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LANDO & ANASTASI, LLP
ONE MAIN STREET, SUITE 1100
CAMBRIDGE, MA 02142

EXAMINER
CARTER, MICHAEL W

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BIEN CHANN, DANIEL J. RIPIN, TSO YEE FAN,
and ANTONIO SANCHEZ-RUBIO

Appeal 2015-004834
Application 12/837,530
Technology Center 2800

Before CATHERINE Q. TIMM, JAMES C. HOUSEL, and
JENNIFER R. GUPTA, *Administrative Patent Judges*.

GUPTA, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal[1] under 35 U.S.C. § 134(a) from the Examiner's decision[2] finally rejecting claims 1–17. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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[1] Appellants identify the real party in interest as Massachusetts Institute of Technology. Appeal Brief filed August 12, 2014 ("App. Br."), 3.
[2] Final Office Action mailed December 10, 2013 ("Final Act.").

The subject matter on appeal relates to laser systems employing plural amplifiers arranged to reduce the effects of non-linearities on gain-bandwidth and power output. Spec. 1, ll. 11–13. Claims 1 and 12, reproduced below, are illustrative of the claims on appeal.

> 1. A laser system, comprising:
>
> a seed oscillator, having a seed output;
>
> dispersive optics, operative to receive the seed output and divide the seed output into spectrally separate seed components;
>
> *an array of individually addressable, phase adjustable laser amplifiers* corresponding to the spectrally separate seed components, each laser amplifier receiving as its seed one of the spectrally separate seed components and producing one of the spectrally separate amplified components; and
>
> *phase actuators controlling the individually addressable, phase adjustable laser amplifiers*;
>
> wherein the dispersive optics are further configured to combine the spectrally separate amplified components into an output beam.
>
> 12. A method of operating a laser system comprising:
>
> generating a seed signal;
>
> dividing the seed signal into spectrally separate component signals;
>
> amplifying the spectrally separate component signals within at least one amplifier of a plurality of amplifiers;
>
> recombining the spectrally separate component signals into an amplified output; and
>
> *controlling phases of the amplified spectrally separate component signals within the at least one amplifier of the plurality of amplifiers*.

Appeal Br. 9 and 10–11 (emphasis added to identify key limitations).

REJECTIONS ON APPEAL

1. Claims 1, 3–7, 11–13, and 15–17 stand rejected under 35 U.S.C. § 103(a) as obvious over Frankel et al. (US 2004/0057475 A1, published March 25, 2004) in view of Silberberg et al. (US 6,327,068 B1, issued Dec. 4, 2001) (hereinafter "Silberberg");
2. Claim 2 stands rejected under 35 U.S.C. § 103(a) as obvious over Frankel in view of Silberberg and further in view of Wang (US 2007/0280325 A1, published Dec. 6, 2007) (hereinafter "Wang");
3. Claims 8 and 14 stand rejected under 35 U.S.C. § 103(a) as obvious over Frankel in view of Silberberg and further in view of Skupsky et al. (US 4,961,195, issued Oct. 2, 1990) (hereinafter "Skupsky"); and
4. Claims 9 and 10 stand rejected under 35 U.S.C. § 103(a) as obvious over Frankel in view of Silberberg and further in view of Jiang et al. (US 2008/0089698 A1, published April 17, 2008) (hereinafter "Jiang").

DISCUSSION

Appellants present separate arguments regarding the patentability of independent claims 1 and 12. We limit our discussion to those claims in deciding the appeal.

Claim 1

The Examiner finds Frankel teaches a laser system (Fig. 2) including a seed oscillator, having seed output (21), dispersive optics (14, 24), operative

to receive the seed output and divide the seed output into spectrally separate seed components, independently addressable laser amplifiers (12) corresponding to the spectrally separate seed components, each laser amplifier receiving as its seed one of the spectrally separate seed components and producing one of the spectrally separate amplified components, where dispersive optics (14, 24) are further configured to combine the spectrally separate amplified components into an output beam (Frankel ¶¶ 28–30). Final Act. 2. The Examiner acknowledges that Frankel does not teach the laser amplifiers are phase adjustable or phase actuators controlling the individually addressable, phase adjustable laser amplifiers. *Id.*

The Examiner finds Silberberg teaches an adaptive pulse compressor (Fig. 1) that includes phase adjusters 18 (a Spatial Light Modulator (SLM) array that controls phase and amplitude of a pulse) and phase actuators controlling the individually addressable phase adjusters 32. Final Act. 3. The Examiner finds that one of ordinary skill in the art would have been motivated, based on Silberberg, to include Silberberg's phase adjusters 18 between Frankel's diffractive elements 14, 24 next to Frankel's laser amplifiers 12 to realize arbitrary phase functions for efficient compression (Silberberg, Abstract). *See id.*; *see also* Examiner's Answer mailed January 28, 2015 ("Ans."), 2–3 (explaining Silberberg's phase adjuster 18 is placed between the dispersive optics of Frankel along with the amplifiers of Frankel where the phase adjuster would adjust the individual wavelength components of the diffracted beam while the amplifiers would amplify those individual wavelength components resulting in "individually addressable, phase adjustable laser amplifiers.").

