CLAIMS

1. A planar composite structure (PCS) configured for use as a stator of an axial flux motor or generator, the PCS comprising:

at least one dielectric layer;

first elongated conductive elements arranged angularly on the at least one dielectric layer, each of the first elongated conductive elements extending radially between a first radial distance from an origin point associated with the at least dielectric layer and a second radial distance from the origin point, wherein the second radial distance is greater than the first radial distance;

conductive inner end turns disposed on the at least one dielectric layer, each of the conductive inner end turns being connected between portions of at least two of the first elongated conductive elements at the first radial distance;

conductive outer end turns disposed on the at least one dielectric layer, each of the conductive outer end turns being connected between portions of at least two of the first elongated conductive elements at the second radial distance; and

at least one second elongated conductive element disposed on the at least one dielectric layer, the at least one second elongated conductive element extending radially between a third radial distance from the origin point and a fourth radial distance from the origin point, wherein:

the fourth radial distance is greater than the third radial distance,

either (a) the fourth radial distance is less than the first radial distance, or (b) the third radial distance is greater than the second radial distance, and

the at least one second elongated conductive element is thermally connected to at least a first one of the first elongated conductive elements without the at least one second elongated conductive element also being electrically connected to the first one of the first elongated conductive elements.

2. The PCS of claim 1, further comprising at least one third elongated conductive element disposed on the at least one dielectric layer, wherein the at least one third elongated conductive element:

is on an opposite side of the at least one dielectric layer as the at least one second elongated conductive element;

extends along at least a portion of a length of the at least one second elongated conductive element so as to establish a thermal connection between the at least one third elongated conductive element and the at least one second elongated conductive element by the at least one dielectric layer; and

is thermally connected to the first one of the first elongated conductive elements.

3. The PCS of claim 2, wherein the third radial distance is greater than the second radial distance.

4. The PCS of claim 2, wherein the fourth radial distance is less than the first radial distance.

5. The PCS of claim 1, wherein the third radial distance is greater than the second radial distance.

6. The PCS of claim 1, wherein the fourth radial distance is less than the first radial distance.

7. A planar composite structure (PCS) configured for use as a stator of an axial flux motor or generator, the PCS comprising:

at least one dielectric layer;

first elongated conductive elements arranged angularly on the at least one dielectric layer, each of the first elongated conductive elements extending radially between a first radial distance from an origin point associated with the at least one dielectric layer and a second radial distance from the origin point, wherein the second radial distance is greater than the first radial distance, a first one of the first elongated conductive elements being disposed on a first surface of the at least one dielectric layer, and a second one of the first elongated conductive elements being disposed on a second surface of the at least one dielectric layer opposite the first surface;

conductive inner end turns disposed on the at least one dielectric layer, each of the conductive inner end turns being connected between portions of at least two of the first elongated conductive elements at the first radial distance;

conductive outer end turns disposed on the at least one dielectric layer, each of the conductive outer end turns being connected between portions of at least two of the first elongated conductive elements at the second radial distance;

a second conductive element disposed on the first surface, a first portion of the second conductive element being connected to a first portion of the first one of the first elongated conductive elements at the second radial distance; and

a first via extending through the at least one dielectric layer, wherein the first via:

is angularly offset from the first portion of the first one of the first elongated conductive elements, and

electrically interconnects the first one of the first elongated conductive elements and the second one of the first elongated conductive elements through at least the second conductive element.

8. The PCS of claim 7, further comprising:

a first outer elongated conductive element disposed on the at least one dielectric layer and extending radially between a third radial distance from the origin point and a fourth radial distance from the origin point, wherein:

the fourth radial distance is greater than the third radial distance,

the third radial distance is greater than the second radial distance, and

the first outer elongated conductive elements is thermally connected to the first one of the first elongated conductive elements.

9. The PCS of claim 8, further comprising:

a second outer elongated conductive element disposed on the at least one dielectric layer and extending radially between the third radial distance and the fourth radial distance, wherein:

the first outer elongated conductive element is not electrically connected to the first one of the first elongated conductive elements,

the second outer elongated conductive element is on an opposite side of the at least one dielectric layer as the first outer elongated conductive element,

the second outer elongated conductive element extends along at least a portion of a length of the first outer elongated conductive element so as to establish a thermal connection between the second outer elongated conductive element and the first outer elongated conductive element by the at least one dielectric layer, and

the second outer elongated conductive elements is thermally connected to the first one of the first elongated conductive elements through the first via.

