The invention claimed is:

1. A stirred-tank reactor, comprising: a thermostatable reactor jacket; at least one driven stirrer shaft comprising a top portion and a bottom portion; a stirring and/or shearing element nonrotatably connected to the stirrer shaft; at least one starting material feed at a top position; at least one product discharge which is at a bottom position; and a sliding bush which receives the stirrer shaft so that a bearing gap is formed, wherein the stirrer shaft is lubricated and flushed with a reaction product, wherein the product discharge is in the form of a central bottom outflow through which the stirrer shaft at least partly passes.

2. The reactor of claim 1, wherein at least one starting material feed into the reaction space is provided directly in the region of a stirrer shaft entry which is at a top position.

3. The reactor of claim 1, wherein the stirrer shaft forms a part of the bottom outflow at the bottom portion.

4. The reactor of claim 1, wherein the stirrer shaft is formed, at least at its end which passes through the bottom outflow, as a hollow shaft which communicates with the reaction space.

5. The reactor of claim 1, wherein the bottom outflow is in the form of a step bearing for the stirrer shaft.

6. The reactor of claim 5, wherein the bearing gap of the step bearing is dimensioned so that the reaction mixture can flow through it.

7. The reactor of claim 1, wherein an end of the stirrer shaft which passes through the bottom outflow has a contour in the form of at least partly flattened bearing journals.

8. The reactor of claim 1, wherein the stirrer shaft has at least one outflow channel opening into the reaction space and extending at least partly transversely to the longitudinal axis thereof.

9. A process for polymerizing at least one unsaturated monomer with the stirred-tank reactor of claim 1, the process comprising: supplying a feed of at least one starting material into the reactor; polymerizing the at least one starting material; and discharging at least one product out of the reactor.

10. The process of claim 9, wherein the polymerizing is carried out under superatmospheric pressure.

11. The process of claim 10, wherein a superatmospheric pressure, relative to atmospheric pressure, of greater than .gtoreq 5 bar is established.

12. The process of claim 10, wherein the reactor is operated with hydrodynamic filling.

13. The process of claim 10, wherein the supplying comprises metering of the at least one starting material into the reactor at least two points of the reactor which are spatially separated from one another.

14. The process of claim 10, wherein the at least one starting material is introduced via at least one metering lance into a central region of the reactor.

15. The process of claim 10, wherein flow through the reactor takes place in a direction of gravitational force on the at least one starting material and product.

16. The process of claim 10, wherein at least a part of the starting materials is mixed together before entering into a reaction space of the reactor.

17. The process of claim 10, wherein a jacket temperature of the reactor is

adjusted so that it is at least 5.degree. C. above a glass transition temperature of polymer of a reaction solution within the reactor.

18. The reactor of claim 1, wherein an outer diameter of the stirrer shaft does not increase between the top portion and the bottom portion of the stirrer shaft.

19. The reactor of claim 2, wherein the stirrer shaft is formed, at least at its end which passes through the bottom outflow, as a hollow shaft which communicates with the reaction space.

20. The reactor of claim 2, wherein the bottom outflow is in the form of a step bearing for the stirrer shaft.

The invention claimed is:

1. A stirred-tank reactor, comprising: a thermostatable reactor jacket; at least one driven stirrer shaft comprising a top portion and a bottom portion; a stirring and/or shearing element nonrotatably connected to the stirrer shaft; at least one starting material feed at a top position; at least one product discharge which is at a bottom position; and a sliding bush which receives the stirrer shaft so that a bearing gap is formed, wherein the stirrer shaft is lubricated and flushed with a reaction product, wherein the product discharge is in the form of a central bottom outflow through which the stirrer shaft at least partly passes, wherein the stirrer shaft is formed, at least at its end which passes through the bottom outflow, as a hollow shaft which communicates with the reaction space.

2. The reactor of claim 1, wherein at least one starting material feed into the reaction space is provided directly in the region of a stirrer shaft entry which is at a top position.

3. The reactor of claim 1, wherein the stirrer shaft forms a part of the bottom outflow at the bottom portion.

4. The reactor of claim 1, wherein the bottom outflow is in the form of a step bearing for the stirrer shaft.

5. The reactor of claim 4, wherein the bearing gap of the step bearing is dimensioned so that the reaction mixture can flow through it.

6. The reactor of claim 1, wherein an end of the stirrer shaft which passes through the bottom outflow has a contour in the form of at least partly flattened bearing journals.

7. The reactor of claim 1, wherein the stirrer shaft has at least one outflow channel opening into the reaction space and extending at least partly transversely to the longitudinal axis thereof.

8. A process for polymerizing at least one unsaturated monomer with the stirred-tank reactor of claim 1, the process comprising: supplying a feed of at least one starting material into the reactor; polymerizing the at least one starting material; and discharging at least one product out of the reactor.

9. The process of claim 8, wherein the polymerizing is carried out under superatmospheric pressure.

10. The process of claim 9, wherein a superatmospheric pressure, relative to atmospheric pressure, of greater than .gtoreq.5 bar is established.

11. The process of claim 9, wherein the reactor is operated with hydrodynamic filling.

12. The process of claim 9, wherein the supplying comprises metering of the at least one starting material into the reactor at least two points of the reactor which are spatially separated from one another.

13. The process of claim 9, wherein the at least one starting material is introduced via at least one metering lance into a central region of the reactor.

14. The process of claim 9, wherein flow through the reactor takes place in a direction of gravitational force on the at least one starting material and product.

15. The process of claim 9, wherein at least a part of the starting materials is mixed together before entering into a reaction space of the reactor.

16. The process of claim 9, wherein a jacket temperature of the reactor is

adjusted so that it is at least 5.degree. C. above a glass transition temperature of polymer of a reaction solution within the reactor.

17. The reactor of claim 1, wherein an outer diameter of the stirrer shaft does not increase between the top portion and the bottom portion of the stirrer shaft.

18. The reactor of claim 2, wherein the bottom outflow is in the form of a step bearing for the stirrer shaft.