What is claimed is:

1. A superconducting coil device comprising:

a vacuum vessel;

a superconducting coil located inside the vacuum vessel;

a heat shield surrounding the superconducting coil within the vacuum vessel; and

an electric current introduction line configured to introduce an electric current into the superconducting coil, the electric current introduction line comprising:

an outer current lead part that is located outside of the heat shield, within the vacuum vessel, and that is thermally coupled to the heat shield, and

an inner current lead part that is located inside of the heat shield and connects the outer current lead part to the superconducting coil,

wherein the outer current lead part comprises:

a main body serving as an electric current path to the superconducting coil and formed of a metal material,

an insulation layer that covers the main body and formed of a synthetic resin material, and

a heat shield layer that covers the insulation layer and has a lower emissivity than the insulation

layer.

2. The superconducting coil device according to claim 1, wherein the outer current lead part comprises an insulation tape having one surface as the insulation layer and an opposite surface as an adhesion layer to the main body.

3. The superconducting coil device according to claim 1 or 2, wherein the outer current lead part comprises a heat shield tape having one surface as the heat shield layer and an opposite surface as an adhesion layer to the insulation layer.

4. A superconducting coil device comprising:

a vacuum vessel;

a superconducting coil located inside the vacuum vessel;

a heat shield surrounding the superconducting coil within the vacuum vessel; and

an electric current introduction line configured to introduce an electric current into the superconducting coil, the electric current introduction line comprising:

an outer current lead part that is located outside of the heat shield, within the vacuum vessel, and that is thermally coupled to the heat shield, and

an inner current lead part that is located inside of the heat shield and connects the outer current lead part to the superconducting coil,

wherein the outer current lead part comprises:

a main body serving as an electric current path to the superconducting coil,

an insulation layer that covers the main body, and

a heat shield layer that covers the insulation layer and has a lower emissivity than the insulation layer,

wherein the outer current lead part comprises:

a first end portion on a vacuum vessel side,

a second end portion on a heat shield side, and

a connecting portion connecting the first end portion and the second end portion and having a belt-like shape bendable due to a relative displacement between the first end portion and the second end portion in a thickness direction of the outer current lead part, and wherein

the outer current lead part is disposed such that thermal contraction of the outer current lead part caused by cooling of the heat shield generates a displacement of the second end portion in the thickness direction with respect to the first end

portion with the connecting portion being bent in the thickness direction.

5. The superconducting coil device according to any one of claims 1 to 3, further comprising:

a tubular magnetic shield that surrounds the outer current lead part.

6. An electric current introduction line for introducing an electric current into a superconducting coil that is disposed in a vacuum vessel, comprising:

an outer current lead part located inside the vacuum vessel and outside a heat shield disposed to surround the superconducting coil within the vacuum vessel, and that is thermally coupled to the heat shield,

wherein the outer current lead part comprises:

a main body serving as an electric current path to the superconducting coil and formed of a metal material,

an insulation layer that covers the main body and formed of a synthetic resin material, and

a heat shield layer that covers the insulation layer and that has a lower emissivity than the insulation layer.

7. The superconducting coil device according to any one of claims 1 to 3, wherein the main body is formed of pure copper.

8. The superconducting coil device according to any one of claims 1 to 3, wherein the emissivity of the heat shield layer is less than 0.1.

9. The superconducting coil device according to any one of claims 1 to 3, wherein the heat shield layer is formed of a metal material.