CLAIMS

1. An audio transducer diaphragm, comprising:

a diaphragm body having a core material and one or more major faces,

normal stress reinforcement coupled to the body, the normal stress reinforcement being coupled on or adjacent at least one of said major faces for resisting compression-tension stresses experienced at or adjacent the face of the body during operation, and

at least one inner reinforcement member separate to the core material, embedded within the body and oriented at an angle relative to at least one of said major faces for resisting shear deformation experienced by the body during operation.

2. An audio transducer diaphragm as claimed in claim 1 wherein normal stress reinforcement is coupled on or adjacent a pair of opposing major faces of the diaphragm body.

3. An audio transducer diaphragm as claimed in claim 1 wherein the diaphragm comprises a relatively lower mass, per unit area of a major face of the diaphragm body, at one or more of the peripheral regions of the diaphragm distal from a center of mass region, relative to a mass per unit area at or adjacent the center of mass region.

4. An audio transducer diaphragm as claimed in claim 1 wherein the diaphragm comprises a lower mass at one end of the diaphragm relative to an opposing end of the diaphragm.

5. An audio transducer diaphragm as claimed in claim 3 wherein the normal stress reinforcement comprises a lower mass at the one or more peripheral regions of the

diaphragm relative to a mass of the normal stress reinforcement at or adjacent the center of mass region.

6. An audio transducer diaphragm as claimed in claim 3 wherein the diaphragm body comprises a lower mass at the one or more peripheral regions of the diaphragm relative to a mass of the diaphragm body at or adjacent the center of mass region.

7. An audio transducer diaphragm as claimed in claim 1 wherein the normal stress reinforcement comprises a normal stress reinforcement plate coupled on or adjacent at least one major face of the diaphragm.

8. An audio transducer diaphragm as claimed in claim 7 wherein each normal stress reinforcement plate comprises a lower thickness at one or more peripheral regions of the diaphragm distal from a center of mass region of the diaphragm, relative to a thickness of the normal stress reinforcement plate at or adjacent the center of mass region.

9. An audio transducer diaphragm as claimed in claim 7 wherein each normal stress reinforcement plate consists of a substantially solid plate.

10. An audio transducer diaphragm as claimed in claim 9 wherein each normal stress reinforcement plate comprises one or more recesses at one or more peripheral regions of the diaphragm distal from a center of mass region of the diaphragm.

11. An audio transducer diaphragm as claimed in claim 10 wherein the one or more recesses collectively constitute at least 10 percent of a total surface area of the respective major face.

12. An audio transducer diaphragm as claimed in claim 9 wherein each plate is a foil sheet.

13. An audio transducer diaphragm as claimed in claim 7 wherein each normal stress reinforcement plate comprises of a plurality of elongate struts.

14. An audio transducer diaphragm as claimed in claim 13 wherein the plurality of struts are interconnected.

15. An audio transducer as claimed in claim 13 wherein each normal stress reinforcement plate comprises a plurality of spaced struts extending substantially longitudinally along the corresponding major face.

16. An audio transducer as claimed in claim 15 wherein each normal stress reinforcement plate comprises one or more struts extending at an angle relative to the longitudinally extending struts.

17. An audio transducer diaphragm as claimed in claim 13 wherein the struts comprise a lower thickness and/or width at one or more peripheral regions of the diaphragm distal from a center of mass region of the diaphragm, relative to a thickness and/or width of the struts at the center of mass region.

18. An audio transducer diaphragm as claimed in claim 7 wherein each plate is distributed along a substantial portion of a length, and across a substantial portion of a width, of the respective major face.

19. An audio transducer diaphragm as claimed in claim 7 wherein each plate is formed from an anisotropic material.

20. An audio transducer diaphragm as claimed in claim 19 wherein each plate comprises a higher stiffness in directions extending from a centre of mass region of the diaphragm to one or more peripheral regions, distal from the centre of mass region, relative to a stiffness across other directions.

