This invention relates to a process for the manufacture of thin threads, bands, films and the like from brittle artificial masses like aryl olefine polymerizates, especially the polystyrols, and more particularly to the manufacture of artificial silk from such masses.

It has been proposed already to produce films, threads and the like of polystyrols by pulling molten polystyrol material through a nozzle and then pulling off the pressed out material with high speed. In carrying out this process the molten material has hitherto been heated to temperatures not above 155°C, and the fabrics obtained in this way were found to possess the most favorable mechanical properties if their diameter during the pulling out stage of the process was reduced to about 1/4 of the diameter of the nozzle. However, it was not possible according to the hitherto known methods to prepare very thin threads having the flexibility and, at the same time, the mechanical strength and ductility which are required in the case of artificial silk filaments.

Experiments have now shown that in order to produce very thin threads and rolls, for instance filaments of the kind of artificial silk, it is of considerable advantage to press out the molten polymerizates at higher temperatures than those hitherto used, i.e., at temperatures above about 180°C, and more particularly at temperatures from about 180—220°C. In order to avoid decomposition, which may occur if the temperatures are too high, the material is preferably heated to the said temperatures only a short time before it is pressed out from the nozzle. The material may also be used for the present process immediately after its polymerization.

Furthermore, it has been found that the most favorable results are obtained if the masses after leaving the nozzles are stretched out to such a degree that their diameter is reduced to at least 1/3 of the diameter of the nozzle. In this manner, by using nozzles having a diameter of about 0.4—1 mm., artificial silk threads of less than 5 den. can be produced which do not show the brittleness of the original material, but have a good flexibility and strength.

As nozzles there can be advantageously employed the spinning nozzles commonly used in the manufacture of artificial silk from cellulose solutions, and it is a further object of my invention to furnish a method which allows the continuous spinning of endless artificial silk filaments from polymerizates of the type of polystyrol in the same sort of equipment as is used in usual artificial silk manufacture. In this case, by using temperatures above 160°C, there results the further advantage that the spinning velocity can be very much increased without ruptures of the threads taking place. For example, it is now possible to spin threads from polystyrols out of ordinary artificial silk spinning nozzles with a velocity of about 250—400 m. per minute, if temperatures of about 180—240°C. and nozzles having holes of a diameter of about 0.4 mm. are used. The titre of the single threads obtained thereby is as small as 2 den.

The quality of the threads can be further improved by subjecting them to another strong longitudinal pull during cooling especially at temperatures between about 80 and 110°C, whereby their tendency to shrink is reduced and their flexibility and strength are further increased.

Articles manufactured in this way, especially artificial silk threads, are distinguished by possessing very good mechanical properties; their strength, flexibility and ductility are excellent and can be influenced to a certain extent by varying the temperature at the nozzle.

The following examples illustrate the invention without limiting it thereto, the parts being by weight:

Example 1

From a container which is heated to 150°C. 30 molten polystyrol is pressed to a spinning pump and from there is passed on to a spinning nozzle. Between container and nozzle, the mass is heated to about 180°C., and at this temperature it is pressed out from the nozzle which has a plurality 35 of small holes of a diameter of 1 mm. each, at a rate of 0.044 g. per minute per hole. The pressed out material is then pulled off and wound on a reel with a velocity of 200 m. per minute. The resulting threads have a titre of 2 den., a 40 strength of 1.5 g. per den. and a ductility of 35.

Example 2

Between nozzle and reel in the arrangement according to Example 1 there are inserted two rolls, of which the one near the reel is driven with greater velocity than both the reel and the second one. Between these two rolls the thread which is kept at a temperature of about 100°C., is further stretched. The resulting thread has a 50 strength of 2 g. per den. and a ductility of 20.

Instead of using two rolls, the pressed out threads may also be passed through a suitable inert liquid having a temperature of about 80—110°C. and stretched out therein by pulling them.
off quickly by a suitable mechanism, for instance a roller or reel arranged at the other end of the stretching zone.

I claim:

5 1. A process for preparing thin filaments, bands or films from polystyrol which comprises heating the polystyrol to a temperature between about 160° C. and its decomposition point, forcing the heated mass through a nozzle and stretching it to a diameter which is less than about 3/15 the diameter of the nozzle.

10 2. A process for preparing artificial silk-like threads from polystyrol which comprises heating the polystyrol to a temperature between about 160° C. and its decomposition point, forcing the heated mass through an artificial silk spinning nozzle and stretching the resulting threads to a diameter which is less than about 3/15 the diameter of the holes of the nozzle.

15 3. A process for preparing artificial silk-like threads from polystyrol which comprises heating the polystyrol to a temperature between 180–220° C., forcing the heated mass through an artificial silk spinning nozzle and stretching the resulting threads to a diameter which is less than about 3/15 the diameter of the holes of the nozzle.

20 4. A process for preparing thin filaments, bands or films from polystyrol which comprises heating the polystyrol to a temperature between about 160° C. and its decomposition point, forcing the heated mass through a nozzle, pulling it off with such speed that its diameter becomes less than about 3/15 of the diameter of the nozzle, and subjecting it to an additional stretching at temperatures between about 80 and 110° C.

25 5. As new articles of manufacture, endless artificial silk-like threads consisting essentially of polystyrol having a titre of less than about 5 den. prepared by the process defined in claim 1.

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