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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte TIMOTHY NOAH BLATCHLEY and KENNETH J. JACKSON

Appeal 2019-002288
Application 14/717,405
Technology Center 3700

Before DANIEL S. SONG, EDWARD A. BROWN, and
JILL D. HILL, *Administrative Patent Judges.*

HILL, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1, 6, 7, 15, 16, and 20–27[2]. Final Act. 1. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] We use the word Appellant to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Ford Global Technologies, LLC. Appeal Br. 1.
[2] Claims 2–5 and 8 were withdrawn from consideration. Final Act. 1. Claims 9–14, and 17–19 were canceled.

BACKGROUND

Independent claims 1, 15, 20, and 24 are pending. Independent claim 1, reproduced below, illustrates the claimed invention:

> 1. A vehicle comprising:
>
> a heat pump subsystem configured to circulate refrigerant through a condenser and an evaporator; and
>
> a coolant subsystem configured to circulate coolant through a radiator, a powertrain component, a heater core, and a heat exchanger that is arranged to transfer heat from the refrigerant to the coolant, wherein the coolant subsystem selectively transfers heat from the heat pump subsystem to the radiator to increase condensing capacity of the heat pump subsystem.

REFERENCES

The prior art relied upon by the Examiner is:

Name	Reference	Date
Imamura	US 2005/0053814 A1	Mar. 10, 2005
Takeuchi	US 2014/0041826 A1	Feb. 13, 2014
Carpenter	US 2014/0326430 A1	Nov. 6, 2014
Hatakeyama	US 2015/0217623 A1	Aug. 6, 2015
Kuroda	US 2016/0214461 A1	July 28, 2016

REJECTIONS[3],[4]

I. Claims 20–23 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Final Act. 3–4; Ans. 2.

II. Claims 1, 6, and 7 stand rejected under 35 U.S.C. § 102(a)(2) as anticipated by Hatakeyama. Final Act. 7.

III. Claims 15 and 16 stand rejected under 35 U.S.C. § 103 as unpatentable over Hatakeyama and Kuroda[5]. Final Act. 10.

IV. Claims 24 and 27 stand rejected under 35 U.S.C. § 103 as unpatentable over Hatakeyama, Takeuchi, Carpenter, and Imamura. Final Act. 12.

V. Claims 24–26 stand rejected under 35 U.S.C. § 103 as unpatentable over Takeuchi and Imamura. Final Act. 16.

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[3] The Examiner withdraws the following rejections: (1) claims 15, 16, 21 and 26 under 35 U.S.C. § 112, ¶ 1 — because claims 21–23 depend from claim 20 that remains subject to an enablement rejection, we assume the Examiner intended to reject claims 21–23 as well; (2) claims 15, 16 and 20–23 under 35 U.S.C. § 112, ¶ 2, and we assume that the Examiner intended to additionally withdraw the rejection of claim 26, which was rejected for the same reason as claim 21 (Final Act. 7); (3) claim 15 under 35 U.S.C. § 103(a) over Takeuchi and Kuroda; (4) claims 20–23 under 35 U.S.C. § 103(a) over Hatakeyama, Takeuchi, Carpenter, and Imamura. Ans. 2.

[4] The claim objections set forth on page 2 the Final Action were overcome by the Amendment filed April 12, 2018, which was entered by the Examiner, following remand from the Board, on January 23, 2019.

[5] Although the heading of the Final Action states that the rejection is based on Hatakeyama and Takeuchi, the claims are actually rejected as obvious over Hatakeyama and Kuroda. *See* Final Act. 10–12; Ans. 12. Appellant's arguments in the Appeal Brief indicate their understanding that the rejection was based on Kuroda rather than Takeuchi. Appeal Br. 17.

OPINION

Rejection I – Written Description – Claims 20–23

Regarding independent claim 20, the Examiner finds that the limitation "'**a controller programed to operate at least one of the valves such that heat from the heat pump subsystem is circulated to the radiator in response to** (i) current of the circuitry exceeding a threshold value **and (ii) the expansion device being in the first position**" lacks written description in the originally-filed disclosure. According to the Examiner, paragraphs 26 and 41 of Appellant's Specification merely describe "the expansion valve 80 disposed on the conduit 90 and supply[ing] refrigerant to the chiller 102," without describing the controller being programed to operate the valve 80 such that heat from the heat pump subsystem 52 "is circulated to the radiator [140] in response to (ii) the expansion device [80] being in the first position." Final Act. 4.

Appellant states, in the Summary of Claimed Subject Matter section of the Appeal Brief, that support for this limitation is found in paragraphs 47–50 of Appellant's Specification. Appeal Br. 2. Appellant argues that the controller recited in claim 20 focuses on "switching the vehicle from a baseline operation in which the heat pump [subsystem 52] is only condensed by a single heat exchanger [66] . . . to an operation that enlists a heat exchanger [140] of the coolant subsystem [56 and 136] as a secondary heat exchanger to increase condensing capacity" of heat pump subsystem 52 during heavy duty cycles[6] as shown in Figure 5. *Id.* at 4. Appellant

