WHAT IS CLAIMED IS:

1. A seal comprising:
a polymeric jacket defining a seal surface and an inner cavity extending within the polymeric jacket along a length of the polymeric jacket; and
a spring extending within the inner cavity and including a plurality of laser cut spring elements.

2. The seal of claim 1, wherein an edge of the spring is free of a fracture surface.

3. The seal of claim 1, wherein an edge of the spring is free of a separation.

4. The seal of any one of claims 1-3, wherein the polymer jacket includes a polymeric material selected from the group consisting of polyketone, polyaramid, a thermoplastic polyimide, a polyetherimide, a polyphenylene sulfide, a polyethersulfone, a polysulfone, a polyphenylene sulfone, a polyamideimide, ultra high molecular weight polyethylene, a thermoplastic fluoropolymer, a polyamide, a polybenzimidazole, a liquid crystal polymer, or any combination thereof.

5. The seal of any one of claims 1-3, wherein the polymer jacket further comprises a filler selected from the group consisting of a solid lubricant, a ceramic or mineral filler, a polymer filler, a fiber filler, a metal particulate filler, salts, or any combination thereof.

6. The seal of any one of claims 1-3, wherein the polymer jacket has a coefficient of friction of not greater than about 0.4.

7. The seal of claim 6, wherein the coefficient of friction is not greater than about 0.2.

8. The seal of any one of claims 1-3, wherein the polymer jacket has a Young's modulus of at least about 0.5 GPa.

9. The seal of claim 8, wherein the Young's modulus is at least about 1.0 GPa.

10. The seal of any one of claims 1-3, wherein the polymer jacket has an elongation of at least about 20%.

11. The seal of claim 10, wherein the elongation is at least about 40%.

12. The seal of any one of claims 1-3, wherein the spring is formed of a metal alloy selected from the group consisting of stainless steel, a copper alloy, a nickel alloy, or any combination thereof.

13. The seal of any one of claims 1-3, wherein the spring is formed of a sheet material having a thickness not greater than 10 mils.

14. The seal of claim 13, wherein the thickness is not greater than 5 mils.

15. The seal of claim 14, wherein the thickness is not greater than 3 mils.

16. The seal of claim 1, wherein the seal is an annular seal.

17. The seal of any one of claims 1-3, wherein the seal is a face seal.

18. A seal comprising:

an annular jacket comprising a polymeric material and defining an annular cavity extending within the annular jacket; and

a spring extending within the annular cavity, the spring comprising a folded sheet metal including a plurality of laser cut spring elements.

19. The seal of claim 18, wherein an edge of the spring is free of a fracture surface.

20. The seal of claim 18, wherein an edge of the spring is free of a separation.

21. The seal of any one of claims 18-20, wherein the polymeric material is selected from the group consisting of polyketone, polyaramid, a thermoplastic polyimide, a polyetherimide, a polyphenylene sulfide, a polyethersulfone, a polysulfone, a polyphenylene sulfone, a polyamideimide, ultra high molecular weight polyethylene, a thermoplastic fluoropolymer, a polyamide, a polybenzimidazole, a liquid crystal polymer, or any combination thereof.

22. The seal of any one of claims 18-20, wherein the annular jacket further comprises a filler selected from the group consisting of a solid lubricant, a ceramic or mineral filler, a polymer filler, a fiber filler, a metal particulate filler, salts, or any combination thereof.

23. The seal of any one of claims 18-20, wherein the annular jacket has a coefficient of friction of not greater than about 0.4.

24. The seal of any one of claims 18-20, wherein the annular jacket has a Young's modulus of at least about 0.5 GPa.

25. The seal of any one of claims 18-20, wherein the annular jacket has an elongation of at least about 20%.

26. The seal of any one of claims 18-20, wherein the spring is formed of a metal alloy selected from the group consisting of stainless steel, a copper alloy, a nickel alloy, or any combination thereof.

27. The seal of any one of claims 18-20, wherein the spring is formed of a sheet material having a thickness not greater than 10 mils.

28. A method of forming a seal, the method comprising:

dispensing a ribbon of sheet metal;

laser cutting a plurality of spring elements distributed longitudinally along the ribbon to form a spring work piece; and

folding the spring work piece to form a spring.

29. The method of claim 28, wherein laser cutting includes laser cutting with a fiber laser.

30. The method of claim 28, wherein laser cutting includes laser cutting the plurality of spring elements to extend latitudinally across the ribbon.

31. The method of claim 28, wherein the plurality of spring elements extend to have a ratio of the width of a spring work piece formed from the ribbon to the width of the ribbon of at least 0.9.

32. The method of claim 31, wherein the ratio is at least 0.95.

33. The method of claim 32, wherein the ratio is approximately 1.0.

34. The method of any one of claims 28-33, wherein the spring work piece is a continuous piece and wherein folding the spring work piece includes continuously folding the spring work piece.

35. The method of any one of claims 28-33, further comprising laser cutting the ribbon to form separate spring work pieces.

