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Use Of Micro-Structured Plate For Controlling Capacitance Of Mechanical Capacitor Switches

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BRIEF DESCRIPTION

This present invention describes the design of a micro-structured plate for controlling the capacitance of a mechanical capacitor. The capacitance value can be changed by simply changing the number and size of the micro-structured plates.

FULL DESCRIPTION

To fabricate traditional micro-electro-mechanical capacitance switches for lower power radio frequency applications, the area and the thickness of the dielectric film in the Metal-Insulator-Metal (MIM) configuration are varied to control the capacitance values. Changing the dielectric thickness apparently has benefit in manufacturing uniformity. However, in high power applications, the dielectric material has strict thickness requirements in order to prevent breakdown during switching and the "on" state. Variable contact area also makes it difficult to have a homogeneous contact, which becomes crucial in high power radio frequency applications.

The present invention describes a method to design capacitive micro-switches using micro-structures to control capacitance level. Micro structures of different cross-sectional shapes can be fabricated uniformly above the contact surfaces of both capacitor plates. The height, cross-section and gap of the micro-structures are varied to optimize capacitor switch performance at higher radio frequency electric power. The overall contact area of the micro structures determines the capacitance at the contact of both plates.

SUGGESTED USES

This invention is applicable to radio frequency phase shifters, antenna switches, resonators, line switches, attenuators, isolators, tuning circuits and power amplifiers that are critical components for the telecommunication industry.

ADVANTAGES

Micro-structures patterned on a rigid plate can easily manipulate the resulting capacitance across a large range, which is a unique feature for mass production of capacitor switches at different nominal capacitance. The micro-structure design also aids heat dissipation during high power operation.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,641,174	05/02/2017	2011-609

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OTHER INFORMATION

KEYWORDS

Capacitive switch, Radio frequency power, Phase shifters, Diversity antennas, Resonators, Line switches, Attenuators, Tuning circuits, Laminates

CATEGORIZED AS

» **Communications**
» Wireless
» **Semiconductors**
» Design and Fabrication

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