



US006657770B2

(12) **United States Patent**
Marom et al.

(10) **Patent No.:** **US 6,657,770 B2**
(45) **Date of Patent:** **Dec. 2, 2003**

(54) **PROGRAMMABLE OPTICAL
MULTIPLEXER/DEMULTIPLEXER**

(75) Inventors: **Dan Mark Marom**, Howell, NJ (US);
David Thomas Neilson, Old Bridge, NJ (US)

(73) Assignee: **Lucent Technologies Inc.**, Murray Hill, NJ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 54 days.

(21) Appl. No.: **09/944,800**

(22) Filed: **Aug. 31, 2001**

(65) **Prior Publication Data**

US 2002/0196520 A1 Dec. 26, 2002

Related U.S. Application Data

(60) Provisional application No. 60/300,272, filed on Jun. 22, 2001.

(51) **Int. Cl.**⁷ **G02B 26/00**

(52) **U.S. Cl.** **359/290; 359/115; 359/291**

(58) **Field of Search** 359/115-119, 124,
359/127-133, 298, 290-291, 558, 618,
619, 652, 641-42, 644

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,960,133 A * 9/1999 Tomlinson 385/18
6,268,952 B1 * 7/2001 Godil et al. 359/291
2002/0131687 A1 * 9/2002 Wilde 385/24

* cited by examiner

Primary Examiner—Jordan M. Schwartz

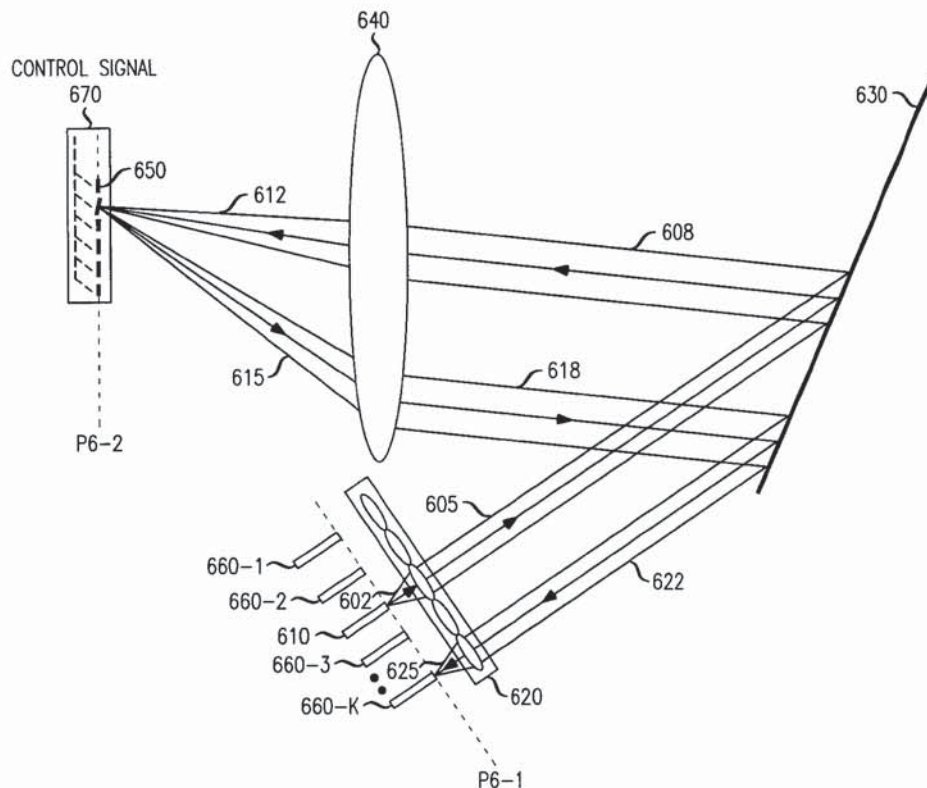
Assistant Examiner—Jessica Stultz

(74) *Attorney, Agent, or Firm*—Barry H. Freedman; David A. Sasso

(57) **ABSTRACT**

A programmable optical demultiplexer can independently assign every input optical channel in a WDM optical communications signal to depart from any desired output port. The demultiplexer device can also be operated in the reverse direction, and thus achieve programmable optical multiplexer functionality, by accepting different wavelengths at each of multiple input ports and efficiently combining the wavelength channels at the multiplexer output port. The programmable multiplexer/demultiplexer device has an optical arrangement for spatially dispersing the optical wavelengths, and tunable micro-mirrors for beam steering each channel independently. Controlling the beam reflection direction determines the connectivity between the input and output ports at the wavelength level.