[6] A heavy duty cycle, such as running the battery chiller and the air conditioner at the same time (Spec. 42), requires an increased condenser

contends that the heat pump subsystem 52 may experience heavy duty cycles when used to both cool the traction battery 24 and provide air conditioning via the climate control system 202. *Id.* at 4–5 (citing Spec. 42 ("The heat pump subsystem 52 may experience heavy duty cycles when it is utilized to cool the traction battery and air-condition the cabin simultaneously.")). According to Appellant, when the expansion device 80 is in the first position, the heat pump subsystem 52 cools the traction battery 24 via chiller 102 which may overload the primary heat exchanger, and when the evaporation device 80 is on the second position, the chiller 102 for the battery 24 is deactivated and the primary heat exchanger 66 is not overloaded. *Id.* at 5. Appellant then contends that the heavy duty cycle operation illustrated schematically in Figure 5 establishes that (1) valves 114 and 148 (for power train cooling subsystem 136) being actuated such that heat from the heat pump subsystem 52 is circulated, via intermediate heat exchanger 74, to the radiator 140, and (2) "the expansion device 80 [is] in the first position so that refrigerant is circulated to the chiller 102 as indicated by the bold lines." *Id.*

The Examiner responds that paragraph 42 of Appellant's Specification "describes a heavy duty cycle . . . to cool the traction battery and air-condition the cabin simultaneously," but fails to expressly or implicitly disclose the controller operating the valves 114, 148 "in **response to the expansion device (80) being in the first position**." Ans. 3. Regarding Appellant's contention that "'**the controls of claim 20 focus on switching the vehicle from a baseline operation (figure 4) to a heavy duty cycle**

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capacity for the heat pump system (Spec. 43), which is referred to as an "increased-condensing mode" (Spec. 47–49).

(figure 5)'" (Appeal Br. 4), the Examiner responds that "[t]his statement implies that the two operations are separate," "cannot take place at the same time," and "take place in sequential order." *Id*. The Examiner contends that this position is inconsistent with Appellant's statement, regarding the baseline operation shown in Appellant's Figure 4, that "'**the heat pump subsystem only cools the traction battery [24] when the expansion device (80) is in the claimed first position**'" (Appeal Br. 5).

The Examiner's reasoning is as follows:

- During baseline operation shown in Figure 4, "the heat pump subsystem (52) exchanges heat with the battery cooling loop (126) through chiller (102)," coolant in the battery cooling loop 126 "only passes through the battery (24),"
- The heavy duty cycle shown in Figure 5 "illustrates the valve[s] 114 and 148 being actuated such that heat from heat-pump subsystem 5[2] is circulated to the radiator 140, and expansion device 80 [is] in the first position so that refrigerant is circulated to the chiller 102."
- During the heavy duty cycle shown in Figure 5, "the heat pump subsystem (52) exchanges heat with the battery cooling loop (126) and coolant subsystem (54) through chiller (102) and heat exchanger (74)."
- There is a contradiction in Appellant's statements because "the controller operat[ing] the valves in response to the expansion device 80 being in the first position cannot be taking place during both the baseline operation and the heavy duty operation," because the system is not in both the baseline operation and heavy duty cycle at the same

time" and the switching from baseline operation to the heavy duty operation is attained by the control of the valves.

See Ans. 3–5.

As best understood after considering independent claim 20 as a whole in light of Appellant's disclosure, "in response to," as recited in claim 20, appears to be "cause and effect" language, implying that the controller is obtaining information and acting accordingly. Thus, claim 20 is construed to include the controller being programmed to receive information about expansion device position and operate the valves in response to such information. This construction appears to be consistent with at least the Examiner's understanding of the meaning of "in response to," although neither the Examiner nor Appellant formally addresses the proper construction of this phrase.

Appellant's invention contemplates increasing condenser capacity using intermediate heat exchanger 74 and radiator 140 of the cooling subsystem (Spec. ¶ 32) when the vehicle is in a fast charging mode that produces more heat and requires active cooling (Spec. 42 ("These very heavy duty cycles may occur when the battery chiller and the A/C are operating simultaneously and it is hot outside; when the battery is producing a high amount of heat-such as during rapid charging . . . ."')). The "current of the circuitry exceeding a threshold" corresponds with rapid battery charging, which heats the battery and requires active cooling (*see* Spec. ¶ 20) and "the expansion device being in a first position" corresponds with refrigerant passing into the chiller to cool the battery. Claim 20 recites the controller operating valves so that heat from the heat pump subsystem is circulated to the coolant subsystem radiator 140 in response to "(i) current of the circuitry exceeding a threshold value *and* (ii) the expansion device being in the first position."

Although Appellant's Specification discloses its controller 100 operating valves 114, 148 so that heat from the heat pump system 52 is circulated to the coolant subsystem radiator 140 in response to rapid battery charging (Spec. ¶ 6 ("A controller is programed to operate at least one of the valves such that heat from the heat pump subsystem is circulated to the radiator in response to current of the circuitry exceeding a threshold value.")), the Specification is silent regarding the controller operating the valves in response to the expansion device 80 being open to allow refrigerant passing into the chiller 102 to cool the battery 24 during rapid battery charging. Rather, the Specification only discloses the controller controlling the expansion device 80 to "regulate flow, pressure, temperature, and state of the refrigerant as needed." Spec. ¶ 25. The state of the expansion device 80 is never disclosed as an input upon which the controller 100 takes action. We decline to infer that the controller "switch[ing] the heat pump to increased-condensing mode in response to the vehicle being in a certain operating mode" (Spec. ¶ 49) discloses the controller switching the heat pump to the increased condensing mode in response to the expansion device being in the first position. Appellant has not persuaded us that a skilled artisan would understand the Specification as disclosing operating the controller to operate the valves in response to the expansion device position.

For this reason, we sustain the written description rejection of claim 20. Claims 21–23 depend from claim 20 and therefore also lack written description in the originally-filed disclosure.

