Claims:

1. An apparatus, comprising:

a cannula, comprising:

a tubular body extending between a first end and a second end, the tubular body having a first side and an opposite second side; and

a leading edge formed at the first end, the leading edge extending along a first plane, the first plane extending between the first side and second side, the first plane forming a leading edge angle between the intersection of the first side and the first plane, wherein the leading edge angle is between 12 degrees and 20 degrees;

a mandrel, comprising:

a body extending between a first end and a second end;

a trocar point formed by the first end;

a notch formed by the body, the notch forming a bed extending between the first end and the second end;

a first sample region formed by the bed, the first sample region, comprising:

a first plurality of ridges, wherein each of the first plurality of ridges comprises:

a flank extending from the bed toward the second end, the flank terminating at a crest;

a second sample region formed by the bed, the second sample region comprising:

a second plurality of ridges, wherein each of the second plurality of ridges comprises:

a flank extending from the bed toward the second end, the flank terminating in a crest; and

a concave slope descending from the crest; and

a deck disposed between the first plurality of ridges and the second plurality of ridges;

a cannula force source imparting movement to the cannula, wherein the cannula force source imparts a loaded force between 7 lbs. and 11 lbs.

2. The apparatus of Claim 1, wherein:

the leading edge angle is 12 degrees; and

the loaded force is 7.32 lbs.

3. The apparatus of Claim 1, wherein the cannula force source is a compression spring.

4. The apparatus of Claim 1, wherein the cannula force source imparts between 2 lbs./in and 3.2 lbs./in upon the cannula.

5. The apparatus of Claim 4, wherein the mandrel force source moves the mandrel between 1 mm and 66 mm.

6. The apparatus of Claim 1, further comprising a mandrel force source imparting movement to the mandrel, wherein the mandrel force source imparts a loaded force between 7 lbs. and 11 lbs.

7. The apparatus of Claim 6, wherein the mandrel force source is a compression spring.

8. The apparatus of Claim 1, wherein:

the leading edge angle is 20 degrees; and

the loaded force is 7.32 lbs.

9. The apparatus of Claim 1, wherein the bed further comprises:

a reverse ridge, the reverse ridge comprising:

a flank extending from the bed toward the first end, the flank terminating at a crest; and

a concave slope descending from the crest.

10. An apparatus, comprising:

a cannula, comprising:

a tubular body extending between a first end and a second end, the tubular body having a first side and a second side;

a vet point formed at the first end, the vet point including:

a leading edge extending along a first plane, the first plane extending between the first side and second side, the plane forming a leading edge angle between the intersection of the first side and the first plane, wherein the leading edge angle is 12 degrees;

a mandrel, comprising:

a body extending between a first end and a second end along a central

longitudinal axis;

a trocar point formed by the first end, the trocar point comprising:

a first beveled surface forming first bevel angle between the intersection of the first beveled surface and the central longitudinal axis, wherein the first bevel angle is 15 degrees;

a notch formed by the body, the notch forming a bed extending between the first end and the second end;

a first sample region formed by the bed, the first sample region, comprising:

a first plurality of ridges, wherein each of the first plurality of ridges comprises:

a flank extending from the bed toward the second end, the flank terminating at a crest; and

a concave slope descending from the crest;

a second sample region formed by the bed, the second sample region comprising:

a second plurality of ridges, wherein each of the second plurality of ridges comprises:

a flank extending from the bed toward the second end, the flank terminating in a crest; and

a concave slope descending from the crest; and

a deck disposed between the first plurality of ridges and the second plurality of ridges;

a cannula spring imparting movement to the cannula, the cannula spring comprising a loaded force of 7.32 lbs.;

a mandrel spring imparting movement to the mandrel, the mandrel spring comprising a loaded force of 7.32 lbs.; and

an actuator housing the cannula spring and mandrel spring.

11. The apparatus of Claim 10, wherein the bed further comprises:

a reverse ridge, the reverse ridge comprising:

a flank extending from the bed toward the first end, the flank terminating at a crest; and

a concave slope descending from the crest.

12. The apparatus of Claim 10, wherein the mandrel spring moves the mandrel between 1 mm

and 66 mm.

