Additionally, machining the ferrule (typically from pure titanium) to provide a high tolerance gap between the ferrule and the insulator (about 10-50 μm) which is necessary to achieve a quality braze joint is demanding and costly. Furthermore, if the gap is not maintained during the brazing process, or if the brazing process itself is not properly performed, a weak joint may be formed that can lead to premature failure of the implantable device.

For these and other reasons there is a need for the embodiments of the present disclosure.

Summary of Invention

In accordance with a first aspect of the invention, there is provided a method of securing a feedthrough to a metal housing for an implantable medical device. The method includes providing the feedthrough comprising an insulating section and at least one conductive section extending through the insulating section, metalizing at least a portion of the insulating section, placing the metalized feedthrough within an opening in the metal housing of the implantable medical device, positioning the feedthrough and metal housing within an ultrasonic welding system, and energizing the ultrasonic welding system such that ultrasonic energy welds the feedthrough directly to the metal housing. The temperature of the metal housing is not raised above the β-transus temperature of the metal housing during the ultrasonic welding.

In accordance with a second aspect of the invention, there is provided an implantable medical device including a metal housing configured for implantation in a human and comprising a biocompatible metal and defining an opening, a feedthrough device configured within the opening of the metal housing and comprising an insulating section and a conducting section, the insulating section electrically isolating the conducting section from the metal housing, and an ultrasonic joint between the feedthrough device and metal housing that hermetically and mechanically bonds the feedthrough device and metal housing. The biocompatible metal of the housing comprises a microstructure primarily having α-phase grains.

In accordance with a third aspect of the invention, there is provided an implantable medical device including a housing having an opening with an opening width, a feedthrough including an insulator having a bottom surface and side surfaces and having an insulator width between opposing side surfaces that

is greater than the opening width; and a ultrasonic joint between at least one of the bottom surface, top surface, and side surfaces of the insulator and the housing which hermetically seals the insulator to the housing.

Brief Description of the Drawings

The accompanying drawings are included to provide a further understanding of embodiments and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments and together with the description serve to explain principles of embodiments. Other embodiments and many of the intended advantages of embodiments will be readily appreciated as they become better understood by reference to the following detailed description. The elements of the drawings are not necessarily to scale relative to each other. Like reference numerals designate corresponding similar parts.

Figure 1 generally illustrates an example of an implantable medical device according to one embodiment.

Figures 2 illustrates a feedthrough device in an implantable in accordance with the prior art.

Figure 3 illustrates a cross-sectional view of a feedthrough in an implantable medical device in accordance with one embodiment.

Figure 4 illustrates a system for fabricating a feedthrough assembly in an implantable medical device in accordance with one embodiment.

Figure 5 illustrates a system for fabricating a feedthrough assembly in an implantable medical device in accordance with one embodiment.

Figure 6 illustrates a method for fabricating a feedthrough assembly in an implantable medical device in accordance with one embodiment.

Detailed Description