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PROVISIONAL APPLICATION COVER SHEET

This is a request for filing a **PROVISIONAL APPLICATION** under 37 CFR 1.53 (b) (2)

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TITLE OF THE INVENTION

ADD-DROP MULTIPLEXOR

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The invention was not made by an agency of the United States Government or under contract with an agency of the United States Government

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The basic arrangement of proposed COADM module is shown in Figure 1. A pair of circulators is used to separate input / output and add/drop signals (not shown).

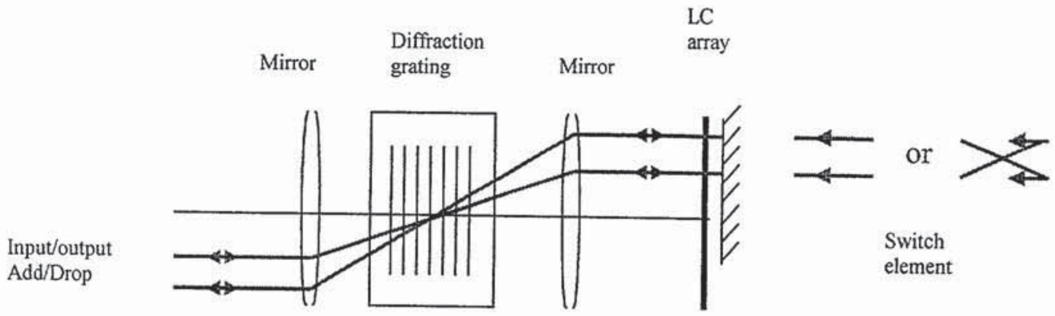

Figure 1.

The front end micro-optics design is shown in Figures 2a, b.

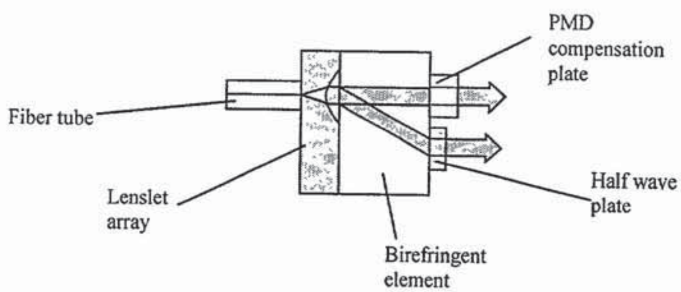

Figure 2a.

The light from input fiber is collimated with a microlens. The polarization diversity arrangement is used to provide two sub beams at the same (horizontal) polarization. A plate, made of the same material as the birefringent element, is inserted into upper sub beam for PMD compensation. An alternative PMD free front end design is shown in Figure 2b.

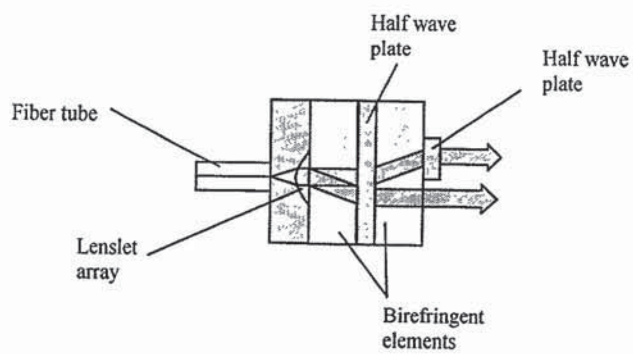

Figure 2b.

In the following Figure 3, the optical layout is explicitly shown. A single mirror is used to provide light focussing / collimation. The diffraction grating is located at the focus of the mirror. Since the input beams are collimated, the light is essentially focussed on the grating. The $1/e^2$ spot size at the grating, $2\omega_1$, and the $1/e^2$ beam diameter, $2\omega_2$, at the microcollimator are related in the following way:

$$\omega_1 * \omega_2 = \lambda * \mathbf{f} / \pi \qquad (1)$$

It follows from Eq. (1) that one can tune the spot size on the grating and the resulting spectral resolution by changing the beam size at microcollimator. It should also be kept in mind that, by symmetry, the spot size at LC array is equal to the spot size at microcollimator; that, in its turn, dictates requirements on the LC array pixel size.

More detailed design exists and can be provided if needed.