13. The apparatus of Claim 10, wherein the cannula spring and mandrel spring are compression springs.

14. An apparatus, comprising:

a cannula, comprising:

a tubular body extending between a first end and a second end, the tubular body having a first side and a second side;

a vet point formed at the first end, the vet point including:

a leading edge extending along a first plane, the first plane extending between the first side and second side, the plane forming a leading edge angle between the intersection of the first side and the first plane, wherein the leading edge angle is 20 degrees;

a mandrel, comprising:

a body extending between a first end and a second end along a central longitudinal axis;

a trocar point formed by the first end, the trocar point comprising:

a first beveled surface forming first bevel angle between the intersection of the first beveled surface and the central longitudinal axis, wherein the first bevel angle is 15 degrees;

a notch formed by the body, the notch forming a bed extending between the first end and the second end;

a first sample region formed by the bed, the first sample region, comprising:

a first plurality of ridges, wherein each of the first plurality of ridges comprises:

a flank extending from the bed toward the second end, the flank terminating at a crest; and

a concave slope descending from the crest;

a second sample region formed by the bed, the second sample region comprising:

a second plurality of ridges, wherein each of the second plurality of ridges comprises:

a flank extending from the bed toward the second end, the flank terminating in a crest; and

a concave slope descending from the crest; and

a deck disposed between the first plurality of ridges and the second plurality of ridges;

a cannula spring imparting movement to the cannula, the cannula spring comprising:

a spring rate of 2 lbs./in.; and

a loaded force of 7.32 lbs.;

a mandrel spring imparting movement to the mandrel, the mandrel spring comprising:

a spring rate of 2 lbs./in.; and

a loaded force of 7.32 lbs.;

an actuator housing the cannula spring and mandrel spring.

15. The apparatus of Claim 14, wherein the bed further comprises:

a reverse ridge, the reverse ridge comprising:

a flank extending from the bed toward the first end, the flank terminating at a crest.

16. The apparatus of Claim 15, wherein the reverse ridge further comprises a concave slope descending from the crest.

17. The apparatus of Claim 14, wherein the mandrel spring moves the mandrel between 1 mm and 66 mm.

18. The apparatus of Claim 14, wherein the cannula spring and mandrel spring are compression springs.

19. An apparatus, comprising:

a cannula assembly, comprising:

a tubular body extending between a first end and a second end, the tubular body having a first side and an opposite second side; and

a leading edge formed at the first end, the leading edge extending along a first plane, the first plane extending between the first side and second side, the first plane forming a leading edge angle between the intersection of the first side and the first plane, wherein the leading edge angle is between 12 degrees and 20 degrees;

a mandrel assembly, comprising:

a body extending between a first end and a second end;

a trocar point formed by the first end;

a notch formed by the body, the notch forming a bed extending between the first end and the second end;

a first sample region formed by the bed, the first sample region, comprising:

a first plurality of ridges, wherein each of the first plurality of ridges comprises:

a flank extending from the bed toward the second end, the flank terminating at a crest; and

a concave slope descending from the crest;

a second sample region formed by the bed, the second sample region comprising:

a second plurality of ridges, wherein each of the second plurality of ridges comprises:

a flank extending from the bed toward the second end, the flank terminating in a crest; and

a concave slope descending from the crest; and

a deck disposed between the first plurality of ridges and the second plurality of ridges;

wherein the cannula assembly translates in a first direction; and

a cannula force source imparting movement to the cannula assembly, wherein the cannula assembly includes a momentum between 0.099 kg m/s and 0.256 kg m/s in the first direction.

20. The apparatus of Claim 19, wherein the cannula assembly momentum is between 0.150 kg m/s and 0.217 kg m/s in the first direction.

21. The apparatus of Claim 19, wherein the first sample region further comprises:

a reverse ridge, the reverse ridge comprising:

a flank extending from the bed toward the first end, the flank terminating at a crest.

22 The apparatus of Claim 19, further comprising:

wherein the mandrel assembly translates in the first direction; and

a mandrel force source imparting movement to the mandrel assembly, wherein the

mandrel assembly includes a momentum between 0.120 kg m/s and 0.282 kg m/s in the first direction.

23. The apparatus of Claim 22, wherein the mandrel assembly momentum is between 0.165 kg m/s and 0.239 kg m/s in the first direction.

24. An apparatus, comprising:

a cannula, comprising:

a body extending between a first end and a second end, the body having a first side and an opposite second side; and

a leading edge formed by the first end, the leading edge extending along a first plane, the first plane extending between the first side and second side, the first plane forming a leading edge angle between the intersection of the first side and the first plane;

a mandrel, comprising:

a body extending between a first end and a second end along a central longitudinal axis;

a notch formed by the body, the notch forming a bed extending between the first end and the second end;

a first sample region formed by the bed, the first sample region, comprising:

a first plurality of ridges, wherein each of the first plurality of ridges comprises:

a flank extending from the bed toward the mandrel body second end, the flank terminating at a crest; and

a concave slope descending from the crest;

a second sample region formed by the bed, the second sample region comprising:

a second plurality of ridges, wherein each of the second plurality of ridges comprises:

a flank extending from the bed toward the mandrel body second end, the flank terminating in a crest; and

a concave slope descending from the crest;

a deck disposed between the first plurality of ridges and the second plurality of ridges.

