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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* JOHN A. SEGERSTROM

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Appeal 2018-008872  
Application 13/763,458  
Technology Center 3600

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Before MICHAEL C. ASTORINO, BRADLEY B. BAYAT, and  
AMEE A. SHAH, *Administrative Patent Judges*.

ASTORINO, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), the Appellant<sup>1</sup> appeals from the Examiner's decision to reject claims 1, 5–7, 10–15, 17, 18, and 20–27. We have jurisdiction under 35 U.S.C. § 6(b). An oral hearing was held on June 4, 2020, a transcript of which has been entered into the record (“Tr.”).

We AFFIRM IN PART.

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<sup>1</sup> We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. The Appellant identifies the real party in interest as Chevron U.S.A. Inc. Appeal Br. 1.

STATEMENT OF THE CASE

*Claimed Subject Matter*

Claims 1 and 15 are the independent claims on appeal. Claim 15, reproduced below, is illustrative of the claimed subject matter.

15. A system for recovering hydrocarbons, the system comprising:

a source for providing a fluid consisting essentially of water;

an oilfield water heater at a surface location having a capacity in a range of about 50 to 150 mmbtu/hr for receiving the fluid from the source and heating the fluid from the source to a temperature from 374°C to 1000°C at a pressure from 3205 to 10000 psia to generate a first supercritical dense phase fluid consisting essentially of water;

a delivery system configured to receive the first supercritical dense phase fluid consisting essentially of water and deliver the first supercritical dense phase fluid for injection directly into an underground hydrocarbon reservoir bearing hydrocarbons via a wellbore to heat the hydrocarbons of the underground hydrocarbon reservoir to reduce viscosity of at least a portion of the hydrocarbons of the underground hydrocarbon reservoir, wherein the first supercritical dense phase fluid is delivered through one or more venturi chokes installed in a wall of the wellbore to the underground hydrocarbon reservoir such that the first supercritical dense phase fluid drops in pressure and flashes across the one or more venturi chokes to a range of about 70% to 100% steam quality or superheated steam; and

a well configured to recover the heated hydrocarbons from the underground hydrocarbon reservoir that have been heated by the first supercritical dense phase fluid.

Appeal Br., Claims App.

*Rejections<sup>2</sup>*

Claims 1, 5, 6, 15, 17, and 20–27 are rejected under 35 U.S.C. § 103(a) as unpatentable over O’Brien (US 2009/0236092 A1, pub. Sept. 24, 2009) and Luke (US 4,648,455, iss. Mar. 10, 1987).<sup>3</sup>

Claims 7, 10–14, and 18 are rejected under 35 U.S.C. § 103(a) as unpatentable over O’Brien, Luke, and Morimoto et al. (*Effect of supercritical water on upgrading reaction of oil sand bitumen*, Journal of Supercritical Fluids 55, 223–231 (2010)- cited previously) (“Morimoto”) [www.elsevier.com/locate/supflu](http://www.elsevier.com/locate/supflu).

ANALYSIS

The Appellant argues the rejection of claims 1, 5–7, 10–15, 17, 18, and 20–27 together and further argues the rejection of claims 20, 21, 24, and 25. *See* Appeal Br. 7, 13. Many of the Appellant’s arguments rely on the premise that the process of independent claim 1 and the system of independent claim 15 require the use a supercritical dense phase fluid. *See, e.g.*, Reply Br. 1 (“O’Brien’s steam ≠ supercritical fluid (particularly at the

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<sup>2</sup> In the Advisory Action, mailed Dec. 21, 2017, the Examiner indicated that the rejection of claim 10 under 35 U.S.C. § 112(b), as presented in the Final Office Action, mailed Sept. 25, 2017, was overcome by the claim amendment, filed Nov. 27, 2017, and not maintained.

<sup>3</sup> Under this ground of rejection the Examiner includes claim 18 in the statement of the rejection, but does not list claim 18 in the body of the rejection. Final Act. 3–8. The Examiner rejects claim 18 in the statement of the rejection of the other ground of rejection and includes claim 18 in the body of the rejection. Therefore, we understand the Examiner’s inclusion of claim 18 in this ground of rejection as a minor oversight and have removed claim 18 from the statement of the rejection.

cited 200°C)”). As will be discussed below, the Appellant’s premise is valid for the process of independent claim 1, but the premise is not valid for the system of claim 15. For that reason, we have separated the analysis for independent claim 1 and its dependent claims from independent claim 15 and its dependent claims.

