Claims

1. A medical device comprising:

a handle for gripping by a user, an end effector coupled to the handle and having at least one electrical contact;

a radio frequency, RF, generation circuit coupled to the handle and operable to generate an RF drive signal and to provide the RF drive signal to the at least one electrical contact;

wherein the RF generation circuit comprises a resonant circuit.

2. A device according to claim 1, wherein the radio frequency generation circuit comprises switching circuitry that generates a cyclically varying signal, such as a square wave signal, from a DC supply and wherein the resonant circuit is configured to receive the cyclically varying signal.

3. A device according to claim 1 or 2 comprising a battery compartment for holding one or more batteries for providing power to said RF generation circuit for generating said RF drive signal.

4. A device according to claim 3, wherein the battery compartment is configured to hold a module comprising said one or more batteries and the RF generation circuit.

5. A device according to claim 1, further comprising:

battery terminals for connecting to one or more batteries;

wherein the RF generation circuit is coupled to said battery terminals;

wherein the frequency generation circuit comprises:

switching circuitry for generating a cyclically varying signal from a potential difference across said battery terminals; and

said resonant circuit, being a resonant drive circuit coupled to said switching circuitry and operable to filter the cyclically varying signal generated by the switching circuitry; and

wherein the RF drive signal is controlled by an output from said resonant drive circuit.

6. A device according to any of claims 1 to 5, comprising a control circuit configured to vary the frequency of the RF drive signal.

7. A device according to claim 6, wherein the control circuit is operable to receive a measurement of the RF drive signal and is operable to vary the frequency of the of the RF drive signal to control the power, voltage and/or current delivered to the at least one electrical contact of the end effector.

8. A device according to claim 7, wherein the measurement is obtained from a sampling circuit that samples a sensed voltage or current signal at a sampling frequency that varies in synchronism with the frequency and phase of the RF drive signal.

9. A device according to claim 8, wherein the frequency at which the sampling circuit is operable to sample the sensed signal is an integer fraction of the frequency of the RF drive signal.

10. A device according to any of claims 6 to 9, wherein the control circuit is configured to vary the frequency of the RF drive signal around the resonant frequency of the resonant circuit.

11. A device according to claim 10, wherein the resonant characteristic of the resonant circuit varies with a load connected to the at least one electrical contact and wherein the control circuit is configured to vary the RF drive frequency to track changes in the resonant characteristic of the resonant circuit.

12. A medical device comprising:

a handle for gripping by a user;

an end effector coupled to the handle and having at least one electrical contact;

a radio frequency, RF, generation circuit operable to generate an RF drive signal and to provide the RF drive signal to the at least one electrical contact; and

a control circuit operable to vary the frequency of the RF drive signal to control at least one of the power, the voltage and the current provided to the at least one contact of the end effector.

13. A device according to claim 12, wherein the RF generation circuit comprises a signal generator operable to generate a cyclically varying signal at the RF frequency; and a frequency dependent attenuator that attenuates the cyclically varying signal in dependence upon the frequency of the cyclically varying signal.

14. A device according to claim 13, wherein the frequency dependent attenuator comprises a resonant circuit having a resonant frequency at or near the RF frequency of the cyclically varying signal.

15. A device according to claim 12, further comprising:

an input for receiving a sensed signal that varies with the RF drive signal applied to the at least one electrical contact;

a sampling circuit for sampling the sensed signal received at said input; and

a measurement circuit operable to make measurements of the RF drive signal using samples obtained from the sampling circuit;

wherein said control circuit is operable to control the RF generation circuit in dependence upon the measurements made by the measurement circuit, to vary the frequency of the generated RF drive signal; and

wherein the sampling circuit is operable to sample the sensed signal at a sampling frequency that varies in synchronism with the frequency of the RF drive signal.

16. A method of operating a medical device comprising generating an RF signal and applying the RF signal to at least one electrode of an end effector of the medical device and controlling the frequency of the generated RF signal to control at least one of the power, current, and voltage applied to the at least one electrode.

Claims

1. A medical device comprising:

a handle for gripping by a user;

an end effector coupled to the handle, the end effector having at least one electrical contact;

battery terminals for connecting to one or more batteries;

a radio frequency, RF, generation circuit coupled to said battery terminals and operable to generate an RF drive signal and to provide the RF drive signal to the at least one electrical contact of said end effector, the one or more batteries and the radio frequency generation circuit housed within the handle;

wherein the radio frequency generation circuit comprises:

switching circuitry for generating a cyclically varying signal from a potential difference across said battery terminals; and

a resonant drive circuit coupled to said switching circuitry and operable to filter the cyclically varying signal generated by the switching circuitry.

2. A device according to claim 1, comprising a control circuit configured to vary the frequency of the RF drive signal.

3. A device according to claim 2, wherein the control circuit is operable to receive a measurement of the RF drive signal and is operable to vary the frequency of the of the RF drive signal to control the power, voltage and/or current delivered to the at least one electrical contact of the end effector.

4. A device according to claim 3, wherein the measurement is obtained from a sampling circuit that samples a sensed voltage or current signal at a sampling frequency that varies in synchronism with the frequency and phase of the RF drive signal.

5. A device according to claim 4, wherein the frequency at which the sampling circuit is operable to sample the sensed signal is an integer fraction of the frequency of the RF drive signal.

6. A device according to any one of claims 1 to 5, wherein the control circuit is configured to vary the frequency of the RF drive signal around the resonant frequency of the resonant circuit.

7. A device according to claim 6, wherein the resonant characteristic of the resonant circuit varies with a load connected to the at least one electrical contact and wherein the control circuit is configured to vary the RF drive frequency to track changes in the resonant characteristic of the resonant circuit.

8. A device according to claim 1, wherein the RF generation circuit comprises a signal generator operable to generate a cyclically varying signal at the RF frequency; and a frequency dependent attenuator that attenuates the cyclically varying signal in dependence upon the frequency of the cyclically varying signal.

9. A device according to claim 8, wherein the frequency dependent attenuator comprises a resonant circuit having a resonant frequency at or near the RF frequency of the cyclically varying signal.

10. A device according to claim 3, further comprising:

an input for receiving a sensed signal that varies with the RF drive signal applied to the at least one electrical contact;

a sampling circuit for sampling the sensed signal received at said input; and

a measurement circuit operable to make measurements of the RF drive signal using samples obtained from the sampling circuit;

wherein said control circuit is operable to control the RF generation circuit in dependence upon the measurements made by the measurement circuit, to vary the frequency of the generated RF drive signal; and

wherein the sampling circuit is operable to sample the sensed signal at a sampling frequency that varies in synchronism with the frequency of the RF drive signal.