25. The apparatus of Claim 24, further comprising:

a cannula force source imparting movement to the cannula; and

wherein the cannula force source imparts a loaded force between 7 lbs. and 11 lbs.

26. The apparatus of Claim 25, wherein the loaded force is 7.32 lbs.

27. The apparatus of Claim 25, wherein the cannula force source imparts between 2 lbs./in and 3.2 lbs./in upon the cannula.

28. The apparatus of Claim 24, further comprising:

a mandrel force source imparting movement to the mandrel; and

wherein the mandrel force source moves the mandrel between 1 mm and 66 mm.

29. The apparatus of Claim 28, wherein the mandrel force source imparts a loaded force between 7 lbs. and 11 lbs.

30. The apparatus of Claim 24, wherein the bed further comprises:

a reverse ridge, the reverse ridge comprising:

a flank extending from the bed toward the first end, the flank terminating at a crest; and

a concave slope descending from the crest.

31. The apparatus of Claim 24, wherein the cannula leading edge angel is between 12 degrees and 20 degrees.

32. The apparatus of Claim 24, wherein the cannula and mandrel are mounted to an actuator.

33. The apparatus of Claim 24, further comprising:

a vet tip point formed by the cannula leading edge, and wherein the vet tip point leading edge angle is 12 degrees;

a trocar point with a first beveled surface formed by the mandrel first end, wherein the first beveled surface forms a first beveled angle between the intersection of the first beveled surface and the central longitudinal axis, wherein the first bevel angel is 15 degrees.

34. The apparatus of Claim 24, further comprising:

a cannula spring imparting movement to the cannula, the cannula spring comprising a loaded force between 7 lbs. and 11 lbs.;

a mandrel spring imparting movement to the mandrel, the mandrel spring comprising a loaded force of between 7 lbs. and 11 lbs.; and

an actuator housing the cannula spring and mandrel spring.

35. The apparatus of Claim 34, wherein the mandrel spring moves the mandrel between 1 mm and 66 mm.

36. The apparatus of Claim 24, further comprising:

a vet tip point formed by the cannula leading edge, and wherein the vet tip point leading edge angle is 20 degrees;

a trocar point with a first beveled surface formed by the mandrel first end, wherein the first beveled surface forms a first beveled angle between the intersection of the first beveled surface and the central longitudinal axis, wherein the first bevel angel is 15 degrees.

37. The apparatus of Claim 36, further comprising:

a cannula spring imparting movement to the cannula, the cannula spring comprising:

a spring rate of 2 lbs./in.; and

a loaded force of 7.32 lbs.;

a mandrel spring imparting movement to the mandrel, the mandrel spring comprising:

a spring rate of 2 lbs./in.; and

a loaded force of 7.32 lbs.;

an actuator housing the cannula spring and mandrel spring.

38. The apparatus of Claim 36, wherein the bed further comprises:

a reverse ridge, the reverse ridge comprising:

a flank extending from the bed toward the first end, the flank terminating at a crest; and

a concave slope descending from the crest.

39. The apparatus of Claim 24, further comprising:

wherein the cannula translates in a first direction; and

a cannula force source imparting movement to the cannula, wherein the cannula includes a momentum between 0.099 kg m/s and 0.256 kg m/s in the first direction.

40. The apparatus of Claim 39, wherein the cannula momentum is between 0.150 kg m/s and 0.217 kg m/s in the first direction.

41. The apparatus of Claim 40, further comprising:

wherein the mandrel translates in the first direction; and

a mandrel force source imparting movement to the mandrel, wherein the mandrel includes a momentum between 0.120 kg m/s and 0.282 kg m/s in the first direction.

42. The apparatus of Claim 41, wherein the mandrel momentum is between 0.165 kg m/s and 0.239 kg m/s in the first direction.

43. The apparatus of Claim 24, further comprising:

a cannula spring imparting movement to the cannula, the cannula spring comprising:

a spring rate of 2 lbs./in.; and

a preload of 2.5 lbs.

44. The apparatus of Claim 24, wherein the first sample region extends between the bed at the mandrel body first end toward the mandrel body second end.

45. The apparatus of Claim 44, wherein the first sample region extends 20 mm.