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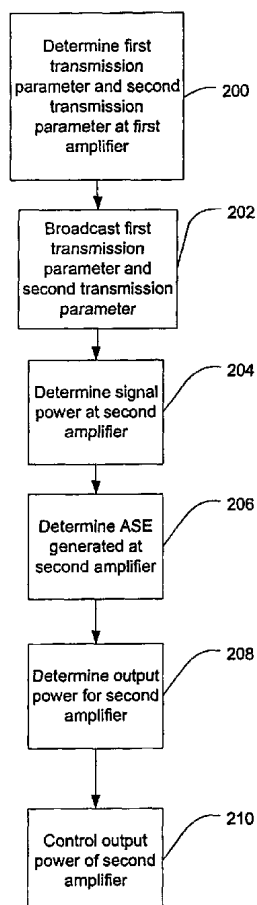
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[Continued on next page]

(54) **Title:** METHOD AND SYSTEM FOR CONTROLLING AMPLIFIER POWER IN AN OPTICAL COMMUNICATIONS NETWORK HAVING ADD/DROP CAPABILITY



(57) **Abstract:** The invention includes a method for controlling amplifier output power in an optical communications network having channel add/drop capability. A first transmission parameter and a second transmission parameter are determined at a first amplifier. In an exemplary embodiment, the first transmission parameter is a composite express signal-to-noise ratio and the second transmission parameter is a composite signal-to-noise ratio. The total output power of a downstream amplifier is adjusted in response to the first transmission parameter and second transmission parameter. A system for implementing the method is also disclosed.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H04B 10/00, 10/02, 10/08, 10/12

US CL : 359/110, 161, 177, 341.4

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 359/110, 114, 124, 154, 155, 161, 164, 177, 337.11, 337.13, 341.4, 341.41, 341.42, 341.43

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Continuation Sheet**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 5,805,322 A (TOMOFUJI, Hiroaki) 08 September 1998 (08.09.1998), column Fig. 14, column 18 (entire).	31, 34 ----- 37, 40-41, 43-44
X --- Y	US 6,023,366 A (KINOSHITA, Susumu) 08 February 2000 (08.02.2000), column 12, line 48 to column 13, line 26, Fig. 12.	23-24, 27-28 ----- 25-26, 29-30
Y	US 5,654,816 A (FISHMAN, Daniel A.) 05 August 1997 (05.08.1997), columns 1-2, lines 66 to 5; column 4-6.	1, 6-7, 10, 15, 18-19
Y	US 5,894,362 A (ONAKA et al.) 13 April 1999 (13.04.1999), column 2, line 55-column 3, line 36; column 10 (entire), Fig. 8.	6-7, 10, 15, 18-19 25-26, 29-30
Y	US 5,978,115 A (CONDUCT et al.) 02 November 1999 (02.11.1999), column 4, lines 13-30, Fig. 2.	7, 35, 37, 40-41, 43-44
Y	US 6,219,162 B1 (BARNARD et al.) 17 April 2001 (17.04.2001), column 9, line 6, Fig. 7.	18
A, P	EP 1 113 597 A2 (Bode et al.) 04 July 2001 (04.07.2001), paragraphs [0005] - [0007].	1-22, 31-44.



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:		"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"B"	earlier application or patent published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

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INTERNATIONAL SEARCH REPORT

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,229,876 A (FATEHI et al.) 20 July 1993 (20.07.1993), Figs. 4-6, column 3, lines 30-46; column 5 (entire); column 6, lines 29-32.	1-22, 31-44
A, P	US 6,344,915 B1 (ALEXANDER et al.) 05 February 2002 (05.02.2002), column 3, lines 63-67, column 4, lines 13-20; column 5 (entire), column 6, lines 26-27, lines 33-36, lines 43-47, and lines 54-56.	1-22, 31-44
A	US 6,163,399 A (BERG, Loren Scott) 19 December 2000 (19.12.2000), column 3, lines 20-26.	1-22, 31-44.
A, P	US 6,259,543 B1 (GOLOVCHENKO et al.) 10 July 2001 (10.07.2001), Abstract.	1-22, 31-44.
A	US 5,986,782 A (ALEXANDER et al.) 16 November 1999 (16.11.1999), column 1, lines 52-67, column 2, lines 1-2; column 3, lines 18-21; Fig. 2; column 3, lines 66-67 to column 4, line 3; column 5, lines 25-61.	1-44
A, P	US 6,404,523 B1 (MORIKAWA et al.) 11 June 2002 (11.06.2002), abstract	1-22, 31-44
A, E	US 6,441,955 B1 (TAKATSU et al.) 27 August 2002 (27.08.2002), Abstract, column 1, lines 43-48, lines 56-58; column 2, lines 5-13, lines 25-28, lines 58-65.	1-22, 31-44
A	US 5,471,334 A (MASUDA et al.) 28 November 1995 (28.11.1995)	1-44
A	US 6,163,392 A (CONDICT et al.) 19 December 2000 (19.12.2000)	1-44
A	US 5,532,864 A (ALEXANDER et al.) 02 July 1996 (02.07.1996)	1-22, 31-44
A	US 5,673,129 A (MIZRAHI, Victor) 30 September 1997 (30.09.1997)	1-44
A, E	US 6,433,903 B1 (BARRY et al.) 13 August 2002 (13.08.2002).	1-22, 31-44
A, E	US 6,421,167 B1 (COHEN et al.) 16 July 2002 (16.07.2002)	1-22, 31-44
A	US 6,072,601 A (TOYOHARA, Atsushi) 06 June 2000 (06.06.2000)	1-22, 31-44.
A, P	US 6,335,810 B1 (UEHARA, Daisuke) 01 Jan. 2002 (01.01.2002).	1-44
A	US 5,485,299 A (JONES, Kevan P.) 16 Jan. 1996 (16.01.1996)	1-22, 31-44.
A, P	US 2002/0044340 A1 (CAVALIERE et al.) 18 April 2002 (18.04.2002), paragraph [0023].	1-44
A	US 5,444,238 A (GHERARDI et al.) 22 August 1995 (22.08.1995) abstract:	23-30

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/14183

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest☐

The additional search fees were accompanied by the applicant's protest.

☐

No protest accompanied the payment of additional search fees.

Continuation of Item 4 of the first sheet:

The title is not sort and percise as required by PCT Rule 4.3. The new title is:

"Optical Network with Controlled Optical Amplifiers"

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-22 and 31-44, drawn to a method and apparatus to effect control of the output power of the second amplifier based on two transmission parameters, the second amplifier's ASE, and the second amplifier's output power.

Group II, claim(s) 23-30, drawn to a method of determining blocked ASE at a network element and using that information to control a downstream amplifier.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The claims of Group I require the presence of two amplifiers, the first amplifier determines at least a first transmission parameter, based on the output power of the first amplifier and then the second amplifier is controlled based on at least a first transmission parameter as well as the output power of the second amplifier, and that amplifier's amplified spontaneous emissions (ASE). The claims of Group II do not require a first amplifier that determines two transmission parameters, nor do the claims of Group II require that there be a measurement of ASE at the second amplifier. Group II requires that ASE be blocked by an upstream network element, not that an upstream (first amplifier) determines at least a first transmission parameter. Ergo, the inventions of Group I and II involve different inventive concepts by virtue of their distinct structure, as well as the processing that occurs at the second amplifier.

Continuation of B. FIELDS SEARCHED Item 3:

IEEEExplore (search terms - supervisory, control signal, network control, output power and amplifier)

INSPEC (same)

google.com (control[ing, ed, able] optical amplifier and output power)