

Magnetic Sensor Innovation

Amorphous MI Sensor

An ultra high sensitivity magnetic sensor based on nanotechnology:
the Amorphous MI Sensor

Aichi Micro Intelligent Corporation proposes new devices and systems built around the Amorphous MI Sensor.

Amorphous MI Sensor: Outline

The MI Sensor is a third-generation magnetic sensor which makes practical use of amorphous metal wire, which has a unique electron spin arrangement at the nano-level.

Principle

1 Amorphous Wire

Amorphous magnetic metal wire is 20um diameter FeCoSiB alloy wire in an amorphous state without crystalline structure due to a unique production method. Amorphous metal wire exhibits ideal soft magnetic properties and is an optimal material for high sensitivity magnetic sensors. (Fig.1)

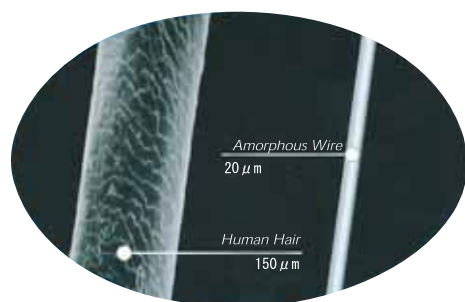
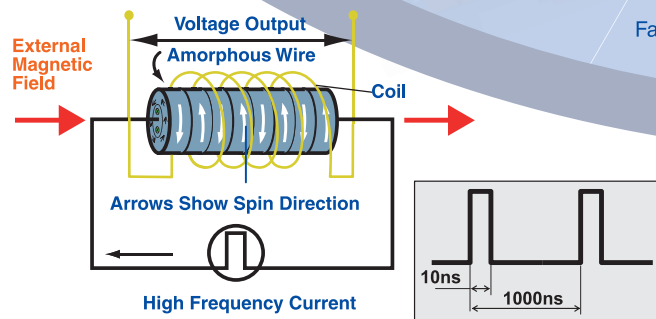


