

RIVO MULTITRADE OPTICAL SYSTEMS

Working Principle of the Optical Splitter Patent



Overview

US20040008946A1 The optical power splitter has one input optical waveguide and N output optical waveguides and splits an optical signal incident from US201.

Key Takeaways

Optical splitters divide an incoming optical signal into multiple output signals using waveguide structures, relying on multi-mode interference, adiabatic tapering, or mode conversion principles. Spiral Waveguide Splitters

Some optical splitter patents use a spiral waveguide core surrounded by multiple adjacent waveguide cores. The input optical signal propagates through the spiral, and optical power is gradually coupled into the surrounding waveguides. This design leverages multi-mode interference (MMI), where overlapping modes in the spiral region interfere constructively and destructively to distribute power evenly or according to a desired ratio among the output waveguides. Spiral designs reduce the footprint of the splitter while maintaining precise splitting ratios and are suitable for integration on photonics chips with electronic components for compact, low-cost systems (US12372720B2) .

Trident Structure Splitters

Another approach uses a trident structure, consisting of a tapered first waveguide that receives a multimode optical signal and two oppositely tapered second waveguides arranged on either side. The signal in the first waveguide is adiabatically split into two single-mode signals in the second waveguides. The tapering ensures minimal loss and smooth mode transition, making the splitter suitable for silicon photonics applications where low insertion loss and high fabrication tolerance are critical (EP3561561A1) .

Asymmetric Taper and Mode Multiplexer Splitters

Some patents describe splitters that use asymmetric tapers to convert part of the optical signal from the fundamental mode to a higher-order mode. An optical mode multiplexer then separates the modes into different branches, converting the higher-order mode back to the fundamental mode at the output. This allows precise control of splitting ratios, including extreme ratios like 90/10 or 95/5, and supports broadband operation with low loss (US20240159963) .

Y-Splitters

Traditional Y-splitters divide the optical power evenly between two output waveguides. They are commonly used in Mach-Zehnder interferometers as 3-dB couplers. Modern designs improve tolerance to fabrication variations and reduce sensitivity to layer thickness, enhancing efficiency and reliability in integrated photonics systems (US20150104130) .

Summary of Working Principles

- Multi-mode interference (MMI): Uses interference patterns in a multimode region to distribute optical power.
- Adiabatic tapering: Gradually changes waveguide dimensions to split modes with minimal loss.
- Mode conversion and multiplexing: Converts part of the signal to higher-order modes and separates them into different outputs.
- Waveguide geometry: Spiral, trident, or Y-shaped structures determine the splitting behavior and footprint. These principles allow optical splitters to achieve precise power distribution, low insertion loss, broadband operation, and compact integration in photonics chips for telecom, datacom, and sensing applications.

Article Content

US20040008946A1

The optical power splitter has one input optical waveguide and N output optical waveguides and splits an optical signal incident from

US20140219608A1

The optical power splitters do not introduce mode dependent loss and preserve polarization, enabling the optical power splitters to be

U.S. Patent for Optical power splitters incorporating one or more ...

An optical power splitter is an optical component that is used in photonics chips to split optical power between multiple output

U.S. Patent for Optical power splitter Patent (Patent # 7,088,891 ...

An optical power splitter that can minimize the chip size with its manufacturing cost. The optical power splitter has one input optical

Optical power splitter

The optical power splitter has one input optical waveguide and N output optical waveguides and splits an optical

OPTICAL POWER SPLITTER

A fundamental component in waveguide optics is an optical splitter, commonly referred to as a Y-splitter, which divides the optical

OPTICAL SPLITTER INCLUDING A TRIDENT STRUCTURE

In particular the present invention proposes an optical splitter with a trident (waveguide) structure, which is capable of propagating a

20230300501 Optical distribution network, optical network system ...

An optical distribution network, an optical network system, a splitter, and a method for identifying a port of the splitter

Working Principle Of Optical Splitter

Optical splitter, also called optical beam splitter, is an integrated waveguide optical power distribution device that can

How Does a Beam Splitter Work? Types, Principles & Applications

Learn how beam splitters work, compare cube and plate designs, and explore applications in lasers, microscopy, and interferometry.

How Beamsplitters Work: Types, Mechanisms, and Applications

Beamsplitters may vary in terms of their size, shape, and material, but all work on the principle that the splitter transmits

Optical Splitters Demystified: The Silent Heroes Powering Your FTTH ...

□□ How Does an Optical Splitter Work? The working principle is based on the fundamental physics of light. Light,

US20150104130A1

a fundamental component in waveguide optics is an optical splitter, commonly referred to as a Y-splitter, which divides the optical

What is the significance of understanding the working principles of

Understanding the working principles of a PLC (Planar Lightwave Circuit) fiber splitter is crucial for several reasons,

US20040008946A1

The optical power splitter includes at least two optical splitters having a structure of a planar lightwave circuit element and arranged

WO2015057484A1

a fundamental component in waveguide optics is an optical splitter, commonly referred to as a Y-splitter, which divides the optical

Your Go-to Guide to Optical Splitter

Working Principle of Optical Splitter A fiber optic splitter generally consists of input port (s), output ports, couplers,

Beam Splitters – optical power splitter, beamsplitter, thin-film ...

Beam splitter cubes can be used not only for simple light beams, but also for beams carrying images, e.g. in various types of

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This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