32 Claims, 6 Drawing Sheets



Capella 2014

FIG. 1

PRIOR ART

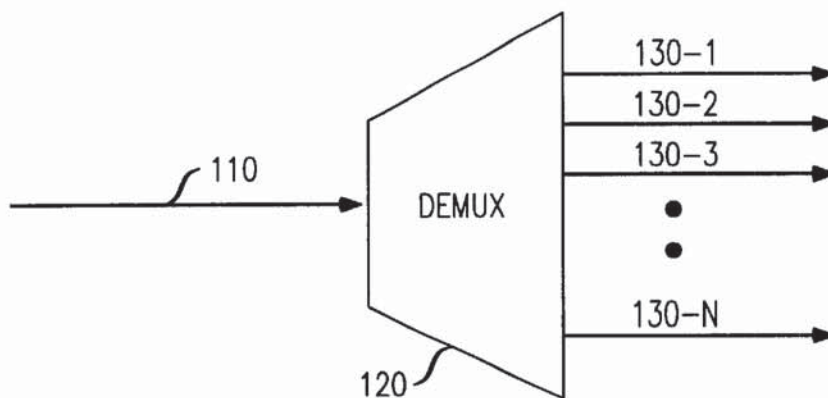


FIG. 2

PRIOR ART

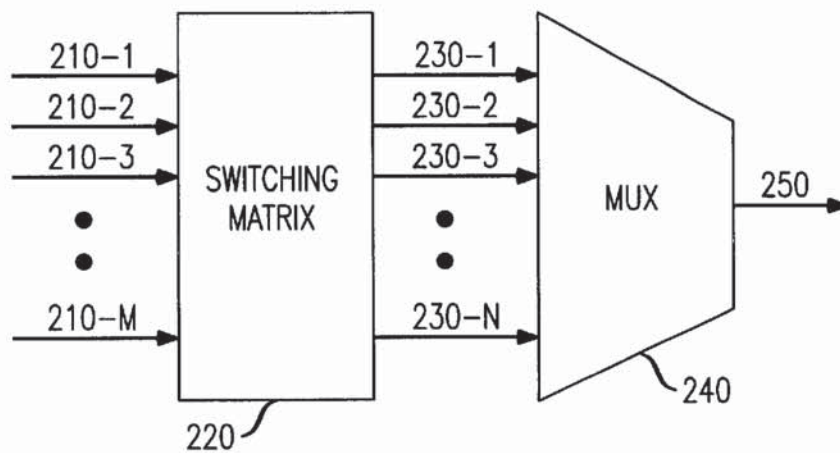


FIG. 3(A)

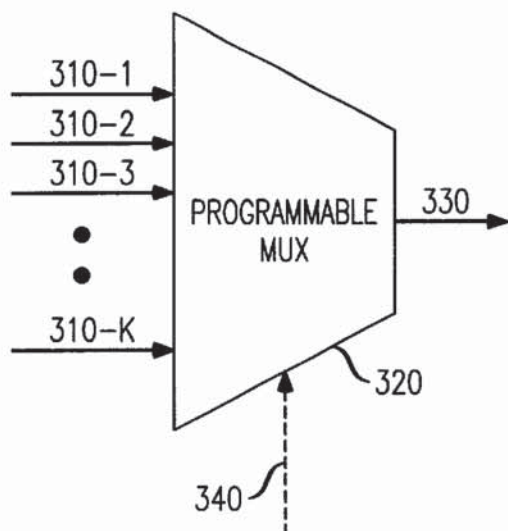


FIG. 3(B)

