Electrical Contact Geometry for Switchgear Applications

Switch-contact geometries and using finite elements analysis to compare the contact geometries with respect to the maximum electric field, mass, and contact resistance

Georgia Tech inventors are developing different switch-contact geometries and using finite element analysis to compare the contact geometries with respect to the maximum electric field, mass, and contact resistance. Comparative analysis of different contact geometries (elliptical, Bruce, and Rogowski) have shown advantages over the conventional spherical contacts.

The proposed geometries of Rogowski, Bruce, and elliptical contacts show a reduced field enhancement in the sub-millimeter separation range, which is important for applications with limited contact travel such as piezoelectrically actuated disconnect switches. These contact profiles also have a significantly reduced height compared to spherical contacts, which results in a reduction of bulk contact resistance and mass. These optimized contact geometries are expected to substantially improve the performance of high speed disconnect switches. Long term performance of the proposed contact geometries needs to be investigated.

Summary Bullets

- Faster operation
- Enabling of fault current limitation
- Reduction in risk of damaging electrical equipment

Solution Advantages

- Faster operation
- Enabling of fault current limitation
- Reduction in risk of damaging electrical equipment

Potential Commercial Applications

- Circuit breakers
- Disconnect switches
- Vacuum Interrupters
- Sectionalizers

- Grounding switches
- Transfer switches

Background and More Information

Fast mechanical disconnect switches are an integral part of hybrid circuit breakers, which protect devices to clear faults in medium voltage distribution systems. Compared to their conventional counterparts, hybrid circuit breakers can have the ability to limit the fault current, which can allow more interconnections between substations with advantages for grid reliability and resiliency. The proposed design of an ultra-fast mechanical disconnect switch operates in vacuum, carries continuous current similar to conventional vacuum interrupters, opens at current zero, features minimum moving mass, and has an open contact separation of less than a millimeter. The limited separation distance requires an optimized contact geometry to keep the electric field within safe limits, minimize the moving mass, and reduce contact resistance.

Inventors

- Dr. Lukas Graber
  Assistant Professor and Director of Plasma and Dielectrics Laboratory – Georgia Tech School of Electrical and Computer Engineering
- Tushar Damle
  Ph.D Student at Plasma and Dielectrics Laboratory – Georgia Tech School of Electrical and Computer Engineering
- Gyu Lim
  Graduate Research Student – Georgia Tech School of Electrical and Computer Engineering

IP Status

: US11424084B2

Publications

, -

Images

Visit the Technology here:
Electrical Contact Geometry for Switchgear Applications