Claims

1. A mixing and kneading machine (1) for continual compounding including a screw shaft (3) rotating in a casing (2) and simultaneously moving axially translationally, **characterized in that** the ratio Da/Di of screw shaft outer diameter to screw shaft inner diameter is between 1.5 and 2.0, that the ratio Da/H of screw shaft outer diameter Da to stroke H is between 4 and 6 and that the ratio T/H of the pitch T to the stroke H is between 1.3 and 2.5, whereby the screw shaft (3) is operated at a rotational speed exceeding 500 rpm.

2. The mixing and kneading machine (1) as set forth in claim 1, characterized in that the screw shaft (3) is operated at a rotational speed exceeding 800 rpm.

3. The mixing and kneading machine (1) as set forth in claim 1, characterized in that the mixing and kneading machine (1) comprises in the conveying direction a plurality of zones in sequence forming a processing space (6).

4. The mixing and kneading machine (1) as set forth in claim 3, characterized in that the processing space (6) is formed by at least one infeed zone (8), a melting zone (9), a mixing/dispersing zone (10) as well as a vent zone (11).

5. The mixing and kneading machine (1) as set forth in claim 3 or 4, characterized in that the rotational speed of the screw shaft (3) is adapted to the length of the processing space (6) such that the product residence time in the machine is between 1 and 20 seconds.

6. The mixing and kneading machine (1) as set forth in claim 3 or 4, characterized in that the pitch of the screw vanes (4) is adapted to the length of the processing space (6) such that the product residence time in the machine at rotational speeds of the screw shaft (3) exceeding 500 rpm is maximally 20 seconds.

7. The mixing and kneading machine (1) as set forth in any of the preceding claims, the mixing and kneading machine (1) being provided with kneader pins (5) secured to the casing (2) which protrude into the processing space (6), characterized in that the main surfaces of the screw vanes (4) and/or of the kneader pins (5) are configured at least in part as free-formed surfaces.

8. The mixing and kneading machine (1) as set forth in claim 7, characterized in that the three-dimensional geometry of the main surfaces of the screw vanes (4) and/or of the kneader pins (5) is/are configured at least in part such that they have at no point a natural starting point.

9. A method of implementing continual compounding by means of a mixing and kneading machine (1) configured as set forth in claim 1, characterized in that the screw shaft is operated at a rotational speed exceeding 500 rpm, particularly exceeding 800 rpm.

10. The method as set forth in claim 9, characterized in that the rotational speed of the screw shaft is adapted such that the mean product residence time in the machine (1) is between 1 and 20 seconds.

11. The method as set forth in claim 9 or 10, characterized in that bulk-flowable, plastic and/or pasty masses are prepared.

What is claimed is:

1. A mixing and kneading machine (1) for continual compounding including a screw shaft (3) rotating in a casing (2) and simultaneously moving axially translationally, wherein the screw shaft includes screw vanes (4) and the screw shaft is characterized in that the ratio Da/Di of screw shaft outer diameter to screw shaft inner diameter is between 1.5 and 2.0, that the ratio Da/H of screw shaft outer diameter Da to stroke H is between 4 and 6 and that the ratio T/H of the pitch T to the stroke H is between 1.3 and 2.5, whereby the screw shaft (3) is operated at a rotational speed exceeding 500 rpm.

2. The mixing and kneading machine (1) as set forth in claim 1, characterized in that the screw shaft (3) is operated at a rotational speed exceeding 800 rpm.

3. The mixing and kneading machine (1) as set forth in claim 1, characterized in that the mixing and kneading machine (1) comprises in the conveying direction a plurality of zones in sequence forming a processing space (6).

4. The mixing and kneading machine (1) as set forth in claim 3, characterized in that the processing space (6) is formed by at least one infeed zone (8), a melting zone (9), a mixing/dispersing zone (10) as well as a vent zone (11).

5. The mixing and kneading machine (1) as set forth in claim 3 or 4, characterized in that the rotational speed of the screw shaft (3) is adapted to the length of the processing space (6) such that the product residence time in the machine is between 1 and 20 seconds.

6. The mixing and kneading machine (1) as set forth in claim 3 or 4, characterized in that the pitch of the screw vanes (4) is adapted to the length of the processing space (6) such that the product residence time in the machine at rotational speeds of the screw shaft (3) exceeding 500 rpm is maximally 20 seconds.

7. The mixing and kneading machine (1) as set forth in any one of claims 1-6, the mixing and kneading machine (1) being provided with kneader pins (5) secured to the casing (2) which protrude into the processing space (6), characterized in that the main surfaces of any of the screw vanes (4) and of the kneader pins (5) are configured at least in part as free-formed surfaces.

8. The mixing and kneading machine (1) as set forth in claim 7, characterized in that the three-dimensional geometry of the main surfaces of any of the screw vanes (4) and of the kneader pins (5) are configured at least in part such that they have at no point a natural starting point.

9. A method of implementing continual compounding by means of a mixing and kneading machine (1) configured as set forth in claim 1, characterized in that the screw shaft is operated at a rotational speed exceeding 500 rpm.

10. The method of claim 9 where the screw shaft is operated at a rotational speed exceeding 800 rpm.

11. The method as set forth in claim 9 or claim 10, characterized in that the rotational speed of the screw shaft is adapted such that the mean product residence time in the machine (1) is between 1 and 20 seconds.

12. The method as set forth in any one of claims 9-11, characterized in that bulk-flowable, plastic and pasty masses are prepared.