

1      The opinion in support of the decision being entered today was *not* written  
2      for publication and is *not* binding precedent of the Board.  
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5                    UNITED STATES PATENT AND TRADEMARK OFFICE  
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8                    BEFORE THE BOARD OF PATENT APPEALS  
9                    AND INTERFERENCES  
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12                    *Ex parte* YOUICHI AKASAKA  
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15                    Appeal 2007-0680  
16                    Application 10/655,901  
17                    Technology Center 3600  
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20                    Decided: March 29, 2007  
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23      Before ROBERT E. NAPPI, LINDA E. HORNER, and ANTON W.  
24      FETTING *Administrative Patent Judges*.  
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26      NAPPI, *Administrative Patent Judge*.  
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29                    DECISION ON APPEAL  
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31      This is a decision on appeal under 35 U.S.C. § 6(b) of the final  
32      rejection of claims 1, 4 through 11 and 14 through 20. For the reasons stated  
33      *infra* we will not sustain the Examiner's rejection of these claims.  
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35  
36                    INVENTION  
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1 The invention is directed to an amplifier for an optical communication  
2 system. A light beam used to provide pumping power is split, a portion is  
3 coupled to a fiber in the direction counter to the direction of the signal  
4 propagation. The other portion is coupled to a second fiber in the direction  
5 of signal propagation in that fiber. See page 3 of Appellant's specification.  
6 Claim 1 representative of the invention and reproduced below:

7           1. A communication system for distributed Raman amplification of  
8 optical signals, the communication system comprising:

9 a first fiber span;

10 a second fiber span;

11 a third fiber span;

12 a first pump system configured to generate and transmit a first light  
13 beam;

14        a first splitter configured to receive the first light beam, split the first  
15 light beam into a first portion of the first light beam and a second portion of  
16 the first light beam, transfer the first portion of the first light beam onto the  
17 first fiber span to backward propagate over the first fiber span, and transfer  
18 the second portion of the first light beam onto the second fiber span to  
19 forward propagate over the second fiber span;

20 a second pump system configured to generate and transmit a second  
21 light beam; and

22        a second splitter configured to receive the second light beam, split the  
23        second light beam into a first portion of the second light beam and a second  
24        portion of the second light beam, transfer the first portion of the second light  
25        beam onto the second fiber span to backward propagate over the second  
26        fiber span, and transfer the second portion of the second light beam onto the  
27        third fiber span to forward propagate over the third fiber span;

28 wherein a power of the first portion of the first light beam is not equal  
29 to a power of the second portion of the first light beam; and

30 wherein a power of the first portion of the second light beam is not  
31 equal to a power of the second portion of the second light beam.

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The references relied upon by the Examiner are:

Grubb US 6,344,922 B1 Feb. 5, 2002

Fidric US 6,603,593 B2 Aug. 5, 2003

C.R.S. Fludger et al. (Fludger), "Pump to Signal RIN transfer in Raman Fibre Amplifiers" Electronics Letters, Vol. 37, No. 1, Jan. 4, 2001 pp 15-17.

Govind P. Agrawal, Fiber-Optic Communication Systems, 3<sup>rd</sup> Edition, Wiley Interscience, May 28, 2002, pp. 243-246.

## REJECTION AT ISSUE

Claims 1, 4, 11, and 14 stand rejected under 35 U.S.C. § 103 (a) as being unpatentable over Grubb in view of Fludger. The Examiner’s rejection is set forth on pages 3 and 4 of the Answer. Claims 5, 6, 8, 15, 16, and 18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Grubb in view of Fludger and Fidric. The Examiner’s rejection is set forth on pages 4 and 5 of the Answer. Claims 7, 9, 10, 17, 19, and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Grubb in view of Fludger and Agrawal. The Examiner’s rejection is set forth on pages 5 and 6 of the Answer. Throughout the opinion we make reference to the Brief and Reply Brief (received May 2, 2006 and July 28, 2006 respectively), and the Answer (mailed June 26, 2006) for the respective details thereof.

## ISSUES

1       Appellant contends that the Examiner’s rejection of independent  
2 claims 1 and 11 under 35 U.S.C. § 103(a) is in error. Appellant argues that  
3 Fludger does not discuss the effects on RIN<sup>1</sup> in a fiber that is both forward  
4 and reversed pumped with unequal power. Further, Appellant argues that  
5 because Fludger teaches that counter-pumping is favored over co-pumping,  
6 Fludger teaches away from combined forward and reverse pumping  
7 implemented simultaneously over a single length of fiber, as taught by  
8 Grubb (Br. 7-9).

9 The Examiner asserts that the rejection is proper. The Examiner  
10 states, on page 7 of the Answer, that simultaneous forward and backward  
11 pumping and an uneven split of a single light beam are not limitations  
12 recited in the independent claims. Further, the Examiner asserts that Fludger  
13 is directed to performance over a transmission system.

14 Appellant rebuts the Examiner’s claim interpretation in the Reply  
15 Brief, asserting the independent claims 1 and 11 recite simultaneously  
16 forward and reverse pumping a fiber strand and an uneven split of a single  
17 light beam (Reply Br. 3-4).

18 Thus, the issues before us are whether the independent claims recite  
19 simultaneously forward and reverse (co-pumping and counter-pumping) a  
20 fiber strand, and an uneven split of a single light beam. The further issue is  
21 whether the combination of the references teaches these limitations.

## 23 FINDINGS OF FACT

<sup>1</sup> “RIN” stands for relative intensity noise (Fludger 16, left column).