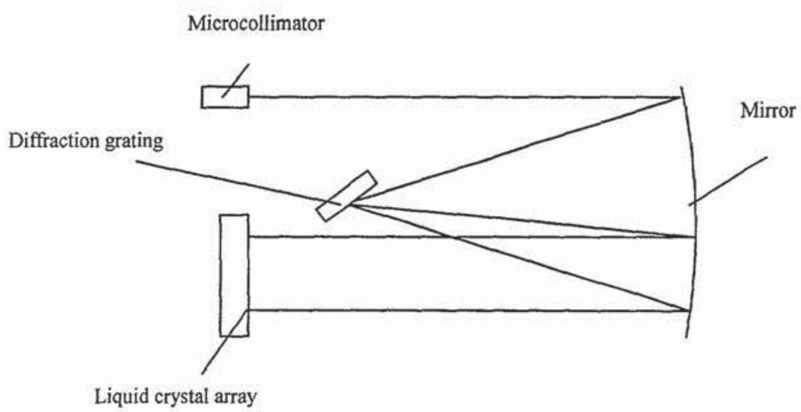

Figure 3.

Figures 4a and 4b below illustrate how the LC array can be used to provide switching between pass through and add / drop states. The optical system shown in Figures 1 and 3 delivers the light beams from microcollimators to the LC array with no or little additional spot expansion. Since there is a diffraction grating in the intermediate focal plane, the light at LC plane will be dispersed in wavelength. In Figures 4a and 4b, the dispersion direction is perpendicular to the plane of paper.

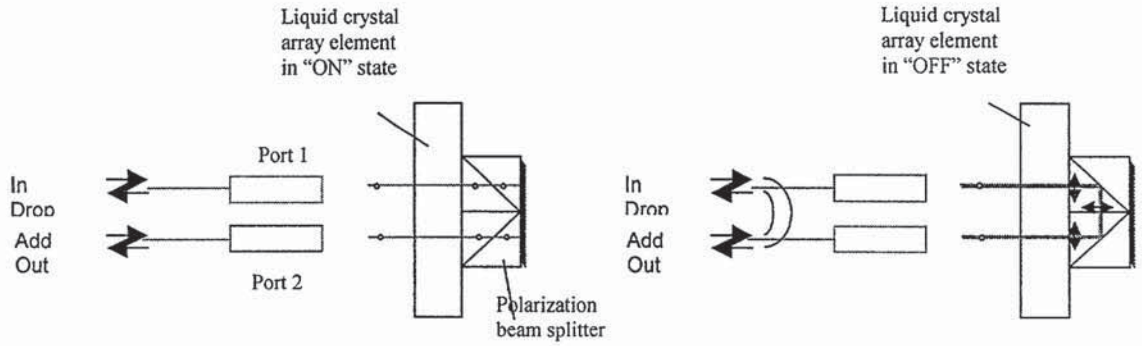

Figure 4a.

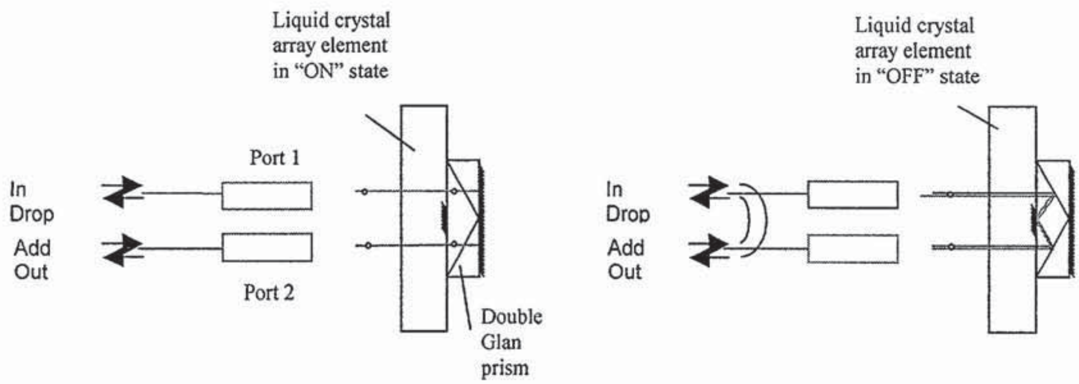

Figure 4b.

The LC cell in "OFF" state rotates polarization by 90 degrees. In "ON" state, polarization is not rotated. It is seen from Figures 4a and 4b that in "OFF" state the light paths of two ports are interchanged. In "ON" state of LC pixel, the light is reflected back into respective port. Since every spectral channel is passed through an independently controlled pixel, a full reconfigurability of all 40 or more channels is obtained. Further, the arrangement of Figure 4b has additional advantage of low PMD since the respective positions of two sub beams originating from each port does not change upon switching.

With respect to LC cell type, the twisted nematic (TN) cell is a preferable candidate since it has a very small residual birefringence in "ON" state. Since birefringence is small, a very high contrast ratio (>35 dB) can be obtained and maintained over the wavelength and temperature range.

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