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PROCESS AND APPARATUS FOR THE MANUFACTURE OF ARTIFICIAL THREADS OF DERIVATES OF CELLULOSE

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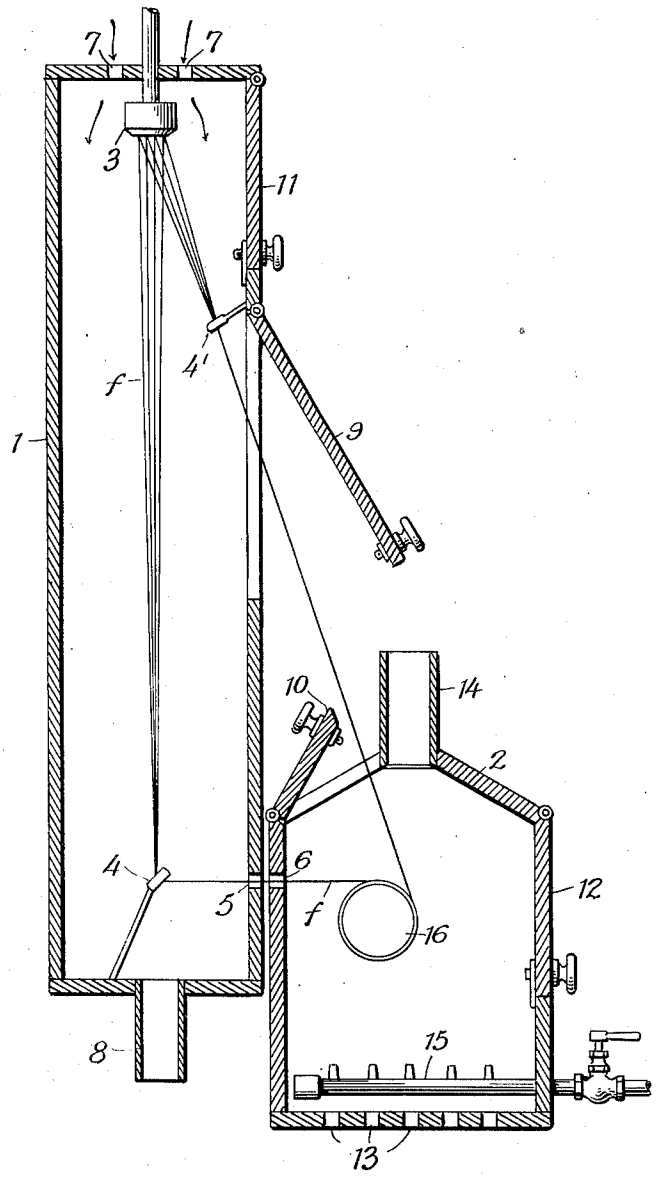

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PROCESS AND APPARATUS FOR THE MANUFACTURE OF ARTIFICIAL THREADS OF DERIVATES OF CELLULOSE

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The invention relates to a process and apparatus suitable for the manufacture of artificial threads from derivates of cellulose according to the dry stretch-spinning method.

With the methods used up to now the solution of derivates of cellulose, for instance acetate of cellulose, solved in acetone, is spun in a closed chamber, a so-called cell, which latter is heated. It is obvious, that the spinning process must be carried through in a closed cell, since the solving agents must be recovered. Following the suggestions of prior inventors in heating the cell it was intended on the one hand to favorably influence the spinning process and on the other hand to force the solving agents as entirely as possible within the spinning cell from the threads and to recover them. By employing this known heated spinning cell it was however, impossible to obtain satisfactory results, especially in using acetates of cellulose.

Trials made by the inventor have shown that even in case all measures of precaution were taken as regards the uniform heating of all cells, which is imperative for proper working, not all drawbacks were overcome. In particular it is not possible to avoid eddies of air within the cell caused by such heating or the non-desired heating of certain parts of equipment within said cells, for instance of the nozzle. The inventor, however, soon recognized that the suppression of eddies of air and of the heating of the nozzle was most important. These drawbacks could not be overcome according to new suggestions nor through the combination of two oppositely moving currents of air which were exhausted in the centre. Finally it was found that the heating of the air contained in the cells did per se reduce the capability of stretching of the threads being formed.

All these drawbacks are overcome by the present invention, if the heating of the spinning cell 1 as shown in the drawing or of the air within said cell is abandoned, while the treatment of the newly formed threads with heat is carried out outside of the spinning cell. Suitably the treatment with heat carried out outside of the spinning cell is likewise carried out in a closed chamber, the heating cell 2, enabling easy recovering of the solving means still present in the threads.

