WHAT IS CLAIMED IS:

1. A magnetic element comprising:

a bottom magnetic body;

a central magnetic body provided in a middle of the bottom magnetic body;

a peripheral magnetic body provided on a periphery of the bottom magnetic body;

an internal coil disposed on an outer periphery of the central magnetic body and capable of generating a magnetic field;

an external coil disposed on an outer periphery of the peripheral magnetic body and capable of generating a magnetic field;

a detection coil disposed on an outer periphery of the central magnetic body and capable of detecting a magnetic field, and

a signal source configured to supply current to the internal coil and the external coil simultaneously and to generate the magnetic fields simultaneously.

2. The magnetic element according to claim 1, wherein the bottom magnetic body has a columnar shape and the peripheral magnetic body is disposed at both ends of the columnar shape.

3. The magnetic element according to claim 1, wherein the peripheral magnetic body is provided in plurality on the periphery of the bottom magnetic body.

4. The magnetic element according to claim 1, wherein the peripheral magnetic body is a wall portion provided on the periphery of the bottom magnetic body so as to surround the central magnetic body.

5. The magnetic element according to any one of claims 1 to 4, wherein the internal coil and the external coil can be electrically connected in parallel.

6. The magnetic element according to any one of claims 1 to 5, wherein the direction of the magnetic field generated by the internal coil in the central magnetic body can be the same as the direction of the magnetic field generated by the external coil in the central magnetic body.

7. The magnetic element according to any one of claims 1 to 6, further comprising a detection coil disposed on an outer periphery of the peripheral magnetic body and capable of detecting a magnetic field.

8. The magnetic element according to claim 7, further comprising a dummy coil disposed on an outer periphery of the central magnetic body and/or on an outer periphery of the peripheral magnetic body and capable of detecting a magnetic field.

9. The magnetic element according to any one of claims 1 to 6, further comprising a dummy coil disposed on an outer periphery of the central magnetic body and capable of detecting a magnetic field.

10. An eddy current sensor comprising the magnetic element according to any one of claims 1 to 9.

11. A polishing apparatus comprising:

a polishing table on which a polishing pad for polishing an object can be mounted;

a drive section that can drive to rotate the polishing table;

a holding section that can hold the object and press the object against the polishing pad;

the eddy current sensor according to claim 10 disposed inside the polishing table

and capable of detecting an eddy current formed by the internal coil and the external coil in the object as the polishing table rotates using the detection coil; and

an end point detection section that can detect a polishing end point indicating an end of polishing of the object from the detected eddy current.

12. The polishing apparatus according to claim 11, wherein the end point detection section determines a polishing rate of the object from the detected eddy current, calculates an estimated polishing amount when the object is polished at the polishing rate and can thereby detect the polishing end point.

13. The polishing apparatus according to claim 12, wherein the end point detection section compares data relating to a film thickness obtained from the eddy current and data relating to a film thickness predicted from the polishing rate, and can prevent use of the data relating to the film thickness obtained from the eddy current when the comparison result is greater than a predetermined value.

14. The polishing apparatus according to claim 12 or 13, wherein the end point detection section can detect the polishing end point from the estimated polishing amount and a threshold relating to the film thickness corresponding to the polishing end point.

15. A polishing method for polishing between a polishing pad and an object disposed opposed to the polishing pad, the polishing method comprising:

a step of holding the polishing pad using a polishing table;

a step of driving to rotate the polishing table;

a step of driving to rotate a holding section for holding the object and pressing the object against the polishing pad;

a step of disposing the eddy current sensor according to claim 10 inside the polishing table and detecting an eddy current formed in the object by the internal coil and the

external coil as the polishing table rotates using the detection coil; and

a step of detecting a polishing end point indicating an end of polishing of the object from the detected eddy current.

16. The polishing method according to claim 15, wherein the strength of a magnetic field generated by the internal coil and/or the external coil is changed when conductivity of the object changes.

17. The polishing method according to claim 15 or 16, wherein the eddy current sensor according to claim 10 is disposed in plurality inside the polishing table and the plurality of eddy current sensors have different levels of detection sensitivity.

18. A computer-readable recording medium that records a program for causing a computer to control a polishing apparatus that polishes an object, the polishing apparatus comprising:

a polishing table on which a polishing pad for polishing an object can be mounted;

a drive section that can drive to rotate the polishing table; and

a holding section that holds the object and can press the object against the polishing pad;

the program causing the computer to function as:

end point detection section means that can detect a polishing end point indicating an end of polishing of the object from a detected eddy current of the eddy current sensor according to claim 10 disposed inside the polishing table and capable of detecting the eddy current formed in the object by the internal coil and the external coil as the polishing table rotates using the detection coil; and

control means for controlling polishing by the polishing apparatus.