知繁业茂 | Yintrust

Optical Tomographic (OT) Device for Combination with MR in Preclinical Imaging

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Technology description

Optical Tomography (OT) and MR combination for dual-modality imaging
Optical techniques, such as bioluminescence and fluorescence, are emerging as powerful new modalities for molecular imaging in disease and therapy. Combining innovative molecular biology and chemistry, researchers have developed optical methods for imaging a variety of cellular and molecular processes in vivo, including protein interactions, protein degradation, and protease activity. DKFZ developed an optical imaging detector regarding fluorescence and bioluminescence for small animal imaging, which is compatible for magnetic resonance imaging (MRI). This technology provides the possibility to study simultaneously tracer/marker kinetics of optical (OT) as well as NMR induced signals.

Solution

The device can be used to detect and stage tumors, to image specific cellular and molecular processes (e.g. gene expression, or more complex molecular interactions such as protein-protein interactions), to monitor multiple molecular events simultaneously, to track single- or dual-labeled cells using reporter genes or dual-modal labels visible to both optical and MR imaging, to optimize drug and gene therapy, to image drug effects at a molecular and cellular level, to assess disease progression at a molecular pathological level, especially to create the possibility of achieving all of the above goals of imaging in a single, rapid, reproducible, and quantitative manner.

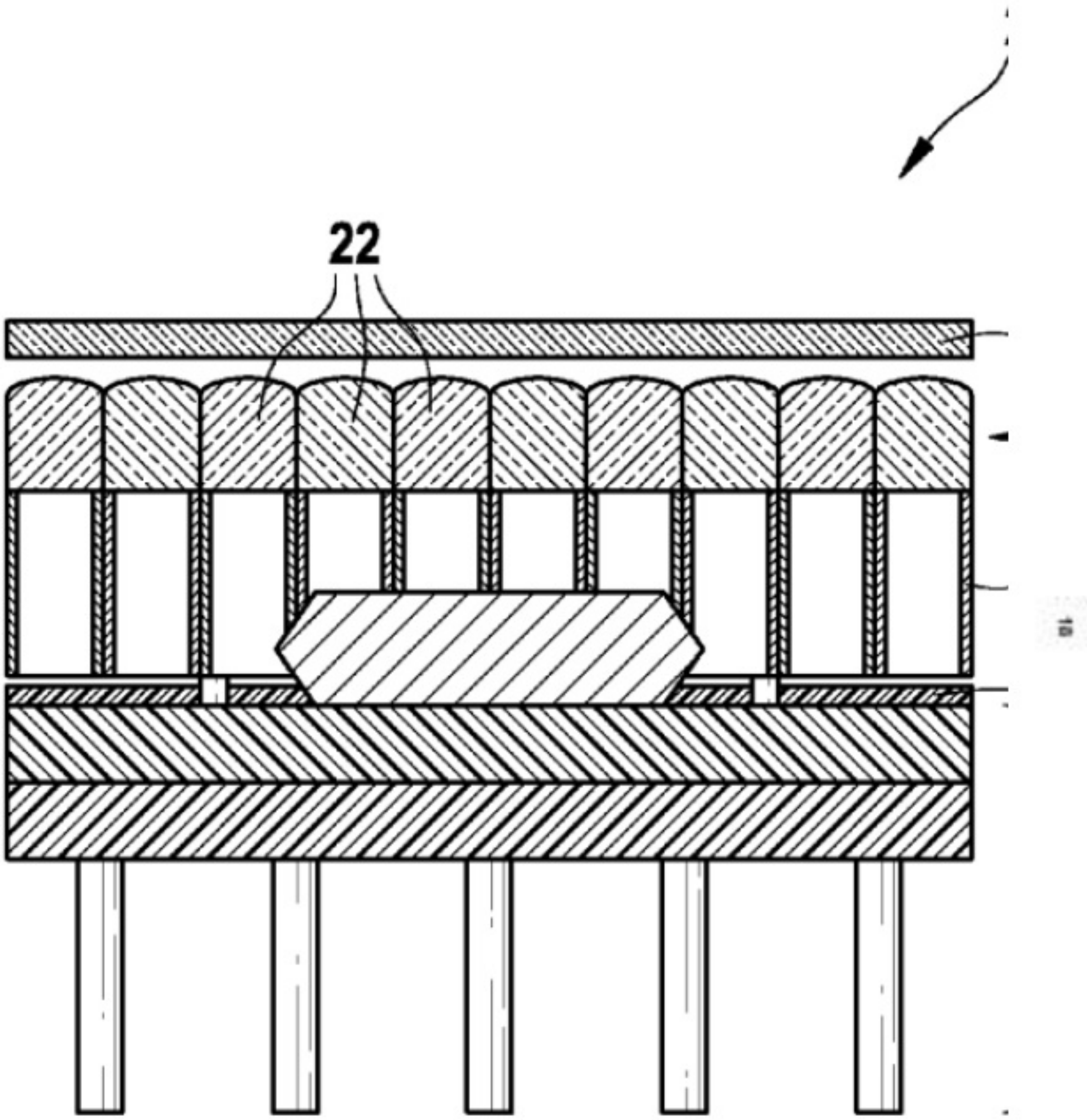

Figure 1: Optical detector with micro lenses; (22) Micro-lenses

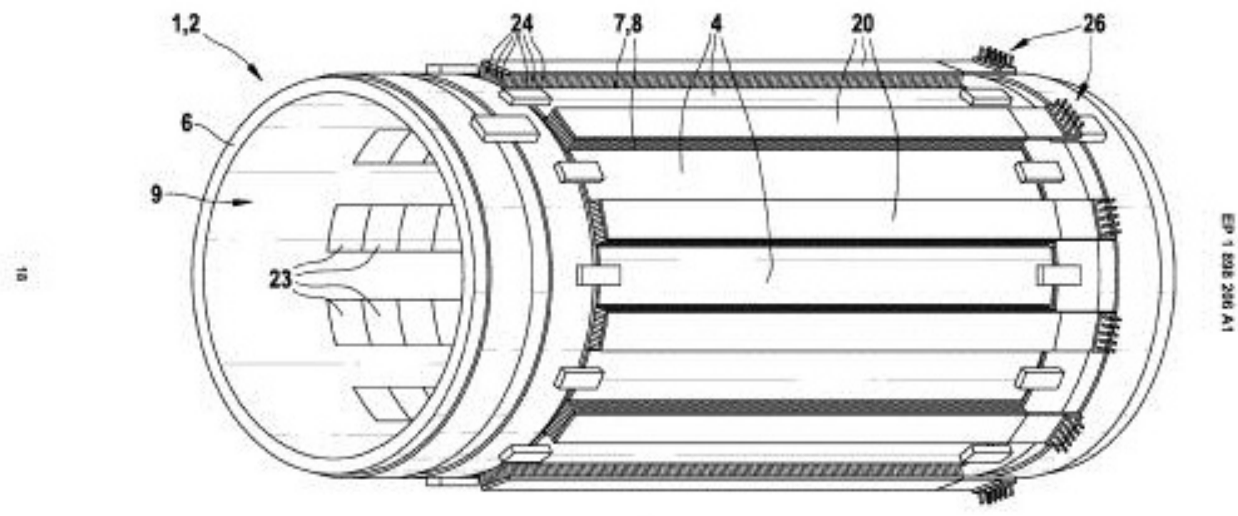

Figure 2: Schematically perspective view of a section of a dual-modality imaging system with micro-lens arrays and photo detectors at the focal planes of the micro lens arrays; 20) Detector block, (21) Micro-lens array, (23) Filter, (24) Optical collimator. (25) Photo detector, (26) Electronic parts and signal transmission elements, (27) Imaged object, (28) Light sources, (29) Light ray, (30) Gaps

References

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"A novel optical tomographic instrument for multimodal imaging application in mice" in J. Nucl. Med. 2011; 52 (Supplement 1):1958; by Joerg Peter and Liji Cao; Medical Physics in Radiology, German Cancer Research Center, Heidelberg, Germany; Abstract No. 1958.

Application area

Optimizing drug and gene therapy.
Imaging drug effects at a molecular and cellular level.
Monitoring multiple molecular events nearsimultaneously.
Monitoring time-dependent therapeutic influences on gene products in the same animal.
Studying the interaction between tumor cells and the immune system.

Advantages

No necessity for contact between detector and object.
Thin CMOS detector (option for small device).
High resolution/sensitivity.
Combination MR-OT possible.
Identical imaging geometries and animal positioning.
Shorter acquisition time and better study management.

Institution

German Cancer Research Center

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