36. The method of claim 35, wherein folding the spring work piece includes positioning the spring work piece and folding the positioned spring work piece.

37. The method of any one of claims 28-33, further comprising inserting the spring into a seal jacket.

38. A method of forming a seal, the method comprising:
dispensing a ribbon of sheet metal having a thickness of not greater than 5 mils;
forming with a fiber laser device a plurality of spring elements distributed along a length of the ribbon and extending latitudinally across the ribbon;
cutting the laser cut ribbon with the laser device to form a spring work piece; and
folding the spring work piece along a longitudinal length of the ribbon.

39. The method of claim 38, wherein the plurality of spring elements extend to have a ratio of the width of a spring work piece formed from the ribbon to the width of the ribbon of at least 0.9.

40. The method of claim 38, wherein folding the spring work piece includes positioning the spring work piece and folding the positioned spring work piece.

41. The method of claim 38, further comprising inserting the spring into a seal jacket.

42. A machine comprising:
a static component;
a rotatable component; and
a seal disposed between the static component and the rotatable component, the seal comprising:
a polymeric jacket defining a seal surface and an inner cavity extending within the polymeric jacket along a length of the polymeric jacket; and

a spring extending within the inner cavity and including a plurality of laser cut spring elements.

43. A method of forming a seal, the method comprising:
dispensing a tube;
laser cutting the tube to form a spring work piece; and
inserting the spring work piece into a jacket to form the seal.

44. The method of claim 43, wherein laser cutting the tube include cutting a spiral.

45. The method of claim 43, wherein laser cutting the tube includes cutting a pattern of spring elements distributed longitudinally along the length of the tube.

46. The method of claim 43, further comprising rotating the tube while laser cutting.

47. The method of claim 43, wherein the tube includes a metal or metal alloy.

WHAT IS CLAIMED IS:

1. A seal comprising:

a polymeric jacket defining a seal surface and an inner cavity extending within the polymeric jacket along a length of the polymeric jacket; and

a spring extending within the inner cavity and including a plurality of laser cut spring elements, wherein each of the plurality of the laser cut spring elements has a thickness not greater than 0.254 mm (10 mils), and an edge of the spring is free of a fracture surface and/or free of striations or separations.

2. The seal of claim 1, wherein each of the plurality of the laser cut spring elements has a thickness in a range of 0.025 mm to 0.203 mm (1 mil to 8 mil)s.

3. The seal of claim 1, wherein the seal is a face seal.

4. The seal of any one of claims 1-3, wherein the polymer jacket includes a polymeric material selected from the group consisting of polyketone, polyaramid, a thermoplastic polyimide, a polyetherimide, a polyphenylene sulfide, a polyethersulfone, a polysulfone, a polyphenylene sulfone, a polyamideimide, ultra high molecular weight polyethylene, a thermoplastic fluoropolymer, a polyamide, a polybenzimidazole, a liquid crystal polymer, or any combination thereof.

5. The seal of any one of claims 1-3, wherein the polymer jacket further comprises a filler selected from the group consisting of a solid lubricant, a ceramic or mineral filler, a polymer filler, a fiber filler, a metal particulate filler, salts, or any combination thereof.

6. The seal of any one of claims 1-3, wherein the polymer jacket has a coefficient of friction of not greater than 0.4.

7. The seal of any one of claims 1-3, wherein the polymer jacket has a Young's modulus of at least 0.5 GPa.

8. The seal of any one of claims 1-3, wherein the polymer jacket has an elongation of at least 20%.

9. The seal of any one of claims 1-3, wherein the spring is formed of a metal alloy selected from the group consisting of stainless steel, a copper alloy, a nickel alloy, or any combination thereof.

10. A seal comprising:

an annular jacket comprising a polymeric material and defining an annular cavity extending within the annular jacket, wherein the polymeric jacket has an elongation of at least 50%; and

a spring extending within the annular cavity, the spring comprising a folded sheet metal including a plurality of laser cut spring elements, wherein each of plurality of laser cut spring elements has a thickness not greater than 0.254 mm (10 mils) and an edge of the spring is free of a fracture surface and/or free of striations or separations.

11. A method of forming a seal, the method comprising:

dispensing a ribbon of sheet metal;

laser cutting a plurality of spring elements distributed longitudinally along the ribbon to form a spring work piece; and

folding the spring work piece to form a spring,

wherein laser cutting includes laser cutting with a fiber laser having an optical fiber active gain medium.

12. The method of claim 11, wherein the ribbon of sheet metal has a thickness of no greater than 0.254 mm (10 mils).

13. The method of claim 11, wherein laser cutting includes laser cutting the plurality of spring elements to extend latitudinally across the ribbon.

14. The method of claim 11, wherein the plurality of spring elements extend to have a ratio of the width of a spring work piece formed from the ribbon to the width of the ribbon of at least 0.9.

15. The method of any one of claims 11-14, wherein the spring elements are connected forming contiguous spring work pieces, and laser cutting further comprising laser cutting the ribbon to form separate spring work pieces.