

High Frequency Coil Assembly

The present invention relates to a high frequency coil assembly which includes a shield case and a jar-like core both having through holes for adjusting the inductance of the coil.

A conventional high frequency coil is normally constructed to cover a bobbin having a coil wound thereon with a jar-like core and a metal case. The case and the jar-like core of such a coil have through holes for receiving a driver used to rotate a threaded core received in the bobbin and thus move it along the length of the bobbin.

It is better to make those holes as small as possible from the point of view of magnetic shield effect and a closed magnetic path effect.

To reduce the effect of magnetic flux being focused on the edge of the hole of the case, the conventional high frequency coil provides a larger hole in the case than that in the jar-like core.

However, the manufacture of smaller coils results in disadvantageously breaking the jar-like core.

The present inventors studied the cause of these breakages and found that as shown in Fig. 6, which is a section view showing holes of the metal case and the jar-like core, a burr 42 whose length is about 0.1 to 0.2 mm is likely to be formed on the edge of a hole 41 of the case 40 when a hole 41 is formed by means of press working.

As the overall dimension of the high frequency coil designed for surface mounting on a printed circuit board becomes smaller and smaller, the dimension of the jar-like core, one of the components of the coil assembly, is made smaller. In particular, the thickness of the jar-like core is as thin as about 0.5 mm.

The jar-like core 43 is automatically press

fitted into the case 40 by means of a machine. In this operation, the burr 42 formed on the edge 45 of the hole 44 of the core 43 may often break or crack a part of the edge 45, resulting in breaking the core 43.

It is possible to remove the burr 42 from the case 40 as a separate working step. However, this step increases the cost of the case so that the completed coil assembly becomes too expensive to sell.

The present invention provides a high frequency coil assembly comprising:

- a bobbin, a coil-wound portion formed on an outside surface of said bobbin, said bobbin including a bore having a portion to be screwed for receiving a threaded core,

- a jar-like core covering said bobbin and having a through hole for receiving a driver used to rotate a threaded core, and

- a metal case covering said jar-like core and having a through hole disposed at a location corresponding to said through hole of said jar-like core, said through hole of said jar-like core having an inner wall surface which includes (a) a first edge portion adjacent said metal case and located radially outside an edge of said through hole of said metal case and (b) a second edge portion remote from said metal case and located radially inside said edge of said through hole of said metal case.

In order that the present invention be more readily understood, embodiments thereof will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a sectional view showing a high frequency coil according to a first embodiment of the present invention;

Fig. 2 is a partially enlarged sectional view showing a part of the high frequency coil shown in Fig.

1;

Fig. 3 is a perspective view showing a case and a core included in the high frequency coil;

Fig. 4 is a partially enlarged sectional view showing a high frequency coil according to a second embodiment of the present invention; and

Fig. 5 is a partial sectional view showing the conventional high frequency coil.

The description will be directed to a high frequency coil according to a first embodiment of the invention with reference to Figs. 1 to 3, in which Fig. 1 is a sectional view of the coil, Fig. 2 is a partially enlarged sectional view showing holes of a metal case and a jar-like core, and Fig. 3 is a perspective view showing the metal case and the jar-like core.

Reference numeral 1 denotes a bobbin made of synthetic resin and having collars 2 disposed along the length of a hollow winding portion 4. The bobbin 1 provides a coil 3 between adjacent collars 2. The hollow winding portion 4 has a bore which receives a threaded core 5 which is screwed for adjusting inductance. The winding portion 4 also has a base 6, the side surface of which has a terminal 7 designed for surface mounting.

A jar-like core 8 covers the coil-wound portion of the bobbin 1 and sits on the base 6. A metal case 9 covers the jar-like core 8 and is attached to the base 6.

The core 8 and the case 9 are provided with concentric holes 10 and 11 in the tops thereof. The winding portion 4 of the bobbin 1 projects above the uppermost collar 2 and fits into the holes 10 and 11. A driver is fitted into the holes 10 and 11 so as to vertically move the threaded core 5 as it is rotated.

Though the inner surface of the case 9 comes in contact with the top of the jar-like core 8, as is

obvious from Fig. 2, the section of the hole 10 of the jar-like core 8 is formed in a stepwise manner. The edge portion 12 of the hole 10 of the core 8 is located outside the edge 13 of the hole of the case 9.

The positional relation between the edge portion 12 of the hole 10 and the edge 13 of the hole 11 prevents a burr 14 from being in contact with the area around the edge of the hole 10 of the core 8 in the event that a burr 14 is formed on the edge 13 of the case 9, thus preventing the core 8 from being broken.

Fig. 4 is a partially expanded sectional view showing holes of a metal case and a jar-like core included in a high frequency coil according to a second embodiment of the present invention. The same portions as those shown in Figs. 1 to 3 are referenced by the same numbers.

In this embodiment, a taper surface 22 is formed on the section of the hole 21 of the jar-like core 20 so that the upper edge portion 23 of the core is located outside the edge 13 of the hole 11 of the case 9 on the plane level.

The foregoing embodiments are all constructed to fit the winding portion 4 of the bobbin 1 into the holes of the case and the jar-like core. However, the winding portion 4 may be located under the holes without being fitted to the holes.

The foregoing embodiments have described a high frequency coil designed for surface mounting. However, it goes without saying that the present invention may apply to a high frequency coil having terminal pins for connection.

The threaded core 5 to be screwed with the winding portion 4 may be removed.

As described above, the present invention provides the high frequency coil which is designed to locate the edge portion of the hole of the core being in

contact with the case outside of the edge of the hole of the case on the plane level.

The burr formed on the hole edge of the case is thus not allowed to come into contact with the jar-like core resulting in preventing the core from being broken, even when the hole of the jar-like core is made smaller for reducing leakage of a magnetic flux. This feature makes a great contribution to enhancing the yield of the manufacturing process for high frequency coils in particular, surface mount high frequency coils.

The present invention further makes it possible to use a case formed by press working, resulting in advantageously reducing the cost of the coil.

If a coil having small inductance is require, the threaded core is removed from the jar-like core to minimize the inductance of the coil.



CLAIMS:

1. A high frequency coil assembly comprising:
 a bobbin, a coil-wound portion formed on an outside surface of said bobbin, said bobbin including a bore having a portion to be screwed for receiving a threaded core,
 a jar-like core covering said bobbin and having a through hole for receiving a driver used to rotate a threaded core, and
 a metal case covering said jar-like core and having a through hole disposed at a location corresponding to said through hole of said jar-like core, said through hole of said jar-like core having an inner wall surface which includes (a) a first edge portion adjacent said metal case and located radially outside an edge of said through hole of said metal case and (b) a second edge portion remote from said metal case and located radially inside said edge of said through hole of said metal case.
2. A high frequency coil assembly according to claim 1, wherein the through holes of said jar-like core and metal case are arranged coaxially around a central axis of said bobbin and placed at different positions along the central axis.
3. A high frequency coil assembly according to claim 1, wherein the inner wall surface of the through hole of said jar-like core is tapered to provide said first edge portion and said second edge portion.
4. A high frequency coil assembly according to claim 1, wherein the top end of said bobbin is inserted into said through holes.



5. A high frequency coil assembly according to claim 1, wherein the inner wall surface of said through hole of said jar-like core has a stepped shape to provide said first edge portion and said second edge portion.

6. A high frequency coil assembly according to claim 1, and comprising a threaded core which is received in the bore of the bobbin.

7. A high frequency coil assembly substantially as hereinbefore described with reference to Figs 1-4 of the accompany drawings.