Fig.1 Amorphous Wire

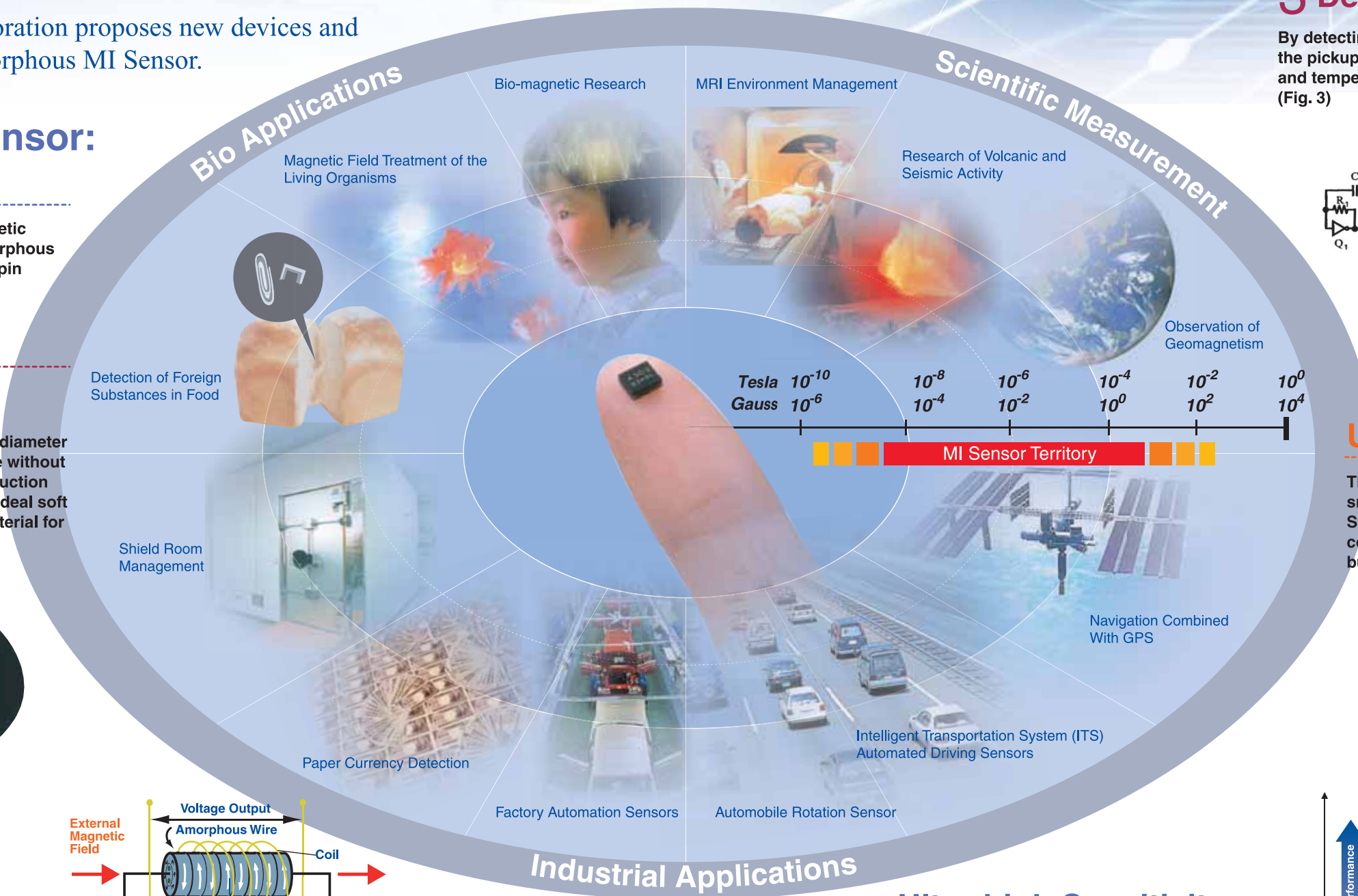
2 MI Effect

The MI Sensor is a practical application of the MI effect, in which when pulse electric current is passed to amorphous metal wire, the wire impedance changes significantly in response to the strength of the external magnetic field. (Fig.2)



$$Z = \frac{a}{2\sqrt{2}\rho} R_{dc}(1+j)\sqrt{\omega\mu(H_{ex})}$$

Fig.2 MI Effect



3 Detection Circuit

By detecting the imaginary part of the MI effect with the pickup coil around the amorphous wire, linearity and temperature characteristics are greatly improved. (Fig. 3)

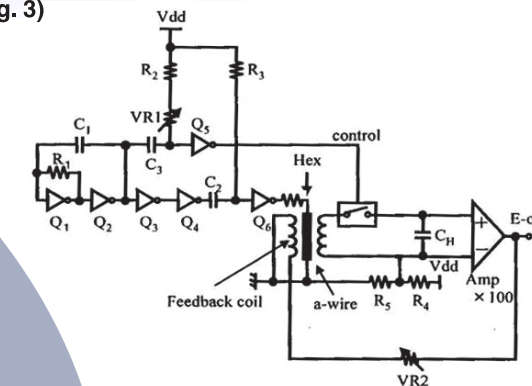


Fig.3 Detection Circuit

Ultra-small MI Sensor

The Amorphous MI Sensor employs an ultra-small MI element (Fig.4) developed by Aichi Steel Corporation. Aichi Micro Intelligent continues to develop devices and systems built around the MI Sensor.



Fig.4 Micro MI Element

Ultra-high Sensitivity Applying Nanotechnology

The MI Sensor has 10,000 times greater sensitivity than conventional magnetic sensors. (Fig.5)

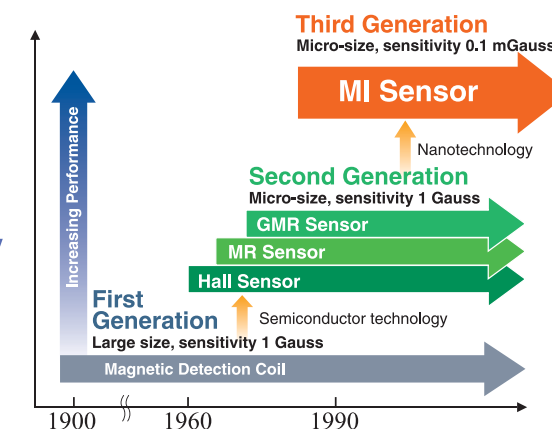


Fig.5 Magnetic Sensor History