NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

FATIGUE FRACTURE TECHNOLOGY, LLC,
Appellant

v.

NAVISTAR, INC.,
Appellee

2020-1094

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2018-00853.

Decided: December 28, 2020

MEREDITH MARTIN ADDY, AddyHart P.C., Atlanta, GA, argued for appellant. Also represented by ROBERT PATRICK HART, Chicago, IL.

CRAIG D. LEAVELL, Barnes & Thornburg LLP, Chicago, IL, argued for appellee.

Before WALLACH, TARANTO, and CHEN, *Circuit Judges*.

TARANTO, *Circuit Judge*.

Fatigue Fracture Technology, LLC (FFT) owns U.S. Patent No. 7,143,915, which concerns processes for fracturing connecting rods. In March 2018, Navistar, Inc. sought an inter partes review of claims 1, 7, 9, and 10 of the '915 patent. The Patent Trial and Appeal Board instituted the requested review and determined that the four claims are unpatentable on four grounds, each ground applicable to all four claims: anticipation by the Brovold patent, obviousness based on the Cavallo patent combined with the Brovold patent, obviousness based on the Cavallo patent combined with the Bayliss patent, and obviousness based on the Cavallo patent combined with the Brovold and Bayliss patents. *See Navistar, Inc. v. Fatigue Fracture Tech., LLC*, IPR2018-00853, 2019 WL 4126205 (P.T.A.B. Aug. 29, 2019) (*Final Written Decision*). On appeal, we affirm the Board's determination of unpatentability based on Cavallo and Bayliss. We do not reach (or, therefore, either question or approve) the Board's other unpatentability determinations.

I

A

The '915 patent concerns connecting rods that connect the crankshaft to the piston in internal-combustion engines. A connecting rod shown in the patent and prior art has the shape of a soap-bubble wand or an unstrung tennis racket—with a linear portion and a ring-shaped head, the hollow of the ring (the bore) to hold the crankshaft. A common method for manufacturing such a connecting rod is to produce it initially in one piece, then to fracture it across the bore to form two pieces (cap and rod) that may be assembled together around the crankshaft. *See* J.A. 1823. An objective when designing or choosing a process for the fracturing step is to minimize plastic deformation at the split, because such deformation can make it difficult to fit the two parts back together smoothly. *Id.* When the parts

do not fit back together smoothly, the result can be a defective fit between the connecting rod and crankshaft, which can cause friction-generating movement that degrades components over time or creates sparks during engine operation. *See* J.A. 372.

Titled "Process to Fracture Connecting Rods and the Like with Resonance-Fatigue," the '915 patent describes purported improvements in the fracturing process. The patent observes that many of the known methods for fracturing connecting rods rely on applying an "outward pressure" to the bore until "the generated stresses are high enough to fracture the connecting rod." '915 patent, col. 1, lines 30–33. The patent then notes a challenge: Because "connecting rods are made of high strength materials, the fracturing force is required to be of big magnitude," *id.*, col. 1, lines 39–40, but larger forces tend to produce more plastic deformation, with its undesirable results, *id.*, col. 1, lines 41–50.

The patent proposes a solution based on applying small magnitude forces repeatedly rather than applying a large fracturing force once. *Id.*, col. 3, lines 1–14. Specifically, the patent teaches using a cyclic force to fatigue the connecting rod, thereby creating cracks and micro-cracks, and only then fracturing the rod into two pieces by applying a dynamic force. *Id.*, Abstract; *id.*, col. 3, lines 16–24; *id.*, col. 4, lines 35–43; *id.*, col. 7, lines 20–36. Independent claim 1 is representative. It recites:

> 1. A process for the fracture separation of a part having a cylindrical bore passing therethrough into a first portion and a second portion, the cylindrical bore having a central axis, the part having two opposed sides proximate to the intersection of a predetermined fracture plane passing through the cylindrical bore and the part, the process including the steps of:

a) optionally applying at least one pre-stressing force to at least one of the first portion, the second portion and said sides of said part, said at least one pre-stressing force selected from the group compr[]ising:

> i) a longitudinal pre-stressing force applied to one of the first portion and the second portion relative to the other of the portion and the second portion, said longitudinal pre-stressing force being applied in a direction substantially perpendicular to said predetermined fracture plane, and
>
> ii) a lateral pre-stressing force applied to each of the opposed sides of the part, each of said lateral pre-stressing forces being applied along substantially straight line that is substantially parallel to the predetermined fracture plane and substantially perpendicular to the central axis, where at any time instant, each of the lateral pre-stressing forces being substantially equal in magnitude and acting opposite in direction to one another;

b) applying at least one fatigue force to at least one of the first portion and the second portion, said at least one fatigue force being selected from the group comprising:

> i) a longitudinal cyclic force applied to one of the first portion and the second portion relative to the other of the first portion and the second portion, said longitudinal cyclic force being applied in a direction substantially perpendicular to said predetermined fracture plane, and

> ii) a lateral cyclic force applied to each of the opposed sides of the part, each of the said lateral cyclic forces being applied along a substantially straight line that is substantially parallel to the predetermined fracture plane and substantially perpendicular to the central axis, where at any time instant, each of said lateral cyclic forces being substantially equal in magnitude and acting opposite in direction to one another;
>
> c) applying at least one dynamic force to one of the first portion and the second portion relative to the other of the first portion and the second portion, said at least one dynamic force being applied in a direction substantially perpendicular to said predetermined fracture plane, said dynamic force being applied to fracture the part into the first portion and the second portion so as to separate the first portion from the second portion substantially along said predetermined plane.

Id., col. 6, line 61, through col. 7, line 45. Claims 7, 9, and 10 depend on claim 1 and therefore incorporate all of claim 1's limitations. FFT has not made any argument on appeal that distinguishes the dependent claims from claim 1.

B

In March 2018, Navistar filed a petition for an inter partes review of claims 1, 7, 9, and 10 of the '915 patent. J.A. 1358–59. In its petition, Navistar challenged claim 1 on eight grounds. J.A. 1345–46. Navistar relied on three key prior-art references: U.S. Patent No. 4,754,906 (Brovold); U.S. Patent No. 5,699,947 (Cavallo); and U.S. Patent No. 3,155,300 (Bayliss).

Brovold describes and claims a system for manufacturing a connecting rod that includes breaking it into two parts. *See* Brovold, col. 1, lines 6–11. Brovold discloses a

fracturing tool that is "adaptable for either brittle fractures using one load cycle or for cycling the members to cause fatigue breaks, generally under a low number of cycles." *Id.*, col. 2, lines 26–33.

Cavallo teaches how to fracture connecting rods by using a hybrid hydraulic and mechanical system, in which the hydraulic component provides a pre-separation force and the mechanical component applies the separation force. *See* Cavallo, col. 2, line 66, through col. 3, line 13. Cavallo's figure 4 shows the forces applied during the process: first, a clamping pressure is applied hydraulically, followed by "pre-loading" pressures applied hydraulically, and a final, mechanical force that actually parts the "cap" from the "rod." *See id.*, fig.4. Cavallo does not discuss applying the pre-loading pressure, or any pressures, in a cyclic manner.

Cavallo refers to Brovold as a "typical hydraulic parting procedure," *id.*, col. 2, lines 13–22, and notes:

> The greatest drawback of this known hydraulic parting method is the relatively slow rate at which the pressure of the hydraulic fluid fed into said hydraulic cylinder reaches the value required to part the cap. The material of the cap thus undergoes yielding and elongation, which negatively affect, as mentioned above, both the microcrystalline structure of the parting sections and the geometry of the connecting rod being machined, causing problems in the subsequent assembly of said cap.

Id., col. 2, lines 23–31.

