CLAIMS

1. An ophthalmic lens device with a variable optic insert positioned within at least a portion of an optical zone of the ophthalmic lens device, wherein the variable optic insert comprises:

a curved front surface and a curved back surface, wherein the front surface and the back surface are configured to bound at least a portion of one chamber;

an energy source embedded in the variable optic insert in at least a region comprising a non-optical zone; and

a layer containing liquid crystal material positioned within the at least one chamber, wherein the layer includes regions of liquid crystal material aligned in a pattern wherein an index of refraction across at least a first portion of the variable optic insert varies with a radial dependence.

2. The ophthalmic lens device of Claim 1 wherein the index of refraction across at least the first portion of the optic insert has a parabolic dependence on a radial dimension.

3. The ophthalmic lens device of Claim 2 wherein an optical effect of the layer containing liquid crystal material is supplemented by an effect of different radii of insert surfaces.

4. The ophthalmic lens device of Claim 2 wherein the lens is a contact lens.

5. The ophthalmic lens device of Claim 4 further comprising :
a first layer of electrode material proximate to the curved back surface; and
a second layer of electrode material proximate to the curved front surface.

6. The ophthalmic lens device of Claim 5 wherein at least a portion of the layer containing liquid crystal material varies its index of refraction affecting a ray

of light traversing the layer containing liquid crystal material when an electric potential is applied across the first layer of electrode material and the second layer of electrode material.

7. The ophthalmic lens device of Claim 6 wherein the variable optic insert alters a focal characteristic of the lens.

8. The ophthalmic lens device of Claim 7 further comprising an electrical circuit, wherein the electrical circuit controls a flow of electrical energy from the energy source to the first and second electrode layers.

9. The ophthalmic lens device of claim 8 wherein the electrical circuit comprises a processor.

10. An ophthalmic lens device with a variable optic insert positioned within at least a portion of an optical zone of the ophthalmic lens device, wherein the variable optic insert comprises:

a curved first front surface and a curved first back surface wherein the first front surface and the first back surface are configured to bound at least a portion of a first chamber;

a curved second front surface and a curved second back surface wherein the second front surface and the second back surface are configured to bound at least a portion of a second chamber;

at least one layer containing liquid crystal material positioned within the at least one chamber, wherein the at least one layer includes regions of liquid crystal material aligned in a pattern wherein an index of refraction across at least a first portion of the variable optic insert varies with a radial dependence; and

an energy source embedded in the insert in at least a region comprising a non-optical zone.

11. The ophthalmic lens device of Claim 10 wherein the index of refraction across at least the first portion of the optic insert has a parabolic dependence on a radial dimension.

12. The ophthalmic lens device of Claim 11 wherein an optical effect of the layer containing liquid crystal material is supplemented by an effect of different curvature of insert surfaces.

13. The ophthalmic lens device of Claim 10 wherein the lens is a contact lens.

14. The ophthalmic lens device of Claim 13 further comprising :

a first layer of electrode material proximate to the first curved back surface; and

a second layer of electrode material proximate to the curved first front surface.

15. The ophthalmic lens device of Claim 14 wherein the layer containing liquid crystal material varies its index of refraction affecting a ray of light traversing the layer containing liquid crystal material when an electric potential is applied across the first layer of electrode material and the second layer of electrode material.

16. The ophthalmic lens device of Claim 15 wherein the variable optic insert alters a focal characteristic of the lens.

17. The ophthalmic lens device of Claim 16 further comprising an electrical circuit, wherein the electrical circuit controls a flow of electrical energy from the energy source to the first and second electrode layers.

