



(43) International Publication Date
17 October 2013 (17.10.2013)

- (51) International Patent Classification:
H04B 10/071 (2013.01) *G01M 11/00* (2006.01)
- (21) International Application Number:
PCT/EP2013/057518
- (22) International Filing Date:
10 April 2013 (10.04.2013)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
P201230554 13 April 2012 (13.04.2012) ES
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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,

HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:
28 November 2013

(54) Title: A SYSTEM FOR PHYSICAL LAYER SUPERVISION IN OPTICAL NETWORKS BASED ON TUNEABLE OTDR, AN HYBRID OPTICAL SWITCH AND A FOCS

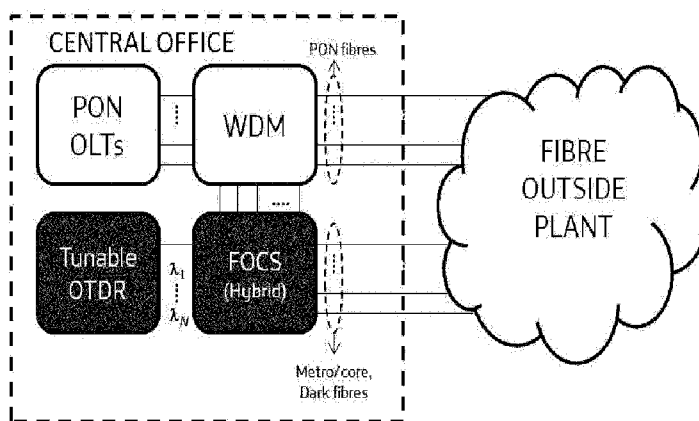


Figure 2

(57) Abstract: A system for physical layer supervision in optical networks based on tuneable OTDR, an hybrid optical switch and a FOCS. The system comprising: - a light source arranged to inject a monitoring light signal using a plurality of different wavelengths together with at least one data light signal at an input of an optical network or a dark fibre to circulate there through; - a plurality of optical filters provided at different points of said optical network in case of in-line PON monitoring to receive said monitoring light signal and filtering at least part thereof, in the form of respective reflected light signals; - light detecting means arranged to receive said respective reflected light signals from said optical network or said dark fibre; and - analysis means connected to said light detecting means to analyse said received reflected light signals to perform a physical layer monitoring of the optical network; the system further comprises: - a fibre optic cross-connection system, or FOCS, between said light source and said optical network or said dark fibre and comprising at least one hybrid optical switch to deliver said light signal to a desired optical network or to a dark fibre, depending on said plurality of different wavelengths. The hybrid optical switch, for fibre switching a light source injecting a monitoring light signal using a plurality of different wavelengths

[Continued on next page]



comprising at least one passive optical wavelength multiplexer-demultiplexer to deliver said light signal to another of said hybrid optical switch or to a desired optical network or to a dark fibre, depending on said plurality of different wavelengths. The fibre optic cross connection system, or FOCS, comprising at least one hybrid optical switch to deliver a light signal to at least one desired optical network or dark fibre, depending on a plurality of different wavelengths.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/057518

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04B10/071 G01M11/00
ADD.
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)
H04B G01M

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)
EPO-Internal, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 321 541 A (COHEN LEONARD G [US]) 14 June 1994 (1994-06-14) figures 12,13 column 10, line 31 - column 11, line 37 column 14, lines 37-53 -----	1-5
Y	US 6 396 575 B1 (HOLLAND WILLIAM R [US]) 28 May 2002 (2002-05-28) figure 1 column 2, lines 26-29 column 3, lines 55-61 column 4, lines 20-23 column 6, lines 50-56 -----	1-5
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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)

"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

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search 8 July 2013	Date of mailing of the international search report 16/10/2013
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Petitit, Nicolas
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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/057518

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6 317 535 B1 (JENNINGS MARK RICHARD [US] ET AL) 13 November 2001 (2001-11-13) figure 2 column 4, lines 58-67 column 6, lines 17-21 -----	1-5
A	EP 2 357 737 A2 (KOREA ADVANCED INST SCI & TECH [KR]) 17 August 2011 (2011-08-17) paragraph [0026] paragraph [0027] paragraph [0029] paragraph [0036] figure 1 -----	1-5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2013/057518

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

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

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims 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. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional 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 fees, this Authority did not invite payment of additional fees.

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.:

1-5

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5

Tunable OTDR network comprising the hybrid optical switch

2. claims: 6-15

The hybrid optical switch comprises at least one passive optical wavelength multiplexer-demultiplexer

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2013/057518

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
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