

(12) **United States Patent**  
**Wilson et al.**

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(54) **HIGH TEMPERATURE VACUUM FURNACE HEATER ELEMENT SUPPORT ASSEMBLY**

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(57) **ABSTRACT**

An electrical insulating and heating element support assembly for a high temperature vacuum furnace having a threaded support rod for connecting a heating element to the insulated hot-zone support ring in an electrically non-connected position includes insulator sleeves and washers surrounding the rod in contact with a series of refractory metal washers which may include graphite and/or molybdenum as shielding liners used to protect electrical insulators from having electrical short path means due to deposition of conductive materials onto the non-conducting insulators, and the use of threaded nuts and bushings to anchor the rod and shielding arrangement within the furnace hot zone. The non-conducting insulators and washers are made from materials with high thermal and electrical resistance, such as preferably alumina or mullite, and radially surround the support rod and the heating element. The electrically non-connected shielding washers and nuts, and the rod can be made from graphite or molybdenum, and are designed to be easily disassembled in order to provide relatively easier maintenance service to the vacuum furnace. This design accomplishes the dual objective of supporting both the heating element and the high temperature insulation support ring while remaining electrically non-connected from the heating element. It also allows for variations in thickness of the furnace insulation and heating elements which is common for different furnace designs. This new stand-off assembly is designed to be easily disassembled in order to provide faster maintenance turnaround time and reuse of the stand-off hardware. Another equally important advantage of this design is the absence of holes in the support rod for the placement of pin retainers, and the elimination of the pin retainers, commonly found in prior art vacuum furnace heater element support assembly designs.

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- (58) **Field of Classification Search**  
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**21 Claims, 3 Drawing Sheets**

