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Device for producing granulated grains from plastics melts

The invention relates to a device for producing granulated grains from plastics melts, having a granulating head, to which is attached a perforated plate which is provided with outlet openings for the melt, over which [openings] rotating blades slide, and a granulating housing, which is connected to the perforated plate and is rotationally symmetrical relative to its axis and which is provided with a plurality of nozzles which are arranged distributed over its periphery and by way of which a cooling and conveying medium is supplied to the interior of the granulating housing, the cooling and conveying medium flowing in a spiral manner in the direction towards a removal device, where it is removed together with the granulated grains.

As is known, granulated grains, which are used as the starting material for producing plastics components, are produced by granulating apparatus from a hot plastics melt. In the case of an apparatus of this type, care must be taken that the granulated grains produced by means of the rotating blades by crushing the plastics melts issuing from the openings in the perforated disc are rapidly cooled in the granulating housing before they are removed, in order to prevent the still hot granulated grains from being deformed, sticking together and/or adhering to the wall of the granulating housing.

In the case of a known apparatus, a jet of water is sprayed tangentially into a chamber provided behind the perforated disc and the rotating blades and is built up there to form a rapidly rotating ring of water. The water overflowing out of the chamber covers the entire inner surface of the granulating housing in a rotating manner and issues from the said housing at the end opposite the perforated plate. In this connexion, the flow velocity of the water in the direction towards the axis of the housing is determined by the height of the drop of the ring of water from the inlet to the outlet and can be altered only by increasing the throughput of water. In the case of this apparatus there is the disadvantage that, on account of the gravity-conveying system used, the granulated grains are not rapidly removed from the impact area on the wall of the granulating housing, in order to prevent the granulated grains from piling up and thus sticking together.

Apparatus are also known, in which the cooling and conveying medium is

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allowed to enter tangentially into the granulating housing, the said medium flowing in helical flow lines along the wall of the granulating housing in the direction towards the outlet or moving forward in a helical manner. In this connexion, the axial flow component is achieved by a drop in the granulating housing in the direction towards the outlet or by a conically widened granulating housing. The axial component - produced in this way - of the movement of the fluid cooling agent is insufficient in particular in the region of the nozzles, so that at first essentially only a rotating ring of the cooling medium is produced in this region, resulting in the disadvantage that where the granulate strikes or enters the cooling medium, the granulate is not conveyed away sufficiently quickly in the direction towards the outlet. In this way the granulated grains strike against one another, and undesired agglomerates are formed.

The object of the present invention is to improve an apparatus for producing granulated grains from plastics melts, in such a way that the granulated grains in the granulating housing are prevented from piling up and sticking together and that adhesion to the wall of the said housing is prevented in a reliable manner. In this connexion, the invention takes as its starting point an apparatus of the type described at the beginning and essentially consists in that the direction of the axis of each nozzle forms an acute angle with the direction of the axis of the granulating housing, so that the cooling and conveying medium is introduced into the granulating housing in the form of a multiple spiral with mutually overlapping spiral paths. In this way, when issuing from the nozzles, the cooling and conveying medium already has a movement component away from the granulating head, so that the granulated grains are removed in the axial direction immediately after their formation, so that no accumulation of granulated grains occurs in the region of the perforated disc and of the rotating blades cooperating with the said perforated disc, where the granulated grains could stick together. On account of the rotating multiple spirals, an essentially continuous coating of the medium is additionally formed, which reliably prevents the granulated grains from adhering to the housing wall.

Optimum values are obtained when the nozzle axis forms an angle of between 60° and 80° with the housing axis.

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The nozzles are expediently arranged uniformly distributed over the periphery of the granulating housing, two to eight nozzles preferably being provided, namely a small number of nozzles in the case of a small housing diameter and a large number in the case of a large housing diameter. A multiple spiral of the cooling and conveying medium, which covers the entire walls of the granulating housing, and with maximum axial velocity is then produced in the region of impact of the granulated grains on the housing wall. In this connexion, the nozzle axes extend approximately tangentially to the wall of the granulating housing.

