

Description

The invention relates to an apparatus for processing thermoplastic plastics material, comprising a receiving receptacle, in the bottom zone of which there is arranged a comminuting and mixing tool rotatable around an approximately vertical axis, and a screwtype extruder arranged radially relative to the vertical axis, the housing of the screwtype extruder being connected on its intake side to the interior of the receptacle by an opening in the wall of the receiving receptacle, which opening is arranged in the zone of the comminuting and mixing tool.

An apparatus of this type is known from EP-A-0 045 734. Using such an apparatus, the plastics material supplied to the receiving receptacle is comminuted by the rotating comminuting and mixing tool and is made to circulate cyclonically, the arising shearing and frictional energy having the effect of warming the plastics material. Since this shearing and frictional energy has a greater effect on large, uncomminuted parts, and thus material which has already been comminuted is warmed more slowly, during the comminuting and mixing process a mixture of adequate thermal homogeneity is formed. This mixture is removed from the receiving receptacle through the screwtype extruder and at the same time plasticized and shaped. In order that the screwtype extruder can be uniformly charged substantially independently of the filling level of the receiving receptacle, in the known apparatus the screwtype extruder is arranged with its end projecting into the receiving receptacle axially spaced above the comminuting and mixing tool. As a result of the circulating movement of this tool, the particles of material are forced into the zone of a baffle plate provided on the receptacle wall, and are guided from this baffle plate towards the receiving end of the screwtype extruder. This construction is disadvantageous because the baffle plate protruding inwards from the receptacle wall hinders the sinking

of the material to be comminuted in the receptacle, and because it is necessary to deflect the comminuted material several times before it can be received by the screwtype extruder. Since the screw protrudes into the interior of the receptacle by more than one screw turn, there is additionally the disadvantage that the cyclonic circulation is disturbed, with concomitant inhomogeneity of mixing, and particularly with large particles of material there is a danger of blockage of the comminuting and mixing tool.

With another known apparatus (FR-A-2 418 707), the screwtype extruder is arranged tangentially to the receiving receptacle and is connected to the latter by an opening in the wall of the receiving receptacle. Since filling or clogging of the screwtype extruder is determined by the centrifugal forces acting on the particles of material, there is a danger with this known apparatus that the screwtype extruder is filled non-uniformly, a change in the filling level in the receiving receptacle also becoming apparent.

The present invention has the object of avoiding these disadvantages and providing an apparatus for processing thermoplastic plastics material, in which the mixing cyclonic shape is not disturbed and a uniform comminution and mixing of the plastics material as well as a uniform supply thereof to the screwtype extruder are guaranteed. In this, the invention takes as its starting point an apparatus of the type described at the outset and substantially consists in the fact that the screwtype extruder is arranged at the level of the comminuting and mixing tool, no parts of the screwtype extruder protruding from the inner wall of the receiving receptacle, and that the free end of the working edges of the comminuting and mixing tool is set back, when seen in the direction of rotation, so that, when the apparatus is in use, in addition to the centrifugal force component, a pressure component acts on the plastics material, by which pressure component the plastics material is forced into the screwtype extruder. By eliminating parts of the screwtype extruder which protrude inwards from the inner wall of the receptacle, the cyclonic circulation remains undisturbed and uniform comminution and mixing of the supplied plastics material

is achieved, with the centrifugal force arising on rotation of the comminuting and mixing tool ensuring uniform supply of the comminuted material to the screwtype extruder, since in fact this centrifugal force acts in the same direction in which the screw of the screwtype extruder draws into the screwtype extruder the material to be removed. The arrangement of the screwtype extruder and the tool at the same height means that this centrifugal force is fully effective without the material having to be deflected. In addition to the centrifugal force effect mentioned there is also the fact that an additional pressure component similar to a smoothing effect acts on the material because of the construction of the working edges of the tool, this pressure component forcing the material through the opening into the housing of the screwtype extruder.