Rejection II – Anticipation by Hatakeyama – Claims 1, 6, 7

Regarding independent claim 1, the Examiner finds that Hatakeyama discloses, *inter alia*, a vehicle with "a heat pump subsystem (10) configured to circulate refrigerant through a condenser (12)" and an evaporator 14, and "a coolant subsystem (30) configured to circulate coolant through a radiator (32), a powertrain component (33), a heater core (35), and a heat exchanger (16) that is arranged to transfer heat from the refrigerant to the coolant (see figure 3)." Final Act. 7–8.

Appellant refers to this as the Group III rejection, and argues claims 1, 6, and 7 as a group. We select claim 1 as representative. Claims 6 and 7 stand or fall with claim 1. Appeal Br. 3, 6–8. Appellant argues that the Examiner erred in finding that Hatakeyama discloses circulating coolant between its radiator 32 and heat exchanger 16 "so that heat can be transferred from the A/C loop 10 (alleged heat pump subsystem) to the radiator 32." Appeal Br. 7. According to Appellant, Hatakeyama's Figures 3–6 "illustrate different modes of the system 100 and none of these figures show a mode[] in which coolant is circulated from the heat exchanger 16 to the radiator 32, which [is] required to anticipate claim 1." *Id.*

Appellant also argues that, although Hatakayama's paragraph 41 states that "the high water temperature loop 30 is a cooling water circuit that allows the heat, absorbed in at least either one of the motor 33 and the water condenser 16, to be radiated in at least either one of the radiator 32 and the heater core 35," none of Hatakeyama's Figures "show an arrangement in which this is possible, and nothing in the [Hatakeyama's disclosure] suggests that paragraph 41 is describing an unillustrated alternative embodiment." Appeal Br. 7–8. Appellant asserts that Hatakeyama's paragraph 41 is intended to recite that the high water temperature loop 30 "is a cooling water circuit that allows the heat, absorbed in at least either one of the motor 33 and the water condenser 16, to be radiated in at least either one of the radiator 32 and the heater core 3[5], *respectively*." *Id.* at 8 (emphasis revised). According to Appellant, "[t]his reading is supported by the illustrated modes in Figures 3–6. Figure 6 illustrates heat being transferred from the motor 33 to the radiator [32], and Figure 3 illustrates heat being transferred from the water condenser 16 to the heater core 35." *Id.*

The Examiner responds, first, that the rejection maps (1) Hatakeyama's air conditioner loop 10 to the claimed heat pump subsystem, (2) Hatakeyama's water condenser 16 to the claimed heat exchanger, (3) Hatakeyama's high water temperature loop 30 to the claimed coolant subsystem, and (4) Hatakeyama's radiator 32 to the claimed radiator. Ans. 6. The Examiner then explains that Hatakeyama's water condenser 16 is an intermediate heat exchanger between its heat pump subsystem (A/C loop 10) and its coolant subsystem (high water temperature loop 30), and "exchanges heat between the loops (10 and 30)." *Id.* The Examiner further explains that Hatakeyama's radiator 32 belongs to its coolant subsystem 30 "that radiates heat absorbed from the refrigerant." *Id.* According to the Examiner, "Hatakeyama clearly describes [a] heat exchange relationship between the water condenser 16 and the radiator 32," and states that in the radiator 32 circuit, "the cooling water discharge[s] the heat that is absorbed in the water condenser 16 to the cabin, in the heater core 35, and **also discharges the heat to the outside of the cabin, in the radiator 32**." *Id.* at 6–7. Also, the Examiner determines, when the temperature of the cooling water of coolant subsystem 30 exceeds the target temperature, the cooling water in the A/C loop 30 "is forcibly cooled by the radiation by the radiator [32]." *Id.* at 6–7 (citing Hatakeyama ¶¶ 41, 103).

In response to Appellant's contention that Hatakeyama's Figures 3–6 fail to show coolant circulated from the water cooler 16 to the radiator 32, the Examiner contends that "Figures 3–6 are just some examples to show some of the operation modes for the system of Hatakeyama." Ans. 7. The Examiner disagrees with Appellant's contention that Hatakeyama's paragraph 41 should read as the high water temperature loop 30 being a cooling water circuit that allows the heat, absorbed in at least either one of the motor 33 and the water condenser 16, to be radiated in at least either one of the radiator 32 and heater core 30, "respectively," arguing that "either one" as recited by Hatakeyama directly contradicts the "respective" relationship proposed by Appellant. *Id.* at 7–8.

Appellant replies that Hatakeyama makes clear that its high water temperature loop 30 circulates either to a sub-loop including radiator pump 31, radiator 32, and motor 33, *or* H/C pump 34 heater core 35, and water condenser 16. Reply Br. 3. Appellant contends that Hatakeyama's Figure 3–6 support this sub-loop interpretation, because none of the figures shows both pumps 31, 34 "being in a same *live* coolant loop," which means Hatakeyama's radiator 32 and water condenser 16 are in separate sub-loops. *Id*. Appellant reiterates that the Examiner's interpretation of Hatakeyama's paragraph 41 contains error. *Id.* at 4.

Regarding the disclosure of Hatakeyama's paragraph 103, relied on by the Examiner in the Answer to support the positions set forth regarding Hatakeyama's paragraph 41, Appellant argues that paragraph 103 discusses a heating mode, in which condensing capacity is not an issue, making it irrelevant to claim 1[7], which is directed to increasing condensing capacity of a heat pump subsystem. Reply Br. 4. Appellant concludes that "it is more likely than not that *Hatakeyama* fails to disclose the claimed" invention. *Id*.

