

UNITED STATES PATENT OFFICE

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ULTRA HIGH FREQUENCY CIRCUIT
CONDUCTOR MEMBER

Christopher Henry Foulkes, London, England,
assignor to International Standard Electric
Corporation, New York, N. Y.

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4 Claims. (Cl. 178-44)

This invention relates to ultra high frequency circuits and more particularly to such circuits constituted by hollow resonator structures.

It is well known that an alternating current tends to flow along the surface of a conductor and that as the frequency is increased the current penetration decreases. At very high frequencies the current may penetrate to a depth only of a few thousandths of an inch. This phenomenon is known as "skin effect."

For any metal surface forming part of an ultra high frequency circuit, the presence of die marks, scratches or ridges of any kind in a direction inclined to current flow, therefore increases the length of the current path, and the circuit becomes very inefficient.

In accordance with the invention, therefore, it is proposed to polish or burnish a high frequency current-conducting surface of a conductor forming part of an ultra high frequency circuit with a motion which is parallel to the direction of current flow. In this manner all die marks, scratches and other surface irregularities in a direction inclined to the direction of current flow are removed: and the direction in which the conductor has been polished or burnished is, of course readily perceptible when the operation is completed.

The invention has been applied with surprisingly satisfactory results to hollow resonators forming parts of velocity modulated electron discharge tubes. For example, in such a resonator constituted by a length of coaxial line of the kind described in United States application No. 367,401, filed by J. H. Fremlin on November 27, 1940, for Electron discharge apparatus, and which application has matured to Patent No.

2,320,860 dated June 1, 1943, the direction of current flow is parallel to the axis, and it has been found that an improvement of up to 30% in efficiency is obtained when the inside surface is polished or burnished with particular care with a motion parallel to the axis of the resonator. For convenience the terms "polishing" and "polished" in the claims are intended to include burnishing and similar surface smoothing operations and the resulting surfaces.

What is claimed is:

1. The method of preparing the surface of an electrical conductor forming part of an ultra high frequency circuit, which consists in polishing said surface with a motion parallel to the direction of intended current flow, whereby such surface marks as remain are in the said direction.

2. An electrical conductor member adapted to form part of an ultra high frequency circuit, having a polished surface along which a high frequency current is intended to flow, said surface being of the type produced by polishing with a motion parallel to the intended direction of said flow and characterized by the fact that all material surface irregularities extend parallel to such flow.

3. A hollow resonator adapted for use in a velocity modulated electron discharge tube having a polished inner surface as set forth in claim 2.

4. A hollow resonator adapted for use in a velocity modulated electron discharge tube comprising a length of coaxial line having a polished inner surface as set forth in claim 2.

CHRISTOPHER HENRY FOULKES.