



US005943457A

United States Patent [19] Hayward et al.

[11] Patent Number: **5,943,457**
[45] Date of Patent: **Aug. 24, 1999**

[54] GENERALIZED RESONANT COUPLER FILTERS

[75] Inventors: **Geoffrey Hayward**, Edmonton, Canada;
Jan Conradi, Corning, N.Y.

[73] Assignee: **Telecommunications Research Laboratories**, Edmonton, Canada

[21] Appl. No.: **09/047,269**

[22] Filed: **Mar. 24, 1998**

[51] Int. Cl.⁶ **G02B 6/28; H04J 14/02**

[52] U.S. Cl. **385/24; 385/42; 359/124; 359/127; 359/140; 372/6**

[58] Field of Search **385/24, 30, 42, 385/14, 31, 48, 51; 359/115, 124, 127, 140, 153, 161; 372/6, 20**

[56] References Cited

U.S. PATENT DOCUMENTS

4,768,850	9/1988	Moslehi et al.	385/24
5,396,507	3/1995	Kaminow et al.	372/20
5,574,584	11/1996	Darcie et al.	359/125
5,657,406	8/1997	Ball	385/24
5,675,675	10/1997	Trouchet	385/24
5,689,217	11/1997	Gu et al.	333/116
5,802,224	9/1998	Okuta et al.	385/43
5,818,991	10/1998	Marez et al.	385/43

OTHER PUBLICATIONS

Planar Lightwave Circuit Optical Dispersion Equalizer, Koichi Takiguchi, Katsumari Okamoto, Senichi Suzuki, and Yasuji Ohmori, IEEE Photonics Technology Letters, Jan. 1994, vol. 6, No. 1, pp. 86-88.

Primary Examiner—Hemang Sanghavi

Attorney, Agent, or Firm—Christensen O'Connor Johnson & Kindness PLLC

[57] ABSTRACT

A signal processing circuit, the signal processing circuit comprising first and second waveguides, a series of successive couplers C_i between the first and second waveguides, the couplers being spaced from each other along the first and second waveguides, the first and second waveguides having a delay differential ΔL_k between successive couplers C_{k-1} and C_k , the delay differentials ΔL_k not being all the same. The first and second waveguides preferably have delay differentials between successive directional couplers defined by

$$\beta \Delta L_k = \beta n_k \Delta L + \Phi_k$$

where n_k is a set of co-prime positive integers. β is defined by $\beta = 2\pi n_{eff} / \lambda$. ΔL is defined by $\Delta L = c / n_{eff} \Delta f$, c is the speed of light in a vacuum, n_{eff} is the effective refractive index of the conduit, λ is a wavelength selected from a range of carrier wavelengths $\lambda_1 \dots \lambda_{NCh}$ for which the add/drop multiplexer is resonant. Φ_k is a phase parameter between 0 and 2π , and Δf is a pre-selected spectral range of the resonant coupler

11 Claims, 9 Drawing Sheets