We agree with the Examiner. Although it may seem, if one looks solely to the illustrated modes of Hatakeyama's Figures 3–6, that Hatakeyama's paragraph 41 should require Appellant's proffered "respectively" language, Hatakeyama's paragraph 103 supports the language of paragraph 41 as understood by the Examiner. Paragraph 103 discloses that, when the battery needs to be cooled (determined at steps S9–S10 in Figure 7) and the A/C is on to cool the vehicle cabin (determined at steps S18–S19 in Figure 8), Hatakeyama causes the high water temperature loop 30 to function as a "radiator circuit," which means that the heater core circuit including the pump 34, heater core 35, and condenser 16 "in which the cooling water in the high water temperature loop **30** circulates through the heater core **35**, as illustrated in FIG. **3**, added with a circuit, in which the cooling water also circulates through the radiator **32** by the driven radiator pump **31**," allows "the cooling water [to discharge] the heat that is absorbed in the water condenser **16** to the cabin, in the heater core **35**, and also discharges the heat to the outside of the cabin, in the radiator **32**." Hatakeyama ¶ 103. Although not explicitly illustrated in its figures, use of radiator 32 with heat exchanger 16 is contemplated in Hatakeyama's "radiator circuit" that is used when the A/C is on to cool the cabin and the battery also needs to be cooled.

[7] Although Appellant's arguments in the Reply Brief discussion of Group III refer to claim 15, we understand Appellant to be arguing regarding claim 1.

Regarding Appellant's contention that claim 15 is necessarily limited to an A/C mode, because it is "related to increasing condensing capacity," Appellant provides no persuasive evidence to support this contention. Further, we are not persuaded that Hatakeyama offloading heat via its heater core 35 mandates that the vehicle is in a heating mode rather than an A/C mode, particularly given that steps S9 through S19 in Hatakeyama's Figures 7–8, described in paragraphs 92 through 103, inform us that entry into the "radiator circuit" occurs when the system is in a cooling mode. *See* Hatakeyama Fig. 7 (S12), ¶ 96).

For these reasons, we sustain the Examiner's rejection of claim 1. Claims 6 and 7 fall with claim 1.

Rejection III – Obviousness – Claims 15, 16

Regarding independent claim 15, similar to the findings regarding claim 1 above, the Examiner finds that Hatakeyama discloses (1) a heat pump subsystem 10 circulating refrigerant through an interior heat exchanger 14, an exterior heat exchanger 12, and a battery chiller 17, and (2) a coolant subsystem 30 configured to circulate coolant through a radiator 32, a power electronics module (construing "power electronics module" as a "powertrain component" and finding the limitation met by Hatakeyama's motor 33), a heater core 35, valving 37 and a refrigerant-to-coolant heat exchanger 16. Final Act. 11. The Examiner also finds that Hatakeyama discloses the refrigerant-to-coolant heat exchanger 16 "selectively transfer[ring] heat from the refrigerant to the coolant (paragraph [0041])" and the valving 37 having a first position arranged to circulate the coolant through the refrigerant-to-coolant heat exchanger 16 and to the radiator 32 "so that heat from the refrigerant is dissipated by the radiator (32; paragraph

[0041]), and a second position arranged to prevent the coolant from circulating to the refrigerant-to-coolant heat exchanger." *Id*. The Examiner then finds that Hatakeyama discloses a controller 70 programmed to, responsive to the refrigerant being circulated to the battery chiller 17 and the interior heat exchanger 14, actuate valving 37 "to the first position to increase condensing capacity of the heat pump subsystem (paragraph [0041])," but does not disclose actuating valving to increase condensing capacity of the heat pump subsystem *responsive to the refrigerant exceeding a threshold pressure*. *Id*.

The Examiner finds, however, that Kuroda discloses a controller 23 operating a three-way valve 18 "*in response to the refrigerant exceeding a threshold pressure* to increase condensing capacity of the heat pump subsystem." *Id.* at 12 (emphasis added) (citing Kuroda ¶¶ 71, 76, Figs. 4, 5). The Examiner concludes that it would have been obvious to modify Hatakeyama's system to incorporate Kuroda's refrigerant pressure-based valve control to "improve the thermal management and heat transfer between the refrigerant system and coolant system." *Id*.

Appellant refers to this as the Group VI rejection. Appeal Br. 3. Appellant argues claims 15 and 16 as a group. Appeal Br. 17–20. We select claim 15 as representative. Claim 16 stands or falls with claim 15.

Appellant argues, again, that the combination of Hatakeyama and Kuroda fails to teach a valve having "a first position arranged to circulate the coolant through the refrigerant-to-coolant heat exchanger and to the radiator so that heat from the refrigerant is dissipated by the radiator and a second position arranged to prevent the coolant from circulating to the refrigerant-to-coolant heat exchanger." Appeal Br. 18. Appellant argues that, as explained above regarding the rejection of claim 1, Hatakeyama fails to disclose circulating coolant "between the radiator 32 and the water cooler 16 so that heat can be transferred from the A/C loop 10 (alleged heat pump subsystem) to the radiator 32," such that "valve 37 does not include a first position arranged to circulate the coolant through the refrigerant-to-coolant heat exchanger (water cooler 16) and to the radiator 32." *Id.* Appellant further argues that Kuroda fails to cure the deficiencies of Hatakeyama. *Id.*

The Examiner responds that, as set forth in the response to Appellant's arguments regarding claim 1, Hatakeyama itself discloses a valve having "'*a first position arranged to circulate the coolant through the refrigerant-to-coolant heat exchanger and to the radiator so that heat from the refrigerant is dissipated by the radiator and a second position arranged to prevent the coolant from circulating to the refrigerant-to-coolant heat exchanger*.'" Ans. 12–13.

