CLAIMS

1. An electrosurgical vessel sealer comprising:

an instrument shaft comprising a coaxial transmission line for conveying microwave electromagnetic (EM) energy;

a distal end assembly arranged at a distal end of the instrument shaft to receive the microwave EM energy from the instrument shaft, the distal end assembly comprising:

a pair of jaws that are movable relative to each other to open and close a gap between opposing inner surfaces thereof; and

a blade for cutting through biological tissue,

wherein the pair of jaws comprise an energy delivery structure arranged to emit the microwave EM energy into the gap between the opposing inner surfaces,

wherein the energy delivery structure comprises a coplanar microstrip antenna mounted on the inner surface of one or both of the pair of jaws, the coplanar microstrip antenna being arranged to confine an emitted microwave field substantially within a region between the pair of jaws,

wherein the blade is slidably disposed within the distal end assembly to be movable through the region between the pair of jaws,

wherein the coplanar microstrip antenna comprises:

a planar dielectric substrate having a top surface that is exposed at the gap between the opposing inner surfaces, and an under surface on an opposite side of the planar dielectric substrate from the top surface;

a ground conductor layer on the under surface;

a ground conductive strip on the top surface and electrically connected to the ground conductor layer; and

an active conductive strip on the top surface, the active conductive strip being spaced from the ground conductive strip, and

wherein the active conductive strip and the ground conductive strip are positioned to have a uniform closest spacing within the region between the pair of jaws.

2. An electrosurgical vessel sealer according to claim 1, wherein the active conductive strip is an elongate longitudinally extending finger electrode, and wherein the

ground conductive strip is a U-shaped element that flanks the finger electrode and surrounds its distal end.

3. An electrosurgical vessel sealer according to claim 1 or 2, wherein the ground conductive strip is electrically connected to the ground conductor layer via through holes formed in the dielectric substrate.

4. An electrosurgical vessel sealer according to any preceding claim, wherein the pair of jaws comprises an active jaw having the energy delivery structure mounted therein, and a passive jaw which does not receive a microwave EM energy feed.

5. An electrosurgical vessel sealer according to claim 4, wherein the inner surface of the passive jaw at the gap comprises a resilient deformable layer of electrically insulating material.

6. An electrosurgical vessel sealer according to any preceding claim, wherein each jaw in the pair of jaws has a respective energy delivery structure mounted therein, and wherein the distal end assembly includes a power splitter for dividing the microwave EM energy received from the coaxial transmission line between the respective energy delivery structures.

7. An electrosurgical vessel sealer according to any preceding claim, wherein the opposing inner surfaces include textured or ridged portions to retain biological tissue within the gap.

8. An electrosurgical vessel sealer according to any preceding claim, wherein the pair of jaws are pivotable relative to each other about a hinge axis that lies transverse to a longitudinal axis of the coaxial transmission line.

9. An electrosurgical vessel sealer according to any preceding claim, wherein the pair of jaws comprises:

a static jaw that is fixed relative to the instrument shaft, and

a movable jaw that is pivotably mounted relative to the static jaw to open and close the gap between the opposing inner surfaces.

10. An electrosurgical vessel sealer according to claim 9, wherein the energy delivery structure is disposed on the inner surface of the static jaw.

11. An electrosurgical vessel sealer according to any preceding claim, wherein the blade is a slidable in a longitudinal direction between a retracted position in which it lies proximal to the pair of jaws and an extended position in which it lies within the region between the pair of jaws.

12. An electrosurgical vessel sealer according to any preceding claim, wherein the blade is slidable along a longitudinally extending recessed groove formed in the pair of jaws.

13. An electrosurgical vessel sealer according to any one of claims 1 to 10, wherein the blade is mounted within one of the pair of jaws, and is slidable in a lateral direction between a retracted position in which it lies beneath the inner surface of the jaw and an extended position in which it lies within the region between the pair of jaws.

14. An electrosurgical vessel sealer according to any preceding claim, wherein the blade comprises a rigid element with a sharp edge adapted to slice biological tissue.

15. An electrosurgical vessel sealer according to any one of claims 1 to 13, wherein the blade comprises any one of: a bipolar radiofrequency cutting element, an ultrasound sonotrode, and a heatable wire element.

16. An electrosurgical vessel sealer according to any preceding claim, wherein the instrument shaft is arranged to convey radiofrequency (RF) EM energy and the distal end assembly is arranged to receive the RF EM energy from the instrument shaft, and wherein the distal end assembly further comprises a dissector element arranged to deliver the RF EM

energy for cutting through biological tissue, wherein the dissector element is located outside the region between the pair of jaws.

17. An electrosurgical vessel sealer according to any one of claims 16 to 20, wherein the dissector element is mounted on an outer surface of the pair of jaws.

18. An electrosurgical vessel sealer according to any one of claims 16 to 20, wherein the dissector element is mounted on a longitudinal extender, the longitudinal extender being movable longitudinally with respect to the pair of jaws.

19. An electrosurgical vessel sealer according to any one of claims 16 to 22, wherein the dissector element is mounted at a distal end of the distal end assembly.

20. An electrosurgical vessel sealer according to any preceding claim, wherein the distal end assembly and instrument shaft are dimensioned to fit within an instrument channel of a surgical scoping device.

21. An electrosurgical vessel sealer according to any preceding claim, wherein the surgical scoping device is a laparoscope.