Acoustic detection of liquid droplets on solid surfaces

Reference No: B69126

CHALLENGE

To fully exploit the potential of **industrial automation,** expected with the rise of the industry 4.0, **continuous monitoring of the infrastructure** becomes an absolute necessity. This includes for example sensors to **monitor if and where a leak has occurred** in systems containing liquids. It has long been known that droplets deposited on a surface will attenuate surface acoustic waves (SAW), propagating along said surface. Thus, a series of such sensors, positioned underneath a pipe or reservoir, is able to determine when and where a leak has occurred. The miniaturized design, high thermal stability, and possibility of wireless integration of these SAW sensors make them very promising devices for industrial internet of things applications. However, conventional SAW sensors are typically made from **piezoelectric material** and have to be mounted directly on the surface to be monitored. This **requires extra precautions when the liquids in question are conducting.**

INNOVATION

The invented method and device is based on **Lamb-wave attenuation[1].** Exploiting this approach, the piezoelectric **sensor elements can be mounted on the backside of any structural material,** i.e. glass, plastics, and metal, eliminating the danger of coming in direct contact with the liquid. A particular advantage of such an acoustics-based method is the large area that can be monitored with only a few sensors and even the droplet location on a two-dimensional plane can be determined.

COMMERCIAL OPPORTUNITIES

Industrial use cases include applications such as **leak detection** and **monitoring condensation.** Further applications include **rain detection for smart home systems and wiper control** in specialty vehicles.

DEVELOPMENT STATUS

Prototype has been successfully tested.

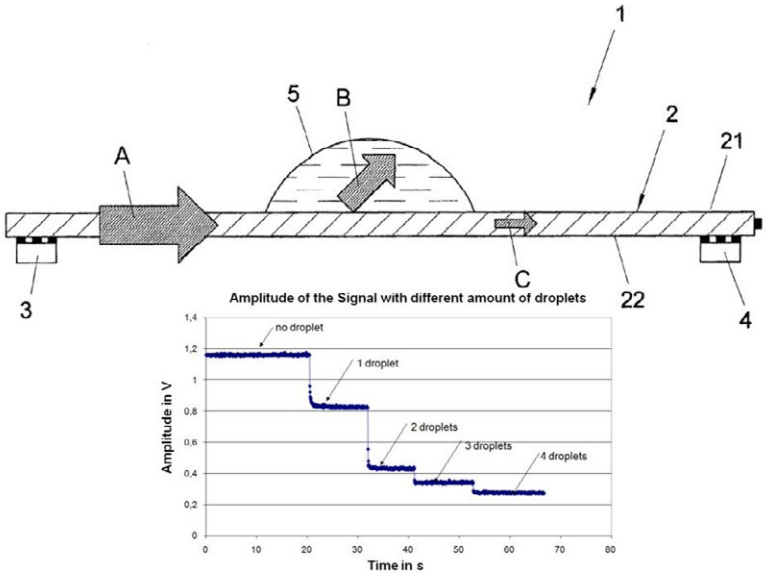

Figure: (Top) Showing the method and device[2]. A Lamb-wave **(A)** emitted by the source **(3)** is attenuated by losses **(B)** when passing a droplet **(5)**. The attenuated wave **(C)** is detected by a sensor **(4)**. (Bottom) Measurements demonstrating the quantitative nature of the results.

REFERENCES:

1. M. Schmitt et al., Proc. Sensoren und Messsysteme 2010, 298-305 (2010)
2. EP2417444B1

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HOCHSCHULE COBURG

Technology from HOCHSCHULE COBURG

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