For the reasons set forth above in our analysis of Rejection II, we agree with the Examiner on this issue.

Appellant also argues that Hatakeyama fails to disclose "a controller program[m]ed to, responsive to the refrigerant being circulated to the battery chiller and the interior heat exchanger, actuate the valving to the first position to increase condensing capacity of the heat pump subsystem." According to Appellant, Hatakeyama's Figures 3 and 5 are the only Figures "that illustrate coolant circulating to both the battery chiller 18 and the water cooler 16," and do not show coolant being circulated to the radiator. Appeal Br. 18. Appellant further argues that Kuroda, likewise, fails to cure the deficiencies of Hatakeyama. *Id.* at 18–19 (referring back to arguments regarding patentability of claim 15 over the withdrawn rejection based on Takeuchi and Kuroda).

The Examiner responds that Hatakeyama discloses "a controller program[m]ed to, responsive to the refrigerant being circulated to the battery chiller and the interior heat exchanger, actuate the valving to the first position to increase condensing capacity of the heat pump subsystem." Ans. 14. The Examiner further responds that Kuroda is relied on only to disclose "a controller programmed to, responsive to the refrigerant exceeding a threshold pressure, actuate the valving to the first position to increase condensing capacity of the heat pump subsystem." Ans. 15.

Appellant's argument on this point appears to rely, again, on whether the Examiner erred in determining that Hatakeyama's paragraphs 41 and 103 disclose circulation through both the radiator 32 and the heat exchanger 16 of its coolant subsystem 30. For the reasons explained in our analysis of Rejection II, we discern no error in the Examiner's finding. Appellant's argument regarding the controller programming, therefore, is not persuasive.

Appellant further argues that, because neither Hatakeyama nor Kuroda recognize or address the design challenges faced by the inventor, the combination of references does not support an obviousness rejection. Appeal Br. 19.

The Examiner interprets this as a non-analogous art argument. Ans. 26–27. The Examiner responds that Hatakeyama is in the field of a refrigeration system for cooling a vehicle battery in vehicle, and is therefore in the same field of endeavor. *See* Ans. 27. Regarding Kuroda, the Examiner finds that Kuroda "is in the refrigeration field" and is therefore in the same field of endeavor. *Id.* at 28.

Appellant argues that the argument was not intended as an analogous art argument, but rather a contention that "an ordinary artisan first needs to recognize a problem before turning to additional prior art to cure it," and "it is well recognized that a reference which does not even mention the problem cannot suggest a solution, and is not a nonobviousness-defeating reference." Reply Br. 6 (citing *Leo Pharmaceutical Products, Ltd. v. Rea*, 726 F. 3d 1346, 1353 (Fed. Cir. 2013)). Appellant argues that the Examiner erred in finding that Hatakeyama "recognizes increasing condensing capacity with a radiator in Figure 5" (Ans. 5), because Hatakeyama's Figure 5 shows the cabin and battery being heated, and therefore does not teach a radiator being used to increase condensing capacity. Reply Br. 6 (citing Hatakeyama ¶ 74 (the cooling water is heated by the hot water heater 54 as necessary")). Appellant continues that Hatakeyama's paragraph 103 "fails to recognize the need to increase condensing capacity in some operating modes of a heat pump by recruiting a radiator as a secondary condenser." *Id.* at 7. Rather, Hatakeyama's paragraph 103 "discusses a heating mode in which the water condenser 16 is heating coolant for the heater core 35," and "discusses using the radiator 32 to reduce the coolant temperature but does not discuss that the A/C loop has difficulty condensing during this operating mode." *Id*.

Appellant's reliance on *Leo Pharmaceutical* is misplaced. The Federal Circuit limited *Leo Pharmaceutical* to a situation where the applied prior art did not provide any apparent reason for one of ordinary skill in the art to arrive at the claimed subject matter not only due to the failure of the applied prior art to recognize and address the problem found by Appellants, but also due to the divergent teachings and express disclaimer in the applied prior art that would have precluded one of ordinary skill in the art from arriving at such combination. This interpretation of *Leo Pharmaceutical* is consistent with *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 420 (2007), which states in relevant part:

> The first error of the Court of Appeals in this case was to foreclose this reasoning by holding that courts and patent examiners should look only to the problem the patentee was trying to solve. . . . The Court of Appeals failed to recognize that the problem motivating the patentee may be only one of many addressed by the patent's subject matter. The question is not whether the combination was obvious to the patentee but whether the combination was obvious to a person with ordinary skill in the art. Under the correct analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

Further, Hatakeyama recognizes that adding a radiator to a coolant loop by employing a heat exchange to share heat among coolant loops can increase condensing capacity when the A/C is on and the battery needs to be cooled. *See* Hatakeyama Figs. 7–8, ¶¶ 92–103.

