UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/740,636	06/16/2015	Jeffrey F. Perlak	81813US1; 67097-3236PUS1	6832

54549 7590 12/27/2019

CARLSON, GASKEY & OLDS/PRATT & WHITNEY
400 West Maple Road
Suite 350
Birmingham, MI 48009

EXAMINER	
BURKE, THOMAS P	

ART UNIT	PAPER NUMBER
3741	

NOTIFICATION DATE	DELIVERY MODE
12/27/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ptodocket@cgolaw.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JEFFREY F. PERLAK, JOSEPH B. STAUBACH, FREDERICK M. SCHWARZ, and JAMES D. HILL

Appeal 2019-003949
Application 14/740,636
Technology Center 3700

BEFORE JILL D. HILL, LEE L. STEPINA, and ARTHUR M. PESLAK, *Administrative Patent Judges.*

STEPINA, *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 12–14, 17, and 26. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

---

[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 United Technologies Corporation. Appeal Br. 2.

CLAIMED SUBJECT MATTER

The claims are directed to a temperature-modulated recuperated gas turbine engine. Claim 12, reproduced below with emphasis added, is illustrative of the claimed subject matter:

> 12. A recuperated gas turbine engine comprising:
>
> an engine core including a compressor section, a combustor section, and a turbine section;
>
> an exhaust duct downstream of the turbine section for receiving a hot turbine exhaust stream from the turbine section, the exhaust duct including a heat exchanger and a temperature-control module upstream of the heat exchanger, the temperature-control module operable to influence at least one of temperature and flow of the hot turbine exhaust stream, *the heat exchanger aft of the turbine section*;
>
> a compressor bleed line leading from the compressor section into the heat exchanger and a compressor return line leading from the heat exchanger into the engine core upstream of the combustor section; and
>
> a controller in communication with at least the compressor bleed line and the temperature-control module, *the controller configured to selectively regulate feed of compressed air through the compressor bleed line into the heat exchanger and configured to selectively regulate a temperature and flow of the hot turbine exhaust stream with respect to the heat exchanger*.

Appeal Br. 8 (Claims Appendix).

REFERENCES

The prior art relied upon by the Examiner is:

Name	Reference	Date
Templin	US 3,717,994	Feb. 27, 1973
Mackay	US 2010/0229525 A1	Sept. 16, 2010
Merchant	US 2010/0247304 A1	Sept. 30, 2010
Robinson	US 2013/0318988 A1	Dec. 5, 2013

REJECTIONS

I. Claims 12, 13, and 17 are rejected under 35 U.S.C. § 103 as unpatentable over Templin and Robinson. Final Act. 3.

II. Claim 14 is rejected under 35 U.S.C. § 103 as unpatentable over Templin, Robinson, and Mackay. Final Act. 5.

III. Claim 26 is rejected under 35 U.S.C. § 103 as unpatentable over Templin, Robinson, and Merchant. Final Act. 6.

OPINION

Rejection I

Location of Heat Exchanger

The Examiner finds that Templin discloses a recuperated gas turbine engine having most of the limitations of claim 12, including, *inter alia*, a turbine section and a heat exchanger. Final Act. 3. The Examiner notes that Templin does not disclose a temperature-control module upstream of the heat exchanger that is operable to selectively modulate a temperature and flow of the hot turbine exhaust stream with respect to the heat exchanger. *Id.* Nonetheless, the Examiner finds that Robinson discloses a temperature-control module (BY) operable to influence at least one of temperature and flow. *Id.* (citing Robinson ¶ 39, Fig. 1). The Examiner concludes that it would have been obvious to include a temperature-control module in the engine of Templin to guide the working medium through or past the turbine heat exchanger and to optimize heat exchanger flow, heat exchanger loss, and heat exchanger efficiency correlation, as well as the core engine thermodynamic efficiency. Final Act. 4 (citing Robinson ¶ 20).

Appellant argues that the Examiner "provides no reason for why it would have been obvious to locate Templin's heat exchanger 23 'aft of the

turbine section.'" Appeal Br. 3. Appellant asserts that the reason provided in the Advisory Action, mailed October 17, 2018, namely, that the relocation is "merely rearranging parts," is conclusory because the Examiner does not provide a motivation for doing so. *Id.* According to Appellant, because there is no benefit and because the Examiner has not established that the modification is possible, the proposed relocation would not have been obvious. *Id.* at 3–4.