Bayliss discloses, more generally, a method of breaking off a piece of metal bar stock by "providing a sharp notch to weaken the bar in the position in which it is to be parted, and applying alternating stresses to induce rapid fatigue failure of the bar at the weakened section." Bayliss, col. 1, lines 11–19. Bayliss also teaches that extreme cooling of

the region to be parted is advantageous. *Id.*, col. 1, lines 39–53 ("[I]t is arranged . . . for the alternating stresses to be applied while at least the zone to be fractured of the bar stock is maintained at a temperature in the region of, but preferably below, the brittle/ductile transition temperature of the metal.").

The Board instituted an inter partes review in September 2018. *Navistar, Inc. v. Fatigue Fracture Tech., LLC*, IPR2018-00853, 2018 WL 4362766 (P.T.A.B. Sept. 12, 2018) (*Institution Decision*). In instituting the review, the Board construed "fatigue force" to mean "a time-varying force that causes fluctuations of stresses that weaken the part," "cyclic force" to mean "a force that regularly repeats between a maximum value and a minimum value," and "dynamic force" to mean "a force that changes with time." *Id.* at *4–7 (cleaned up). The Board used the same constructions in its final decision. *Final Written Decision*, 2019 WL 4126205, at *5. Neither party disputed those constructions before the Board. *Id.*

In August 2019, the Board issued its final written decision. The Board determined that Navistar had shown by a preponderance of the evidence that claim 1 is unpatentable on several grounds—among them, obviousness based on Cavallo combined with Bayliss. *Id.* at *24. In agreeing with Navistar on that ground, the Board noted that Cavallo discloses a three-step process for fracturing connecting rods: apply pre-clamping forces hydraulically, apply pre-loading forces hydraulically, and apply a parting force mechanically. *Id.* at *12; Cavallo, col. 2, line 66, through col. 3, line 13. The Board found that Cavallo's pre-loading forces are not applied in a cyclic manner so as to meet the fatigue-force limitation of claim 1. *Final Written Decision*, 2019 WL 4126205, at *13. But Bayliss discloses cyclic fatigue forces that are applied to weaken a metal bar, which, the Board noted, was conceded by FFT's expert. *Id.* at *17. The Board found that a relevant artisan would have been motivated to modify the system in Cavallo by replacing its

pre-loading force with the cyclic force of Bayliss, *id.* at *17–19, rendering the challenged claims of the '915 patent unpatentable for obviousness.

FFT timely appealed. J.A. 2615; 35 U.S.C. §§ 141(c), 319; 37 C.F.R. § 90.3. We have jurisdiction under 28 U.S.C. § 1295(a)(4)(A).

II

We review the Board's ultimate obviousness determination de novo but the factual findings for substantial evidence. *Personal Web Techs., LLC v. Apple, Inc.*, 917 F.3d 1376, 1381 (Fed. Cir. 2019). Factual determinations "include findings as to the scope and content of the prior art, the differences between the prior art and the claimed invention, the level of ordinary skill in the art, the presence or absence of a motivation to combine or modify with a reasonable expectation of success, and objective indicia of nonobviousness." *Ariosa Diagnostics v. Verinata Health, Inc.*, 805 F.3d 1359, 1364 (Fed. Cir. 2015). In conducting substantial-evidence review, we ask "'whether a reasonable fact finder could have arrived at the agency's decision, . . . taking into account evidence that both justifies and detracts from an agency's decision.'" *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1366 (Fed. Cir. 2016) (quoting *In re Gartside*, 203 F.3d 1305, 1312 (Fed. Cir. 2001)).

FFT has not shown reversible error in the Board's determination that claim 1 is unpatentable for obviousness over Cavallo and Bayliss. FFT's expert (Dr. Sheldon Mostovoy) conceded that Cavallo's disclosure of the parting force teaches the dynamic force required by limitation (c) of claim 1 of the '915 patent. *See* J.A. 605, 616–19; *see also* J.A. 2608. In addition, Bayliss teaches the cyclic fatigue-force limitation, disclosing "applying alternating stresses to induce rapid fatigue failure." Bayliss, col. 1, lines 15–19. Together then, Cavallo and Bayliss disclose the two forces at issue. Moreover, Dr. Mostovoy admitted that this

combination results in claim 1 of the '915 patent. *See* J.A. 605, 627–29.

