SUMMARY ~~OF THE INVENTION~~

It would be advantageous to have improved inductor coil and method of cooling an inductor coil.

The object of the present invention is solved with the subject matter of the independent claims, wherein further embodiments are incorporated in the dependent claims. It should be noted that the following described aspects and examples of the invention apply also to the inductor coils and to the methods of cooling inductor coils.

In a first aspect, there is provided an inductor coil, comprising:

- a first component;
- a second component;
- a length of conductor;
- a heat sink.

The first component is located adjacent to the second component. A core is formed from the first component and the second component. A first part of the length of conductor is wound around at least the core to form a plurality of turns of conductor. The heat sink comprises a thermally conductive material. The heat sink comprises a first part and a second part. The first part of the heat sink has a first material and/or structural characteristic and the second part of the heat sink has a second material and/or structural characteristic different to the first material and/or structural characteristic. An inner surface of the first part of the heat sink is in contact with an outer surface of a part of the plurality of turns of conductor.

In an example, the first material and/or structural characteristic comprises a magnetic permeability and the second material and/or structural characteristic comprises a magnetic permeability greater than the magnetic permeability of the first part of the heat sink.

In an example, the first material and/or structural characteristic comprises a resistance or resistivity and the second material and/or structural characteristic comprises a resistance or resistivity less than the resistance or resistivity of the first part of the heat sink.

conductor located around the gap in the core is spaced from the central axis by at least one second distance greater than the at least one first distance.

In an example, a core portion of the first component is spaced from a core portion of the second component to form a gap in the core. A spacer is located in the gap in the core to form a gap around the core. An outer surface of a portion of the spacer is located a distance from a central axis of the core that is greater than a distance from the central axis to an outer surface of the first component and an outer surface of the second component that form the core.

In an example, a dimension of the portion of the spacer adjacent to the outer surface of the first component and the outer surface of the second component in the direction of the central axis is greater than a dimension of the gap in the core in the direction of the central axis.

In an example, the outer surface of the portion of the spacer is configured to contact the one or more turns of conductor located around the gap in the core.

In an example, the spacer comprises a non-conductive material.

In an example, the spacer comprises a central hole configured to be located around the central axis.

In a second aspect, there is provided an inductor coil, comprising:

- a first component;
- a second component;
- a length of conductor;
- a heat sink;

The first component is located adjacent to the second component. A core is formed from the second component. A first part of the length of conductor is wound around at least the core to form a plurality of turns of conductor. The heat sink comprises a thermally conductive material. The heat sink comprises a first part and a second part. The first part of the heat sink has a first material and/or structural characteristic ~~magnetic permeability~~ and the second part of the heat sink has a second material and/or structural characteristic ~~magnetic~~

~~permeability~~ different to the first material and/or structural characteristic~~greater than the first magnetic permeability~~. An inner surface of

In an example, the spacer comprises a central hole configured to be located around the central axis.

In a third aspect, there is provided a method of cooling an inductor coil. The inductor coil comprises a first component, a second component, and a length of conductor. The first component is located adjacent to the second component. A core is formed from the first component and the second component. A first part of the length of conductor is wound around at least the core to form a plurality of turns of conductor. The method comprises:

- utilizing a heat sink, wherein the heat sink comprises a thermally conductive material, wherein the heat sink comprises a first part and a second part, wherein the first part of the heat sink has a first material and/or ~~magnetic permeability~~ structural characteristic and the second part of the heat sink has a second material and/or structural characteristic ~~magnetic permeability greater than~~ different to the first material and/or structural characteristic~~magnetic permeability~~; and
- wherein, utilizing the heat sink comprises contacting an inner surface of the first part of the heat sink with an outer surface of a part of the plurality of turns of conductor.

In an example, the first material and/or structural characteristic comprises a magnetic permeability and the second material and/or structural characteristic comprises a magnetic permeability greater than the magnetic permeability of the first part of the heat sink.

In an example, the first material and/or structural characteristic comprises a resistance or resistivity and the second material and/or structural characteristic comprises a resistance or resistivity less than the resistance or resistivity of the first part of the heat sink.

In an example, a circumferential resistance of the first part of the heat sink is greater than a radial resistance of the first part of the heat sink, and the circumferential resistance of the first part of the heat sink is greater than a radial resistance of the second part of the heat sink and is greater than a circumferential resistance of the second part of the heat sink.

In an example, the first material and/or structural characteristic comprises a conductivity or conductance and the second material and/or structural characteristic comprises

a conductivity or conductance less than the resistance or resistivity of the first part of the heat sink.

of the central axis is greater than a dimension of the gap in the core in the direction of the central axis.

In an example, the method comprises contacting the outer surface of the portion of the spacer with the one or more turns of conductor located around the gap in the core.

In an example, the spacer comprises a non-conductive material.

In an example, the spacer comprises a central hole configured to be located around the central axis.

In a fourth aspect, there is provided a method of cooling an inductor coil. ~~t~~The inductor coil comprises a first component, a second component, and a length of conductor. The first component is located adjacent to the second component. A core is formed from the second component. A first part of the length of conductor is wound around at least the core to form a plurality of turns of conductor. The method comprises:

- utilizing a heat sink, wherein the heat sink comprises a thermally conductive material, wherein the heat sink comprises a first part and a second part, wherein the first part of the heat sink has a first material and/or ~~magnetic permeability~~ structural characteristic and the second part of the heat sink has a second material ~~magnetic permeability~~ and/or structural characteristic different to ~~greater than~~ the first ~~magnetic permeability~~material and/or structural characteristic; and
- wherein utilizing the heat sink comprises contacting an inner surface of the first part of the heat sink with an outer surface of a part of the plurality of turns of conductor.

In an example, the first material and/or structural characteristic comprises a magnetic permeability and the second material and/or structural characteristic comprises a magnetic permeability greater than the magnetic permeability of the first part of the heat sink.

In an example, the first material and/or structural characteristic comprises a resistance or resistivity and the second material and/or structural characteristic comprises a resistance or resistivity less than the resistance or resistivity of the first part of the heat sink.

In an example, a circumferential resistance of the first part of the heat sink is greater than a radial resistance of the first part of the heat sink, and the circumferential