In response, the Examiner notes that Templin and Robinson show different known arrangements for heat exchangers that heat fluid exiting a turbine. Ans. 4. According to the Examiner, it would have been an obvious matter of design choice to use the location aft of the turbine, as shown by Robinson, "since Appellant has not disclosed that the positioning of the heat exchanger solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with the placement of the heat exchanger of either Templin or Robinson." *Id.*

Appellant replies that because the Examiner has shifted the grounds from "rearrangement of parts" to "design choice," it is unclear what grounds is being used. Reply Br. 2. According to Appellant, in any event, the Examiner has not stated a benefit for relocating the heat exchanger, or whether the heat exchanger would fit or could be relocated in an automobile. *Id.*

Appellant's argument that the Examiner is using "shifting grounds for the § 103 rejection," does not apprise us of Examiner error. Listed under the heading "Rearrangement of Parts" in the MPEP is *In re Kuhle*, 526 F.2d 553 (CCPA 1975), which states that "the particular placement of a contact in a conductivity measuring device was held to be *an obvious matter of design*

choice." MPEP §2144(VI)(C). Thus, "rearrangement of parts" and "design choice" rely on the same legal premise. As to whether the rejection is proper (regardless of whether the Examiner phrases the rejection in terms of design choice or rearrangement of parts), as the Examiner correctly notes, the question is whether the position of the heat exchanger is for a particular purpose to perform a function that is different than in the prior art. In other words, no benefit is required. *See In re Gal*, 980 F.2d 717 (Fed.Cir.1992) (finding of "obvious design choice" precluded where the claimed structure and the function it performs are different from the prior art).

Here, Robinson has the same structure (aft of the turbine) and performs the same function of using turbine exhaust to heat gas flow in the heat exchanger (*see* Robinson ¶ 38). Given that Templin's heat exchanger is aft (downstream) of the turbine in a flow direction and uses turbine exhaust to heat the gas flowing to heat exchanger 23, the Examiner's use of design choice is appropriate. Moreover, Templin generally relates to "regenerative gas turbine engines," and is not limited to automobiles. Templin, 1:4–5. Appellant does not explain adequately why arranging the components of Templin as in another known regenerative gas turbine engine, namely, Robinson, which has the same order of flow, would not function in the same manner

Control of Exhaust

Appellant also argues that the rejection is improper because it fails to view the references as a whole in that Templin and Robinson take opposite approaches to managing a heat exchanger. Appeal Br. 4. According to Appellant, Templin manages the heat exchanger by controlling compressor air flow into the heat exchanger, whereas Robinson is controlling turbine

exhaust flow into the heat exchanger. *Id.* Appellant contends that because Templin already manages its heat exchanger by controlling compressor air flow, "the rejection fails to establish that there would be any need or benefit to controlling turbine exhaust flow in Templin to manage the heat exchanger." *Id.* Appellant asserts that, moreover, because "Templin wants to take full advantage of its heat exchanger … there is no reason to *reduce* the volume and/or temperature of the hot turbine exhaust stream flowing through Templin's duct 22 as taught by Robinson, and as the rejection seems to suggest." *Id.*

In response, the Examiner notes that Robinson is directed to operating the heat exchanger so that heat exchanger loss and core engine efficiency are optimized. Ans. 5. According to the Examiner, this teaching is consistent with Templin because both Templin and Robinson "are concerned with operating the gas turbine system in a way that may optimize the thermodynamic efficiency of the engine e.g., mitigating a loss of energy in the form of heat." *Id.* Explaining the rationale for the rejection, the Examiner states that "the modification of Templin is to include the concept of providing bypass means for optionally guiding exhaust from the turbine section to pass through the heat exchanger or around the heat exchanger in order to optimize thermodynamic efficiency, as taught by Robinson." *Id.*

In reply, Appellant contends that Templin avoids heat loss during a "cold start" to maximize fuel economy by bypassing heat exchanger 23 during starting, but that "100% of the flow from Templin's compressor bleed line passes through the heat exchanger 23 during normal operation." Reply Br. 2. According to Appellant, implementing a bypass "in Templin would cause Templin to *not* use the full capacity of its heat exchanger during

non-startup conditions. There is no reason for such a modification in Templin." *Id.* at 3.

The Examiner has the better position. "When determining the patentability of a claimed invention which combines two known elements, 'the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.'" *In re Beattie*, 974 F.2d 1309, 1311–12 (Fed. Cir. 1992) (quoting *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1462 (Fed. Cir. 1984)).

Here, although we appreciate Appellant's position that there would be no "need or benefit to controlling turbine exhaust flow in Templin to manage the heat exchanger" (Reply Br. 3), Templin would benefit from this arrangement in the same way that Robinson benefits. Specifically, Templin would continue to control the flow to the heat exchanger to bypass the heat exchanger during start-up using the compressor flow and then would bypass the turbine exhaust flow to the heat exchanger for improved thermodynamic efficiency as in Robinson.[2] Robinson discloses operating under stationary conditions or within the operating range within the operating limits, at the maximum combustor temperature "for a predefined power output, while maximum efficiency levels are preferably kept in one or multiple components of the engine," and using the bypass for high outputs, in particular full load, "in such a way that the heat exchanger flow, heat

[2] The Examiner's proposed modification is akin to providing adjustment of both the hot and cold water in a shower, rather than providing adjustment of only the cold water while requiring the hot water to remain at a fixed maximum setting.

exchanger loss, and heat exchanger efficiency correlation and the core engine cycle thermodynamic efficiency are or will be optimized." Robinson ¶¶ 19, 20; *see also* Ans. 5.