1           Grubb teaches many arrangements for optical communication  
2 systems. Grubb teaches that optical pump energy can be supplied to an  
3 optical fiber counter, and/or co-directionally to signal propagation (Grubb,  
4 col. 9, ll. 10-26). Grubb teaches an arrangement in figure 5(a) where there  
5 are several fiber segments 28, 30 and 40 and there are several pumping  
6 sources (lasers items 32 and couplers 36). Figure 5(a) depicts the pumping  
7 energy going through a distributor (item 24) and being coupled in manner  
8 that appears to forward and reverse pump the fibers (note, signal propagation  
9 is left-to-right, the splitters appear to provide pumping power to fibers to the  
10 left (counter pumping) and the right (co-pumping)). However, the  
11 description of figure 5(a) states that the pump source provides power  
12 “counter-directionally to the optical signals being transmitted.” (Grubb, col.  
13 9, ll. 28-33). Further, we note that Grubb states that distributor 24 is “known  
14 in the art” and provides no explanation of whether it produces an even split  
15 of the signal or an uneven split of the signal. Thus, we do not find  
16 substantial evidence that the embodiment depicted in figure 5(a) teaches  
17 splitting the power from one source to counter pump one fiber segment and  
18 co-pump another segment or that the distributor (item 24) unequally splits  
19 the beam.

20           Fludger teaches that systems which use Raman fiber amplifiers may  
21 be co-pumped or counter-pumped (Fludger, introduction on p. 15). Fludger  
22 discusses the effects of each on relative intensity noise (RIN). Fludger  
23 concludes that in counter-pumped Raman amplification the different  
24 directions of propagation cause the noise to be low pass filtered (Fludger,  
25 conclusion on p. 17). We find no discussion in Fludger of splitting the beam

1 of light from one pumping source into two unequal portions and counter-  
2 pumping one segment with one portion of the beam and co-pumping another  
3 fiber with the other portion of the beam.

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## 5 ANALYSIS

6 Independent claim 1 recites “a first pump . . . to generate and transmit  
7 a first light beam, a first splitter configured to receive the first light beam,  
8 split the first light beam into a first portion of the first light beam and a  
9 second portion of the first light beam, transfer the first portion of the first  
10 light beam onto the first fiber span to backward propagate over the first fiber  
11 span, and transfer the second portion of the first light beam onto the second  
12 fiber span to forward propagate over the second fiber span.” Claim 1 also  
13 recites a second pump and splitter which transfers light to backward  
14 propagate the second fiber and forward propagate a third fiber. We find no  
15 limitations that recite that the first, second or third fiber is simultaneously  
16 forward and reverse propagated. We are not persuaded by Appellant’s  
17 argument that the recitations of beam transmission by pumps of claim 1 must  
18 be interpreted as simultaneous pumping, as the specification does not  
19 contemplate one pump source to operate while the other is off. Claim 1  
20 recites a system “comprising” various elements; this does not limit the claim  
21 to a system containing only the recited elements, rather it is open ended and  
22 encompasses any system that includes the recited elements. Further, before  
23 the Office, claims are to be given their broadest reasonable interpretation.  
24 We consider the Examiner’s interpretation to be reasonable and Appellant’s  
25 asserted reading of simultaneous forward and backward pumping of a fiber

1 span to be importing limitations from the specification into the claims.  
2 Through a similar analysis we do not find that claim 11 recites simultaneous  
3 forward and backward pumping of a fiber span.

4 Claim 1 also recites “wherein a power of the first portion of the first  
5 light beam is not equal to a power of the second portion of the first light  
6 beam; and wherein a power of the first portion of the second light beam is  
7 not equal to a power of the second portion of the second light beam.” Thus,  
8 claim 1 recites that the beam from the first pump is split into two unequal  
9 parts and that the beam from the second pump is split into two unequal parts.  
10 Accordingly, we disagree with the Examiner’s claim interpretation and find  
11 that claim 1 recites an uneven split of a single light beam.

12 Having determined the scope of the claims, we next consider the art  
13 applied to reject the claims. Independent claims 1 and 11 stand rejected over  
14 Grubb in view of Fludger. The Examiner’s rejection relies upon the system  
15 arrangement depicted in figure 5(a) of Grubb. As discussed *supra*, we find  
16 that Grubb provides scant description of how the fiber segments 28, 30 or 40  
17 are being pumped. Thus, we find that Grubb alone fails to provide  
18 substantial evidence of using one laser through a splitter to forward pump  
19 one fiber segment and reverse one fiber segment. As discussed *supra*,  
20 Grubb is silent as to the operation of splitter 24 and as such fails to provide  
21 substantial evidence of splitting a single beam in to two un-equal parts.  
22 Further, we find no discussion in Fludger of splitting a beam into two  
23 unequal parts. Thus, we do not find that the combination of Grubb and  
24 Fludger teach all of the limitations of independent claims 1 and 11.

1 We further note that the art used to reject the other dependent claims,  
2 Fidric and Agrawal, does not teach splitting a beam into two unequal parts  
3 and using the parts to forward pump one fiber segment and reverse pump a  
4 second fiber segment.

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## CONCLUSION

We consider the Examiner’s rejection of claims 1, 4 through 11, and 14 through 20 under 35 U.S.C. § 103(a) to be in error as we do not find that the combination of the combination of Grubb in view of Fludger teaches or suggests the limitations in independent claims 1 and 11. The Examiner has not asserted, nor do we find that Fidric or Agrawal, the references applied against claims 5, 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, and 20, make up for the noted deficiencies in the rejection of independent claims 1 and 11.

Accordingly we will not sustain the Examiner’s rejection of claims 35 U.S.C. § 103 (a) of claims 1, 4 through 11 and 14 through 20.

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ORDER

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For the forgoing reasons, we will not sustain the Examiner's rejections, under 35 U.S.C. § 103. The decision of the Examiner is reversed.

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REVERSED

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