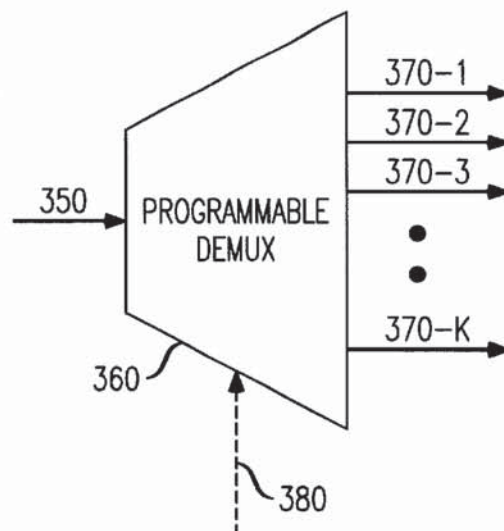


FIG. 4

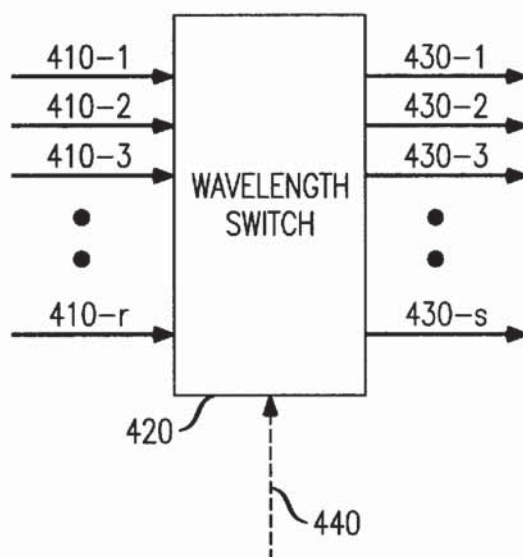
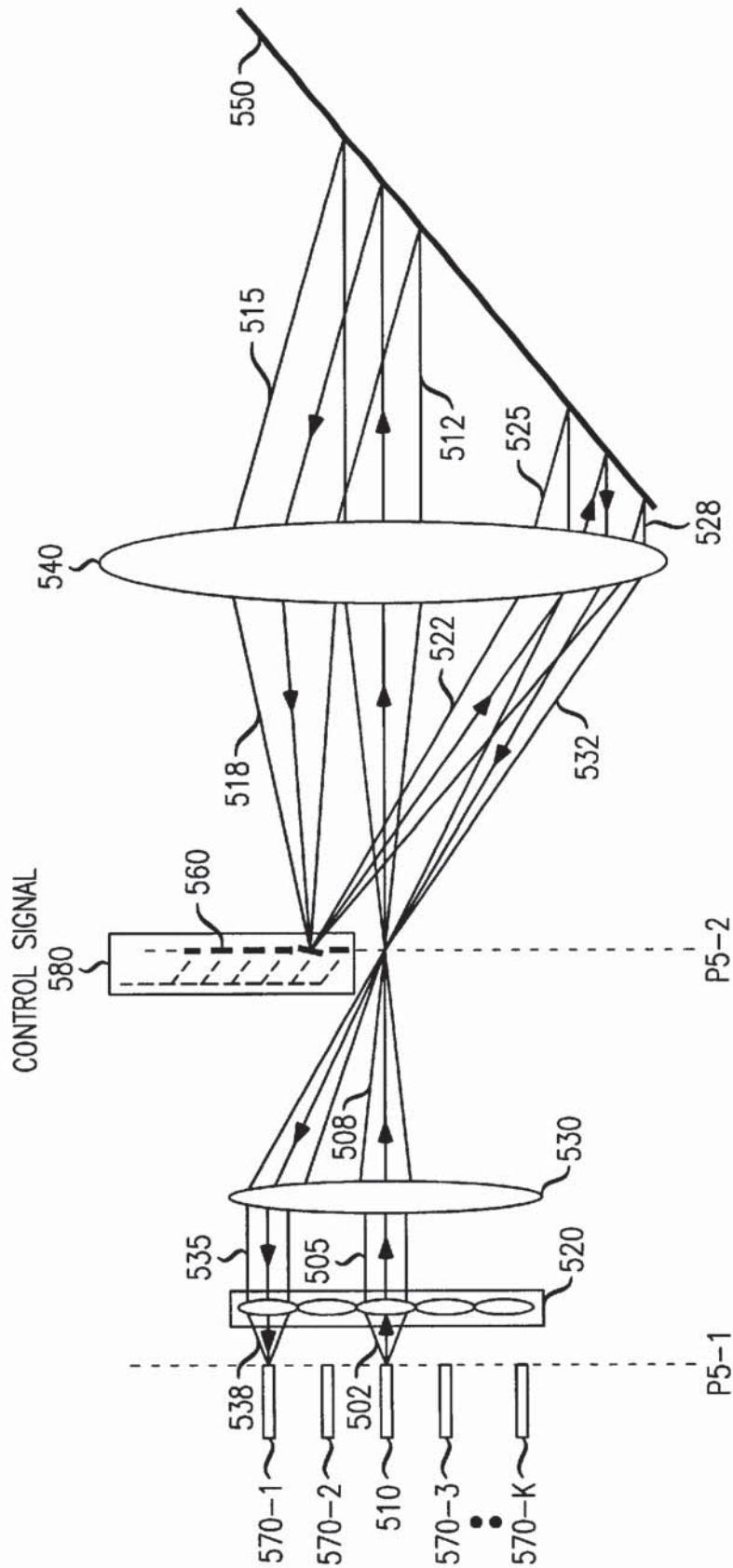
