

CLAIMS

1. An electrosurgical resector tool comprising:
a shaft defining a lumen;
5 an energy conveying structure for carrying
electromagnetic (EM) energy through the lumen of the shaft;
an instrument tip mounted at a distal end of the shaft,
wherein the instrument tip comprises:
a static portion comprising a first blade element;
10 and
a movable portion comprising a second blade element,
wherein the movable portion is movable relative to the static
portion between a closed position in which the first blade
element and second blade element lie alongside each other to
15 an open position in which the second blade element is spaced
from the first blade element by a gap for receiving biological
tissue;
a travel limiting mechanism operable to limit a
maximum extent of relative movement between the second blade
20 element and the first blade element in the open position
and/or the closed position;
a first electrode, a second electrode and a planar
dielectric body, the first and second electrodes being spaced
apart and electrically isolated from each other by the planar
25 dielectric body, and wherein the first electrode and the
second electrode are connected to the energy conveying
structure for delivery of the EM energy from the instrument
tip; and
an actuator for controlling relative movement between the
30 movable portion and the static portion.
2. An electrosurgical resector tool according to claim
1, wherein one of the first blade element and the second blade
element comprises the planar dielectric body extending
35 longitudinally and having the first electrode on a first
laterally facing surface thereof, and wherein, in the closed
position, the other of the first blade element and the second
blade element lies adjacent to a second laterally facing
surface of the longitudinally extending planar dielectric body
40 opposite to the first laterally facing surface thereof.

3. An electrosurgical resector tool according to claim 2, wherein the second electrode is located on the second laterally facing surface of the longitudinally extending planar dielectric body.

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4. An electrosurgical resector tool according to claim 2, wherein the longitudinally extending planar dielectric body is on the first blade element, and wherein the second electrode extends along a side of the second blade element.

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5. An electrosurgical resector tool according to claim 4, wherein the second blade element is formed from an insulator-coated conductive material which is further coated with parylene N, and wherein the second electrode is formed at a side portion of the second blade element where the insulator coating and the parylene N coating is removed.

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6. An electrosurgical resector tool according to any preceding claim, wherein the static portion and the movable portion together comprise at least one pair of cooperating structures arranged to provide the travel limiting mechanism.

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7. An electrosurgical resector tool according to claim 6, wherein a first pair of cooperating structures comprises a raised protrusion and a cooperating stop surface, the raised protrusion and the stop surface being configured in use to abut each other in the open position.

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8. An electrosurgical resector tool according to claim 7, wherein the moveable portion comprises the raised protrusion and the static portion comprises the stop surface.

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9. An electrosurgical resector tool according to claim 8, wherein the raised protrusion is formed on a top surface of the moveable portion and distally of a connection between the movable portion and the static portion, and wherein the stop surface is formed on a top surface of the static portion and proximally of the connection between the movable portion and the static portion.

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10. An electrosurgical resector tool according to any one of claims 6 to 9, wherein a second pair of cooperating structures includes a pair of abutment surfaces, the pair of abutment surfaces being configured in use to abut each other in parallel formation in the closed position.

11. An electrosurgical resector tool according to claim 10, wherein a first abutment surface of the pair of abutment surfaces is formed on a top surface of the movable portion and proximally of a connection between the moveable portion and the static portion, and wherein a second abutment surface of the pair of abutment surfaces is formed on an under surface of the static portion and proximally of the connection between the moveable portion and the static portion.

12. An electrosurgical resector tool according to any preceding claim, wherein the static portion comprises a support arm on which the movable portion is mounted.

13. An electrosurgical resector tool according to claims 12, wherein the support arm defines a slot in the static portion for receiving part of the movable portion and wherein at least one of the following applies:

- a length of the slot is less than 2mm,
- a width of the slot is more than 0.7mm,
- a depth of the slot is more than 0.6mm.

14. An electrosurgical resector tool according to claim 12 or 13, wherein the static portion is formed from an insulator-coated conductive material which is further coated with parylene N, and wherein the support arm comprises a proximal contact portion at which the insulator coating and the parylene N coating is removed to form part of an electrical connection between the energy conveying structure and the second electrode.

