

METHOD FOR DETERMINING STRESS OF A COMPONENT MADE OF MAGNETIZABLE MATERIAL

Area tecnologica principale \longrightarrow Materials

Keyword \longrightarrow Stress | Magnetizable Material | Barkhausen Effect

The Barkhausen effect is the physical phenomenon whereby a magnetic flux is induced within a magnetizable material, while this is exposed to a variable magnetic field. The induced magnetic flow does not vary continuously with respect to the variable magnetic field, but through discrete changes that therefore induce, in a coil placed close to the component itself, current pulses that can be detected, amplified and recorded. It is well known that these pulses, peculiar to the Barkhausen effect, are influenced by any tensile or compressive forces to which the component is subjected.

TECHNICAL SPECIFICATIONS

The specific form of realisation that is envisaged (see Figure 1 below) consists of:

- A component (2) made of magnetisable material on which stress levels are measured
- An U-shaped element (3) with two parallel arms (7) in contact with the surface of the component (2), capable of generating on the component (2) an alternating magnetic field of variable frequencies and amplitudes in controlled manner
- A probe (4) that includes a winding (10) to determine the actual value of the amplitude of the Barkhausen noise due to the action of the magnetic field on the component (2)
- A processing unit (5) to process the Barkhausen noise signal acquired by the probe (4) and that can provide a significant measurement of component stress (2). The unit (5) includes a Alternate current generator (6), a filter (11), a memory unit (15), an analysis unit (20), a Display Stage (35)
- A central unit (30) consisting of an amplifier (12), a data acquisition board (13), a Power Amplifier (14) for the element (13)

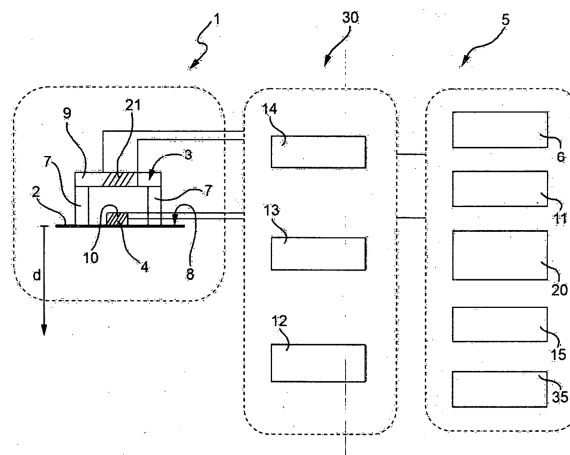


Figure 1 – Schematic view of the system

The system could be used for example in the structure materials field, to measure stress on specific components residue due to particular processing following heat treatments (shot peening, milling); this to allow an accurate evaluation of the fatigue strength of the component.

In general terms, the system can also be used in other fields to determine the stress of a magnetizable component using the Barkhausen effect. The system is also able to address the possible need for assessing stress levels at different depths within the component.

INNOVATION/ADVANTAGES

- A system easily implementable, that does not require special maintenance
- An effective method to assess stress levels in precise positions within a component.

FIELDS OF APPLICATION

- Components for any kind of vehicle
- Components for the nautical sector
- Components of metal structures in general (iron bridges, iron structures for building constructions).

PATENT INFORMATION

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Active Worldwide Extensions

EPO - – EP2572175B1; Filing Date: 2011/05/23; Grant Date 2015/09/16

National extensions: Italy – Germany – France – United Kingdom

USA - US9488537; Filing Date 2013/01/18; Grant Date 2016/11/08

China - CN104185741B; Filing Date 2011/05/23; Grant Date 2015/02/25

Japan - JP2015503717A; Filing Date 2011/05/23; Grant Date 2016/08/31

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