The uniform supply of the comminuted plastics material into the screwtype extruder can be further improved in that, in accordance with a further feature of the invention, the screw and the housing are widened at the intake side towards the opening in the wall of the receiving receptacle in the shape of a funnel.

In order that intake into the screwtype extruder can be controlled, in accordance with the invention the cross section of the opening is variable by a gate valve or the like.

The invention is illustrated diagrammatically in the drawing, with reference to exemplary embodiments.

Fig. 1 shows an apparatus according to the invention, in vertical section.

Fig. 2 illustrates, also in vertical section, a further embodiment of the apparatus according to the invention.

Fig. 3 shows a modified embodiment of Fig. 2, some of the identical parts of the apparatus having been omitted. Fig. 4 illustrates a section along the line IV-IV in Fig. 2.

The apparatus according to the invention for processing plastics material has a receiving receptacle 1, in the bottom zone of which there is provided a comminuting and mixing tool 4 rotatable around an approximately vertical axis and driven by a driving motor 5. Provided at the level of this comminuting and mixing tool 4 in the wall of the receiving receptacle 1 is an

opening 9 to which the housing 2 of a screwtype extruder 15 is connected. In the housing 2 there is an extruder screw 3 which is driven by a driving motor 6 via a V-belt drive 10. The comminuted and mixed plastics material conveyed through the screwtype extruder emerges from the screw housing 2 through the outlet opening 7. A feed hopper 8 for charging the apparatus with the plastics material to be processed is provided at the upper end of the receiving receptacle 1.

As can be seen from Figures 1 to 3, both the housing 2 and the screw 3 are substantially adapted to the contour of the inner wall of the receiving receptacle 1 in the zone of the opening 9 and thus are substantially flush with this contour, but it is also possible to set the screw 3 back somewhat relative to this contour.

The embodiment of Fig. 2 differs from the embodiment of Fig. 1 in that both the screw 3 and the housing 2 of the screwtype extruder are widened at the intake side, at 11, towards the opening 9 in the shape of a funnel.

In the embodiment of Fig. 3, a gate valve 12 is provided in the zone of the opening 9, the position of this gate valve being variable such that it covers the opening 9 to a greater or lesser extent.

As can be seen from Fig. 4, the free ends of the working edges 13 of the mixing and comminuting tool which rotates in the direction of rotation indicated by the arrow 14, are set back, as a result of which a pressure component arises in addition to the centrifugal force component, by which pressure component the comminuted and mixed material is forced through the opening 9 into the screwtype extruder.

Claims

1. Apparatus for processing thermoplastic plastics material, comprising a receiving receptacle (1), in the bottom zone of which there is arranged a comminuting and mixing tool (4) rotatable around an approximately vertical axis, and a screwtype extruder (15) arranged radially relative to the vertical axis, the housing (2) of the screwtype extruder being connected on its

intake side to the interior of the receptacle by an opening (9) in the wall of the receiving receptacle (1), which opening is arranged in the zone of the comminuting and mixing tool (4), characterized in that the screwtype extruder (15) is arranged at the level of the comminuting and mixing tool (4), no parts of the screwtype extruder (15) protruding from the inner wall of the receiving receptacle (1), and that the free end of the working edges (13) of the comminuting and mixing tool (4) is set back, when seen in the direction of rotation, so that, when the apparatus is in use, in addition to the centrifugal force component, a pressure component acts on the plastics material, by which pressure component the plastics material is forced into the screwtype extruder (15).

2. Apparatus according to Claim 1, characterized in that the screw (3) and the housing (2) of the screwtype extruder (15) are widened at the intake side towards the opening (9) in the wall of the receiving receptacle (1) in the shape of a funnel.

3. Apparatus according to Claim 1 or 2, characterized in that the cross section of the opening (9) in the wall of the receiving receptacle (1) is variable by a gate valve (12) or the like.