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METHOD OF PRODUCING ARTIFICIAL SILK

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This invention relates to threads, sheets, films, and other materials produced by extruding (spinning or casting) cellulosic solutions, such as viscose, cellulose acetate and other cellulosic derivatives. More particularly, it relates to a method of producing materials of the type mentioned having a diminished luster. Specifically, it relates to a method of producing rayon having a diminished luster and preferably equal to or lower than that possessed by natural silk.

Artificial thread produced by the usual viscose process is characterized by a high brilliant luster. For many purposes brilliant artificial thread is unsuitable and a product of lower luster is desired. Several methods have already been devised to produce viscose artificial thread having a substantially diminished luster.

One of the methods used prior to this invention consisted in depositing or precipitating a luster-dulling material on previously formed thread. According to one specific procedure of that process, a skein of artificial thread was alternately treated with a solution containing a soluble barium salt and a solution containing a sulphate radical. The insoluble barium salt resulting from the reaction was produced on the surface of the thread and, though it reduced the luster, it did not give permanent effects. Frequently, in use the precipitated material was removed and as a consequence an unattractive material resulted. In addition, the running qualities and the physical properties of the thread were seriously affected. Moreover, the appearance and particularly the luster did not simulate natural silk.

Another proposed procedure for producing artificial thread having a mat appearance consisted in incorporating into the viscose various materials, such as pigments, oils, fats and the like. The thread produced by this process consisted of a mass of cellulose having liquid or pigment particles incorporated therein. Though this method produced a product of low luster, the type of luster was not comparable or similar to that of natural silk. Also, in view of the constitution of the mass, there was a loss of tensile strength.

Hollow artificial threads produced from viscose possessed a reduced luster. These hollow filaments because of their structure had a very low tensile strength and thus were therefore not suitable for a great number of uses.

We have found that we can produce an artificial thread by the viscose process which is characterized by a luster equal to or lower than that possessed by natural silk without sacrificing or reducing the tensile strength of the product. Specifically, we have found that by introducing into the viscose certain substances which disappear or are eliminated automatically at some stage in the usual production or finishing of the thread, an artificial thread is produced which has a crinkled, channeled or porous exterior and is composed of a substantially solid cellulose mass free from foreign material. Due to the structure of the exterior surface, it possesses a luster equal to or lower than that of artificial silk.

It is therefore an object of this invention to provide a method of producing artificial thread by the viscose process having a luster lower than ordinary viscose silk and preferably equal to or lower than that of natural silk.

Another object of this invention is to provide a method of producing a mat appearing artificial thread consisting of solid cellulose free from foreign materials and having a crinkled, porous or channeled surface.

A further object of this invention is to provide a method of producing artificial thread which comprises the addition of a certain substance to viscose which automatically disappears in the usual process of producing or finishing the thread.

Other objects will appear from the following description and appended claims.

According to this invention, artificial thread having a mat appearance and a luster similar to or lower than natural silk is produced by spinning in the usual manner a viscose solution containing a certain substance, which substance is distilled or otherwise removed at one or more stages in the process of producing the thread. No special steps are necessary to remove the added substance. The removal is automatically accomplished in the usual operations of finishing the thread. The product of this process is substantially solid cellulose free from foreign or added materials. It is characterized by a crinkled, porous or channeled exterior surface and possesses substantially its normal tensile strength.

The substance added to the viscose may be kerosene, turpentine or other comparatively high boiling volatile hydrocarbons or similar compounds or substances, solids or liquids which, due to lack of suitable terminology, is designated by the term "vaporizable substance". By the term "vaporizable substance" is meant a substance or compound which is insoluble in a spinning solution, or, if soluble in the spinning solution, insoluble in the coagulating bath liquid, said sub-

stance possessing a sufficiently low vapor pressure so that it will not be removed from the spinning solution prior to spinning, particularly when the spinning solution is evacuated to remove the air, nor is it removed during spinning except in some instances a relatively small per cent may be removed, depending upon the substance chosen, said vapor pressure being sufficiently high so that the substance may be removed from the thread (as by steam distillation or otherwise) in washing, desulphuring, bleaching, drying or other steps in the usual spinning and finishing operations. It is to be observed that this definition does not include such materials as ligroin, benzene, carbontetrachloride, carbon disulphide and similar materials of comparatively low boiling point and high vapor pressure which, though they result in the production of materials having a reduced luster, do not resist evacuation of the spinning solution and/or are removed for the most part during spinning, so that no control of the resulting luster is possible.