Templin discloses that "[t]he saving in fuel is very substantial, particularly from a relative point of view, at light load or idling conditions of operation of the engine." Templin, 1:18–21. Thus, Templin, similar to Robinson, maximizes thermodynamic efficiency at low load for fuel savings. Appellant's contention that adding a bypass after the turbine section would cause Templin to not use the full capacity of its heat exchanger (*see* Reply Br. 3) does not apprise us of Examiner error. Templin does not disclose that the full capacity of the heat exchanger must be used at all times, and Appellant does not explain why it should not be used less. Nor would failing to use the full capacity of the heat exchanger "ruin Templin's objective." Reply Br. 5. Templin's objective is to improve the starting characteristics of a regenerative gas turbine (*see* Templin, 1:5–6), and this functionality is maintained in the Examiner's proposed modification.

Given that Robinson discloses operating a heat exchanger bypass to optimize the core engine cycle thermodynamic efficiency, the Examiner's proposal to bypass the heat exchanger in Templin to optimize thermodynamic efficiency provides a benefit because it offers additional control of Templin's engine in that both the compressor flow and turbine exhaust can be controlled.

We have considered all of Appellant's arguments for the patentability of claim 12. However, we are not apprised of Examiner error. We therefore sustain the rejection of claim 12 as unpatentable over Templin and

Robinson. Appellant does not argue separately for the patentability of claims 13 and 17 (*see* Appeal Br. 5) and these claims fall with claim 12.

Rejection II

The Examiner considers that Templin and Robinson do not teach a controller configured with at least low and high power modes with respect to back pressure on the turbine section, as recited in claim 14. Nonetheless, the Examiner finds that Mackay discloses an operating mode in which the combustion turbine load is reduced by closing valves 402 and 406 and opening valve 404, and an operating mode where the combustion turbine load is moderate to high by closing valves 406 and 404 and opening valve 402 to bypass recuperator 202. Final Act. 6. The Examiner concludes that it would have been obvious to modify Templin to control air to the combustor during low and high load operating states as taught by Mackay "to provide increased efficiency and reduced environmental impact during reduced load operation (Paragraph 41) and to provide reduced nitrous oxide emissions during high load operation (Paragraph 42)." *Id.*

Appellant argues that Mackay does not disclose that "operation of the valve 402 is linked in any way to a 'high power mode.'" Appeal Br. 6. Appellant asserts that, moreover, the proposed modification would change the principle of operation of Templin because reducing nitrous oxide emissions would "correspondingly reduce the compressor airflow to Templin's heat exchanger, thereby providing for less heat recuperation, and reducing the 'very great improvement in fuel consumption' provided by Templin's regenerator." *Id.* (citing Templin, 1:4–21).

The Examiner responds that the proposed modification to Templin is based on control after starting and does not affect Templin's principle of operation of improved starting performance. Ans. 6.

In reply, Appellant argues that "the Examiner's response fails to address Appellant's argument." Reply Br. 4. According to Appellant, during Templin's "normal" operation, airflow is beneficially provided to the heat exchanger, and reducing the airflow "teaches against the proposed modification." *Id.*

We do not agree that the Examiner's modification changes the principle of operation of Templin, and we define the the principle as operating as a regenerator. Nothing in the prior art teaches that the proposed modification would have resulted in an "inoperable" device. In addition, Appellant's arguments regarding possible detrimental effects of reducing the airflow to the heat exchanger are unavailing. *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000) ("The fact that the motivating benefit comes at the expense of another benefit, however, should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another.").

Here, Mackay explicitly discloses that using the heat exchanger when the load is reduced "provides increased efficiency and reduced environmental impact through increased waste heat recovery and reduced carbon monoxide and unburned hydrocarbon emissions," whereas bypassing the heat exchanger under high load "provides reduced nitrous oxide ('NOx') emissions." Mackay ¶¶ 41–42; *see also* Final Act. 6. Mackay's disclosure is consistent with Templin, which discloses very substantial fuel saving "at

light load or idling conditions of operation of the engine." Templin, 1:18–21. On balance, the alleged negative effects of the Examiner's proposed combination, which occurs at high loads, whereas Templin discloses fuel saving "at light load," do not outweigh the proposed benefit of providing increased efficiency and reduced environmental impact during reduced load operation, and reduced nitrous oxide emissions during high load operation.

Appellant's argument that Mackay does not operate in a "high power mode" are unavailing. Appellant's Specification discloses that the term "power mode" relates to back pressure and that in the high power mode, the diverter valve is closed to bypass the heat exchanger. Spec. ¶¶ 46, 48. Similarly, in Mackay's operating mode for high turbine load, the flow bypasses the recuperator 202 (heat exchanger). Mackay ¶¶ 20, 42. Although Mackay does not use the same terminology as Appellant, the operating modes are the same.

We sustain the Examiner's rejection of claim 14 as unpatentable over Templin, Robinson, and Mackay.

Rejection III

Claim 26 depends from claim 12. Appellant does not argue separately for the patentability of claim 26. *See* Appeal Br. 6. For the same reasons discussed for claim 12, we sustain the rejection of claim 26 as unpatentable over Templin, Robinson, and Merchant.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Basis	Affirmed	Reversed
12, 13, 17	103	Templin, Robinson	12,13, 17	
14	103	Templin, Robinson, Mackay	14	
26	103	Templin, Robinson, Merchant	26	
Overall Outcome			12–14, 17, 26	

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