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(54) Microwave oven with reduced electromagnetic noise

(57) A microwave oven includes a magnetron apparatus (14), a heat chamber (13), a chassis (11) and a cabinet (12). The magnetron apparatus (14) contains a magnetron tube (15) which generates an electromagnetic wave, and a metal member (16). The metal member (16) is electrically connected to the anode (15a) and encloses the magnetron tube (15). The heat chamber (13) is supplied with the electromagnetic wave. The heat chamber (13) is mounted on the chassis (11). The cabinet (12) constitutes a body (10) that covers the magnetron apparatus (14) and the heat chamber (13) in combination with the chassis (11). In the microwave oven, the metal member (16) and the cabinet (12) are electrically connected through an electrically conductive sponge (17). This microwave oven can suppress radiation noise.

FIG. 1A

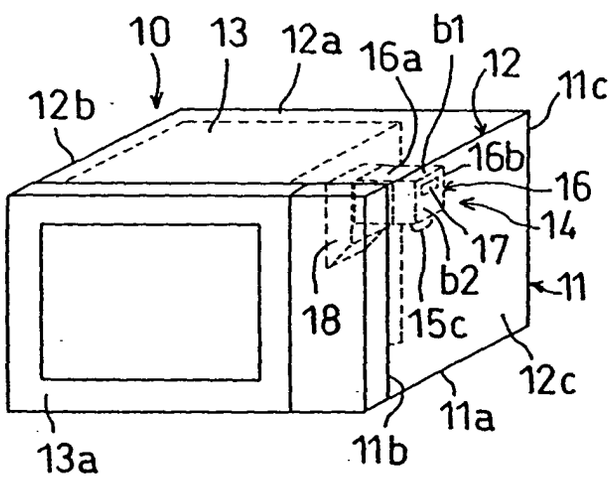

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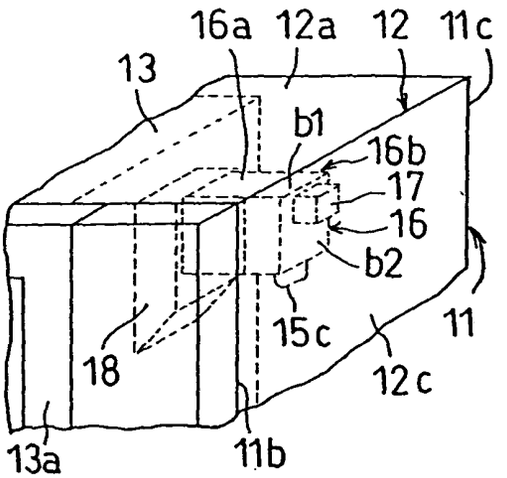
FIG. 1B



Description

Technical Field of the Invention

[0001] The present invention relates to a microwave oven used for cooking or defrosting food, for example.

Background Art

[0002] Conventional microwave ovens are disclosed in Japanese Patent Application Publications 63-110527, 08-007773 and 09-320478, for example. A typical conventional microwave oven will be described with reference to FIG. 10 which is a perspective diagram viewed from the front. A body 100 of a microwave oven comprises a chassis 101, a cabinet 102 and the like.

[0003] The chassis 101 comprises a chassis bottom panel 101a, a chassis front panel 101b, a chassis rear panel 101c and the like. A heat chamber 103 is disposed on the chassis bottom panel 101a. A heat chamber door 103a is attached to part of the chassis 101. The cabinet 102 is formed by bending a metal plate to a right angled U-shape, for example. The cabinet 102 comprises a top wall 102a and side walls 102b and 102c positioned to the right and the left thereof.

[0004] There are provided a plurality of nail-receiving sections (not shown) around chassis edges at the front of the body 100, e.g., at the side where the heat chamber door 103a is positioned. There is also provided a plurality of nails (not shown) around edges of the cabinet 102. The nail-receiving sections of the chassis 101 are mechanically engaged with the nails of the cabinet 102 to fasten both. At the rear of the body 100, the chassis 101 and the cabinet 102 are provided with screw holes to screw both.

[0005] A magnetron apparatus 104 is disposed near the heat chamber 103.

[0006] The magnetron apparatus 104 comprises a magnetron tube (not shown) as a high-frequency source, a yoke 104b, a filter box 104c and the like. The yoke 104b is positioned outside the magnetron tube and forms part of a magnetic circuit. The filter box 104c contains the input section 104a and the like of the magnetron tube.

[0007] A wave guide tube 105 is provided between the heat chamber 103 and the magnetron apparatus 104 to transmit an electromagnetic wave output from the magnetron apparatus 104.

[0008] According to the above-mentioned configuration, food and the like are placed in the heat chamber 103 of the microwave oven. The magnetron apparatus 104 generates an electromagnetic wave that is then supplied to the heat chamber 103 via the wave guide tube 105 to heat the food in the heat chamber 103.

[0009] The microwave oven uses the magnetron tube as a high-frequency generation source. During operation, the magnetron tube generates higher harmonics, radiation noise and the like in addition to a fundamental wave for the oscillatory frequency. In recent years, there is an increasing demand to prevent electromagnetic waves from leaking and suppress higher harmonics and radiation noise.