*Independent Claim 1 and Dependent Claims 5–7, 10–14, 20, 22, 24, and 26*

Independent claim 1 recites “[a] process for recovering hydrocarbons,” including

providing a first supercritical dense phase fluid consisting essentially of water to an underground hydrocarbon reservoir bearing hydrocarbons, wherein the first supercritical dense phase fluid consisting essentially of water is generated by heating water to a supercritical dense phase at a temperature from 374°C to 1000°C and a pressure from 3205 to 10000 psia in an oilfield water heater at a surface location.

Appeal Br., Claims App.

The Examiner finds that “heating water to a supercritical dense phase at a temperature from 374°C to 1000°C,” as recited in claim 1, corresponds with “heating water to a supercritical dense phase at a temperature from 200°C to 1100°C,” as taught by O’Brien. Final Act. 3 (citing O’Brien ¶¶ 16, 17, 21, 54–57, Figs. 1–2). In making this finding, the Examiner relies on only one embodiment taught by O’Brien, namely the embodiment that injects steam. See Ans. 4. This “steam embodiment” that the Examiner relies on is shown in O’Brien’s Figures 1 and 2, where steam is injected into

an oil sands formation.<sup>4</sup> O'Brien ¶¶ 3, 41, 56. Accordingly, the Examiner's rejection does not rely on other embodiments taught by O'Brien, including the embodiment shown in Figure 3 where supercritical material 436 is injected into an oil sands formation.<sup>5</sup> *Id.* ¶ 64.

The Appellant argues that the temperature of the fluid for O'Brien's "steam embodiment" does not correspond to the claimed "temperature," and therefore, is not a supercritical fluid. Reply Br. 1. The Appellant's argument is persuasive.

O'Brien, at paragraph 16, describes with added emphasis:

In the method and system for extracting hydrocarbon products from oil sands it is contemplated that supercritical material will be injected into the formation to produce fracturing and porosity that will maximize the production of useful hydrocarbons from the oil sands formation. The use of a nuclear reactor may reduce energy input cost as compared to employing finished hydrocarbons to produce thermal energy and/or electricity. *Nuclear reactors produce the supercritical temperature in the range from 200° to 1100° C[] (depending on the material to be used)* necessary for increasing the pressure used in the fracturing process compared to conventional hydro fracturing and/or the use of explosives. In oil sand formations, the maximization of fracturing is advantageous to hydrocarbon accumulation and recovery.

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<sup>4</sup> "[Figure] 1 is a schematic diagram of a method and system for producing energy products from oil sands using a nuclear energy source in accordance with the principles of the present invention." O'Brien ¶ 28 (emphasis omitted). "[Figure] 2 is a schematic diagram of the components of the method and system shown in [Figure] 1, in the injection stage." *Id.* ¶ 29 (emphasis omitted).

<sup>5</sup> "[Figure] 3 is a schematic diagram of an alternate embodiment of the components of the method and system for fracturing oil sands formations shown in [Figure] 1." O'Brien ¶ 30 (emphasis omitted).

Here, O'Brien teaches the capability of a nuclear reactor to produce a supercritical temperature for water, which is above a minimum temperature of 374°C at a minimum pressure of 3,205 psi. *See* Spec. 5:8–11; Tr. 3:11–14; Ans. 4 (citing O'Brien ¶¶ 16, 56). However, the capability of O'Brien's nuclear reactor to produce a supercritical temperature of water is a separate matter from the actual temperature of steam in O'Brien's "steam embodiment." To the extent that O'Brien discloses the temperature of the fluid in the "steam embodiment," O'Brien does so by example. O'Brien ¶¶ 86–87. The example explains that steam is injected at temperatures of approximately 300°C or greater for a period of weeks to months. *Id.*

In view of the foregoing, we determine that the Examiner fails to adequately explain on this record — using evidence and/or technical reasoning — how O'Brien's "steam embodiment" corresponds to the step of "heating water to a supercritical dense phase at a temperature from 374°C to 1000°C," as recited in claim 1.

Further, we note that the Examiner determines:

Regarding claim 1, O'Brien discloses wherein the temperature is 200°C to 1100°C ([0016]) and wherein the pressure is from 7,252 to 72,519 psi ([0056]). Although silent to wherein the temperature is "from 374°C to 1000°C" and the pressure is "from 3205 to 10000 psia," as instantly claimed, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide for a temperature and pressure as claimed insofar as because it has been held[.] "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F. 2d 454, 456. . . (CCPA 1955).

