PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : **H01S 3/00, H04J 14/08**	**A1**	**(11) International Publication Number:** **WO 98/15993** **(43) International Publication Date:** 16 April 1998 (16.04.98)

(21) International Application Number: PCT/US97/18209

(22) International Filing Date: 8 October 1997 (08.10.97)

(30) Priority Data:
08/728,649 10 October 1996 (10.10.96) US

(71) Applicant: TYCO SUBMARINE SYSTEMS LTD. [US/US]; 101 Crawford Corners Road, Holmdel, NJ 07733 (US).

(72) Inventor: ALPHONSUS, Justin, E.; 163 Pine Needle Street, Howell, NJ 07731 (US).

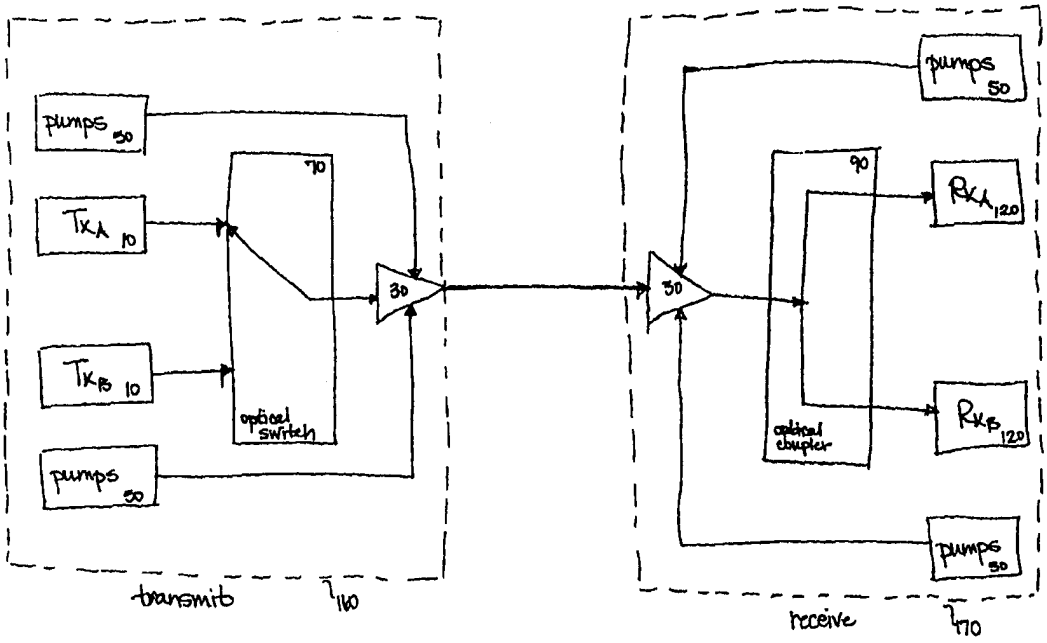
(74) Agents: PIETRANTONIO, Frank; Kenyon & Kenyon, 1025 Connecticut Avenue, N.W., Washington, DC 20036–5405 (US) et al.

(81) Designated States: AU, CA, JP, KR, MX, NZ, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
With amended claims.

Date of publication of the amended claims:
28 May 1998 (28.05.98))

(54) Title: LOSSLESS OPTICAL TRANSMISSION SYSTEM ARCHITECTURE



(57) Abstract

Disclosed is a redundant TTE optical transmission system architecture which eliminates system signal power loss due to protection elements and thus provides a system power budget comparable to non–redundant TTE systems. Further disclosed is a virtually non–failing optical amplifier (3a), for redundant and non–redundant optical systems, which allows for the simultaneous exploitation of the pump power from both sets of laser pumps (50) in a dual–pump configuration, thereby increasing the available system power margin.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

AMENDED CLAIMS

[received by the International Bureau on 31 March 1998 (31.03.98);
original claim 1 amended; new claims 2-14 added (3 pages)]

1. An optical transmission system, comprising:
(A) a first optical transmitter;
(B) a second optical transmitter;
(C) an optical amplifier;
(D) an optical switch, coupled between the first and second optical transmitters and the optical amplifier;
(E) a first laser pump coupled to the optical amplifier; and
(F) a second laser pump coupled to the optical amplifier.

2. The optical transmission system of claim 1 wherein said optical amplifier is simultaneously pumped by said first laser pump and said second laser pump.

3. The optical transmission system of claim 1 wherein said optical amplifier is an erbium-doped fiber amplifier.

4. The optical transmission system of claim 1 wherein said first laser pump and said second laser pump operate at 1480 nanometers.

5. The optical transmission system of claim 1 further comprising a second optical amplifier and a polarization combiner, wherein said second optical amplifier is located remote from said optical amplifier and wherein said first laser pump and said second laser pump are also coupled to said polarization combiner and said polarization combiner is coupled to said second optical amplifier.

6. An optical transmission system, comprising:
a first optical receiver;

a second optical receiver;
an optical amplifier;
an optical coupler, said optical coupler being coupled between said first and second optical receivers and said optical amplifier;
a first laser pump coupled to said optical amplifier; and
a second laser pump coupled to said optical amplifier.

7. The optical transmission system of claim 6 wherein said optical amplifier is simultaneously pumped by said first laser pump and said second laser pump.

8. The optical transmission system of claim 6 wherein said optical amplifier is an erbium-doped fiber amplifier.

9. The optical transmission system of claim 6 wherein said first laser pump and said second laser pump operate at 1480 nanometers.

10. The optical transmission system of claim 6 further comprising a second optical amplifier and a polarization combiner, wherein said second optical amplifier is located remote from said optical amplifier and wherein said first laser pump and said second laser pump are coupled to said polarization combiner and said polarization combiner is coupled to said second optical amplifier

11. An optical transmission system, comprising:
a first optical transmitter, said first optical transmitter transmitting a first optical signal;
a second optical transmitter, said second optical transmitter transmitting a second optical signal;
an optical amplifier;

wherein said first optical signal and said second optical signal are combined onto a single fiber and said combined signals are input to said optical amplifier;

a first laser pump coupled to said optical amplifier; and

a second laser pump coupled to said optical amplifier.

12. The optical transmission system of claim 11 wherein said optical amplifier is simultaneously pumped by said first laser pump and said second laser pump.

13. The optical transmission system of claim 11 wherein said optical amplifier is an erbium-doped fiber amplifier.

14. The optical transmission system of claim 11 wherein said first laser pump and said second laser pump operate at 1480 nanometers.