US 20230232588A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0232588 A1**

MORIYAMA et al. (43) **Pub. Date: Jul. 20, 2023**

(54) **COOLING APPARATUS AND SPACE STRUCTURE**

(71) Applicant: **Mitsubishi Electric Corporation**, Tokyo (JP)

(72) Inventors: **Takashi MORIYAMA**, Tokyo (JP); **Hiroaki ISHIKAWA**, Tokyo (JP); **Tomohiko SAITO**, Tokyo (JP); **Tatsuya KUSASHIMA**, Tokyo (JP)

(73) Assignee: **Mitsubishi Electric Corporation**, Tokyo (JP)

(21) Appl. No.: **18/008,685**

(22) PCT Filed: **Aug. 4, 2020**

(86) PCT No.: **PCT/JP2020/029826**

§ 371 (c)(1),
(2) Date: **Dec. 7, 2022**

Publication Classification

(51) **Int. Cl.**
H05K 7/20 (2006.01)
B64G 1/58 (2006.01)

(52) **U.S. Cl.**
CPC ***H05K 7/2039*** (2013.01); ***B64G 1/58*** (2013.01); ***H05K 7/20327*** (2013.01)

(57) **ABSTRACT**

A cooling apparatus (**100**) cools a heat-generating instrument, such as an electronic instrument (**2**), installed in an installation apparatus. The cooling apparatus (**100**) includes a refrigerant flow path configured circularly by sequentially connecting a pump (**1**) that circulates a refrigerant in a liquid state, a cooler (**3**) that cools the heat-generating instrument with the refrigerant, and a radiator (**5**) that cools the refrigerant. The cooling apparatus (**100**) includes a discharge-side heat exchanger (**7**) provided in a flow path from the pump (**1**) to the cooler (**3**) in the refrigerant flow path, a suction-side heat exchanger (**8**) provided in a flow path from the radiator (**5**) to the pump (**1**) in the refrigerant flow path, and a Peltier device (**9**) that is provided between the discharge-side heat exchanger (**7**) and the suction-side heat exchanger (**8**), and transfers heat from the refrigerant flowing through the suction-side heat exchanger (**8**) to the refrigerant flowing through the discharge-side heat exchanger (**7**).