Appellant next argues that the Examiner's proposed reason for combining Hatakeyama and Kuroda lacks a rational basis. *See* Appeal Br. 19. According to Appellant, the Examiner's reasoning is conclusory and therefore insufficient, because the Examiner fails to explain why adding Kuroda's valve control to Hatakeyama's system "would improve the thermal management and heat transfer of the system." *Id.* at 19–20. Appellant further argues that (1) Kuroda's valve control "occurs during a heating mode of the heat pump whereas claim 15 focuses on A/C mode," (2) Kuroda's valve "is used to control the amount of coolant through heat exchanger 11, which is acting as an evaporator, to modulate the amount of heat being added to the refrigerant system," whereas Hatakeyama's coolant circuit 100 does not contain an evaporator, and (3) "Kuroda teaches to not use valve control during A/C mode." *Id.* at 20. Appellant contends that the Examiner has not addressed these differences. *Id*.

The Examiner responds that Hatakeyama discloses that "when the temperature of the cooling water in the high temperature loop 30 exceeds the target temperature," coolant in the high temperature loop 30 is cooled by the radiator." Ans. 29 (citing Hatakeyama ¶ 103). Further, Hatakeyama's A/C loop 10 can cause overheating in its high temperature loop 30, such that the A/C loop 10 is under high thermal capacity due to increased refrigerant pressure therein. *Id*. When pressure in Hatakeyama's A/C loop 10 exceeds the threshold pressure, "the high thermal heat from the refrigerant loop need[s] to be released through condenser or radiators (32)." *Id*. According to the Examiner, adding Kuroda's valve control to Hatakeyama, would allow Hatakeyama's system to operate its valve 37 to switch the coolant to its radiator 32 based on comparison between the measured refrigerant pressure and the threshold pressure such that the heat absorbed in the heat exchanger 16 from the A/C loop 10 is released in the radiator 32 of the high water temp loop 30. *Id*. at 29–30. Thus, the Examiner concludes, a skilled artisan would understand that adding Kuroda's valve and valve control to Hatakeyama's system "would improve the thermal management and heat transfer of the system." *Id.* at 30.

Regarding Appellant's argument that Kuroda is directed to heating, not an A/C mode, or that Kuroda does not control valves during its A/C mode, the Examiner responds that "whether the system of Kuroda is operated in A/C mode or heating mode, the three-way valve is controlled to pass coolant to the engine cooling portion 40 (see figures 2 and 3)," and the controller "controls the three way valve operation in response to the refrigerant pressure exceed[ing a] threshold (see figures 4-5)." Ans. 31. The Examiner clarifies that Hatakeyama is combined with Kuroda to introduce Kuroda's valve to Hatakeyama's system for pressure control. *Id*. Further, the Examiner asserts, claim 15 does not recite an A/C mode, and Appellants argument are not directed to the actual language of claim 15. *Id*.

Appellant replies that claim 15 need not recite an A/C mode to "be pertinent to A/C mode," because "'A/C mode' is a general descriptor that explains that the outside heat exchanger (condenser) is rejecting heat outside the vehicle and the inside heat exchanger (evaporator) is absorbing heat to cool the cabin." Reply Br. 5. Further, "trigger conditions, 'responsive to the refrigerant being circulated to the battery chiller and the interior heat exchanger' in conjunction with the recited 'to increase condensing capacity' make clear to a person skilled in the art that claim 15 is about A/C mode." *Id.* at 5–6. Additionally, Appellant contends that their Specification "makes clear that inadequate condensing capacity, which is the problem being solved by the invention of claim 15, occurs during A/C mode." *Id.* at 6 (citing Spec. ¶¶ 42–43).

We discern no error in the Examiner's explanation of how Kuroda's valve and valve control could be added to Hatakeyama's system to improve thermal management and heat transfer therein. Appellant does not directly refute this detailed reasoning, or explain why it lacks a rational underpinning. That Kuroda's system differs from Hatakeyama's does not persuade us that Kuroda's teaching of excess pressure valve control inapplicable to Hatakeyama's system.

Further, we discern no reason why operating a valve in response to a pressure threshold being exceeded must be specific to an A/C mode for such teaching to be applicable to Hatakeyama's instance of increased temperature/pressure during a combined A/C and battery cooling mode as addressed in it "radiator circuit." For the reasons explained above, we are not persuaded that the Examiner's reasoning lacks a rational basis. We sustain the rejection of claim 15. Claim 16 falls with claim 15.

Rejection IV – Obviousness – Claims 24, 27

Regarding independent claim 24, similar to the findings regarding independent claims 1 and 15 above, the Examiner finds, *inter alia*, that Hatakeyama discloses "a heat-pump subsystem (10) including refrigerant, an expansion device (18), and a chiller (17) for cooling the traction battery (1; see figure 3)." Final Act. 12–13. The Examiner finds that Hatakeyama's expansion device 18 has "a first position (open position) in which the refrigerant is permitted to circulate to the chiller (17) and a second position (close position) in which the refrigerant is prevented from circulating to the chiller (17)." *Id.* at 13. The Examiner finds that Hatakeyama also discloses "a coolant subsystem (30) including a radiator (32), a valve (37) and a heat exchanger (16) arranged to selectively transfer heat from the heat pump subsystem (10) to the coolant subsystem (30; see figure 3)," and "a controller (70) programed to operate the valve (37) such that heat from the heat pump subsystem (10) is circulated to the radiator (32) in response to the expansion device (18) being in the first [or open] position." *Id.*

Appellant argues claims 24 and 27 together as Group VII. Appeal Br. 3. Appellant argues that independent claim 24 is patentable over Hatakeyama, Takeuchi, Carpenter, and Imamura for the same reasons that independent claim 20 is patentable. Appeal Br. 21. The Examiner withdrew the rejection of claim 20, but not claim 24. Ans. 2. We consider Appellant's arguments for the patentability of claim 20 as they pertain the claim 24.