18. The ophthalmic lens device of claim 17 wherein the electrical circuit comprises a processor.

19. A contact lens device with a variable optic insert positioned within at least a portion of an optical zone of the contact lens device, wherein the variable optic insert comprises:

a curved first front surface and a curved first back surface wherein the first front surface and the first back surface are configured to form at least a first chamber;

a first layer of electrode material proximate to the curved first front surface;

a second layer of electrode material proximate to the curved first back surface;

a first layer containing liquid crystal material positioned within the first chamber, wherein the first layer includes regions of liquid crystal material aligned in a first pattern wherein a first index of refraction across at least a first portion of the variable optic insert varies with a first radial dependence, and wherein the first layer containing liquid crystal material varies its first index of refraction affecting a first ray of light traversing the first layer containing liquid crystal material when a first electric potential is applied across the first layer of electrode material and the second layer of electrode material;

a curved second front surface and a curved second back surface wherein the second front surface and the second back surface are configured to form at least a second chamber;

a third layer of electrode material proximate to the curved second front surface;

a fourth layer of electrode material proximate to the curved second back surface;

a second layer containing liquid crystal material positioned within the second chamber, wherein the second layer includes regions of liquid crystal material aligned in a second pattern wherein a second index of refraction

across at least a second portion of the variable optic insert varies with a second radial dependence, and wherein the second layer containing liquid crystal material varies its second index of refraction affecting a second ray of light traversing the second layer containing liquid crystal material when a second electric potential is applied across the third layer of electrode material and the fourth layer of electrode material;

an energy source embedded in the insert in at least a region comprising a non-optical zone;

an electrical circuit comprising a processor, wherein the electrical circuit controls a flow of electrical energy from the energy source to one or more of the first, second, third or fourth electrode layers; and

wherein the variable optic insert alters a focal characteristic of the contact lens device.

20. A contact lens device with a variable optic insert positioned within at least a portion of an optical zone of the contact lens device, wherein the variable optic insert comprises:

a layer containing liquid crystal material positioned within the variable optic insert, wherein the layer includes regions of liquid crystal material aligned in a pattern wherein an index of refraction across at least a first portion of the variable optic insert varies with a radial dependence; and

wherein at least a first surface of the layer containing liquid crystal material is curved.

21. An ophthalmic lens device with a variable optic insert positioned within at least a portion of an optical zone of the ophthalmic lens device, wherein the variable optic insert comprises:

an insert front curve piece and an insert back curve piece, wherein a back surface of the front curve piece has a first curvature and a front surface of the back curve piece has a second curvature;

an energy source embedded in the insert in at least a region comprising a non-optical zone; and

a layer containing liquid crystal material, wherein the layer includes regions of liquid crystal material aligned in a pattern wherein an index of refraction across at least a first portion of the variable optic insert varies with a radial dependence.

22. The ophthalmic lens device of Claim 21 wherein the index of refraction across at least the first portion of the optic insert has a parabolic dependence on a radial dimension.

23. The ophthalmic lens device of Claim 22 wherein an optical effect of the layer containing liquid crystal material is supplemented by an effect of different curvature of insert surfaces.

24. The ophthalmic lens device of Claim 21 wherein the first curvature is different from the second curvature.

25. The ophthalmic lens device of Claim 21 wherein the lens is a contact lens.

26. The ophthalmic lens device of Claim 25 further comprising :
a first layer of electrode material proximate to the back surface of the front curve piece; and
a second layer of electrode material proximate to the front surface of the back curve piece.

27. The ophthalmic lens device of Claim 26 wherein the layer containing liquid crystal material varies its index of refraction affecting a ray of light traversing the layer containing liquid crystal material when an electric potential is applied across the first layer of electrode material and the second layer of electrode material.

28. The ophthalmic lens device of Claim 27 wherein the variable optic insert alters a focal characteristic of the lens.

29. The ophthalmic lens device of Claim 28 further comprising an electrical circuit, wherein the electrical circuit controls a flow of electrical energy from the energy source to the first and second electrode layers.

30. The ophthalmic lens device of claim 29 wherein the electrical circuit comprises a processor.

31. An ophthalmic lens device with a variable optic insert positioned within at least a portion of an optical zone of the ophthalmic lens device, wherein the variable optic insert comprises:

an insert front curve piece, at least a first intermediate curve piece and an insert back curve piece, wherein a back surface of the front curve piece has a first curvature and a front surface of the first intermediate curve piece has a second curvature;

an energy source embedded in the insert in at least a region comprising a non-optical zone; and

the variable optic insert comprising a layer containing liquid crystal material, wherein the layer includes regions of liquid crystal material aligned in a pattern wherein an index of refraction across at least a first portion of the variable optic insert varies with a radial dependence.

