C. R. LINKMEYER.

PROCESS OF MANUFACTURING FINE ARTIFICIAL THREADS.

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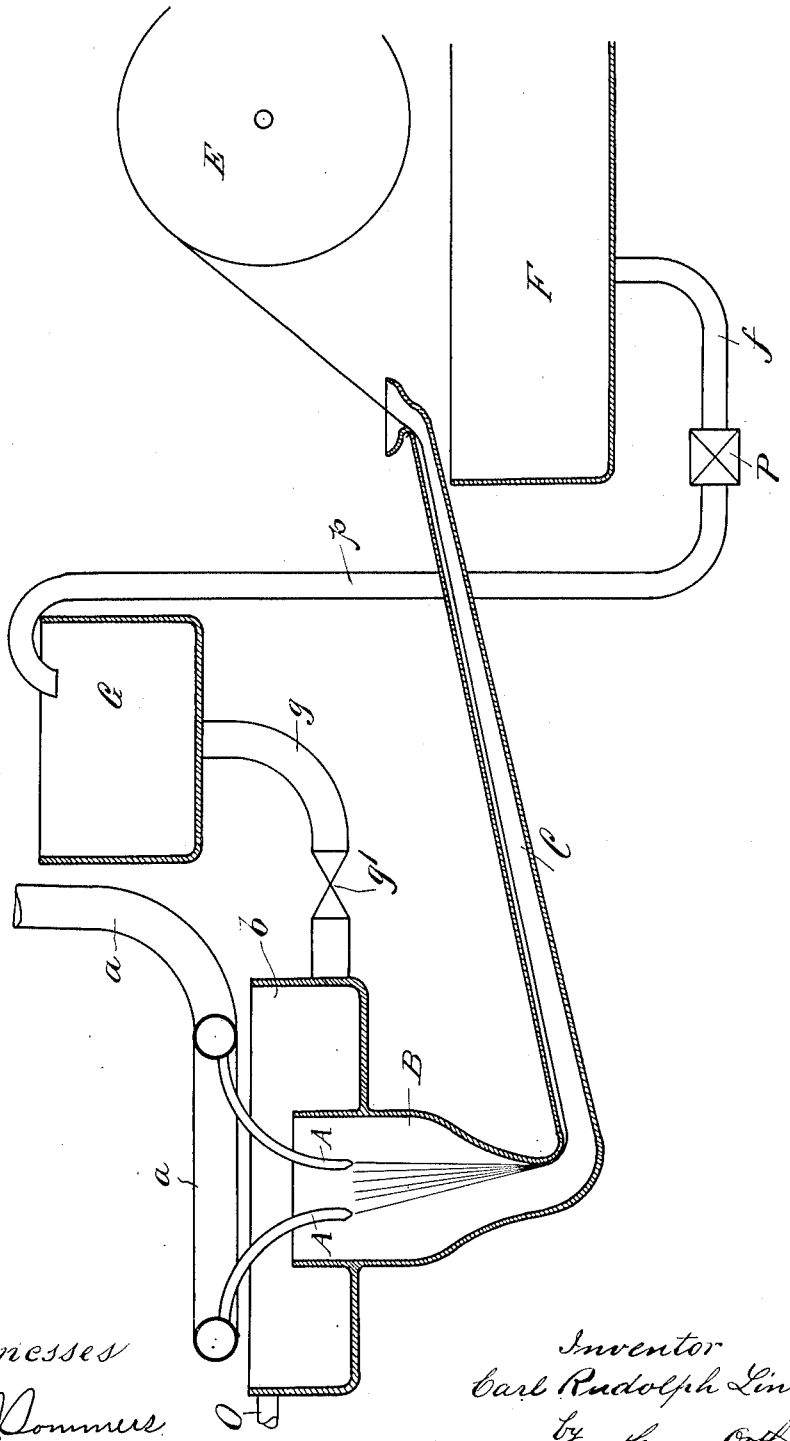

Witnesses
B. Dommers
Mary Ellis

Inventor
Carl Rudolph Linkmeyer
by Henry Orth & Co.
Attys

UNITED STATES PATENT OFFICE.

CARL RUDOLPH LINKMEYER, OF BREMEN, GERMANY.

PROCESS OF MANUFACTURING FINE ARTIFICIAL THREADS.

1,022,097. Specification of Letters Patent. Patented Apr. 2, 1912.

Application filed December 1, 1909. Serial No. 530,847.

To all whom it may concern:

Be it known that I, CARL RUDOLPH LINKMEYER, a subject of the German Emperor, and residing at Bremen, Germany, have invented a certain new and useful Improved Process of Manufacturing Fine Artificial Threads, of which the following is a specification.

My invention relates to processes of manufacturing fine artificial threads or filaments.

When manufacturing fine artificial threads or filaments from cupro-ammonium cellulose solutions which are obtained by coagulating a solution running into a liquid precipitant, two systems were used heretobefore, to wit, either only a single, very intensively acting liquid precipitant was employed when, in consequence of the powerful action of the precipitant the issuing spinning jet is shaped solely in the precipitant and is also simultaneously completely coagulated, this being termed the direct system, or two separate liquid precipitants of different concentration were employed, in which the first bath of less concentration acts only very slowly, the spinning thread only obtaining therein but little strength, partially coagulating and being still very extensible so that it can be drawn out into a thin thread whereupon it enters into a second, very highly concentrated, liquid precipitant and completely coagulates. Both these known processes have great disadvantages. In the first or direct process, the spinning mass must issue from very fine, capillary orifices corresponding about in size to that of the thread to be formed. These excessively fine orifices are liable to occasional disturbances in working. In the process in which two liquid precipitants are used, the spinning orifices can, it is true, be larger, as the semi-rigid threads can be stretched or drawn out in the first liquid to the required size. But as the semi-rigid thread cannot yet be spooled and has to be treated further, the great difficulty is met with here of conveying this weak thread to the second bath. Merely the further working up of the completely coagulated threads causes difficulties when working on a large scale, this being particularly noticeable when the semi-rigid threads are to be supplied to the second bath. Now I have found that solutions of cellulose in cupro-ammonium solutions which possess an exceptional viscosity can be drawn out to fine threads or filaments and be completely hardened simultaneously in one and the same bath, so that these threads can be spooled at once without having to pass through an additional hardening bath. The suitable degree of viscosity is recognized by its being possible to draw from the mass in the open air threads upward of 50 cms. in length. As such a spinning-mass cellulose solutions of greatest possible viscosity are suitable and, particularly, solutions which contain, besides cellulose, other substances of vegetable origin, such as for instance the solutions containing besides cellulose carbo-hydrates other than cellulose (prepared according to my co-pending patent applications Serial Nos. 482,001 486,572 and 503,890). The employability of these solutions for my present process is increased by the percentage of ammonia, when employing ammonical copper as solvent, being kept below the quantity, by weight, of the dissolved cellulose.

The bath must be so concentrated that the viscous jet of the spinning-mass after issuing from the nozzle can still be drawn out during the first 10 cms. of its passage in the bath without rupturing. A bath containing caustic alkali and a chlorid of a metal of the alkalis may be used after it has been diluted to the concentration just described. All other precipitants which are known in the art and can precipitate durable and firm structures from the cellulose solutions in question can, however, also be employed in the above described concentration, for instance precipitating baths of caustic soda lyes, sucrate of lime, saccharine caustic lyes, glycerin sulfuric acids and the like.

For further explaining my process the following example may serve, having reference to the accompanying drawing, in which—

Figure 1 is a vertical section of an apparatus for carrying out the process, and Fig. 2 is a plan view of the spinnerets:—

A number of glass tubes A, to which the spinning-mass is supplied through the supply pipe *a* from a receptacle (not shown) and each tube having at its bottom end an orifice 0.35 mm. to 0.4 mm. in diameter, dip into a funnel-shaped vessel B about 40 cms. long and open at the top and which extends into a slightly rising inclined tube C about 1 meter long. Sufficient liquid precipitant constantly

runs to the funnel-shaped enlarged part *b* of the vessel B to entrain a spinning-jet issuing from each of the orifices of the glass tubes A and draw it out into a fine thread owing to the flowing motion of the precipitant in the funnel-shaped vessel and to the pull of the roller E located at the end of the rising pipe. The threads are at once completely coagulated at the fine diameter obtained and are spooled without delay. Coagulating liquid is contained in the tank F passes by pipe *f* to pump P whose delivery pipe *p* delivers it to the tank G whence it flows by gravity through pipe *g* and valve *g'* to the enlarged portion *b* of vessel B wherein it is maintained at a constant level by reason of the overflow O. In this manner, a thread upward of about 35 meters long can be spun in one minute. As spinning-liquid an ammoniac copper cellulose solution containing 150 grams cellulose and approximately 135 grams ammonia (NH_3) per liter may be used, and as precipitant a liquid containing 1 liter of soda lye of 38° Baumé and 4 kilograms sodium chlorid per 100 liters of water. Without having to be worked up further the threads can then be washed, acidified and then twisted and dried.

I claim: —

1. The herein described process of manufacturing fine artificial threads or filaments which consists in passing a viscous cellulose solution in the form of a thick thread into a precipitant adapted to coagulate, under the conditions of formation, a fine filament only, and in forming from the thick thread while in the same precipitant a filament of such fineness that the precipitant effects the complete coagulation of the filament before it is removed therefrom.

2. The herein described process of manufacturing fine artificial threads or filaments, which consists in passing a viscous cellulose solution containing vegetable matter other than cellulose in the form of a thick thread into a precipitant adapted to coagulate, under the conditions of formation, a fine filament only, and in drawing out from the thick thread while in the same precipitant a filament of such fineness that the precipitant effects the complete coagulation of the filament before it is removed from the precipitant.

3. The herein described process of manufacturing fine artificial threads or filaments, which consists in passing a cellulose solution through orifices to form a number of thick threads into a constantly moving body of a suitably diluted coagulant to entrain the threads from the orifices and to reduce their diameter by the drawing power of the circulating coagulant to such extent that the latter effects the coagulation of the fine filaments resulting before they are removed from the coagulant.

In testimony whereof, I affix my signature in the presence of two witnesses.

CARL RUDOLPH LINKMEYER.

Witnesses:
WILHELM VÖLLMEYER,
ERNST SCHRADER.