Appellant argues that Hatakeyama does not disclose a controller programmed to operate a valve such that heat from the heat pump subsystem is circulated to the radiator in response to "'(ii) the expansion device being in the first position [chiller-active position],'" because Hatakeyama discloses several operating modes in Figures 3–6, and none of the disclosed modes show coolant circulating from the heat exchanger 16 to the radiator 32 while the chiller 17 is active. Appeal Br. 21. Appellant further argues that the remaining references fail to cure this deficiency of Hatakeyama. *Id*.

The Examiner responds that claim 24 only requires "'a controller program[m]ed to operate the valves such that heat from the heat pump subsystem is circulated to the radiator responsive to current of the charge port exceeding a threshold value," and does not require such circulation in response to "'(ii) the expansion device being in the first position'" as recited in claim 20. Ans. 32. Thus, the Examiner contends, Appellant's arguments regarding claim 20 are not persuasive for claim 24. *Id*.

We agree with the Examiner that, because the limitations of independent claim 24 differ from the limitations of claim 20, Appellant's argument directed to the limitation present only in claim 20 is not persuasive.

Appellant also argues that Takeuchi teaches away from the Examiner's proposed combination of references. Appeal Br. 21 (citing Takeuchi Fig. 26). Takeuchi's Figure 26 is a schematic of an embodiment "showing a flow of the refrigerant of the battery coolant circuit and a flow of the refrigerant in the refrigeration cycle in the air conditioning control operation." Takeuchi ¶ 48.

To teach away, a reference must "criticize, discredit, or otherwise discourage the solution claimed…." *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). We see no such criticism, discrediting, or discouraging of the Examiner's proposal to modify Hatakeyama's coolant subsystem to include valves as taught by Takeuchi to help to control the circulation of the fluid to particular components in the circuit.

For the reasons set forth above, we sustain the rejection of claim 24. Claim 27 falls with claim 24.

Rejection V – Obviousness – Claims 24–26

Regarding independent claim 24, the Examiner finds that Takeuchi discloses a heat pump subsystem 11 including refrigerant and a chiller 14 for cooling "a battery (1A; see figure 21)," and a coolant subsystem 10 including a radiator 24, valves 25, 26, and a heat exchanger 16 for transferring heat from the heat pump subsystem 11 to the coolant subsystem 10. Final Act. 16. The Examiner finds that Takeuchi also discloses, *inter alia*, a controller 13 operating the valves 25, 26 "such that heat from the heat pump subsystem (11) is circulated to the radiator (24)." *Id*. The Examiner finds that, although Takeuchi does not disclose controlling the valves 25, 26 "responsive to current of the charge port exceeding a threshold value," Imamura discloses controlling a three-way valve 486 to regulate coolant flow rate when "localized current exceeds a preset current value." *Id*. (citing Imamura ¶ 417, Figure 53).

The Examiner concludes that it would have been obvious to modify Takeuchi's system to incorporate Imamura's "valve control in response to the current comparison . . . to enhance the coolant flow control to dissipate heat generated on [the] battery due to applied current [being] higher than the threshold." Final Act. 16–17.

Appellant addresses this rejection as Group V. Appeal Br. 17. Appellant contends that claim 24 "focuses on . . . cooling the battery with the chiller during a battery charging where the current is above a threshold," during which "the battery is generating so much heat that it is overloading the condenser." *Id*. Appellant explains that additional condensing is needed to cool the charging battery, which is why claim 24 recites operating the valves "such that heat from the heat pump subsystem is circulated to the radiator responsive to current of the charge port exceeding a threshold value." *Id*.

Appellant argues that, rather than addressing battery *cooling*, Takeuchi teaches controls for *heating* a battery to supercool refrigerant, and "[a] battery can only be used as heat sink if the battery temperature is cold." Appeal Br. 17 (citing Takeuchi ¶¶ 267–70). Thus, Appellant argues, "to arrive at claim 24, [Takeuchi's] battery 1a has to be changed from the heat sink to the object to be cooled," and "[s]uch a modification would change the principle operation of *Takeuchi f*or the mode shown in Figure 23." Appeal Br. 17. Thus, Appellant argues, Takeuchi teaches away from battery cooling in the manner claimed. Appellant contends that Takeuchi's Figure 26 represents its battery cooling mode, and shows valve 20 closed "so that heat does not pass from the refrigeration cycle 11 to the radiator 24." *Id*. Appellant also argues that Imamura "fails to cure the above noted deficiencies of Takeuchi." Appeal Br. 17.

The Examiner responds that the rejection relies on the embodiment of Takeuchi's Figures 21–26, wherein Takeuchi "discloses control for cooling a battery." Ans. 9 (citing Takeuchi ¶¶ 55–57). According to the Examiner, Takeuchi explicitly discloses a process for "cooling the battery 1a based on heat exchange between refrigeration cycle 11 and coolant cycle 10 through intermediate heat exchanger 14[8] (see figures 21-26)." *Id.* (citing Takeuchi ¶¶ 253–58). The Examiner contends that, because Takeuchi explicitly discloses cooling its battery 1a, its principle of operation is not changed as proposed by Appellant. *Id*.

