Technology Offer

TLB
Technologie-Lizenz-Büro
der Baden-Württembergischen
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Ultrafast separating and positioning of pulsed laser beams by means of an optical circulating device

Background

In order to increase the productivity and quality in laser material processing, in addition to the development of high-power and high repetition rate laser sources it is essential to implement versatile and precise positioning of the individual pulses on the workpiece.

An approach developed at the Institut für Strahlwerkzeuge of the University of Stuttgart does not require any moving components for beam positioning. This makes the device extremely fast and thus very effective when it comes to using high-performance sources with high repetition rates.

Problem

To date movable optical elements such as mirrors, prisms or glass bodies have been used to apply the laser beam as quickly as possible on the workpiece. They need to be accelerated and decelerated according to the desired beam positioning which depends on the application. This type of mechanical movement limits the system in the sense that it compromises between stability, mobility and speed.

Solution

The invented module for beam separation can easily be added to existing systems and consists of a resonator-like structure of different optical components. These are arranged in a way, that the beam deliberately changes its position in the device after every completed round trip. Thanks to precisely controlled outcoupling, the individual pulse can then exit the device in the desired position. This allows the pulse to be positioned selectively at different machining points on the workpiece or to be directed to different workstations. This type of beam positioning is micron-accurate and ultrafast. Through precise synchronization of the outcoupling mechanism with the laser pulse circulation, each individual pulse can be recalled in the desired position, which enormously increases the flexibility of a machining process. Such an ultrafast switchable module will finally lead to the successful implementation of highly repetitive laser processing in the MHz range and an effective use of high-performance sources.

Contact

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Development Status

Basic principle / TRL1

Patent Situation

US 9,601,897 B2 granted

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Service

TLB GmbH manages inventions until they are marketable and offers companies opportunities for license and collaboration agreements.

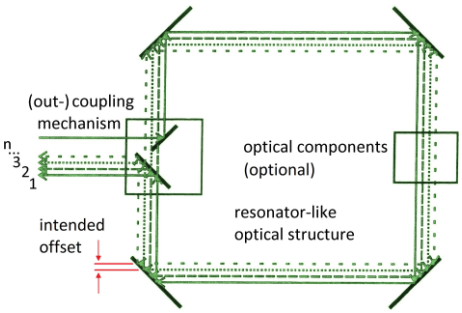

Figure: Exemplary optical setup. Position of laser pulse exit is depending on the number of revolutions 1 to n [IFSW, University of Stuttgart].

Advantages

- Fast switching between beam positions
- A variety of exit positions and exit angles possible
- Accurate single pulse positioning
- Series connection of several modules possible for coarse and fine positioning
- No moving parts

Application

Laser machining