21. An audio transducer diaphragm as claimed in claim 13 wherein the plurality of struts are formed from an anisotropic material comprising of a fiber composite, wherein the fibers are laid in a substantially unidirectional orientation through each strut, and wherein the fibers are laid in substantially the same orientation as a longitudinal axis of the associated strut.

22. An audio transducer diaphragm as claimed in claim 1 wherein the diaphragm body is substantially thick, at least at or adjacent a center of mass region of the diaphragm.

23. An audio transducer diaphragm as claimed in claim 22 wherein the diaphragm body comprises a maximum thickness that is at least about 11% of a maximum length of the body.

24. An audio transducer diaphragm as claimed in claim 23 wherein the maximum thickness is at least about 14% of the maximum length.

25. An audio transducer diaphragm as claimed in claim 1 wherein each inner reinforcement member extends within the diaphragm body along a direction that is

substantially orthogonal to a coronal plane of the diaphragm body, or that is substantially parallel to a longitudinal axis of the body, or both.

26. An audio transducer diaphragm as claimed in claim 1 wherein each inner reinforcement extends from a center of mass region of the diaphragm to one or more peripheral regions most distal from the center of mass region.

27. An audio transducer diaphragm as claimed in claim 1 wherein each inner reinforcement member extends within the diaphragm body at an angle relative to at least one of said major faces sufficient to resist shear deformation in use.

28. An audio transducer diaphragm as claimed in claim 27 wherein each inner reinforcement member is embedded within and between a pair of opposing major faces of the diaphragm body and extends substantially orthogonally to the pair of opposing major faces.

29. An audio transducer diaphragm as claimed in claim 25 comprising a plurality of inner reinforcement members spaced across a width of the diaphragm body.

30. An audio transducer diaphragm as claimed in claim 1 wherein each inner reinforcement member is formed from a material having a specific modulus of at least approximately 8 MPa/(Kg/m^3).

31. An audio transducer diaphragm as claimed in claim 30 wherein each inner reinforcement member is formed from a material having a specific modulus of at least approximately 20 MPa/(Kg/m^3).

32. An audio transducer diaphragm as claimed in claim 1 wherein each inner reinforcement member is formed from an aluminum material or a carbon fiber reinforced plastics material.

33. An audio transducer diaphragm as claimed in claim 1 wherein the diaphragm body in isolation of the outer reinforcement and the at least one reinforcement member has a density of less than approximately 100kg/m^3.

34. An audio transducer diaphragm as claimed in claim 33 wherein the density is less than approximately 20kg/m^3.

35. An audio transducer diaphragm as claimed in claim 33 wherein the diaphragm body comprises of a polystyrene foam material.

36. An audio transducer diaphragm as claimed in claim 1 wherein each major face of the diaphragm body is substantially planar or smooth.

37. An audio transducer diaphragm as claimed in claim 1 wherein the diaphragm body is wedge shaped, consisting of a tapering thickness from one end to an opposing end.

38. An audio transducer diaphragm as claimed in claim 37 wherein the normal stress reinforcement comprises a pair of angled plates connected at one edge, each plate extending along a respective major face of the diaphragm body and the edge locating adjacent a relatively thin end of the wedge shaped diaphragm body.

39. An audio transducer, comprising:

a diaphragm having:

a diaphragm body having a core material and one or more major faces,

normal stress reinforcement coupled to the body, the normal stress reinforcement being coupled on or adjacent at least one of said major faces for resisting compression-tension stresses experienced at or adjacent the face of the body during operation, and

at least one inner reinforcement member separate to the core material, embedded within the body and oriented at an angle relative to at least one of said major faces for resisting and/or substantially mitigating shear deformation experienced by the body during operation; and

a transducing mechanism operatively coupled to the diaphragm and operative in association with movement of the diaphragm.

40. An audio transducer as claimed in claim 39 further comprising a housing for accommodating the diaphragm therein or therebetween, and wherein an outer periphery of the diaphragm comprises one or more peripheral regions that are free from physical connection with an interior of the housing.

41. An audio transducer as claimed in claim 40 wherein the outer periphery is significantly free from physical connection with the interior of the housing such that the one or more peripheral regions constitute at least 20% a total length or perimeter of the periphery.

42. An audio transducer as claimed in claim 41 wherein the outer periphery is substantially free from physical connection such that the one or more peripheral regions constitute at least 50% of the length or perimeter of the periphery.

43. An audio transducer as claimed in claim 42 wherein one or more peripheral regions that are distal from a center of mass region of the diaphragm are approximately entirely free from physical connection with the interior of the housing.

44. An audio transducer as claimed in claim 39 wherein the diaphragm is rotatable during operation of the transducing mechanism about an axis of rotation.

45. An audio transducer as claimed in claim 44 wherein the diaphragm body comprises of a thickness that is tapered and decreases from a first end at or adjacent the axis of rotation to an opposing end distal from the axis of rotation.

46. An audio transducer as claimed in claim 39 wherein the diaphragm body comprises of a thickness that is tapered and decreases from a location of the transducing mechanism to one or more peripheral regions distal from the transducing mechanism.

47. An audio transducer as claimed in claim 44 further comprising:

a transducer base structure,

a hinge assembly rotatably coupling the diaphragm to the transducer base structure.

48. An audio transducer as claimed in claim 47 wherein the hinge assembly comprises:

one or more hinge joints, each hinge joint having a hinge element with a substantially rigid contact surface and an associated contact member with a substantially rigid contact surface, the contact surface of the hinge element of each

hinge joint moving relative to the contact surface of the associated contact member during operation to rotate the supported diaphragm; and

a biasing mechanism configured to bias the contact surface of the hinge element of each hinge joint towards the contact surface of the associated contact member to maintain substantially consistent physical contact between the contact surface of the hinge element and the contact surface of the associated contact member during normal operation.

49. An audio transducer as claimed in claim 47 wherein all parts of the hinge assembly operatively supporting the diaphragm in situ are substantially rigid and have a Young's modulus greater than approximately 8Gpa.

50. An audio transducer as claimed in claim 39 wherein the transducing mechanism comprises a conductive coil or coil(s) coupled about a diaphragm base structure, the diaphragm base structure being rigidly coupled to the diaphragm body, the outer reinforcement and/or the at least one inner reinforcement members.

51. An audio transducer as claimed in claim 39 wherein the transducing mechanism comprises a force transferring component that is in close proximity and rigidly coupled to the diaphragm.

52. An audio transducer as claimed in claim 51 wherein a shortest distance between the force transferring component and the diaphragm body is less than 35% of a maximum dimension of the diaphragm body.

53. An audio transducer as claimed in claim 39 wherein the transducing mechanism comprises a conductive coil or coil(s) that is(are) rigidly coupled to the diaphragm via a

diaphragm base structure and that extends substantially parallel to the axis of rotation of the diaphragm.

54. An audio transducer as claimed in claim 39 further comprising:

a housing for accommodating the diaphragm therein or therebetween, and

at least one decoupling mounting system located between the diaphragm and at least one other part of the audio transducer for at least partially alleviating mechanical transmission of vibration between the diaphragm and the at least one other part, each decoupling mounting system flexibly mounting a first component to a second component of the audio transducer.

55. An audio transducer as claimed in claim 39 wherein the audio transducer is an electroacoustic transducer.

56. An audio transducer as claimed in claim 39 wherein the audio transducer is an acoustoelectric transducer.

57. An audio transducer diaphragm as claimed in claim 1 wherein each inner reinforcement is rigidly coupled to the diaphragm body.

58. An audio transducer as claimed in claim 47 wherein the hinge assembly comprises one or more flexible hinge joints configured to flexibly and rotatably coupled the diaphragm to the transducer base structure.