Appellant maintains the argument that "the combination of references fails to teach a controller programmed to operate the valves such that heat from the heat pump subsystem is circulated to the radiator." Reply Br. 5. Appellant contends that Takeuchi discloses "several different modes in Figures 22–26," and "only Figures 22 and 26 show the battery chiller 14 as active," and in those Figures, "the heat exchanger 16 is inactive." *Id*. Thus, according to Appellant, when Takeuchi's battery chiller is active, its heat exchanger is not active and there can be no exchange of heat when the batter chiller is active. *Id.* ("Figure 26 explicitly states that the valve 20 is closed (valve 20 controls coolant flow between the battery radiator 24 and the heat exchanger 16)"). According to Appellant, only Takeuchi's Figure 23 shows heat being transferred from the heat pump subsystem to the battery radiator

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[8] We assume that designation of Takeuchi's element 14 as the heat exchanger was a typographical error, and the Examiner intended to refer to Takeuchi's element 16 as the heat exchanger based on the Examiner's initial finding.

24, and in operating mode of Figure 23, the battery is used as a heat sink and is not cooled. *Id*.

Here again, the Examiner has the better position considering the disclosure of Takeuchi's paragraphs 263–270, which discuss Takeuchi's Figure 27, which "is a flowchart about the details of the coolant circuit control process." Takeuchi ¶ 263. The process detects the outside air temperature (S400), the exterior heat exchanger outlet temperature (S410), and the battery coolant temperature (S420). *Id.* at ¶¶ 264–266. If the temperature of the exterior heat exchanger (33) outlet side refrigerant is greater than the battery coolant temperature (S430), super-cooling of the refrigerant using the "heat exchanger 16 is performable." *Id.* at ¶¶ 266–267. Super-cooling increases the temperature of the battery 1a and its coolant. *Id.* at ¶ 268. The battery coolant temperature is, therefore, compared with a threshold (440) that is lower than a maximum permissible battery temperature during super-cooling (using heat exchanger 16) to ensure that the battery does not overheat. *Id.* at ¶¶ 268–269. During super-cooling, if the battery coolant temperature is determined to be greater than the outside air temperature (S460), the exterior heat exchanger 33 and radiator 24 are employed to cool the battery coolant by controlling valves 25 and 26, and opening valve 20 (S470). *Id.* at ¶¶ 270–271. Thus, when Takeuchi's A/C compressor is started after the battery cooling process, and while A/C is running, heat is added to the battery as the battery's coolant is used for A/C. Then, when battery gets hotter than the environment, valve 20 is opened to exchanger 16, such that both battery radiator 24 and exterior heat exchanger 33 can cool the battery coolant while A/C is on. This informs us that, even though the battery may be employed as a heat sink during A/C, it can also be cooled by both battery radiator 24 and exterior heat exchanger 33 while A/C is on.

Regarding Appellant's teaching away argument, as explained above, teaching away requires that a reference "criticize, discredit, or otherwise discourage the solution claimed…." *In re Fulton*, 391 F.3d at 1201. We discern no such criticism, discrediting, or discouragement of the claimed system in the disclosure of Takeuchi. Further, regarding Appellant's argument that the Examiner's proposed modification of Takeuchi would change Takeuchi's "principle operation" (Appeal Br. 17), this argument is not persuasive because it does not define Takeuchi's principle of operation or provide a detailed explanation of why/how that principle is changed.

Regarding Appellant's argument that Imamura relates to a fuel cell 12 that is cooled by a liquid coolant system and that Imamura's system for "cooling the fuel cell is not thermally connected to a heat pump subsystem" (Appeal Br. 17), the Examiner responds that Appellant is arguing the references individually, rather than addressing the proposed combination of Takeuchi and Imamura, wherein Takeuchi discloses the claimed system structure except for controlling valves responsive to the current of the charge port exceeding a threshold value, and Imamura discloses that, if localized current exceeds a preset current value, its control section 488 controls a valve 486 to regulate the flow rate of coolant. *Id.* at 9–10 (citing *In re Keller*, 642 F.2d 413 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091 (Fed. Cir. 1986)). The Examiner takes a position that "Takeuchi does not require **a heat pump subsystem** from Imamura to cure the deficiencies of Takeuchi to arrive the invention of claim 24." *Id.* at 10.

Regarding Appellant's argument that Imamura's valves do not affect heat transfer between a heat pump and a coolant system, the Examiner responds that the feature upon which Appellant relies (i.e., increasing condensing capacity of the heat pump) is not recited in claim 24. Ans. 11. The Examiner further responds that Takeuchi discloses the claimed system structure, and "only fails to disclose" controlling the valves responsive to current of charge port exceeding a threshold value, which is disclosed in Imamura. *Id*. We agree with the Examiner, because the proposed combination of Takeuchi and Imamura does not rely on Imamura's valves affecting heat transfer between a heat pump and a coolant system. For the above reasons, we sustain the Examiner's rejection of claim 24. Claims 25 and 26 fall with claim 24.

CONCLUSION

The Examiner's rejections are AFFIRMED as to claims 1, 6, 7, 15, 16, and 20–27.

DECISION SUMMARY

Claims Rejected	**35 U.S.C. §**	**Reference(s)/Basis**	**Affirmed**	**Reversed**
20–23	112, ¶ 1	Written Description	20–23	
1, 6, 7	102	Hatakeyama	1, 6, 7	
15, 16	103	Hatakeyama, Kuroda	15, 16	
24, 27	103	Hatakeyama, Takeuchi, Carpenter, Imamura	24, 27	
24–26	103	Takeuchi, Imamura	24–26	
Overall Outcome			**1, 6, 7, 15, 16, 20–27**	

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED