CLAIMS

1. A portable wireless communication device comprising:

an insulating substrate having a first surface and a second surface opposed to the first surface;

a coil antenna arranged in the insulating substrate and having a loop shape; and

an IC chip electrically connected to the coil antenna;

wherein

the coil antenna includes a plurality of first electrodes arranged on the first surface side of the insulating substrate, a plurality of second electrodes arranged on the second surface side of the insulating substrate, and a plurality of through electrodes arranged inside the insulating substrate,

each of the plurality of first electrodes includes a first portion and a second portion,

each of the plurality of second electrodes includes a third portion and a fourth portion,

the first portion of one first electrode of the plurality of first electrodes is connected to the fourth potion of one second electrode of the plurality of second electrodes via one through electrode of the plurality of through electrodes,

the second portion of the one first electrode of the plurality of first electrodes is connected to the third portion of another second electrode of the plurality of the second electrodes via another through electrode of the plurality of through electrodes, and

the coil antenna has a spiral shape in the circumference direction.

2. The portable wireless communication device according to Claim 1, wherein

at least either one of the plurality of first electrodes and the plurality of second electrodes has meander shape.

~~3. The portable wireless communication device according to Claim 1, wherein~~

~~the coil antenna includes a first antenna having a loop shape and a second antenna arranged inside the first antenna in a plan view and having a loop shape, and~~

~~a portion of the first antenna and a portion of the second antenna are connected.~~

~~4. The portable wireless communication device according to Claim 1, wherein~~

~~the coil antenna includes a first antenna having a loop shape and a second antenna overlapped with the first antenna and having a loop shape, and~~

~~a portion of the first antenna and a portion of the second antenna are connected.~~

~~5. The portable wireless communication device according to Claim 1 comprising;~~

~~a shield overlapped with the coil antenna.~~

~~6. The portable wireless communication device according to Claim 1, wherein~~

~~the coil antenna has a circular shape in a plan view.~~

~~7. The portable wireless communication device according to Claim 1, wherein~~

~~the coil antenna has a rectangular shape in a plan view.~~

~~8~~3. A portable wireless communication device comprising:

a coil antenna having a loop shape; and

an IC chip electrically connected to the coil antenna;

wherein

the coil antenna is formed by a single wire wound around a circular support, and

the coil antenna has a spiral shape in a circumference direction.

~~9~~4. The portable wireless communication device according to any one of Claims 1 to 3~~8~~, wherein

the coil antenna includes a first antenna having a loop shape and a second antenna arranged inside the first antenna in a plan view and having a loop shape, and

a portion of the first antenna and a portion of the second antenna are connected.

~~10~~5. The portable wireless communication device according to any one of Claims 1 to 3 ~~8~~, wherein

the coil antenna includes a first antenna having a loop shape and a second antenna overlapped with the first antenna and having a loop shape, and

a portion of the first antenna and a portion of the second antenna are connected.

~~11. The portable wireless communication device according to Claim 8~~

~~comprising;~~

~~a shield overlapped with the coil antenna.~~

~~12. The portable wireless communication device according to Claim 8, wherein~~

~~the coil antenna has a circular shape in a plan view.~~

~~13. The portable wireless communication device according to Claim 8, wherein~~

~~the coil antenna has a rectangular shape in a plan view.~~

~~14~~6. A portable wireless communication device comprising:

an insulating substrate having a first surface and a second surface opposed to the first surface;

a coil antenna arranged in the insulating substrate and having a loop shape; and

an IC chip electrically connected to the coil antenna;

wherein

the coil antenna is arranged on the first surface or the second surface of the insulating substrate,

the coil antenna includes a plurality of insulating layers, a plurality of electrodes arranged on the insulating substrate or each of the plurality of insulating layers, and a plurality of through electrodes arranged on the plurality of insulating layers and connected with each of the plurality of electrodes, and

the coil antenna has a spiral shape formed by the plurality of electrodes and the plurality of through electrodes in a cross-sectional view orthogonal to a circumference direction.

~~15~~7. The portable wireless communication device according to any one of Claims 1 to 6~~Claim 14~~ comprising;

a shield overlapped with the coil antenna.

~~16~~8. The portable wireless communication device according to any one of Claims 1 to 7~~Claim 14~~, wherein

the coil antenna has a circular shape in a plan view.

~~17~~9. The portable wireless communication device according to any one of Claims 1 to 7~~Claim 14~~, wherein

the coil antenna has a rectangular shape in a plan view.

~~18~~10. An information identification device comprising;

one or more portable wireless communication devices according to any one of claims 1 to ~~17~~9;

~~and~~

a reader/writer.