

CLAIMS

1. An electrosurgical instrument for applying to biological tissue radiofrequency (RF) electromagnetic (EM) energy and/or microwave frequency EM energy, the instrument comprising:

an instrument tip comprising a planar body made of a first dielectric material separating a first conductive element on a first surface thereof from a second conductive element on a second surface thereof, the second surface facing in the opposite direction to the first surface;

a coaxial feed cable comprising an inner conductor, an outer conductor coaxial with the inner conductor and a second dielectric material separating the inner and outer conductors, the coaxial feed cable being for conveying an RF signal and/or a microwave signal; and

a protective hull comprising a third piece of dielectric material mounted to cover the underside of the planar body,

wherein the inner conductor is electrically connected to the first conductive element and the outer conductor is electrically connected to the second conductive element to enable the instrument tip to receive the RF signal and/or the microwave signal,

wherein the protective hull has a smoothly contoured convex undersurface facing away from the planar body,

wherein the planar body has a tapering distal edge, and wherein the underside of the planar body extends beyond the protective hull at the tapering distal edge.

2. An electrosurgical instrument according to claim 1, wherein the underside of the planar body extends beyond the protective hull at the tapering distal edge $0.2w$ or less, where w is the maximum width of the planar body.

3. An electrosurgical instrument according to claim 1 or 2, wherein the tapering distal edge extends around a distal third of planar body.

4. An electrosurgical instrument according to any preceding claim, wherein the tapering distal edge comprises a radiused distal tip.

5 5. An electrosurgical instrument according to any preceding claim, wherein the tapering distal edge is a continuous curve.

10 6. An electrosurgical instrument according to claim 5, wherein the tapering distal edge has curvature formed from a plurality of contiguous radiused sections, each radiused section having a radius of curvature less than its proximal neighbour.

15 7. An electrosurgical instrument according to any preceding claim, wherein the planar body has a length of between $5w$ and $6w$, where w is the maximum width of the planar body.

20 8. An electrosurgical instrument according to any preceding claim, wherein the maximum width of the planar body is 9 mm or less.

25 9. An electrosurgical instrument according to claim 7, wherein the maximum width of the planar body is 2 mm or less.

30 10. An electrosurgical instrument according to any preceding claim, wherein the first and second conductive elements each comprise a layers of metallisation, the layers of metallisation being formed on opposite surfaces of the first dielectric material.

35 11. An electrosurgical instrument according to claim 10, wherein the layers of metallisation are set back from the side edges of the first dielectric material in a proximal region of the planar body.

40 12. An electrosurgical instrument according to claim 11, wherein the proximal region comprises the region of the planar body proximal to the tapering distal end.

13. An electrosurgical instrument according to claim 11 or 12, wherein the layers of metallisation are set back by 0.2 mm.

5 14. An electrosurgical instrument according to any preceding claim, wherein the protective hull is made from polyether ether ketone (PEEK) or ceramic.

10 15. An electrosurgical instrument according to any preceding claim, wherein the protective hull and first dielectric material are formed in one piece.

15 16. An electrosurgical instrument according to any preceding claim, wherein the protective hull is selectively metallised to form part of the first conductive element or second conductive element.

20 17. An electrosurgical instrument according to any preceding claim including a fluid feed conduit for conveying fluid to the instrument tip for delivery out of the instrument.

25 18. An electrosurgical instrument according to claim 17, wherein the fluid feed conduit comprises a sleeve that defines a lumen for transporting fluid to the instrument tip, the sleeve having the planar body and protective hull secured at a distal end thereof, and being arranged to carry the coaxial cable in the lumen.

30 19. An electrosurgical instrument according to claim 18 including a fluid delivery mechanism mounted at the distal end of lumen of the sleeve, the fluid delivery mechanism being operable to deliver fluid from the lumen through the protective hull.

35 20. An electrosurgical instrument according to claim 19, wherein the undersurface of the protective hull has a longitudinally extending recessed channel formed therein, and wherein the fluid delivery mechanism includes an insulating
40 ~~needle guide tube mounted within and extends proximally from~~

the recess channel, and a retractable needle slidably mounted in the needle guide tube.

