the group consisting of water-insoluble benzyl dextran and water-insoluble ethyl dextran and from 10 to 20 parts by weight of low viscosity nitrocellulose dissolved in a common solvent, through a filament-forming device, and passing the extruded fiber, as it proceeds from the filament-forming device, through a hot air blast having a temperature in the range of between about 135–140° F. to remove solvent therefrom.

8. A method of producing a fiber comprising the steps of extruding a viscous mass of from 80 to 90 parts by weight of a dextran ether selected from the group consisting of water-insoluble benzyl dextran and water-insoluble ethyl dextran and from 10 to 20 parts by weight of low viscosity nitrocellulose dissolved in a common solvent, through a filament-forming device, and passing the extruded fiber, as it proceeds from the filament-forming device, through a hot air blast having a temperature in excess of the boiling point of the solvent to remove solvent therefrom.

9. A process of producing a filament comprising the steps of extruding a viscous mass containing from 80 to 90 parts by weight of a water-insoluble benzyl ether of dextran, from 10 to 20 parts by weight of low viscosity nitrocellulose and a solvent for the ether and nitrocellulose through a filament-forming device to form a filament, passing the filament, as it proceeds from the filament-forming device, through a hot air blast to evaporate said solvent completely therefrom, and winding the filament on a rotating drum.

10. A process of producing a fiber comprising the steps of extruding a viscous mass containing from 80 to 90 parts by weight of a water-insoluble ethyl ether of dextran, from 10 to 20 parts by weight of low viscosity nitrocellulose and ethylene glycol monoethyl ether through a filament-forming device having a plurality of openings therein to form a group of filaments, passing the filaments, as they proceed from the filament-forming device, through a hot air blast to dry the same, grouping the filaments into a tow, and winding up the tow on a revolving drum.

11. A fiber consisting essentially of from 80 to 90 parts by weight of a water-insoluble ether of dextran selected from the group consisting of benzyl dextran and ethyl dextran and from 10 to 20 parts by weight of low viscosity nitrocellulose.

12. A fiber consisting of 80 parts by weight of an ether of dextran selected from the group consisting of water-insoluble benzyl dextran and water-insoluble ethyl dextran and 20 parts by weight of low viscosity nitrocellulose.

13. A fiber consisting of 80 parts by weight of a water-insoluble benzyl ether of dextran and 20 parts by weight of low viscosity nitrocellulose.

14. A fiber consisting of 88 parts by weight of a water-insoluble ethyl ether of dextran and about 10 parts by weight of low viscosity nitrocellulose.

15. A group of filaments comprising a tow, each of said filaments consisting essentially of from 80 to 90 parts by weight of a water-insoluble ether of dextran selected from the group consisting of benzyl dextran and ethyl dextran and from 10 to 20 parts by weight of low viscosity nitrocellulose.

16. A group of filaments comprising a tow, each of said filaments consisting essentially of from 80 to 90 parts by weight of a water-insoluble ether of dextran selected from the group consisting of benzyl dextran and ethyl dextran, from 10 to 20 parts by weight of low viscosity nitrocellulose and a plasticizer.

17. A spinnable fiber-forming composition consisting essentially of a mixture of from 80 to 90 parts by weight of a water-insoluble dextran ether selected from the group consisting of benzyl dextran and ethyl dextran, from 10 to 20 parts by weight of low viscosity nitrocellulose, and a common solvent for the dextran ether and nitrocellulose.

18. A spinnable fiber-forming composition consisting essentially of, as total solids, about 80 parts by weight of a water-insoluble dextran ether selected from the group consisting of benzyl dextran and ethyl dextran, and about 20 parts by weight of low viscosity nitrocellulose.

19. A spinnable fiber-forming composition consisting essentially of a mixture of from 80 to 90 parts by weight of a water-insoluble dextran ether selected from the group consisting of benzyl dextran and ethyl dextran, from 10 to 20 parts by weight of low viscosity nitrocellulose, a common solvent for the dextran ether and nitrocellulose, and a diluent.

20. A spinnable fiber-forming composition consisting essentially of a mixture of from 80 to 90 parts by weight of a water-insoluble dextran ether selected from the group consisting of benzyl dextran and ethyl dextran, from 10 to 20 parts by weight of low viscosity nitrocellulose, a common solvent for the dextran ether and nitrocellulose, a diluent, and a plasticizer.

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