32. The ophthalmic lens device of Claim 31 wherein the index of refraction across at least the first portion of the optic insert has a parabolic dependence on a radial dimension.

33. The ophthalmic lens device of Claim 32 wherein the first curvature is different from the second curvature.

34. The ophthalmic lens device of Claim 31 wherein the lens is a contact lens.

35. The ophthalmic lens device of Claim 34 further comprising:

a first layer of electrode material proximate to the front curve piece; and

a second layer of electrode material proximate to one or more of the intermediate curve piece and the back curve piece.

36. The ophthalmic lens device of Claim 34 further comprising:

a first layer of electrode material proximate to the front curve piece; and

a second layer of electrode material proximate to the intermediate curve piece.

37. The ophthalmic lens device of Claim 36 wherein the layer containing liquid crystal material varies its index of refraction affecting a ray of light traversing the layer containing liquid crystal material when an electric potential is applied across the first layer of electrode material and the second layer of electrode material.

38. The ophthalmic lens device of Claim 37 wherein:

the variable optic insert alters a focal characteristic of the lens.

39. The ophthalmic lens device of Claim 38 further comprising an electrical circuit, wherein the electrical circuit controls a flow of electrical energy from the energy source to the first and second electrode layers.

40. The ophthalmic lens device of claim 39 wherein the electrical circuit comprises a processor.

CLAIMS

1. A contact lens with a variable optic insert positioned within at least a portion of an optical zone of the ophthalmic lens device, wherein the variable optic insert comprises:
a curved front surface and a curved back surface, wherein the front surface and the back surface are configured to bound at least a portion of one chamber;
an energy source embedded in the variable optic insert in at least a region comprising a non-optical zone; and
a layer containing liquid crystal material positioned within the at least one chamber, wherein the layer includes regions of liquid crystal material aligned in a pattern wherein an index of refraction across at least a first portion of the variable optic insert varies with a radial dependence;
wherein the index of refraction across at least the first portion of the optic insert has a parabolic dependence on a radial dimension.

2. The contact lens of Claim 1, wherein an optical effect of the layer containing liquid crystal material is supplemented by an effect of different radii of insert surfaces.

3. The contact lens of Claim 1, further comprising:
a first layer of electrode material proximate to the curved back surface; and
a second layer of electrode material proximate to the curved front surface.

4. The contact lens of Claim 3, wherein at least a portion of the layer containing liquid crystal material varies its index of refraction affecting a ray of light traversing the layer containing liquid crystal material when an electric potential is applied across the first layer of electrode material and the second layer of electrode material and wherein the variable optic insert alters a focal characteristic of the lens.

5. The contact lens of Claim 4, further comprising an electrical circuit, wherein the electrical circuit controls a flow of electrical energy from the energy source to the first and

second electrode layers wherein the electrical circuit comprises a processor.

6. A contact lens with a variable optic insert positioned within at least a portion of an optical zone of the ophthalmic lens device, wherein the variable optic insert comprises:
a curved first front surface and a curved first back surface wherein the first front surface and the first back surface are configured to bound at least a portion of a first chamber;
a curved second front surface and a curved second back surface wherein the second front surface and the second back surface are configured to bound at least a portion of a second chamber;
at least one layer containing liquid crystal material positioned within the at least one chamber, wherein the at least one layer includes regions of liquid crystal material aligned in a pattern wherein an index of refraction across at least a first portion of the variable optic insert varies with a radial dependence; and
an energy source embedded in the insert in at least a region comprising a non-optical zone;
wherein the index of refraction across at least the first portion of the optic insert has a parabolic dependence on a radial dimension.