Final Act. 4. This determination is based on the inadequately supported finding that the process particular to O'Brien's "steam embodiment" heats

steam in the temperature range of 200°C to 1100°C and does not remedy the deficiency in the Examiner's rejection.

Lastly, the Examiner fails to rely on the teachings of Luke and/or Morimoto in any manner that would remedy the deficiency in the Examiner's rejection.

In view of the foregoing, we do not sustain the Examiner's rejection of independent claim 1 and the rejections of claims 5–7, 10–14, 20, 22, 24, and 26, which depend therefrom.

*Independent Claim 15 and Dependent Claims 17, 18, 21, 23, 25, and 27*

The system of claim 15 does not require water to be in a supercritical dense phase at a particular temperature and pressure. *See* Appeal Br., Claims App. For example, claim 15 recites, “an oilfield water heater . . . *for* . . . heating the fluid from the source to a temperature from 374°C to 1000°C at a pressure from 3205 to 10000 psia to generate a first supercritical dense phase fluid consisting essentially of water.” *Id.* (emphasis added). This recitation is directed to the oilfield water heater's capability to heat fluid to a particular temperature and pressure. *See* Tr. 4:14–5:25. The recitation does not require a step of heating a fluid (e.g., water) to a supercritical dense phase at a temperature from 374°C to 1000°C.

The Appellant's arguments against the Examiner's rejection of claim 15 heavily rely on the premise that the system of claim 15 requires heating water to a supercritical dense phase temperature and pressure. *See* Appeal Br. 8–12; Reply Br. 1–8. For example, the Appellant argues that “O'Brien teaches away from the limitation of heating to a supercritical dense phase at ‘a pressure from 3205 to 10000 psia’ as required in independent



Claims 1 and 15.” Reply Br. 1. The Appellant, from a similar posture, argues that “[t]he [i]nstant [i]nvention [h]as [s]urprising and [u]nexpected [r]esults [a]s [p]roven by Appellant’s [p]rior [u]nrebutted September 10, 2017 Declaration.” Appeal Br. 11 (emphasis omitted). The Appellant’s arguments are not persuasive of Examiner error.

First, the Appellant’s arguments are particular to the requirements of the process of claim 1 and not the requirements of the system of claim 15. *See, e.g., id.* (“The first supercritical dense phase fluid of independent claim 1 has produced unexpected results.”). As discussed above, the premise that claim 15 requires heating water to a supercritical dense phase at a temperature from 374°C to 1000°C is not valid. Similarly, the premise that claim 15 requires heating water to a supercritical dense phase at a pressure from 3205 to 10000 psia is likewise not valid. Accordingly, the arguments are not persuasive of Examiner error because they are not commensurate in scope with the subject matter of claim 15.

Second, O’Brien teaches the capability of a nuclear reactor to produce a supercritical temperature and pressure for a fluid consisting essentially of water, which is in the claimed temperature and pressure ranges. *See* Ans. 4 (citing O’Brien ¶¶ 16, 56 (“200–1100° and 7252–72519 psia”)). We note that the Appellant does not include an assertion that O’Brien’s “steam embodiment” lacks an “oilfield water heater” as required by claim 15. We appreciate that Appellant’s point that O’Brien discloses numerous embodiments, including one in which high pressure pumps 430 deliver supercritical material. *See* Appeal Br. 8; Reply Br. 3–4. However, none of O’Brien’s embodiments criticize, discredit, or otherwise discourage investigation into the use of the claimed invention. *See DePuy Spine, Inc. v.*

*Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (“A reference does not teach away, however, if it merely expresses a general preference for an alternative invention but does not ‘criticize, discredit, or otherwise discourage’ investigation into the invention claimed.”) (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)).

Third, the Appellant’s arguments appear to heavily rely on the premise that the Examiner is relying on the embodiment shown in O’Brien’s Figure 3 where supercritical material 436 is injected into an oil sands formation by use of high pressure pump 430 for fracturing purposes. *See, e.g.*, Reply Br. 4, 6–7. As discussed above, the Examiner solely relies on the “steam embodiment,” as shown in Figures 1 and 2, for the rejection of claim 15. *See supra*. Accordingly, the Appellant’s arguments in that regard are not particular to the Examiner’s rejection of claim 15 and therefore, not persuasive.