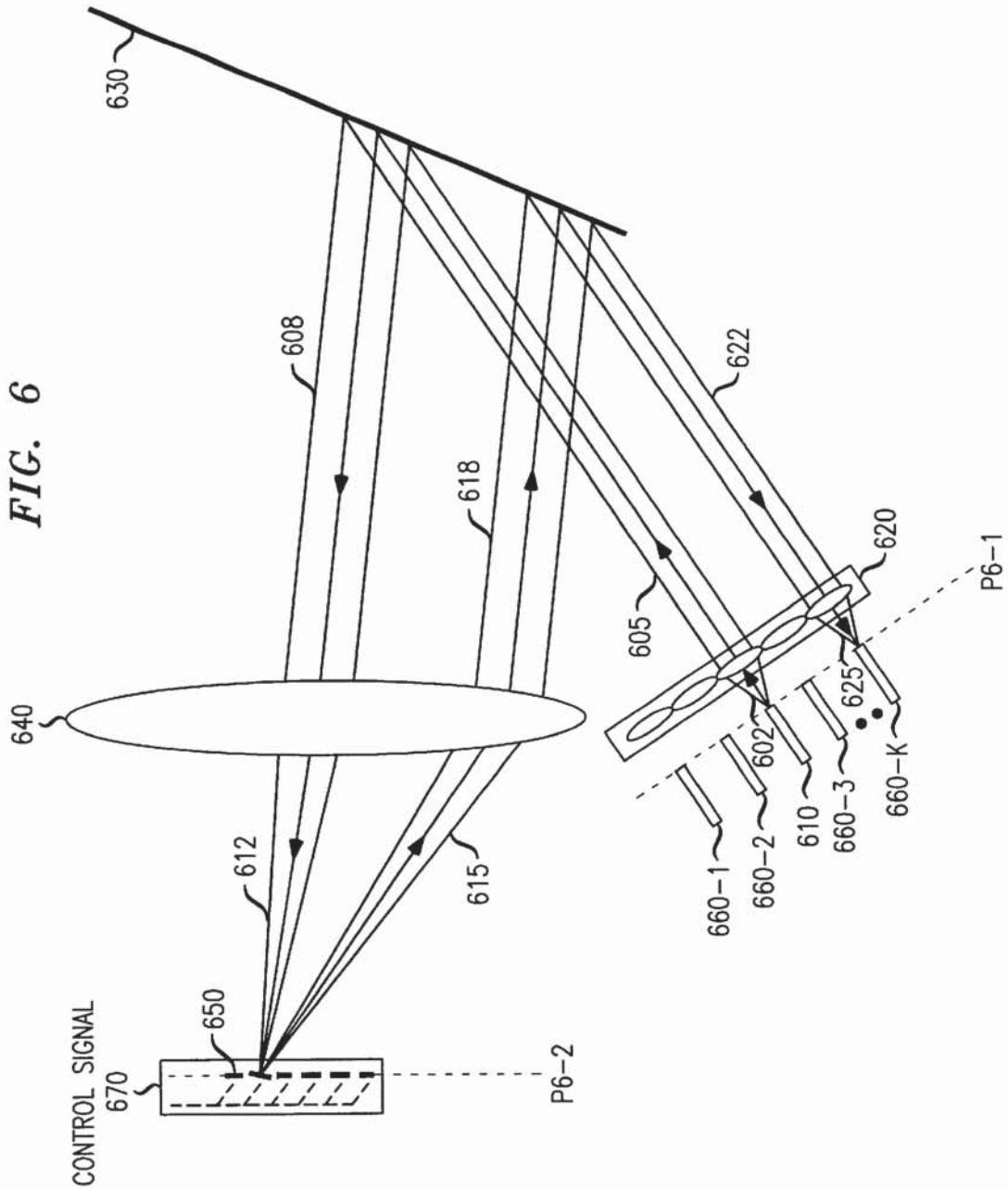


FIG. 5





Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.