

CLAIMS

We claim:

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1. ~~_____~~ An energy delivery device comprising:
 - a) ~~_____~~ an antenna comprising an inner conductor; and
 - b) ~~_____~~ a conductive tip at a distal end of said antenna, wherein said conductive tip comprises one or more sharpness enhancing features selected from the group consisting of a diamond like coating, a plurality of micro-serrations, and a vibration component.
2. ~~_____~~ The device of claim 1,
wherein said diamond like coating is a dielectric material, and/or, wherein said diamond like coating is less than 20 microns;
wherein said micro-serrations are in a tri-facet or quad-facet design, and/or wherein said micro-serrations are 50-100 μm in length;
wherein said vibration component is a piezoelectric transducer, and/or wherein said vibration component generated a vibration of 0.1 to 20 kHz of less than 1 mm travel in the axial direction of the tip.
3. ~~_____~~ 2. The device of claim 1, wherein said vibration component is associated with a handle of said device.
4. ~~_____~~ 3. The device of any one of claim 1, wherein said vibration component ~~generated is~~ configured to generate a vibration of 0.1 to 20 kHz of less than 1 mm travel in the axial direction of the tip.
5. ~~_____~~ 4. The device of any one of claim 3, wherein said device features a plurality of scales adjacent to said micro-serrations.
6. ~~_____~~ 5. The device of claim 1, wherein said inner conductor is not physically coupled to said conductive tip; ~~wherein said inner conductor is capacitively~~ and capacitively-coupled to said conductive tip.
7. ~~_____~~ 6. The device of claim 1, wherein said antenna comprises a ~~conductive~~ conductive outer conductor surrounding at least a portion of said inner conductor, and wherein said antenna comprises a dielectric material between said inner and outer conductors.
8. ~~_____~~ 7. The device of claim 1, wherein said antenna is a triaxial antenna.
9. ~~_____~~ 8. The device of claim 1, wherein said conductive tip comprises a trocar.
10. ~~_____~~ 9. The device of claim 1, wherein said inner conductor comprises a first region distal to a second region, said second region distal to a third region, wherein said third region is contained in a triaxial antenna, wherein said second region lacks an outer conductor of said triaxial antenna, and wherein said first region lacks an outer conductor and dielectric material so said triaxial antenna.
11. ~~_____~~ 10. The device of claim 10, wherein said first region is adhered to and surrounded by a metal fitting, wherein said metal fitting is a brass metal fitting, and wherein said metal fitting extends distally beyond the most distal end of said inner conductor.

~~12.~~—~~11.~~ The device of claim ~~11~~10, wherein said metal filling abuts a dielectric material surrounding the inner conductor in the second region.

~~13.~~—~~12.~~ The device of claim ~~10~~9, wherein said second region comprises a proximal portion containing dielectric material of said triaxial antenna and a distal portion lacking said dielectric material of said triaxial antenna.

~~14.~~—~~13.~~ The device of claim ~~10~~9, wherein said distal portion of said second region comprises a non-conductive sleeve surrounding said inner conductor, and wherein said non-conductive sleeve comprises PTFE.

~~15.~~—~~14.~~ The device of claim ~~10~~9, wherein said conductive tip is attached to an insulator, ~~said insulator~~ attached to a distal end of said metal fitting.

~~16.~~—~~15.~~ The device of claim ~~15~~14, wherein said insulator comprises a ceramic insulator.

~~17.~~—~~16.~~ The device of claim ~~15~~14, wherein said metal fitting, insulator, and conductive tip are positioned and dimensioned so as to generate a low impedance overlap to transfer energy to said conductive tip when energy is supplied to said inner conductor.

~~18.~~—~~17.~~ The device of claim ~~11~~10, wherein said metal fitting is adhered to said inner conductor via an electrically conductive adhesive.

~~19.~~—~~A method of ablating a sample, comprising contacting a device of claim 1 with a sample and providing energy to said device~~

~~20.~~—~~18.~~ A system comprising the device of claim 1 and a power supply electrically connected to said device.