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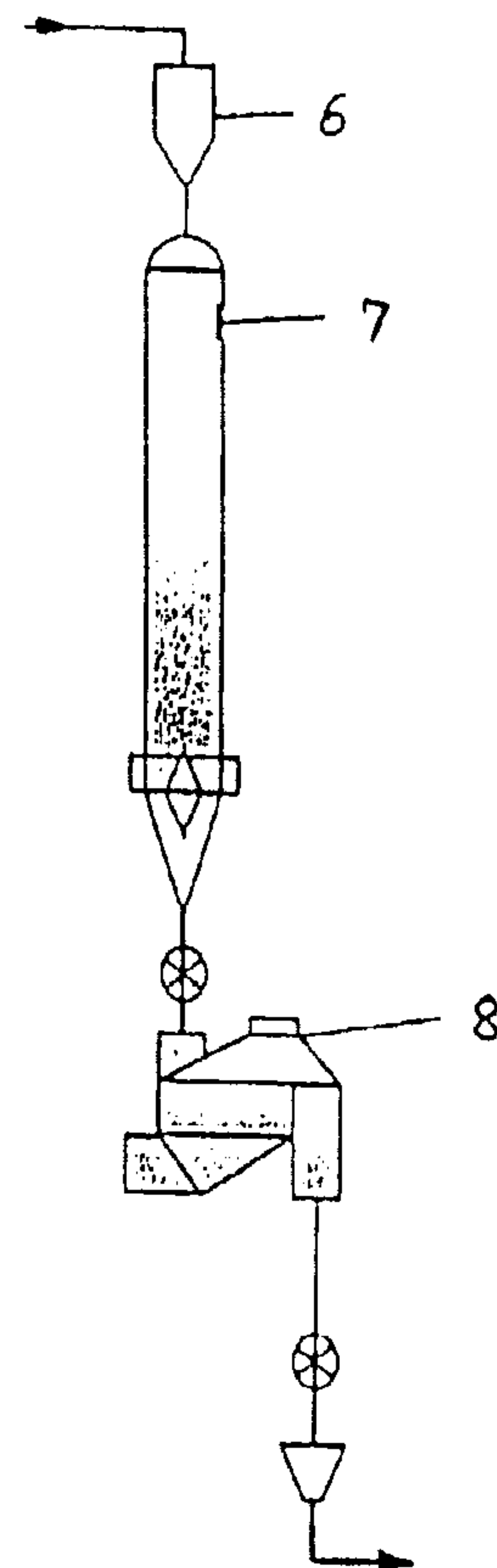
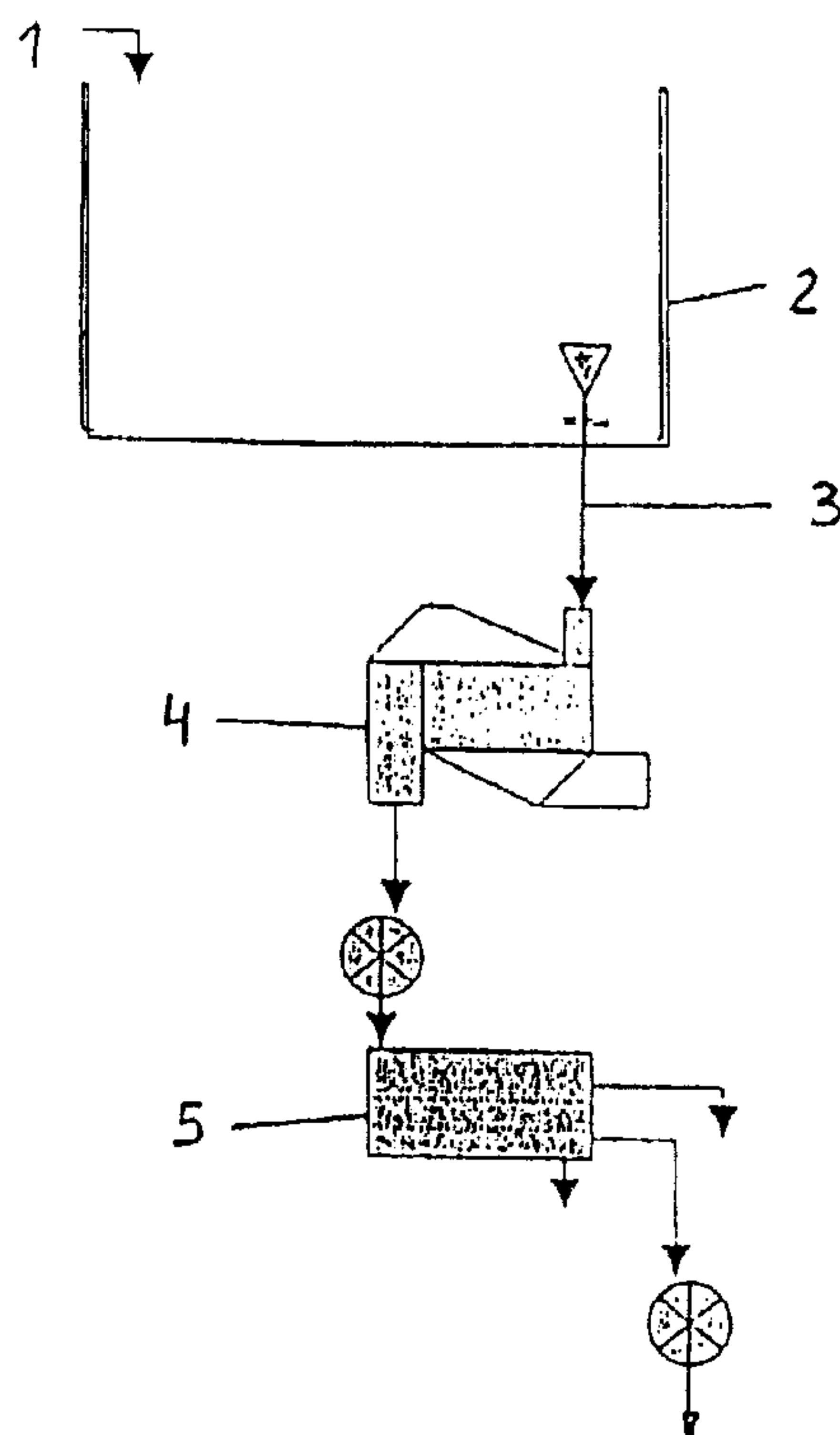
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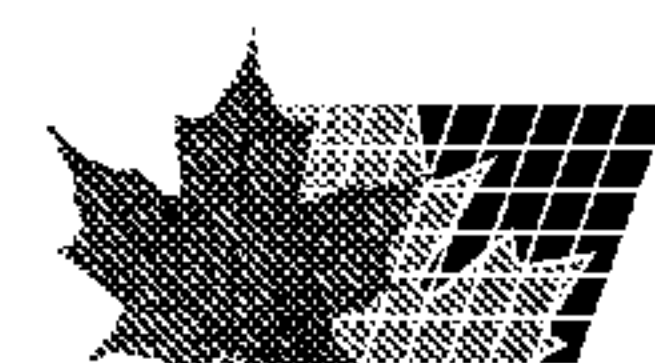
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(54) Titre : PROCÉDE ET DISPOSITIF DE FABRICATION DE MATIERE PLASTIQUE CRISTALLISABLE
(54) Title: PROCEDURE AND DEVICE FOR MANUFACTURING CRYSTALLIZABLE PLASTIC MATERIAL



