CLAIMS

1. An electrosurgical resection instrument for applying to biological tissue radiofrequency (RF) electromagnetic (EM) energy having a first frequency and microwave EM energy having a second frequency higher than the first frequency, the instrument comprising:

a instrument tip comprising a body made of a first dielectric material separating a first conductive element from a second conductive element;

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

a fluid feed conduit for delivering fluid to the instrument tip;

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 the microwave signal, and

wherein the first and second conductive elements are arranged to act:

as active and return electrodes to convey RF EM radiation corresponding to the RF signal, and

as an antenna to radiate microwave EM radiation corresponding to the microwave signal,

wherein the fluid feed conduit is arranged to deliver liquid to the instrument tip, the fluid feed conduit having an outlet at the distal end of the instrument tip for introducing the liquid into the biological tissue, and

wherein the fluid feed conduit comprises a tip section movable in a longitudinal direction relative to the instrument tip body between an extended position in which the outlet is located at the distal tip of the instrument, and a retracted position in which the outlet is set back from the distal tip of the instrument.

2. An instrument according to claim 1, wherein both the first and second conductive elements extend to one or both edges of the first dielectric material.

3. An instrument according to claim 1 or 2, wherein the distal end of the first dielectric material is rounded.

4. An instrument according to any preceding claim, wherein the fluid feed conduit is arranged to deliver saline to the instrument tip.

5. An instrument according to any preceding claim comprising a third dielectric material mounted on the underside of the instrument tip body, the third dielectric member curving upwards along its length towards the instrument tip.

6. An instrument according to claim 5, wherein the third dielectric material includes a longitudinal passage for receiving the fluid feed conduit.

~~7. An instrument according to any preceding claim, wherein the fluid feed conduit comprises a tip section movable in a longitudinal direction relative to the instrument tip body between an extended position in which the outlet is located at the distal tip of the instrument, and a retracted position in which the outlet is set back from the distal tip of the instrument.~~

~~8~~7. An instrument according to any preceding claim ~~7~~, wherein the tip section comprises a needle.

~~9~~8. An instrument according to any preceding claim comprising a common carrier tube for conveying the fluid flow conduit and the coaxial cable together to the instrument tip body, wherein the common carrier tube has an outside diameter of less than 2.5 mm.

~~10~~9. An instrument according to claim ~~9~~8, wherein the common carrier tube comprises a first longitudinal bore for receiving the coaxial cable and a second longitudinal bore for receiving the fluid flow conduit.

~~11~~10. An instrument according to claim ~~9~~8 comprising a rotation knob secured to the common carrier tube for rotating the common carrier tube in the instrument channel of an endoscope.

~~12~~11. A instrument according to claim 1, wherein the fluid feed conduit is arranged to deliver gas into a plasma generation region located between the first and second conductive elements in the instrument tip, and wherein the first and second conductive elements are configured to create an electric field from the received RF signal and/or microwave signal that is capable of ionising the gas to generate a thermal or non-thermal plasma.

~~13~~12. A instrument according to claim ~~12~~11, wherein the plasma generation region either:

is enclosed within the instrument tip, the plasma being used to provide a local return path for the RF signal to facilitate cutting the biological tissue, or

includes an outlet for permitting non-thermal or thermal plasma to be delivered to the biological tissue.

~~14~~13. A instrument according to claim 1, wherein the instrument tip comprises a planar transmission line element in which the body of first dielectric material is a substantially planar element, the first conductive element is a first conductive layer on a first surface of the planar element, and the second conductive element is a second conductive layer on a second surface of the planar element that is opposite to the first surface.

~~15~~14. A instrument according to claim ~~14~~13, wherein the coaxial feed cable and fluid feed conduit have a combined diameter that is less than 2.5 mm, and the instrument tip extends out of the coaxial feed cable by 12 mm or less, and has a width of 2.0 mm or less and a thickness of 0.5 mm or less.