The invention is illustrated diagrammatically in the drawing with reference to one example of embodiment. In the drawing

Fig. 1 is a longitudinal section of an apparatus according to the invention, and

Fig. 2 is a cross-section in the direction of the arrow II-II in Fig. 1.

The apparatus according to the invention comprises a granulating head 2, which is attached to a granulating housing 1 formed rotationally symmetrically to its horizontal axis 12 and to which the plastics melt is supplied by way of an inlet opening 11 and to whose end opposite the inlet opening 11 is secured a perforated plate 3 which is provided with melt outlet openings 10 arranged in the concentric circle about the axis 12. Rotating blades 4, which are driven by a motor 9 by way of a shaft 13, slide over the perforated plate 3. With a given throughput of material, the number of the blades 4, the rotational speed thereof and the number of the openings 10 determine the shape of the granulated grains. The granulated grains cut off by the blades 4 are accelerated by the rotational movement of the blades 4 and are centrifuged in the direction towards the inner wall of the cylindrical granulating housing 1. These granulated grains must now be cooled and removed from the granulating housing 1 by way of an opening 8, from which the cooling and conveying medium also issues. This cooling and conveying medium, for example air or water, which arrives from a pressure source, enters - by way of an inlet tube 7 - a distributor chamber 6 for the cooling and conveying medium, whence it is sprayed into the interior of the granulating housing 1 by way of spray nozzles 5. The direction of the axis of each spray nozzle 5 forms an acute angle of approximately 60 to 80° with the direction of the housing axis 12 and in



addition extends tangentially to the wall of the granulating housing 1. As indicated in Fig. 2, in the case of the example of embodiment illustrated, four spray nozzles 5 are provided arranged distributed at equal intervals from one another over the periphery of the granulating housing 1. The number of the spray nozzles is expediently selected in accordance with the diameter of the granulating housing 1. In the case of a housing diameter of 300 mm, two to four spray nozzles are expediently provided, and in the case of a housing diameter of 600 mm, four to eight spray nozzles are expediently provided.

On account of the arrangement of the spray nozzles 5 described, a circulation of the cooling and conveying medium in the form of a multiple spiral with mutually overlapping spiral paths takes place in the granulating housing 1, as a result of which a rapid removal of the granulated grains takes place from that region in which the granulated grains strike the circulating flow of the cooling and conveying medium after each cutting by the blades 4. By selecting the angle which is formed by the nozzle axes and the housing axis 12, the dwell period of the granulated grains in the cooling medium can be set to a value of sufficient length to ensure that after they have left the housing 1 and after the cooling and conveying medium has been separated by means of a vibrating screen (not shown) or a centrifuge (not shown) the residual heat of the granulated grains is no longer sufficient for agglomeration.

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Claims:

1. A device for producing granulated grains from plastics melts, having a granulating head, to which is attached a perforated plate which is provided with outlet openings for the melt, over which [openings] rotating blades slide, and a granulating housing, which is connected to the perforated plate and is rotationally symmetrical relative to its axis and which is provided with a plurality of nozzles which are arranged distributed over its periphery and by way of which a cooling and conveying medium is supplied to the interior of the granulating housing, the cooling and conveying medium flowing in a spiral manner in the direction towards a removal device, where it is removed together with the granulated grains, characterized in that the direction of the axis of each nozzle (5) forms an acute angle with the direction of the axis (12) of the granulating housing (1), so that the cooling and conveying medium is introduced into the granulating housing (1) in the form of a multiple spiral (14) with mutually overlapping spiral paths.
2. A device according to Claim 1, characterized in that the direction of the axis of each nozzle (5) forms an angle of between 60° and 80° with the direction of the axis (12) of the granulating housing (1).
3. A device according to Claim 1 or 2, characterized in that the axis of each nozzle (5) extends approximately tangentially to the wall of the granulating housing (1).
4. A device according to Claim 1, 2 or 3, characterized in that the nozzles (5) are arranged uniformly distributed over the periphery of the granulating housing (1).
5. A device according to any one of Claims 1 to 4, characterized in that two to eight nozzles (5) are provided, a small number of nozzles (5) being provided in the case of a small housing diameter and a large number being provided in the case of a large housing diameter.