(57) Abrégé/Abstract:

A method for manufacturing a crystallizable plastic material is disclosed. The process includes the step of melting an amorphous plastic material, pelletizing the material, crystallizing it and then post condensing the plastic material with the proviso that the plastic material is not subjected to heating after the melting step but prior to the crystallization step and then subjecting the plastic material to sieving after the crystallization step.



ABSTRACT

A method for manufacturing a crystallizable plastic material is disclosed. The process includes the step of melting an amorphous plastic material, pelletizing the material, crystallizing it and then post condensing the plastic material with the proviso that the plastic material is not subjected to heating after the melting step but prior to the crystallization step and then subjecting the plastic material to sieving after the crystallization step.

WO 01/12698

PCT/CH00/00317

**Procedure and Device for Manufacturing Crystallizable
Plastic Material**

The invention relates to a procedure for manufacturing crystallizable plastic material, such as polyesters and the like, in particular PET, by having the melting phase be followed by crystallization and solid-state post-condensation phase, as well as to a device for executing the procedure.

Crystallization and solid-state post-condensation (SSP) of polyesters obtained from a melt, in particular PET (polyethylene terephthalate), is generally known). In this case, the meltable polyester (melting point 270 °C and above) is processed into cylindrical pellets while simultaneously cooled down to room temperature, and serves as an amorphous parent material for subsequent crystallization and post-condensation to PET. According to EP-A-379684, crystallization takes place in two fluidized beds (combination of solids-air bed and boiling bed) at temperatures of 140 °C to 180 °C. Crystallization is followed by exposure to impact to dissolve agglomerates.

However, crystallizing at a temperature of less than 140 °C already and also executing solid-state post-condensation at a temperature exceeding 180 °C is also known.

EP-A-822214 describes a procedure in which polyester material is extruded, pelleted and crystallized without cooling the melt to a temperature far below the crystallization point. In this case, a temperature of

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approx. 160° C to 220°C is maintained, and crystallization is to take approx. 5 - 30 minutes. However, WO 97/23543 already disclosed this process of strongly cooling off during pelleting. Polyester is held in a melt at approx. 270° C, and drips through an opening onto a metal plate heated to approx. 135°C, where crystallization already takes place. This is then followed by a conventional SSP process over 24 hours at approx. 205°C. According to the instruction in US-A-5510454, the temperature of the plate onto which the drops fall can also measure 180°C.

Also known is a procedure for simultaneously drying and crystallizing thermoplastics, e.g., PET, according to WO94/25239, wherein the plastic strands to be dried are quenched for at most 1.5 seconds to achieve a surface temperature of at least 100°C. As a result of this only partial cooling of the plastic, the crystallization time is to measure at most approx. 20 seconds.