The spinning nozzle 3 is arranged at the top of the spinning cell and at the bottom there is the thread collector or guide 4, where the threads *f* are collected and passed through a small opening 5 of the spinning cell and opening 6 of the heating cell into the latter during operation. Fresh air is admitted to the spinning cell through holes 7 provided close to the nozzle, and passes through the spinning cell from the top to the bottom according to the principle of continuous current, that is to say in the direction of the pull of the threads, and it issues through the suction hole 8. From this it follows that there is no heating of the air in the spinning cell at all. The spinning cell will work at room temperature or according to the degree of cooling of the admitted air and the additional cooling caused by the evaporation of the solving agent, even below such temperature. The motion of air within the cell in the absence of almost any eddies, the passing of said air in the direction of the pull of the thread and the low temperature have proved extraordinarily advantageous for the formation of threads according to the present invention. Under these conditions it is in particular much easier in contradistinction to the heated spinning cells used up to the present, to draw the thread to a high fineness, presumably on account of the fact that the smooth, continuous cool current of air is withdrawing the solving agent only gradually.

In starting the spinning operation it has proved suitable to employ an auxiliary thread guide 4′ and suitable admission doors 9 and 10 with the spinning and heating cell respectively. Likewise a door 11 can be provided in the spinning cell.

Within the heating cell 2 the newly formed threads are wound simultaneously with the heat treatment on suitable spools 16 or on reels. The drawings show spools or rollers used for this purpose. Winding may be done there, however, in any other practical manner, for instance by simultaneously twisting the threads on twisting spools.

The heating cell is provided with a suitable

door 12, air admission holes 13, channel 14 for the exit of air, heating elements 15 and spools 16. Instead of arranging heating elements within the heating cell proper, previously heated air may be likewise admitted to said cell.

The doors 9, 10, 11 and 12 provide means for inspection and access to the cells 1 and 2, the doors 11 and 12 being used to gain access into the interior of the cells and the parts contained therein, for example, for the purpose of charging and cleaning the spinning nozzle 3 and spool 16 and for observing the spinning process from the outside of said cells, while the doors 9 and 10 are used for starting the spinning process, according to which, doors 9 and 10 being opened, the thread is led from the nozzle 3 over the auxiliary thread guide 4' to the roller 16. If the spinning process after being started, progresses normally and it is certain that all nozzle openings operate uniformly, the threads, by means of a hook, are disposed over the thread guide 4, after which the doors 9 and 10 are again closed.

The said heating cell not only serves the purpose of recovering the last portions of the solving agents, but its effect is besides closely related with the quality of the thread obtained according to the present invention. If the spinning apparatus is being operated without heating the heating cell 2, the spinning cell will work faultlessly and the threads can be collected faultlessly in the spooling cell 2 but the threads will be milky and without gloss. If, however, during operation, the spooling cell or the air passing through it is heated to about from 35 to 45 degrees centigrade, glossy threads are obtained.

This effect of subsequent treatment with heat of the threads outside of the spinning cell could not be expected, and it was this observation that made it possible to relieve the spinning cell of the heat treatment and to adapt it to its proper purpose, namely the faultless formation of the thread. In separating the heat treatment from the spinning cell the latter can again be regulated to a greater or less extent freely and exclusively, acccording to its special purpose.

If desired, the threads may pass either freely or on carriers through the properly dimensioned heating cell for a distance sufficient to completely expel the solvents and obtain a proper gloss on the threads, whereupon they are wound on suitable spools or reels outside of the heating cell.

I claim:

1. In the process for the manufacture of artificial threads from derivates of cellulose according to the dry stretch-spinning method, the use of a current of air for the purpose of expelling the solving agent from the threads and passing into the spinning cell through an opening close to the nozzle and continuing its passage through the spinning cell in the direction of the pull of the threads from the top downwards, and withdrawing the air from the lower part of the cell in the vicinity of the thread guide arranged there.

2. The process of manufacturing threads from derivates of cellulose according to the dry stretch method, which comprises dry-stretch spinning the threads in an unheated cell and passing the threads to a separate closed heated cell.

3. The process of manufacturing threads from derivates of cellulose according to the dry-stretch method, which comprises dry-stretch spinning the threads in a ventilated, unheated spinning cell, passing the threads therefrom to a heated cell and spooling the threads in said heated cell.

4. A process for manufacturing threads from derivates of cellulose according to the dry-stretch method, which comprises dry-stretch spinning the threads in one unheated cell, passing them to a second closed cell, and heating and ventilating the second cell.

5. A process for manufacturing threads from derivates of cellulose according to the dry-stretch method, which comprises dry-stretch spinning the thread in an unheated cell at room temperature, conducting the thread therefrom into a second cell, spooling or reeling the thread in such second cell and heating and ventilating the second cell.

6. A process for manufacturing threads from derivates of cellulose according to the dry-stretch method, which comprises dry-stretch spinning the thread in an unheated cell at room temperature and leading vapors therefrom for recovery of solvent, and leading the thread from said cell into a second, heated cell, ventilating the heated cell and withdrawing vapors therefrom for recovery of solvent, and spooling or reeling the thread in the heated cell.

7. A process for manufacturing threads from derivates of cellulose by the dry-stretch method, which comprises spinning the thread in an unheated cell at room temperature, directing a current of air through the cell in the direction of the thread being spun and exhausting the air from the cell for solvent recovery, then passing the thread into a second adjacent cell, heating the cell, exhausting the heated cell for solvent recovery, and spooling the thread in said second cell.

In testimony whereof I have signed my name to this specification.

KONRAD HOFFMANN.