CLAIMS

1. A single crystal pulling apparatus comprising: a crucible unit including a crucible and a tray for securing and holding the crucible from below; and a crucible rotating shaft for supporting the tray from below and for elevating and lowering the tray and the crucible while rotating the tray and the crucible, the single crystal pulling apparatus characterized by having a gap portion formed at least one of between the crucible and the tray and between the tray and the crucible rotating shaft.

2. The single crystal pulling apparatus according to claim 1, wherein the gap portion formed between the crucible and the tray is positioned below a bottom portion of the crucible.

3. The single crystal pulling apparatus according to claim 1, wherein the gap portion formed between the tray and the crucible rotating shaft is positioned below a bottom portion of the tray.

4. The single crystal pulling apparatus according to claim 1, wherein a low heat conductive member is interposed at least one of on a joint surface between the crucible and the tray and on a joint surface between the tray and the crucible rotating shaft, the low heat conductive material having a lower heat conductivity in a direction perpendicular to a main surface than that in the main surface.

5. The single crystal pulling apparatus according to claim 4, wherein the low heat conductive member comprises a one-dimensional carbon fiber-reinforced carbon composite material or a two-dimensional carbon fiber-reinforced carbon composite material.

6. The single crystal pulling apparatus according to claim 5, wherein the carbon fiber-reinforced carbon composite material is formed in a substantially annular shape.

~~10~~7. The single crystal pulling apparatus according to claim 1, wherein the crucible unit comprises: a quartz crucible including a straight trunk portion, a bottom portion, and a curved surface-shaped portion connected from the bottom portion to the straight trunk portion; and a graphite tray for retaining the quartz crucible from below.

~~11~~8. The single crystal pulling apparatus according to claim ~~10~~7, wherein the tray retains at least the bottom portion of the quartz crucible.

~~12~~9. The single crystal pulling apparatus according to claim ~~11~~8, wherein the tray retains the bottom portion and the curved surface-shaped portion of the quartz crucible.

~~13~~10. The single crystal pulling apparatus according to claim ~~12~~9, wherein an outer peripheral surface of the tray and an outer peripheral surface of the straight trunk portion of the quartz crucible are substantially flush with each other.

~~14~~11. A single crystal pulling apparatus according to claim ~~10~~7, further comprising:

a crucible unit-heating device for heating the crucible unit,

the crucible unit-heating device comprising:

a heater disposed so as to surround an outer periphery of the crucible unit; and

a cylindrical-shaped interposed member interposed between the crucible unit and the heater, the interposed member made of a carbonaceous material and disposed so as to surround the outer periphery of the crucible unit.

~~15~~12. The single crystal pulling apparatus according to claim ~~14~~11, wherein the interposed member is disposed so as to be spaced with a microgap from the quartz crucible.

~~7~~13. A low heat conductive member used for the single crystal pulling apparatus according to claim 1, characterized by being interposed at least one of on a joint surface between the crucible and the tray and on a joint surface between the tray and the crucible rotating shaft, and being used for suppressing heat conduction from the crucible to the crucible rotating shaft, and

further characterized by comprising a one-dimensional carbon fiber-reinforced carbon composite material or a two-dimensional carbon fiber-reinforced carbon composite material,

being provided as a separate body both from the tray and from the crucible rotating shaft,

having a tabular shape, and

being disposed so as to form the gap portion.

~~8. The low heat conductive member according to claim 7, characterized by comprising a one-dimensional carbon fiber-reinforced carbon composite material or a two-dimensional carbon fiber-reinforced carbon composite material.~~

9<u>14</u>. The low heat conductive member according to claim 8<u>13</u>, characterized by being formed in a substantially annular shape.