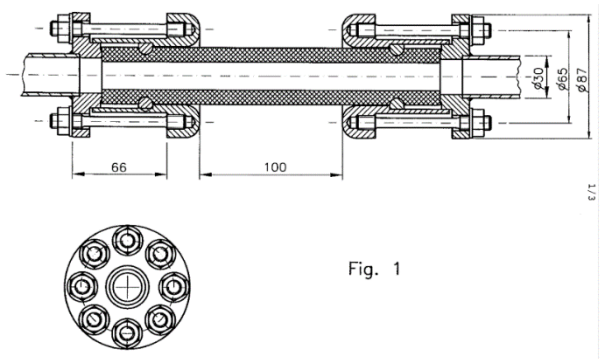
Axial Potential Separator suitable for Cryotechnics

The technology innovation is a new electrical potential separator for cryotechnics. It is applicable particularly to electrically isolating areas, in which different potentials occur. The device consists of a dielectric tube e.g. made of polyimide, which still isolates when subjected to low temperatures as a result of its material properties. An annular groove is located on the exterior of both end areas of the tube, in which a support ring is inlaid. Electrodes are applied to the tube such that they cannot be removed. The electrodes themselves are detachably connected to flanges that are pulled onto the face of the tube to seal the device. The technology is ready for use in the non--fusion domain and was patented by the inventors Stefan Fink and Günter Friesinger.

Description of the technology

When shutting down large cryogenic magnets, high voltage in the area of 10 kV occurs. Within the tube system that is designed for fluid helium as a coolant, it is important to not only guarantee electrical potential separation but also provide vacuum tightness subject to internal pressures of up to 20 atmospheres. A potential separator prevents undesirable current paths that may endanger personnel and equipment. The innovation offered is a device that consists of a dielectric tube e.g. made of polyimide, whose material properties are such as to provide electrical isolation even at low temperatures. It provides the mechanical properties required for its operational use and can be manufactured on an industrial scale with a consistent quality.



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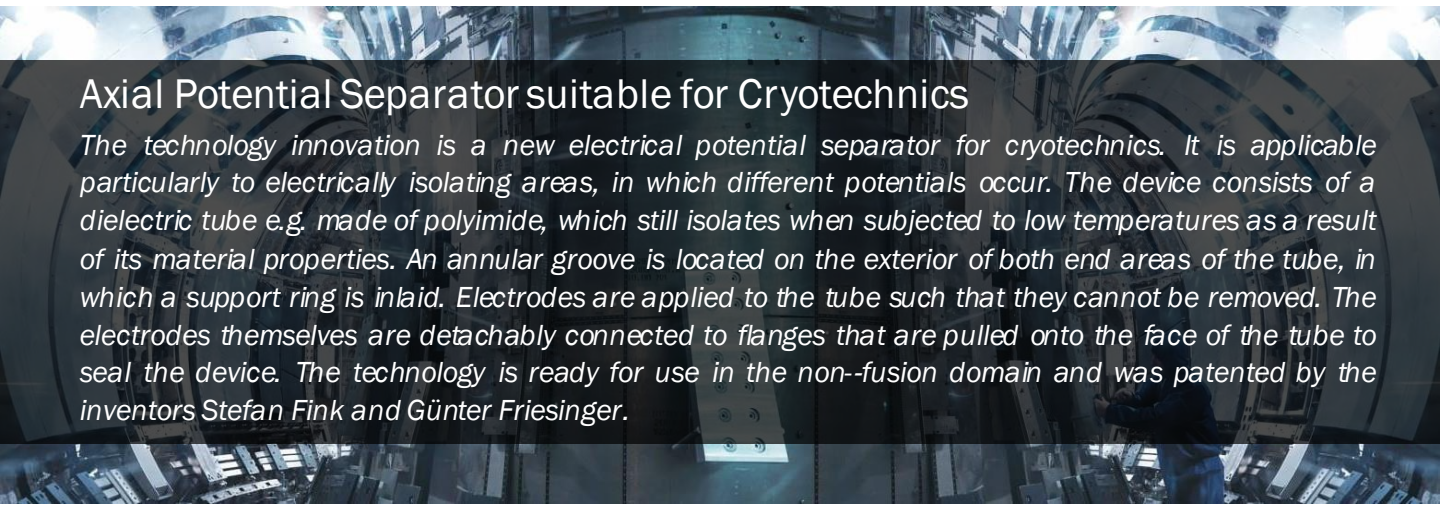
Innovation and advantages of the offer

Up to now, isolation devices made of glass fibre composites have been successfully used for the temperature regimes encountered in cryogenics, i.e. down to 4K. The disadvantage is that they need to be manually fabricated, which is time and cost intensive. In addition, maintaining the required material properties and quality over many samples remains a challenge, and they are generally not available on demand. An alternative is to use ceramic materials. Those are however brittle and often do not provide the mechanical stability and flexibility required for operational use in test facilities. For such an environment the new technology provides a solution. It is furthermore a candidate for industrial manufacturing.

Application of Axial Potential Separator in Fusion Domain (Source: S. Fink: Cryogenic insulation break", KIT, October 31st, 2014)



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Non-fusion Applications

The technology has been developed for application in the Nuclear Fusion domain. Devices have been manufactured that have been used successfully for several months of continuous operation. Due to the material used and the small number of devices produced to date, the production cost is still high but could be reduced for an increased number of units. The key advantage is the consistent quality of the devices produced. The facilities in which the use of such devices would be highly advantageous are those requiring a large temperature regime of operation such as from --60°C up to 200°C and where a failure of a conventional potential separator would cause significant follow-on cost.

Fusion Heritage

The innovative technology for axial potential separators for cryotechnics was developed at the Forschungszentrum Karlsruhe that has merged with the University of Karlsruhe to become the Karlsruhe Institute of Technology (KIT). It was successfully tested and patented and is used at KIT within test facilities. Compared to conventional separators that are typically hand--made, the new device can be manufactured on industrial level with consistent quality

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