LEONARDO

PATENT BROCHURE

SYSTEM FOR SURVEILLANCE OF AN AREA WITHIN WHICH PEOPLE MOVE

Main Technological Area ⟶ Gas detection/sensing

Keyword ⟶ gas analysis | gas monitoring | gas concentration measuring | hollow optic fibre

The present invention relates to a system for surveillance of an area in which people or goods move (for example, airport or sea-port terminals, railway stations, large department stores, shopping centres, industrial plants, etc.) or at specific locations sensitive for security of an internal area that are difficult to access, such as, for example, the air-intake and conditioning ducts, in order to detect in a timely way the presence of toxic agents or explosive precursors in the air.
The system is intrinsically modular in that the basic elements (fibres and optical multiplexers) can be combined in different topologies depending on the extension of the area and its conformation.
The system, in its simplest structure, is composed of (a) a hollow optical fibre, which has been provided throughout its length with radial holes in order to allow gas circulation with outside (Figure 1), (b) a micro-pump, (c) an optical source, (d) a optical sensor, (e) a processing unit which examines the spectrum of the optical signal detected by the sensor.

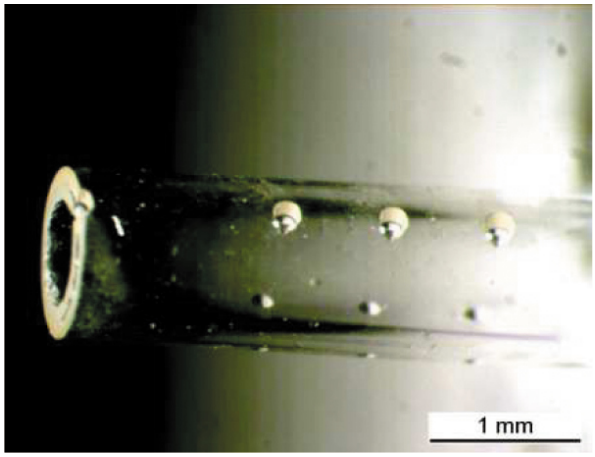

Figure 1 – Hollow fibre with holes

TECHNICAL SPECIFICATIONS

The patented system is composed of a micro-pump that supplies a forced flow of air along the internal channel of hollow optical fibre that extends in the area to be monitored, and through a series of radial micro-holes drilled at regular intervals throughout its extension. It is through such radial holes that the micro-pump can exchange, in the central part of the hollow fibre, the air taken from the environment under observation. The system also includes an optical source placed at one end of the fibre and a sensor placed at the opposite end and such as to detect the optical signal that has traversed the hollow fibre in all of its length. A processing unit examines the spectrum of the optical signal detected by the sensors in order to verify the possible presence of toxic agents in the area under surveillance.

The sensor-line, which is composed of the elements described above, is a possible compromise between a grid of many sensor points and few but more complex remote sensors, the latter needed in order to obtain distributed detection capability in a rather complex environment.
The small number of system components allows a reduction of costs and a simplification of installation and maintenance.

In case of covering an area larger than the area which is controllable via a single hollow fibre (15/20 meters), using optical multiplexer-demultiplexers allows to keep low the number of optical sources and sensors used.

The system usually operates in the 3-15µm spectral band (mid-IR) where the signatures of most of the industrial toxic compounds (TIC: toxic industrial compound) and chemical agents used in war (CWA: chemical war agents) are located. Based on the system architecture described in the patent (hollow fibre and non-complex optical source), sensitivity of some ppm (part per million) or ppb (part per billion) can be reached, using more advanced lasers and sensors.

INNOVATION/ADVANTAGES

Point sensor networks (for example chemical or optical) for the detection of toxic agents in limited areas of the area subject to surveillance, have generally some limits:

- Complexity and high costs due to the use of a large number of interconnected parts. Such situation also occurs using optical point sensors which, even though ensuring continuous operation, sensitivity and selectivity, they are too expensive to be employed in large numbers;
- Difficulty in continuous monitoring; sensors generally need to switch between sampling mode and cleaning/reset status.

The invention feature a system for effective surveillance with high sensitivity and selectivity, in continuous mode, with a fast response time, while keeping low costs of implementation and installation, and leverages on:

- Reduced number of components, compared to systems having the same purposes;
- Flexibility and scalability, depending on the area to be monitored;
- Continuous monitoring capability by not adopting chemical-based detectors;
- Greater sensitivity with respect to systems using a source that radiates in free air;
- Simple alignment and calibration of the system with respect to other solutions;
- Ability to localize threats using simple topological schemes.

FIELDS OF APPLICATION

Homeland security	Surveillance of airport terminals, port terminals, railway stations, malls and industrial plants
Safety	Air monitoring in critical plants, research sites, public agencies
Health	Gas analysis modules in medical applications

PATENT INFORMATION

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Active worldwide applications

EPO - EP2542877B1; filing date: 20/09/2012; grant date: 08/07/2015

National Extensions: Germany - France – United Kingdom – Italy – Netherlands – Poland – Spain – Sweden – Switzerland – Turkey

Russia - 2012142340 - 2555470; filing date: 05/10/2012; grant date: 10/07/2015

Israel - 221756; filing date: 03/09/2012; grant date: 01/10/2016

USA - US8664604; filing date: 08/11/2012; grant date: 04/03/2014

China - 201180012532.1; filing date: 04/03/2011; grant date: 10/06/2015

Brazil - BR1120120223151; filing date: 04/03/2011; grant date: 02/07/2019

United Arab Emirates - PCTIB2011000460; filing date: 04/03/2011; grant date: --/--/----

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