In a device for manufacturing polyamides according to DE-A-19510698, a moving-bed reactor can be evacuated, wherein a vacuum pump can be provided with a separator for removing dust from the waste gas. However, solid foreign materials, dusts and the like are not reliably separated from the plastic material.

US-3405098 describes a procedure for preparing linear condensation polyesters for solid phase polymerization, wherein the melt is quickly quenched in order to obtain an essentially amorphous, solid polyester, which is subsequently heated to 150°C to 200°C again, in order to obtain a partially crystallized polyester, which is subsequently milled into fine particles, and classified using sieves. The polyester prepared in this way is

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then subjected to solid-phase polymerization in a fluidized bed.

The object of the invention is to further develop a procedure for manufacturing crystallizable plastic material, such as polyester or PET, in such a way as to achieve a higher reactivity in the SSP process via larger crystallites and improved surface structure, and to reliably separate solid foreign materials from the plastic material after crystallization. In addition, power consumption is to be reduced. This is accomplished by a procedure for manufacturing crystallizable polyester material, such as polyesters, e.g., PET, by melting amorphous polyester material, which is subsequently granulated, crystallizes and re-condensed, wherein the plastic material need not be heated before crystallization; characterized in that either the plastic material is subjected to a sieving process after crystallization, and that the crystallization takes place at a temperature of 140°C to 180°C, or the fact that after granulation, the plastic material is subjected to a sieving process at about the same temperature as during crystallization and granulation.

Preferred variants include:

- The above-mentioned procedure, wherein the temperature during crystallization, granulation, and sieving measures 100°C to 200°C, preferably 120°C to 160°C.
- The above-mentioned procedure, wherein the retention time during crystallization measures approximately 1 to 40 seconds, preferably 2 to 20 seconds.
- The above-mentioned procedure, wherein the sieving process is followed by further crystallization.

The object of the invention is also to provide a suitable device for executing the above-mentioned procedure. One embodiment of the device includes a granulating device, a fluidized bed (4) and a shaft reactor (7), characterized in that a sieve (5) is placed downstream from the fluidized bed (4).

The invention will be described in greater detail below in an embodiment based on a drawing. The drawing shows a basic diagram in the single figure.

PET 1 passes from a melt reactor (not shown) at a temperature of approx. 280°C into a cutter 2 during cooling and solidification.

The amorphous pellets 3 with a temperature of 140°C to 180°C obtained in this way are then passed without further cooling to a fluidized bed 4 for a retention time usually employed in the procedure, and then to a sieve 5, with downstream ambient air separator if needed, to remove dust and other foreign solids.

According to EP-A-379684, the fluidized bed 2 can also be a combination of solids-air bed and boiling bed. If necessary, the sieving process is followed by further crystallization (not shown).

The PET cleaned and crystallized is passed in the usual manner to a preheater 6 or directly into a shaft reactor 7, where the solid phase recondensation into PET takes place, and only thereafter is the granulate cooled to room temperature in a cooler 8.

CLAIMS

1. A process for manufacturing crystallizable polyester comprising:

- (a) providing amorphous polyester from a melt reactor;
- (b) pelletizing the polyester;
- (c) crystallizing the polyester at a temperature of 140°C to 180°C; and
- (d) post-condensing the polyester;

wherein the polyester is not subjected to heating after step (a) and prior to the crystallization step and the polyester is subjected to sieving after the crystallization step.

2. The process according to claim 1 wherein the polyester is polyethylene terephthalate.

3. A device for manufacturing crystallizable polyester for executing a process according to claim 1, the device comprising a pelletizer, a fluidized bed (4) and a shaft reactor (7), wherein a sieve (5) is placed downstream from the fluidized bed (4).

4. The device according to claim 3, wherein the polyester is polyethylene terephthalate.

5. A process for manufacturing crystallizable polyester comprising:

- (a) providing amorphous polyester from a melt reactor;
- (b) crystallizing the polyester at 140°C to 180°C;
- (c) pelletizing the polyester; and
- (d) post-condensing the polyester;

wherein the polyester is not warmed again after step (a) and prior to the crystallization step and the is subjected to sieving after the pelletization step at roughly the same temperature as during the crystallization step and the pelletization step.

6. The process according to claim 5, wherein the temperature during the pelletization step and the sieving step is between 100°C and 200°C.

7. The process according to claim 5, wherein the temperature during the pelletization step and the sieving step is between 120°C and 160°C.

8. The process according to claim 5, wherein retention time during the crystallization step is approximately 1 to 40 seconds.

9. The process according to claim 5, wherein retention time during the crystallization step is approximately 2 to 20 seconds.

10. The process according to claim 5, wherein the sieving step is followed by a second crystallization step.

11. The process according to claim 5, wherein the polyester is polyethylene terephthalate.

12. A device for manufacturing crystallizable polyester, for executing a process according to claim 5, comprising a first crystallizer and a downstream cutter (2), wherein a sieve (5) is placed downstream from the cutter (2).

13. The device according to claim 12, wherein a second crystallizer is placed downstream from the sieve (5).

14. The device according to claim 12, wherein the polyester is polyethylene terephthalate.

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