5 21. An electrosurgical instrument according to claim 19, wherein the undersurface of the protective hull has a tubular protrusion integrally formed therein, the tip of the protrusion having an outlet for ejecting a fluid.

10 22. An interface joint for interconnecting an electrosurgical generator and an electrosurgical instrument, the interface joint comprising:

 a housing made of electrically insulating material, the housing having:

15 a first inlet for receiving radiofrequency (RF) electromagnetic (EM) energy and/or microwave frequency EM energy from the electrosurgical generator,

 a second inlet for receiving fluid, and
 an outlet;

20 a single cable assembly for connecting the outlet to the electrosurgical instrument, the signal cable assembly comprising a flexible sleeve that defines a fluid flow path that is in fluid communication with the second inlet, and which conveys a coaxial cable that is connected to the first inlet.

25 23. An interface joint according to claim 22, wherein the housing includes an internal watertight branched passageway which defines a fluid flow path between the second inlet and the outlet, and wherein the branched passageway has
30 a first port adjacent to the first inlet for admitting the coaxial cable.

35 24. An interface joint according to claim 22 including a slidable trigger on the housing, the slidable trigger being attached to a push rod that extends out of the housing through the outlet.

40 25. An interface joint according to claim 24, wherein the housing includes an internal watertight branched passageway which defines a fluid flow path between the second inlet and the outlet, and wherein the branched passageway has

a first port adjacent to the first inlet for admitting the coaxial cable and a second port adjacent the slidable trigger for admitting the push rod.

5 26. An interface joint according to claim 23 or 25, wherein the first port comprising a sealing bung which defines a watertight passage for the coaxial cable.

10 27. An interface joint according to claim 23 or 25, wherein the second port comprising a sealing bung which defines a watertight passage for the push rod.

15 28. An interface joint according to claim 23 or 25, wherein the internal watertight branched passageway is formed from a pair of Y-shaped conduits.

20 29. An interface joint according to any one of claims 22 to 28, wherein cable assembly has an outer diameter in the range 1.2 mm to 9 mm.

25 30. An interface joint according to any one of claims 22 to 29, wherein the flexible sleeve has spiral wound reinforcement or spiral wound multiple cross braiding therein to assist in the transfer of torque.

30 31. An interface joint according to claim 30, wherein the spiral wound reinforcement or spiral wound multiple cross braiding have a variable pitch.

35 32. An interface joint according to any one of claims 22 to 31, wherein the housing comprises a strain relief element mounted in the outlet and surrounding the flexible sleeve.

 33. An interface joint according to any one of claims 22 to 32 having a coaxial cable attached to the first inlet via a interface connection, wherein the interface connection is arrange to permit relative rotation of the interface joint relative to the coaxial cable.

34. An interface joint according to any one of claims 22 to 33, wherein the flexible sleeve comprises a multi lumen tube.

5 35. An interface joint according to claim 34, wherein the flexible sleeve includes an extruded separator element inserted inside a single lumen tube, the extruded separator element including a plurality of through channels.

10 36. An interface joint according to claim 25, wherein a distal end of the push rod is connected to a proximal end of a needle ferrule, which has an internal volume in fluid communication with the fluid flow path through the flexible sleeve, and wherein a needle is mounted in the distal end of
15 the needle ferrule in fluid communication with the internal volume.

20 37. An interface joint according to any one of claims 22 to 36, wherein the housing is an elongate capsule sized to fit in an operator's hand.

25 38. A torque transfer unit for rotating an electrosurgical instrument at the distal end of an endoscope by transferring a user's rotating force to a flexible sleeve connected to the electrosurgical instrument, wherein the torque transfer unit comprises an elongate clamp arranged to impart a gripping force along a length of the flexible sleeve that lies outside the endoscope, the elongate clamp comprising:

30 an upper elongate housing member,
a lower elongate housing member pivotably connected to the upper elongate housing member and defining a passage for the flexible sleeve,

35 wherein the upper elongate housing member and the lower elongate housing member are pivotable between a release position in which the torque transfer unit is slidable up and down the flexible sleeve, and a clamping position, in which the flexible sleeve is gripped between the upper elongate housing member and the lower elongate housing member.