Fourth, to rebut the Examiner’s rejection, the Appellant presents a declaration from the inventor, John A. Segerstrom (“Segerstrom Declaration”), as evidence. We note that the statements made in the Segerstrom Declaration are like the Appellant’s arguments in that they heavily rely on the premise that the system of claim 15 requires heating water to a supercritical dense phase temperature and pressure, and appear to rely on the premise that the Examiner is relying on the embodiment shown in O’Brien’s Figure 3, rather than on O’Brien’s “steam embodiment,” as shown in Figures 1 and 2. Segerstrom Declaration, *passim*. The Appellant presents arguments based on statements made in the Segerstrom Declaration. *See* Appeal Br. 10–12; Reply Br. 5–6.

For example, the Appellant argues that “[t]he high density [of water] leads to the unexpected result of an oilfield type steam generator to be able to produce the first supercritical dense phase fluid of independent claim 1 without exceeding heat flux capacity of the heater tubes.” Appeal Br. 11 (citing Segerstrom Decl. ¶ 6); *see id.* at 11–12 (citing Segerstrom Decl. ¶ 7). In addition to the reasons discussed above, this argument is not persuasive because claim 15 does not require heater tubes with any particular heat flux capacity or thermal efficiency. *See* Ans. 5. Also, the Appellant’s argument is particular to “water,” rather than the claimed fluid, i.e., “a fluid consisting essentially of water.” Similarly, the Appellant contends that the “supercritical dense phase fluid of independent claim 1 can be distributed on the surface and subsurface to venturi chokes through much smaller surface and subsurface distribution piping, casing and tubing, and maintain latent heat targets as with conventional two-phase steam.” Appeal Br. 12 (citing Segerstrom Decl. ¶ 8); *see* Reply Br. 5, 6. The Appellant’s contention is not persuasive. In addition to the reasons discussed above, the argument is not commensurate in scope with the claimed subject matter because claim 15 does not require piping of any particular size or made of any particular material. Notably, the Appellant points out that claim 23, which depends from claim 15, does require “high pressure piping having a diameter in a range of about 6 to 61 cm.” *See* Appeal Br. 12; Reply Br. 5; Segerstrom Decl. ¶ 8. However, the arguments based on the statements in the Segerstrom Declaration lack quantitative measurements (*see* Tr. 12:25–13:20) and/or comparative data to be able to ascertain whether the results would have been understood as surprising or unexpected. Therefore, the evidence presented is not strong evidence of non-obviousness.

The Appellant also contends that “[t]his less expensive and simpler SCW system thus meets a long standing unmet need for easy and consistent latent heat distribution to injector wellheads and into the reservoir.” Appeal Br. 12. The Appellant’s contention is not persuasive because it fails to be supported by evidence that establishes on the record that an art-recognized problem existed in the art for a long period of time without solution, that the need was persistent, or that others tried to meet the need and failed.

We have considered the Appellant’s remaining arguments in the Appeal Brief and the Reply Brief and determined that they are not persuasive of error. Thus, we sustain the Examiner’s rejection of independent claim 15 and claims 17, 23, and 27, which depend therefrom.

For the rejection of claims 21 and 25, the Appellant appears to argue that the Examiner is relying on an embodiment in O’Brien in which the minimum pressure is 14,504 psi. *See* Appeal Br. 13; Reply Br. 8. This embodiment referenced by the Appellant is not the one that the Examiner relies on. Ans. 5–6. As discussed above, the Examiner relies on the “steam embodiment” as shown in Figures 1 and 2, where the minimum disclosed pressure is 7,252 psi (i.e., 50 MPa). Final Act. 5 (citing O’Brien ¶ 56); Ans. 4 (citing O’Brien ¶ 56). Accordingly, the Appellant’s argument is unpersuasive as it relies on a faulty premise. Therefore, we sustain the Examiner’s rejection of claims 21 and 25.

The remaining rejection of claim 18, which depends from claim 15, under a combination of O’Brien, Luke, and Morimoto is not argued separately. For the reasons discussed above, we sustain the Examiner’s rejection of claim 18.

CONCLUSION

In summary:

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>References/Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1, 5, 6, 15, 17, 18, 20–27	103(a)	O’Brien, Luke	15, 17, 21, 23, 25, 27	1, 5, 6, 20, 22, 24, 26
7, 10–14, 18	103(a)	O’Brien, Luke, Morimoto	18	7, 10–14
<b>Overall Outcome</b>			15, 17, 18, 21, 23, 25, 27	1, 5–7, 10–14, 20, 22, 24, 26

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

AFFIRMED IN PART