Appellants argue the Examiner reversibly erred in finding Frankel and Silberberg, alone or in combination, teach or suggest "an array of individually addressable, phase adjustable laser amplifiers," as recited in claim 1. App. Br. 4–5.

We find Appellants' argument to be persuasive of reversible error in the Examiner's rejection. As the Examiner acknowledges, Frankel's laser system (Fig. 2) includes laser amplifiers 12, which are not phase adjustable. Final Act. 2. Silberberg teaches a pulse compressor (Fig. 1) that includes a phase adjuster 18 (singular). As Appellants point out, phase adjuster 18 is not an amplifier, nor does the Examiner contend that it is. App. Br. 5; *see also* Ans. *generally*. Silberberg teaches a laser system (Silberberg 9:28–43; Fig. 5) where the pulse compressor (including phase adjuster 18) and amplifiers 44 are separate components of the system. Thus, we are persuaded that the Examiner erred in finding that Frankel in combination with Silberberg teach or suggest a singular amplifier that is phase adjustable let alone multiple amplifiers that are phase adjustable. Nor has the Examiner explained why, based on Silberberg, one of ordinary skill in the art would have been motivated to incorporate Silberberg's phase adjuster 18 within each of Frankel's amplifiers 12 to produce phase adjustable laser amplifiers.

In addition, we also note that Silberberg only discloses a single phase actuator 32, and the Examiner has not explained why, based on Silberberg, it would have been obvious to incorporate multiple actuators 32 into Frankel's laser system.

In view of the foregoing, we do not sustain the Examiner's rejection of claim 1, or claims 2–11, which depend therefrom.

Claim 12

For claim 12, the Examiner finds that Frankel discloses a method of operating a laser system (Fig. 2) including generating seed signal 21, dividing the seed signal into separate component signals 24, amplifying the spectrally separate component signals within at least one amplifier of a plurality of amplifiers 12, and recombining the spectrally separate component signals into amplified output 14 (Frankel 28–30). Final Act. 5. The Examiner finds that Frankel does not teach controlling phases of the amplified spectrally separate component signals within the at least one amplifier of a plurality of amplifiers. Final Act. 5.

The Examiner finds that Silberberg teaches controlling phases of the separate component signals 32 in order to realize arbitrary phase functions for efficient compression (Silberberg, Abstract; 5:38–43). Final Act. 5. The Examiner finds that one of ordinary skill in the art would have been motivated, based on Silberberg, to control the amplified spectrally separate component signals within the at least one amplifier of Frankel's plurality of amplifiers in order to realize arbitrary phase functions for efficient compression. Final Act. 5.

Appellants argue the Examiner reversibly erred in finding Frankel and Silberberg, alone or in combination, teach or suggest "controlling phases of the amplified spectrally separate component signals <u>within the at least one amplifier</u> of the plurality of amplifiers," as recited in claim 12. App. Br. 6–7.

We find Appellants' argument to be persuasive of reversible error in the Examiner's rejection. As the Examiner finds, Silberberg teaches placing phase adjusting element 18 *next to* Frankel's amplifier array 12 such that

Silberberg's phase adjuster 18 would adjust the individual components of the diffracted beam while Frankel's amplifiers 12 would amplify each individual wavelength component (i.e., spectrally separate component signal). *See* Ans. 4 (emphasis added). Silberberg, however, does not teach or suggest controlling phases of wavelength components using a phase adjuster *within* a laser amplifier. (Silberberg 9:28–43; Fig. 5). Nor does the Examiner explain why it would have been obvious, based on Silberberg, to use Silberberg's phase adjuster within the amplifier. Thus, we are persuaded that the Examiner erred in finding that Frankel in combination with Silberberg teach or suggest "controlling phases of the amplified spectrally separate component signals within the at least one amplifier of the plurality of amplifiers," as recited in claim 12. Accordingly, we do not sustain the Examiner's rejection of claim 12, or claims 13–17, which depend therefrom.

DECISION

For the above reasons, the rejections of claims 1–17 are reversed.

REVERSED