In accordance with this process, one or a plurality of the vaporizable compounds is introduced into the viscose prior to the spinning thereof and is eliminated automatically in the process of producing the finished thread without the aid of any special operations. It may be incorporated in the viscose at any time between dissolving the cellulose xanthate in caustic soda and the time the viscose is ready to be spun. It may also be added to the steeping caustic, to the alkali cellulose or to the carbon disulphide. Preferably, it is added to the mixture of caustic soda, water and cellulose xanthate as these are being mixed. The substance may be added directly to the caustic solution or may be first mixed with a small amount of caustic and then added to the main charge. Preferably, an emulsion of the vaporizable compound in water is separately prepared in any suitable manner and this emulsion added to the batch. If desired, to aid the emulsification any of the commonly known emulsifying agents for this purpose, including soaps, gums, sulphonated vegetable oils, alkylated naphthalene and anthraquinone sulphonic acids (such as the Nekals) may be employed.

The amount of vaporizable substance added depends on the desired luster. Satisfactory results have been obtained by incorporating approximately from 0.05% to 3.0% of the vaporizable compound in a viscose solution of the usual type, the proportions being based on weight. The following specific examples indicate the preferred quantities of the various materials added:

Kerosene____ 0.5% emulsified with Monopole oil
Turpentine__ 0.6% emulsified with Nekal A. E. M.

The process may be carried out as previously explained, but in order to more clearly illustrate one precise mode of operation, the following description of one procedure is given:

To a spinning charge of 100 pounds of viscose produced in the usual manner, there is added a thick, creamy emulsion containing 14 ccs. of a suitable emulsifying agent, such as Monopole oil, 227 grams of kerosene and 280 cc. of water. The emulsion is preferably made by dissolving the emulsifying agent in the kerosene and then adding the water with constant agitation. Upon the introduction of the emulsion in the viscose, the mass is agitated until the distribution of the emulsion is complete. The viscose thus produced is allowed to ripen and is spun and the thread produced processed in the usual manner. During the usual finishing operations, the kerosene is automatically substantially eliminated.

Any of the well-known coagulating baths may be used. We prefer, however, to use one containing zinc or analogous metals. A bath which has given satisfactory results consists of 11% sulphuric acid, 24% sodium sulphate and 0.8% zinc sulphate.

The product resulting from the method previously described consists of substantially pure cellulose. When examined under the microscope at a magnification not exceeding 440 diameters, it appears as a substantially solid thread showing no liquid, gas or solid particles. Magnification of 440 diameters is used as a standard because a regular viscose thread, if inspected at a sufficiently great magnification, may show the presence of foreign liquid or solid particles or even of air which may not have been completely removed from the viscose. The cross-section of the product is similar to that of an undelustered thread, except that the surface structure and contour are crinkled, porous or channeled. This feature permits greater scattering of light than is possible in the ordinary undelustered thread.

Although this invention has been described specifically in connection with artificial thread produced from viscose, it is not limited thereto. The principles of this invention are equally applicable to other cellulose spinning solutions, as, for instance, those containing cellulose derivatives such as cellulose acetate, cellulose ethers, or the like. Furthermore, the invention is not restricted to the production of artificial thread. It is likewise suitable in the manufacture of sheets or films from cellulosic solutions of the type previously mentioned and including viscose, cellulose acetate, and cellulose ethers.

The term "extruding" used in the claims is intended to cover generically the extrusion of the cellulosic solution from the spinnerets in the production of threads or the casting of the solutions to produce sheets or films.

Since it is obvious that various changes may be made in the specific details of operation above set forth without departing from the nature or spirit of this invention, this invention is not restricted thereto except as set forth in the appended claims.

We claim:

1. A method of producing solid artificial thread having a luster equal to or lower than natural silk which comprises introducing a vaporizable high boiling hydrocarbon in a viscose solution, spinning said solution and finishing the thread in the usual manner whereby the hydrocarbon is substantially eliminated.

2. A method of producing solid artificial thread having a luster equal to or lower than natural silk which comprises introducing a vaporizable high boiling hydrocarbon in a viscose solution at some stage in the manufacture thereof, spinning said solution and finishing the thread in the usual way whereby the hydrocarbon is substantially eliminated.

3. A method of producing solid artificial thread having a luster equal to or lower than natural silk which comprises introducing an emulsion of a vaporizable high boiling hydrocarbon in a viscose solution, spinning said solution and finishing the thread in the usual manner whereby the hydrocarbon is substantially eliminated.

4. A method of producing solid artificial thread having a luster equal to or less than natural silk which comprises introducing 0.05% to 3.0% by

weight of a vaporizable high boiling hydrocarbon in a viscose solution at some stage in the manufacture thereof, spinning said solution and finishing the thread in the usual manner, whereby the hydrocarbon is substantially eliminated.