15. An electrosurgical resector tool according to any preceding claim, wherein the movable portion is pivotable relative to the static portion, whereby the second blade element is angled relative to the first blade element in the open position, and wherein, in the open position, the travel

limiting mechanism is arranged to limit a maximum angle between the first and second blade elements to 60 degrees.

5 16. An electrosurgical resector tool according to any preceding claim, wherein the actuator comprises a control rod slidably mounted in the shaft, the control rod having an attachment feature engaged with the movable portion, whereby longitudinal movement of the control rod in the shaft causes movement of the movable portion relative to the static
10 portion.

 17. An electrosurgical resector tool according to claim 16, further comprising a first tube, a second tube and a third tube, wherein the first tube surrounds the control rod except
15 a distal end region of the control rod, wherein the second tube surrounds the distal end region of the control rod except the attachment feature of the control rod, and the second tube protrudes proximally into the first tube to define an overlap region where the first tube overlaps the second tube, and
20 wherein the third tube surrounds the overlap region and a proximal end region of the static portion.

 18. An electrosurgical resector tool according to claim 17, wherein the first, second and third tubes are
25 substantially clear and are bonded to the instrument tip by ultra-violet adhesive.

 19. An electrosurgical resector tool according to any preceding claim,
30 wherein the energy conveying structure comprises a coaxial transmission line extending in a longitudinal direction through the lumen, and wherein the coaxial transmission line comprises an inner conductor separated from an outer conductor by a dielectric material, and
35 wherein the inner conductor is connected to one of the first electrode and the second electrode and the outer conductor is connected to the other of the first electrode and the second electrode for delivery of the EM energy from the instrument tip.

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20. An electrosurgical resector tool according to any preceding claim, wherein the energy conveying structure is for carrying radiofrequency (RF) electromagnetic (EM) energy and microwave EM energy, and

5 wherein the first electrode and the second electrode are operable:

as active and return electrodes for delivering RF energy conveyed from the energy conveying structure; and

10 a microwave field emitting structure for delivering microwave energy conveyed from the energy conveying structure.

21. An electrosurgical apparatus comprising:

an electrosurgical generator for supplying electromagnetic (EM) energy;

15 a surgical scoping device having an instrument cord for insertion into a patient's body, the instrument cord having an instrument channel extending therethrough;

an electrosurgical resector tool according to any preceding claim inserted through the instrument channel of the surgical scoping device.

22. An electrosurgical apparatus according to claim 21, when dependent on claim 20, wherein the electrosurgical generator is capable of supplying radiofrequency (RF) EM energy and microwave EM energy.

23. An electrosurgical resector tool comprising:

a shaft defining a lumen;

30 an energy conveying structure for carrying electromagnetic (EM) energy through the lumen of the shaft;

an instrument tip mounted at a distal end of the shaft, wherein the instrument tip comprises:

a static portion comprising a first blade element; and

35 a movable portion comprising a second blade element, wherein the movable portion is movable relative to the static portion between a closed position in which the first blade element and second blade element lie alongside each other to an open position in which the second blade element is spaced from the first blade element by a gap for receiving biological tissue;

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5 a first electrode, a second electrode and a planar dielectric body, the first and second electrodes being spaced apart and electrically isolated from each other by the planar dielectric body, and wherein the first electrode and the second electrode are connected to the energy conveying structure for delivery of the EM energy from the instrument tip;

10 an actuator for controlling relative movement between the movable portion and the static portion, the actuator comprising a control rod slidably mounted in the shaft, the control rod having an attachment feature engaged with the movable portion, whereby longitudinal movement of the control rod in the shaft causes movement of the movable portion relative to the static portion; and

15 a first tube, a second tube and a third tube, wherein the first tube surrounds the control rod except a distal end region of the control rod, wherein the second tube surrounds the distal end region of the control rod except the attachment feature of the control rod, and the second tube protrudes proximally into the first tube to define an overlap region where the first tube overlaps the second tube, and wherein the third tube surrounds the overlap region and a proximal end region of the static portion.

25 24. An electrosurgical resector tool according to claim 23, wherein the first, second and third tubes are substantially clear and are bonded to the instrument tip by ultra-violet adhesive.

30 25. An electrosurgical resector tool according to claim 23 or 24, wherein the instrument tip further comprises a travel limiting mechanism operable to limit a maximum extent of relative movement between the second blade element and the first blade element in the open position and/or the closed position.

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