The Board also found that a relevant artisan would have had a motivation to combine Cavallo and Bayliss by modifying Cavallo to use the longitudinal cyclic fatigue force of Bayliss. *Final Written Decision*, 2019 WL 4126205, at *17–19. The Board accepted Navistar's contention that use of the Bayliss forces, compared to Cavallo's pre-loading forces, would weaken the bar for easier parting. *Id.* at *17–18. That finding is supported by substantial evidence, which reflects similarities of structure and purpose between Cavallo and Bayliss. *See* J.A. 623–26, 662–63 (Mostovoy Deposition); *see also* J.A. 213–14, 293–95 (Declaration of Navistar's Expert, Mr. Thomas Brovold).

FFT makes two arguments as to why a relevant artisan would not have been motivated to combine Cavallo and Bayliss. Neither is sufficient to disturb the Board's finding.

First, FFT argues that the process disclosed in Bayliss is too slow, stating that Cavallo describes Brovold's hydraulic parting procedure as too slow and that the process taught in Bayliss is even slower than the process taught in Brovold. FFT Opening Br. at 54. Specifically, FFT cites testimony by Navistar's expert, Mr. Brovold, that the manufacturing time in Brovold could be 30 seconds, J.A. 737–38, and Navistar's statement that Bayliss describes a process that can take 17.5 minutes to fracture the bar, Bayliss, col. 2, lines 48–52. But the Board had a sufficient basis to reject this argument, as it did. *See Final Written Decision*, 2019 WL 4126205, at *19. Claim 1 of the '915 patent does not require the parting process to be completed within any particular time, as FFT's expert admitted. *Id.* (citing Ex. 1068, 36:15–23, 37:18–24, 99:10–16). Moreover, the process described in claim 1 can be applied to a "wide variety of connecting rods types and sizes," '915 patent, col. 4, line 65, through col. 5, line 3, and FFT's expert conceded that some connecting rods are smaller than the particular bar

featured in Bayliss (and could therefore be fractured more quickly), *see Final Written Decision*, 2019 WL 4126205, at *19 (citing J.A. 486 and Ex. 1068, 101:16–102:24). On those bases, the Board reasonably rejected reliance on the Bayliss 17.5-minute example as undermining the make-parting-easier motivation to combine Bayliss with Cavallo.

Second, FFT argues that the Board's finding of motivation to combine is undermined by Bayliss's disclosure of extreme cooling of the rods being split. FFT Opening Br. at 55–56. FFT relies on *In re Fine*, a case in which this court rejected a "hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." 837 F.2d 1071, 1075 (Fed. Cir. 1988). But *Fine* is materially different from this case, at least because in *Fine* one of the two prior-art references to be combined warned against using the teachings of the other. *Id.* at 1074–75. Here, Cavallo contains no such warning; specifically, it does not discuss cooling or temperature more generally. Moreover, the Board correctly observed that the '915 patent does not preclude the use of cooling in combination with the application of cyclic fatigue forces. *Final Written Decision*, 2019 WL 4126205, at *18; *see also* J.A. 418 (FFT's expert admitting that claim 1 does not require the absence of cooling); J.A. 566–68 (same). On those bases, the Board reasonably rejected FFT's cooling-based argument against the motivation to make the Bayliss-Cavallo combination at issue.

In short, the Board's finding that Bayliss teaches claim 1's cyclic fatigue-force limitation and that a relevant artisan would have been sufficiently motivated to combine Cavallo and Bayliss is supported by substantial evidence. We therefore affirm the Board's determination that Cavallo combined with Bayliss renders claim 1 unpatentable for obviousness. Given that no separate argument has been presented to us about the dependent claims, this conclusion suffices for us to affirm the Board's decision.

III

The decision of the Board is affirmed.

AFFIRMED