5. A method of producing solid artificial thread having a reduced luster which comprises incorporating kerosene in a viscose solution at some stage in the manufacture thereof, spinning said solution and finishing the thread in the usual manner whereby said kerosene is substantially eliminated.

6. A method of producing solid artificial thread having a reduced luster which comprises incorporating 0.05% to 3.0% by weight of kerosene in a viscose solution at some stage in the manufacture thereof, spinning said solution and finishing the thread in the usual manner whereby said kerosene is substantially eliminated.

7. A method of producing solid artificial thread having a reduced luster which comprises incorporating 0.5% by weight of kerosene in a viscose solution at some stage in the manufacture thereof, spinning said solution and finishing the thread in the usual manner, whereby said kerosene is substantially eliminated.

8. A method of producing solid artificial thread having a reduced luster which comprises incorporating an emulsion containing kerosene in a viscose solution in such quantities that from 0.05% to 3.0% by weight of kerosene is present, spinning said solution and finishing the thread in the usual manner, whereby said kerosene is substantially eliminated.

9. A method of producing solid artificial thread having a reduced luster which comprises incorporating a member of the terpene group in a viscose solution at some stage in the manufacture thereof, spinning said solution and finishing the thread in the usual manner whereby said member is substantially eliminated.

10. A method of producing solid artificial thread having a reduced luster which comprises incorporating turpentine in a viscose solution at some stage in the manufacture thereof, spinning said solution and finishing the thread in the usual manner, whereby said turpentine is substantially eliminated.

11. A method of producing solid artificial thread having a reduced luster which comprises incorporating 0.05% to 3.0% by weight of turpentine in a viscose solution at some stage in the manufacture thereof, spinning said solution and finishing the thread in the usual manner, whereby said turpentine is substantially eliminated.

12. A method of producing solid artificial thread having a reduced luster which comprises incorporating 0.6% by weight of turpentine in a viscose solution at some stage in the manufacture thereof, spinning said solution and finishing the thread in the usual manner, whereby said turpentine is substantially eliminated.

13. A method of producing solid artificial thread having a subdued luster which comprises incorporating an emulsion containing turpentine in a viscose solution in such quantities that from 0.05% to 3.0% by weight of turpentine is present, spinning said solution and finishing the thread in the usual manner, whereby said turpentine is substantially eliminated.

14. A method of preparing solid threads, films, sheets and the like which comprises extruding a cellulosic solution containing 0.05% to 3.0% by weight of kerosene in an aqueous bath and finishing the material in the usual manner whereby said kerosene is substantially eliminated.

15. A method of preparing solid threads, films, sheets and the like which comprises extruding a solution containing 0.05% to 3.0% by weight of turpentine and finishing the material in the usual manner whereby said turpentine is substantially eliminated.

16. A method of preparing solid threads, films, sheets and the like which comprises extruding a cellulosic solution containing a vaporizable high boiling hydrocarbon in an aqueous bath and finishing the material in the usual manner whereby said hydrocarbon is substantially eliminated.

17. A method of preparing solid threads, films, sheets and the like which comprises extruding a solution containing a member of a terpene group and finishing the material in the usual manner whereby the terpene is substantially eliminated.

18. A method of preparing solid threads, films, sheets and the like which comprises extruding a cellulosic solution containing 0.5% by weight of kerosene in an aqueous bath and finishing the material in the usual manner whereby said kerosene is substantially eliminated.

19. A method of preparing solid threads, films, sheets and the like which comprises extruding a solution containing 0.6% by weight of turpentine and finishing the material in the usual manner whereby said turpentine is substantially eliminated.

20. A method of preparing solid threads, films, sheets and the like which comprises extruding a viscose solution containing 0.05% to 3.0% by weight of kerosene and finishing the material in the usual manner whereby said kerosene is substantially eliminated.

21. A method of preparing solid threads, films, sheets and the like which comprises extruding a viscose solution containing 0.05% to 3.0% by weight of turpentine and finishing the material in the usual manner whereby said turpentine is substantially eliminated.

22. A method of preparing solid threads, films, sheets and the like which comprises extruding a viscose solution containing a vaporizable high boiling hydrocarbon and finishing the material in the usual manner whereby said hydrocarbon is substantially eliminated.

23. A method of preparing solid threads, films, sheets and the like which comprises extruding a viscose solution containing a member of a terpene group and finishing the material in the usual manner whereby the terpene is substantially eliminated.

24. A method of preparing solid threads, films, sheets and the like which comprises extruding a viscose solution containing 0.5% by weight of kerosene and finishing the material in the usual manner whereby said kerosene is substantially eliminated.

25. A method of preparing solid threads, films, sheets and the like which comprises extruding a viscose solution containing 0.6% by weight of turpentine and finishing the material in the usual manner whereby said turpentine is substantially eliminated.

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