DESCRIPTION

Title of Invention: IMMERSION COOLING DEVICE, HEAT PIPE, AND COLD PLATE

Technical Field

[0001]

The present disclosure relates to an immersion cooling device.

Background Art

[0002]

A cooling system for electronic equipment using a fluorine-based cooling liquid has been known (e.g., Patent Literature 1).

Citation List

Patent Literature

[0003]

PTL 1: JP2016-46431A

Summary of Invention

Technical Problem

[0004]

~~An object~~ Embodiments of the present disclosure ~~is~~ seek to to provide an immersion cooling device for use in the immersion cooling of electrical and electronic equipment.

Solution to Problem

[0005]

Item 1. An immersion cooling device comprising

electrical and electronic equipment,

a fluorine-based insulation refrigerant, and

a refrigerant tank for storing the fluorine-based insulation refrigerant,

wherein the electrical and electronic equipment is at

least partially immersed in the fluorine-based insulation refrigerant, ~~and~~

wherein the fluorine-based insulation refrigerant has a boiling point of 50 to 60°C, and

wherein the fluorine-based insulation refrigerant comprises 1,1,1,3,3,3-hexafluoroisopropyl methyl ether (HFE-356 mmz) and/or 1,1,2,3,3,3-hexafluoropropyl methyl ether (HFE-356 mec).

~~Item 2. The immersion cooling device according to Item 1, wherein the fluorine-based insulation refrigerant has an electrical resistivity of 1×10^{7} to 1×10^{15} Ω·cm.~~

~~Item 3. The immersion cooling device according to Item 1 or 2, wherein the fluorine-based insulation refrigerant comprises 1,1,1,3,3,3-hexafluoroisopropyl methyl ether (HFE-356 mmz) and/or 1,1,2,3,3,3-hexafluoropropyl methyl ether (HFE-356 mec).~~

Item ~~4~~2. The immersion cooling device according to Item ~~3~~1, wherein the refrigerant tank further stores methanol.

Item ~~5~~3. A heat pipe comprising

a hermetic container,

an evaporation part connected to the hermetic container,

a condensation part connected to the hermetic container, and

a fluorine-based insulation refrigerant enclosed in the hermetic container,

wherein the fluorine-based insulation refrigerant comprises 1,1,2,3,3,3-hexafluoropropyl methyl ether (HFE-356 mec).

Item ~~6~~4. The heat pipe according to Item ~~5~~3, wherein the fluorine-based insulation refrigerant further comprises 1,1,1,3,3,3-hexafluoroisopropyl methyl ether (HFE-356 mmz).

Item ~~7~~5. The heat pipe according to Item ~~5~~3 or ~~6~~4, wherein methanol

is further enclosed in the hermetic container.

Item ~~8~~6. A cold plate comprising

a heat-receiving part,

a heat-releasing part, and

a circulation route through which a fluorine-based insulation refrigerant circulates,

wherein the fluorine-based insulation refrigerant has a boiling point of 50 to 60°C, and

wherein the fluorine-based insulation refrigerant comprises 1,1,1,3,3,3-hexafluoroisopropyl methyl ether (HFE-356 mmz) and/or 1,1,2,3,3,3-hexafluoropropyl methyl ether (HFE-356 mec).

Advantageous Effects of Invention

[0006] According to the immersion cooling device of the present disclosure, electrical and electronic equipment can be efficiently cooled.

Brief Description of Drawings

[0007]

Fig. 1 schematically illustrates the schematic structure of the immersion cooling device in the present disclosure.

Fig. 2 schematically illustrates the schematic structure of the heat pipe in the present disclosure.

Description of Embodiments

[0008]

Definition of Terms

The numerical range expressed by using the term “to” in this specification indicates a range that includes numerical values shown before and after “to” as the minimum and maximum values.

[0009] In this specification, "A and/or B" means either A or B, or both A and B.

[0010] In this specification, the term “refrigerant” includes

CLAIMS

[Claim 1]

An immersion cooling device comprising

electrical and electronic equipment,

a fluorine-based insulation refrigerant, and

a refrigerant tank for storing the fluorine-based insulation refrigerant,

wherein the electrical and electronic equipment is at least partially immersed in the fluorine-based insulation refrigerant, ~~and~~

wherein the fluorine-based insulation refrigerant has a boiling point of 50 to 60°C, and

wherein the fluorine-based insulation refrigerant comprises 1,1,1,3,3,3-hexafluoroisopropyl methyl ether (HFE-356 mmz) and/or 1,1,2,3,3,3-hexafluoropropyl methyl ether (HFE-356 mec).

~~[Claim 2]~~

~~The immersion cooling device according to claim 1, wherein the fluorine-based insulation refrigerant has an electrical resistivity of 1×10^{7} to 1×10^{15} Ω·cm.~~

~~[Claim 3]~~

~~The immersion cooling device according to claim 1 or 2, wherein the fluorine-based insulation refrigerant comprises 1,1,1,3,3,3-hexafluoroisopropyl methyl ether (HFE-356 mmz) and/or 1,1,2,3,3,3-hexafluoropropyl methyl ether (HFE-356 mec).~~

[Claim ~~4~~2]

The immersion cooling device according to claim ~~3~~1, wherein the refrigerant tank further stores methanol.

[Claim ~~5~~3]

A heat pipe comprising

a hermetic container,

an evaporation part connected to the hermetic container,

a condensation part connected to the hermetic container, and

a fluorine-based insulation refrigerant enclosed in the hermetic container,

wherein the fluorine-based insulation refrigerant comprises 1,1,2,3,3,3-hexafluoropropyl methyl ether (HFE-356 mec).

[Claim ~~6~~4]

The heat pipe according to claim ~~5~~3, wherein the fluorine-based insulation refrigerant further comprises 1,1,1,3,3,3-hexafluoroisopropyl methyl ether (HFE-356 mmz).

[Claim ~~7~~5]

The heat pipe according to claim ~~5~~3 or ~~6~~4, wherein methanol is further enclosed in the hermetic container.

[Claim ~~8~~6]

A cold plate comprising

a heat-receiving part,

a heat-releasing part, and

a circulation route through which a fluorine-based insulation refrigerant circulates,

wherein the fluorine-based insulation refrigerant has a boiling point of 50 to 60°C, and

wherein the fluorine-based insulation refrigerant comprises 1,1,1,3,3,3-hexafluoroisopropyl methyl ether (HFE-356 mmz) and/or 1,1,2,3,3,3-hexafluoropropyl methyl ether (HFE-356 mec).