CLAIMS

1. A dental instrument comprising:

a positioning member having a channel configured to deliver a high-velocity liquid jet to a cavity in a tooth, the positioning member having a proximal end portion and a distal end portion; and

an impingement member disposed near the distal end portion of the positioning member, the impingement member having an impingement surface, wherein the instrument is configured such that the high-velocity liquid jet impacts the impingement surface during operation of the high-velocity liquid jet,

wherein the distal end portion of the positioning member comprises ~~one or more~~ a plurality of openings disposed near the impingement member, the openings configured to allow outflow of liquid from the liquid jet after impact with the impingement surface.

2. The dental instrument of Claim 1, wherein the positioning member comprises an elongated member having a longitudinal axis.

3. The dental instrument of Claim 2, wherein at least a portion of the elongated member has a cross-section perpendicular to the longitudinal axis that is substantially circular or substantially polygonal.

4. The dental instrument of Claim 2, wherein the elongated member is substantially straight between the proximal end portion and the distal end portion.

5. The dental instrument of Claim 2, wherein the channel has a channel axis, and the channel axis is substantially parallel to the longitudinal axis of the elongated member.

6. The dental instrument of Claim 5, wherein the high-velocity liquid jet propagates along a jet axis, the jet axis substantially parallel to the channel axis or the longitudinal axis of the elongated member.

7. The dental instrument of Claim 1, further comprising a nozzle configured to output a high-velocity liquid jet.

37. The dental instrument of Claim 1, wherein the distal end portion of the positioning member is sized and shaped such that the distal end portion can be positioned in a pulp cavity of the tooth and such that the one or more openings are submerged in liquid in the tooth.

38. The dental instrument of Claim 37, wherein the dental instrument is configured to generate a hydroacoustic field in the tooth by the impingement of the high-velocity liquid jet on the impingement member.

39. The dental instrument of Claim 38, wherein the hydroacoustic field generated by the dental instrument includes acoustic power over a broad range of acoustic frequencies.

40. The dental instrument of Claim 38, wherein the hydroacoustic field generated by the dental instrument detaches organic material in the tooth.

41. An apparatus for treating a tooth, the apparatus comprising:

a pressure wave generator having a positioning member and a distal portion with an impingement surface, the positioning member being arranged relative to the impingement surface so as to direct a beam of energy onto the surface to produce acoustic pressure waves,

wherein the apparatus is configured such that the beam of energy impacts the impingement surface at a portion of the impingement surface that is substantially perpendicular to a longitudinal axis of the positioning member.

42. The apparatus of Claim 41, wherein the beam of energy comprises a fluid jet beam.

43. The apparatus of Claim 42, wherein the fluid jet beam comprises degassed liquid.

44. The apparatus of Claim 42, wherein the positioning member comprises the distal portion.

45. The apparatus of Claim 42, wherein the positioning member comprises a guide tube having a channel with an opening on the distal portion of the guide tube.

46. The apparatus of Claim 45, wherein the pressure wave generator is configured to output sufficient energy so as to cause at least some fluid cavitation within the tooth chamber.

47. An apparatus for treating a tooth, the apparatus comprising:

a pressure wave generator having a fluid beam forming portion including an orifice and an impact surface, the impact surface being spaced from the orifice and positioned such that an axis through the orifice extends to the impact surface, the impact surface being configured to be inserted into a tooth chamber in a tooth,

wherein the impact surface comprises a concave surface facing the orifice, the concave surface substantially symmetric about the axis.

48. The apparatus of Claim 47, wherein the fluid beam forming portion is configured to form a fluid jet beam that will substantially impact the impact surface.

49. The apparatus of Claim 48, wherein the fluid beam forming portion is configured to form a fluid jet beam having sufficient energy to cause at least some cavitation within the tooth chamber when the fluid jet beam impacts the impact surface.

50. The apparatus of Claim 49, further comprising a guide tube having a channel extending along the axis and configured to permit the fluid jet beam to flow therethrough.

51. The apparatus of Claim 50, further comprising a flow restrictor positioned around the pressure wave generator.

52. The apparatus of Claim 51, wherein the flow restrictor is configured to retain at least some fluid within the tooth chamber.

53. The apparatus of Claim 47, the apparatus further comprising a handpiece coupled to the fluid beam forming portion.