CLAIMS

1. A method for producing a single silicon crystal doped with n-type dopant and having in a cylindrical portion an electrical resistivity of not more than 2 mohmcm, by pulling of the single crystal by the CZ method from a melt contained in a crucible, comprising in the course of the pulling of the cylindrical portion of the single crystal, the supplying of a gas stream comprising gaseous dopant to a surface of the melt, the gas stream being guided from a sublimation facility outside a pulling chamber in a tubing system into the pulling chamber and through a heat shield which surrounds the growing single crystal, or along an outer surface of the heat shield, to an annular channel on a lower end of the heat shield and from there through nozzles to the surface of the melt, characterized in that the dopant consumption is ascertained and the supply of dopant to the melt is controlled by one or more of a weighing cell, a camera with image processing, and a flow meter in that part of the tubing system which lies outside the pulling chamber.

2. The method as claimed in claim 1, wherein the dopant in the form of a chemical compound or in a molecular or atomic form of an element of the dopant is guided to the surface of the melt, and the dopant comprises one or more of the elements P, As and Sb.

3. The method as claimed in claim 1 or claim 2, wherein the dopant is passed through at least two nozzles to the surface of the melt.

4. The method as claimed in any of claims 1 to 3, wherein the gas stream is guided by the nozzles in a direction perpendicular to the surface of the melt or toward the surface of the melt in a direction away from an axis through the middle of the single crystal or toward the surface of the melt in a direction toward the axis through the middle of the single crystal.

5. The method as claimed in claim 1 or claim 2, wherein the gas stream is guided to the surface of the melt by adjacent nozzles in respectively different directions on account of their arrangement, with alternation of an arrangement perpendicular to the surface of the melt, a tilted arrangement toward the single crystal and a tilted arrangement away from the single crystal.

6. The method as claimed in any of claims 1 to 5, wherein the tubing system is heated regionally or completely from the outside in the region outside the pulling chamber.

7. An apparatus for producing a single silicon crystal doped with an n-type dopant and having in a cylindrical portion an electrical resistivity of not more than 2 mohmcm, comprising
a pulling chamber for pulling the single crystal by the CZ method;
a crucible for accommodating a melt of silicon;
a heat shield for shielding a growing single crystal;
a sublimation facility for converting solid dopant into gaseous dopant, and a tubing system for supplying a gas stream comprising the gaseous dopant to a surface of the melt,
wherein the sublimation facility is arranged outside the pulling chamber, and the tubing system, leading through the heat shield or along an outer surface of the heat shield, opens out in an annular channel at the lower end of the heat shield, and the annular channel has nozzles for guiding the gas stream to the surface of the melt, characterized by one or more of a weighing cell, a camera with image processing, and a flow meter in that part of the tubing system which lies outside the pulling chamber.

8. The apparatus as claimed in claim 7, wherein there are at least two nozzles.

9. The apparatus as claimed in claim 7 or claim 8, wherein the nozzles are distributed with uniform spacing over the annular channel.

10. The apparatus as claimed in any of claims 7 to 9, wherein adjacent nozzles are arranged such that the gas stream is guided in respectively different directions to the surface of the melt, with alternation of an arrangement perpendicular to the surface of the melt, a tilted arrangement toward the single crystal and a tilted arrangement away from the single crystal.

11. The apparatus as claimed in any of claims 7 to 10, which comprises a tubing heater which heats the tubing system regionally or completely from the outside in the region outside the pulling chamber.