39. A torque transfer unit according to claim 38,
wherein the upper elongate housing member and the lower
elongate housing member each carry a U-shaped clamping member,
the U-shaped clamping members being arranged to oppose one
5 another to impart a substantially uniform gripping pressure on
the flexible sleeve when the upper elongate housing member and
the lower elongate housing member are in the clamping
position.

10 40. A torque transfer unit according to claim 38 or 39,
wherein the upper elongate housing member and the lower
elongate housing member are retainable in the clamping
position by a releasable clip.

15 41. A torque transfer unit according to any one of
claims 38 to 40 including an intermediate deformable grip tube
is position around the flexible sleeve between the flexible
sleeve and the U-shaped clamping members.

CLAIMS

1. An interface joint for interconnecting an
electrosurgical generator and an electrosurgical instrument,
5 the interface joint comprising:

a housing made of electrically insulating material, the
housing having:

a first inlet for receiving radiofrequency (RF)
electromagnetic (EM) energy and/or microwave frequency EM
10 energy from the electrosurgical generator,

a second inlet for receiving fluid, and

an outlet;

a single cable assembly for connecting the outlet to the
electrosurgical instrument, the signal cable assembly
15 comprising a flexible sleeve which defines a fluid flow path
that is in fluid communication with the second inlet and which
conveys a coaxial cable that is connected to the first inlet;
and

a slidable trigger on the housing, the slidable trigger
20 being attached to a push rod that extends out of the housing
through the outlet.

2. An interface joint according to claim 1, wherein the
housing includes an internal watertight branched passageway
25 which defines a fluid flow path between the second inlet and
the outlet, and wherein the branched passageway has a first
port adjacent to the first inlet for admitting the coaxial
cable.

3. An interface joint according to claim 2, wherein the
branched passageway has a second port adjacent the slidable
30 trigger for admitting the push rod.

4. An interface joint according to claim 3, wherein the second port comprises a sealing bung which defines a watertight passage for the push rod.

5 5. An interface joint according to any one of claims 2 to 4, wherein the first port comprising a sealing bung which defines a watertight passage for the coaxial cable.

10 6. An interface joint according to any one of claims 2 to 5, wherein the internal watertight branched passageway is formed from a pair of Y-shaped conduits.

15 7. An interface joint according to any preceding claim, wherein the cable assembly has an outer diameter in the range 1.2 mm to 9 mm.

20 8. An interface joint according to any preceding claim, wherein the flexible sleeve has spiral wound reinforcement or spiral wound multiple cross braiding therein to assist in the transfer of torque.

25 9. An interface joint according to claim 8, wherein the spiral wound reinforcement or spiral wound multiple cross braiding has a variable pitch.

10. An interface joint according to any preceding claim, wherein the housing comprises a strain relief element mounted in the outlet and surrounding the flexible sleeve.

30 11. An interface joint according to any preceding claim having a coaxial cable attached to the first inlet via a interface connection, wherein the interface connection is arrange to permit relative rotation of the interface joint relative to the coaxial cable.

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12. An interface joint according to any preceding claim, wherein the flexible sleeve comprises a multi lumen tube.

5 13. An interface joint according to claim 12, wherein the flexible sleeve includes an extruded separator element inserted inside a single lumen tube, the extruded separator element including a plurality of longitudinally extending through channels.

10 14. An interface joint according to any preceding claim, wherein a distal end of the push rod is connected to a proximal end of a needle ferrule, which has an internal volume in fluid communication with the fluid flow path through the flexible sleeve, and wherein a needle is mounted in the distal
15 end of the needle ferrule in fluid communication with the internal volume.

20 15. An interface joint according to any preceding claim, wherein the housing is an elongate capsule sized to fit in an operator's hand.