7. The contact lens of Claim 6, wherein an optical effect of the layer containing liquid crystal material is supplemented by an effect of different curvature of insert surfaces.

8. The contact lens of Claim 6, further comprising:
a first layer of electrode material proximate to the first curved back surface; and
a second layer of electrode material proximate to the curved first front surface.

9. The contact lens of Claim 8, wherein the layer containing liquid crystal material varies its index of refraction affecting a ray of light traversing the layer contain-ing liquid crystal material when an electric potential is applied across the first layer of electrode material and the second layer of electrode material and wherein the variable optic insert alters a focal characteristic of the lens.

10. The contact lens of Claim 9, further comprising an electrical circuit, wherein the electrical circuit controls a flow of electrical energy from the energy source to the first and second electrode layers wherein the electrical circuit comprises a processor.

11. A contact lens with a variable optic insert positioned within at least a portion of an optical zone of the ophthalmic lens device, wherein the variable optic insert comprises:
an insert front curve piece and an insert back curve piece, wherein a back surface of the front curve piece has a first curvature and a front surface of the back curve piece has a second curvature;
an energy source embedded in the insert in at least a region comprising a non-optical zone; and
a layer containing liquid crystal material, wherein the layer includes regions of liquid crystal material aligned in a pattern wherein an index of refraction across at least a first portion of the variable optic insert varies with a radial dependence;
wherein the index of refraction across at least the first portion of the optic insert has a parabolic dependence on a radial dimension.

12. The contact lens of Claim 11, wherein an optical effect of the layer containing liquid crystal material is supplemented by an effect of different curvature of insert surfaces.

13. The contact lens of Claim 11, wherein the first curvature is different from the second curvature.

14. The contact lens of Claim 11, further comprising:
a first layer of electrode material proximate to the back surface of the front curve piece; and
a second layer of electrode material proximate to the front surface of the back curve piece.

15. The contact lens of Claim 14, wherein the layer containing liquid crystal material varies its index of refraction affecting a ray of light traversing the layer containing liquid

crystal material when an electric potential is applied across the first layer of electrode material and the second layer of electrode material and wherein the variable optic insert alters a focal characteristic of the lens.

16. The contact lens of Claim 15, further comprising an electrical circuit, wherein the electrical circuit controls a flow of electrical energy from the energy source to the first and second electrode layers wherein the electrical circuit comprises a processor.

17. A contact lens with a variable optic insert positioned within at least a portion of an optical zone of the ophthalmic lens device, wherein the variable optic insert comprises:
an insert front curve piece, at least a first intermediate curve piece and an insert back curve piece, wherein a back surface of the front curve piece has a first curvature and a front surface of the first intermediate curve piece has a second curvature;
an energy source embedded in the insert in at least a region comprising a non-optical zone; and
the variable optic insert comprising a layer containing liquid crystal material, wherein the layer includes regions of liquid crystal material aligned in a pattern wherein an index of refraction across at least a first portion of the variable optic insert varies with a radial dependence;
wherein the index of refraction across at least the first portion of the optic insert has a parabolic dependence on a radial dimension.

18. The contact lens of Claim 17, wherein the first curvature is different from the second curvature.

19. The contact lens of Claim 17, further comprising:
a first layer of electrode material proximate to the front curve piece; and
a second layer of electrode material proximate to one or more of the intermediate curve piece and the back curve piece.

20. The contact lens of Claim 17, further comprising:
a first layer of electrode material proximate to the front curve piece; and
a second layer of electrode material proximate to the intermediate curve piece.

21. The contact lens of Claim 20, wherein the layer containing liquid crystal material varies its index of refraction affecting a ray of light traversing the layer containing liquid crystal material when an electric potential is applied across the first layer of electrode material and the second layer of electrode material and wherein the variable optic insert alters a focal characteristic of the lens.

22. The contact lens of Claim 21, further comprising an electrical circuit, wherein the electrical circuit controls a flow of electrical energy from the energy source to the first and second electrode layers wherein the electrical circuit comprises a processor.