

CLAIMS

1. A bipolar pulse generating circuit for an electrosurgical generator, the bipolar pulse generating circuit comprising:
- 5 a voltage source connectable to a load via a switching element;
- a coaxial transmission line having an inner conductor separated from an outer conductor by a dielectric material, wherein the inner conductor has a first end connected between an input of the switching element and the voltage source and a second end in an open circuit condition, whereby the coaxial transmission line is charged by the voltage source when the switching element is in an OFF state and to be discharged when the switching element is in an ON state;
- 10 a first output connectable to the load, wherein the first output is located between an output of the switching element and ground to support a positive pulse when the coaxial transmission line discharges; and
- 20 a second output connectable to the load, wherein the second output is located between the outer conductor of the coaxial transmission line and ground to support a negative pulse when the coaxial transmission line discharges,
- wherein the impedance of the coaxial transmission line is configured to match a sum of (i) the impedance the switching element, (ii) the impedance of the load at the first output, and (iii) the impedance of the load at the second output.
- 25
2. A bipolar pulse generating circuit according to claim 1, wherein a delay line is connected to either the first output or the second output, whereby supply of the positive pulse and negative pulse at the first output and second output occurs sequentially.
- 30

3. A bipolar pulse generating circuit according to claim 1 or 2, wherein the delay line has an adjustable length.

5 4. A bipolar pulse generating circuit according to claim 2 or 3, wherein the delay line is another length of coaxial transmission line.

5. A bipolar pulse generating circuit according to any preceding claim, wherein the switching element comprises:
10 a plurality of series connected avalanche transistors;
and
a trigger pulse generator configured to generate a trigger pulse to activate the plurality of series connected avalanche transistors.

15

6. A bipolar pulse generating circuit according to claim 5, wherein the trigger pulse generator comprises a TTL device.

20

7. A bipolar pulse generating circuit according to claim 5 or 6, wherein the trigger pulse has a voltage less than the emitter-base breakdown voltage of each of the plurality of avalanche transistors.

25

8. A bipolar pulse generating circuit according to any one of claims 5 to 7, wherein the trigger pulse generator is connected to the plurality of series connected avalanche transistors via a transformer.

30

9. A bipolar pulse generating circuit according to any one of claims 5 to 8, wherein the trigger pulse is applied between the collector and emitter of a first transistor of the plurality of series connected avalanche transistors.

10. A bipolar pulse generating circuit according to claim 9, wherein the first transistor is furthest from the coaxial transmission line.

5 11. A bipolar pulse generating circuit according to any one of claims 5 to 10, wherein a diode is connected in parallel with each of the plurality of series connected avalanche transistors to clamp the voltage across each transistor to less than its collector-base breakdown voltage.

10

12. A bipolar pulse generating circuit according to any one of claims 5 to 11, wherein each transistor in the plurality of series connected avalanche transistors is identical.

15

13. A bipolar pulse generating circuit according to any preceding claim, wherein the coaxial transmission line has a length selected to provide a line delay equal to or less than 5 ns.

20

14. A bipolar pulse generating circuit according to any preceding claim, wherein the coaxial transmission line is charged by the voltage source through a resistor.

25

15. A bipolar pulse generating circuit according to any preceding claim, wherein the load is an electrosurgical instrument.

30 16. An electrosurgical generator having a bipolar pulse generating circuit according to any preceding claim.