

CLAIMS

1. An electrosurgical instrument comprising:
a proximal portion comprising a coaxial transmission line
5 for conveying microwave electromagnetic (EM) energy;
a distal radiating portion; and
an intermediate impedance transformer arranged to match
an impedance of the coaxial transmission line to an impedance
of the distal radiating portion,
10 wherein the distal radiating portion comprises a
microwave antenna for emitting the microwave EM energy
conveyed by the coaxial transmission line,
wherein the distal radiating portion has a maximum outer
diameter less than an outer diameter of the coaxial
15 transmission line.
2. An electrosurgical instrument according to claim 1,
wherein the coaxial transmission line comprises an inner
conductor separated from a proximal outer conductor by a first
20 dielectric material, and wherein the inner conductor extends
beyond a distal end of the proximal outer conductor through
the intermediate impedance transformer and into the distal
radiating portion.
- 25 3. An electrosurgical instrument according to claim 2,
wherein the intermediate impedance transformer is a quarter
wavelength coaxial transmission line.
- 30 4. An electrosurgical instrument according to claim 3,
wherein, in the quarter wavelength coaxial transmission line,
the inner conductor is separated from an intermediate outer
conductor by a second dielectric material having a smaller
outer diameter than the first dielectric material.
- 35 5. An electrosurgical instrument according to claim 4,
wherein the second dielectric material is a reduced diameter
portion of the first dielectric material that extends beyond
the distal end of the proximal outer conductor.

6. An electrosurgical instrument according to claim 4, wherein the second dielectric material has a higher relative permittivity than the first dielectric material.

5 7. An electrosurgical instrument according to any one of claims 2 to 6, wherein the inner conductor extends through the distal radiating portion to form a conductive portion of the microwave antenna.

10 8. An electrosurgical instrument according to any one of claims 2 to 6 comprising a distal conductive finger mounted on a distal end of the inner conductor, wherein the distal conductive finger forms a conductive portion of the microwave antenna.

15 9. An electrosurgical instrument according to claim 7 or 8, wherein the microwave antenna is a loaded monopole antenna having a distal dielectric material mounted over the conductive portion of the microwave antenna.

20 10. An electrosurgical instrument according to claim 9, wherein the distal dielectric material is a reduced diameter portion of the first dielectric material that extends beyond the distal end of the proximal outer conductor.

25 11. An electrosurgical instrument according to claim 9, wherein the distal dielectric material is a rigid material having a higher relative permittivity than the first dielectric material.

30 12. An electrosurgical instrument according to any one of claims 7 to 11, wherein a distal end of the microwave antenna is sharpened to facilitate insertion into tissue.

35 13. An electrosurgical instrument according to claim 7 or 8, wherein the microwave antenna is a slotted antenna.

40 14. An electrosurgical instrument according to claim 13, wherein the distal radiating portion comprises a distal coaxial transmission line having a distal inner conductor separated from a distal outer conductor by a distal dielectric

material, and wherein the slotted antenna is formed by removed portions of the distal outer conductor.

5 15. An electrosurgical instrument according to claim 14, wherein the distal inner conductor is electrically connected to the distal outer conductor at a distal tip of the microwave antenna.

10 16. An electrosurgical instrument according to any preceding claim, wherein the distal radiating portion comprises a bipolar structure for delivering radiofrequency (RF) energy.

15 17. An electrosurgical instrument according to any preceding claim, wherein the bipolar structure is formed by the microwave antenna.

20 18. An electrosurgical apparatus comprising:
a surgical scoping device having an instrument cord configured to be insertable into a patient's body, wherein the instrument cord has an instrument channel formed therethrough; and
an electrosurgical instrument according to any preceding claim dimensioned to be insertable through the instrument
25 channel.

30 19. An electrosurgical apparatus according to claim 18, wherein the surgical scoping device is an ultrasound-enabled endoscope.

35 20. An electrosurgical apparatus according to claim 18 further comprising an electrosurgical generator connected to supply radiofrequency (RF) energy and microwave energy to the coaxial transmission line separately or simultaneously, wherein the instrument is selectively operable in a plurality of treatment modes, the plurality of treatment modes comprising any of: (i) microwave only, (ii) RF only, (iii) RF followed by microwave, (iv) microwave followed by RF, (v) RF and microwave simultaneously.