10. The PCS of claim 7, wherein the first via is angularly offset in a first direction from the first portion of the first one of the first elongated conductive elements, and the PCS further comprises a second via extending through the at least one dielectric layer, wherein the second via:

is angularly offset in a second direction from the first portion of the first one of the first elongated conductive elements, the second direction being opposite the first direction, and

electrically interconnects the first one of the first elongated conductive elements and the second one of the first elongated conductive elements through at least the second conductive element.

11. The PCS of claim 10, further comprising:

first and second outer elongated conductive elements disposed on the at least one dielectric layer and each extending radially between a third radial distance from the origin point and a fourth radial distance from the origin point, wherein:

the fourth radial distance is greater than the third radial distance,

the third radial distance is greater than the second radial distance, and

each of the first and second outer elongated conductive elements is thermally connected to the first one of the first elongated conductive elements.

12. The PCS of claim 11, further comprising:

third and fourth outer elongated conductive elements disposed on the at least one dielectric layer and each extending radially between the third radial distance and the fourth radial distance, wherein:

neither of the first and second outer elongated conductive elements is electrically connected to the first one of the first elongated conductive elements,

the third and fourth outer elongated conductive elements are on an opposite side of the at least one dielectric layer as the first and second outer elongated conductive elements,

the third outer elongated conductive element extends along at least a portion of a length of the first outer elongated conductive element so as to establish a thermal connection between the third outer elongated conductive element and the first outer elongated conductive element by the at least one dielectric layer,

the fourth outer elongated conductive element extends along at least a portion of a length of the second outer elongated conductive element so as to establish a thermal connection between the fourth outer elongated conductive element and the second outer elongated conductive element by the at least one dielectric layer,

the third outer elongated conductive elements is thermally connected to the first one of the first elongated conductive elements through the first via, and

the fourth outer elongated conductive elements is thermally connected to the first one of the first elongated conductive elements through the second via.

13. The PCS of claim 12, wherein the first and second outer elongated conductive elements are disposed on a same surface of the at least one dielectric layer.

14. The PCS of claim 11, wherein the first and second outer elongated conductive elements are disposed on a same surface of the at least one dielectric layer.

15. A planar composite structure (PCS) configured for use as a stator of an axial flux motor or generator, the PCS comprising:

at least one dielectric layer;

first elongated conductive elements arranged angularly on the at least one dielectric layer, each of the first elongated conductive elements extending radially between a first radial distance from an origin point associated with the at least dielectric layer and a second radial distance from the origin point, wherein the second radial distance is greater than the first radial distance;

conductive inner end turns disposed on the at least one dielectric layer, each of the conductive inner end turns being connected between portions of at least two of the first elongated conductive elements at the first radial distance;

conductive outer end turns disposed on the at least one dielectric layer, each of the conductive outer end turns being connected between portions of at least two of the first elongated conductive elements at the second radial distance; and

first and second outer elongated conductive elements disposed on the at least one dielectric layer and each extending radially between a third radial distance from the origin point and a fourth radial distance from the origin point, wherein:

the fourth radial distance is greater than the third radial distance,

the third radial distance is greater than the second radial distance, and

each of the first and second outer elongated conductive elements is thermally connected to a first one of the first elongated conductive elements.

16. The PCS of claim 15, wherein the first and second outer elongated conductive elements are disposed on a same surface of the at least one dielectric layer.

17. The PCS of claim 15, wherein at least one of the first and second outer elongated conductive elements is angularly offset from the first one of the first elongated conductive elements.

18. The PCS of claim 15, further comprising:

third and fourth outer elongated conductive elements disposed on the at least one dielectric layer and each extending radially between the third radial distance and the fourth radial distance, wherein:

neither of the first and second outer elongated conductive elements is electrically connected to the first one of the first elongated conductive elements,

the third and fourth outer elongated conductive elements are on an opposite side of the at least one dielectric layer as the first and second outer elongated conductive elements,

the third outer elongated conductive element extends along at least a portion of a length of the first outer elongated conductive element so as to establish a thermal connection between the third outer elongated conductive element and the first outer elongated conductive element by the at least one dielectric layer,

the fourth outer elongated conductive element extends along at least a portion of a length of the second outer elongated conductive element so as to establish a thermal connection between the fourth outer elongated conductive element and the second outer elongated conductive element by the at least one dielectric layer,

the third outer elongated conductive elements is thermally connected to the first one of the first elongated conductive elements through a first via, and

the fourth outer elongated conductive elements is thermally connected to the first one of the first elongated conductive elements through a second via.

19. The PCS of claim 18, wherein the first and second outer elongated conductive elements are disposed on a same surface of the at least one dielectric layer.

20. The PCS of claim 18, wherein at least one of the first and second outer elongated conductive elements is angularly offset from the first one of the first elongated conductive elements.