[0010] The conventional microwave oven prevents electromagnetic waves from leaking by providing the output section with a radio frequency choke structure, providing the input section with the filter box, and using the shield function of the body, for example.

[0011] The chassis constituting the microwave oven body is electrically connected to the heat chamber by means of welding or caulking. The heat chamber is electrically connected to the anode of a magnetron tube that is generally grounded. Accordingly, the chassis is grounded, providing excellent shielding characteristics.

[0012] The cabinet is fixed to the chassis by means of mechanical contact at the front of the body and is screwed to the chassis at the rear thereof. Normally, coated metal plates are used for the cabinet and the chassis in consideration for the appearance and the like. Since the coating material is insulative, many parts of the cabinet in contact with the chassis are electrically insulated from the chassis at the cabinet front. In this case, the front edge of the cabinet floats electrically, degrading the shielding characteristic against radiation noise.

[0013] At the rear of the body, the cabinet is connected to the chassis with screws, allowing electrical connection to the chassis rear panel. Accordingly, the cabinet contacts with the anode of the magnetron tube via the chassis, the heat chamber, the wave guide tube and the like.

[0014] According to the above-mentioned configuration, the front edge of the cabinet floats electrically. The rear edge is connected to the anode of the magnetron tube. For this reason, the cabinet functions as an antenna to generate radiation noise, thus degrading the shielding effect of the cabinet.

[0015] FIG. 11A shows the relationship among frequency f, wavelength λ and quarter wavelength. FIG. 11B shows the relationship among cabinet sizes and the like for microwave ovens A through E. FIG. 11C shows the relationship among width W, height H and depth D of the cabinet of the microwave oven.

[0016] In FIG. 11B, reference symbol W denotes a width of the cabinet 102, H denotes a height of the cabinet 102; D denotes a depth of the cabinet 102; (W+2 H) denotes a size resulting from adding the width W to the double of height H; fw denotes a frequency to cause width W to be a quarter wavelength; fH denotes a frequency to cause the height H to be a quarter wavelength; and (fw+2 ·H) denotes a frequency to cause the size (W+2 ·H) to be a quarter wavelength.

[0017] According to the above-mentioned relationship, for example, let us assume that the width W, the height H, or the size (W+2 -H) of the cabinet 102 corresponds to a quarter wavelength of the radiation noise. It is considered that the cabinet 102 functions as an an-

tenna for radiation noise.

[0018] It is, therefore, an object of the present invention to provide a microwave oven capable of solving the above-mentioned defect and suppressing radiation noise.

Summary of the Invention

[0019] According to an aspect of the present invention, there is provided a microwave oven comprising: (i) a magnetron apparatus to output an electromagnetic wave, the magnetron apparatus including: a magnetron tube as a source of generating the electromagnetic wave, the magnetron tube having an input section and an anode; an electrically conductive yoke constituting part of a magnetic circuit to form a magnetic field in the magnetron tube; an electrically conductive filter box to enclose the input section of the magnetron tube; and an electrically conductive radiator to cool the magnetron tube; (ii) an electrically conductive heat chamber supplied with the electromagnetic wave; (iii) an electrically conductive chassis for the heat chamber to be mounted on; and (iv) an electrically conductive cabinet constituting a body to cover the magnetron apparatus and the heat chamber in combination with the chassis; the microwave oven characterized in that at least one out of the yoke, the filter box and the radiator are electrically connected to the anode and the cabinet.

[0020] According to another aspect of the present invention, there is provided a microwave oven comprising: a magnetron apparatus including a magnetron tube having an anode to generate an electromagnetic wave, and a metal member which is electrically connected to the anode and encloses the magnetron tube; an electrically conductive heat chamber supplied with the electromagnetic wave; an electrically conductive chassis for the heat chamber to be mounted on; and an electrically conductive cabinet constituting a body to cover the magnetron apparatus and the heat chamber in combination with the chassis; the microwave oven characterized in that the metal member and the cabinet are electrically connected.

[0021] The present invention can provide a microwave oven that suppresses radiation noise.

Brief Description of the Drawings

[0022]

FIG. 1A is a perspective diagram of a microwave oven of an embodiment of the present invention viewed from the front;
FIG. 1B is a partial enlargement of FIG. 1A;
FIG. 2A is a side views illustrating a magnetron apparatus used in the present embodiment;
FIG. 2B shows an aspect viewed from the right of FIG. 2A;
FIG. 3 is a perspective view illustrating a chassis used in the present embodiment;
FIG. 4 is a perspective view illustrating a cabinet used in the present embodiment;
FIG. 5A is a schematic perspective view illustrating another embodiment of the present embodiment viewed from the front;
FIG. 5B is a partially enlarged view of FIG. 5A.;
FIGS. 6A through 6E are characteristics diagrams showing characteristics of the present invention;
FIGS. 7A, 7B and 7C are fragmentary perspective views illustrating still other embodiments of the present invention;
FIGS. 8 A, 8B and 8C are fragmentary perspective views illustrating yet other embodiments of the present invention;
FIGS. 9A, 9B, 9C and 9D are fragmentary perspective views illustrating yet still other embodiments of the present invention;
FIG. 10 is a perspective view illustrating a conventional microwave oven;
FIG. 11A is a table showing the relationship among frequency f, wavelength λ and quarter wavelength;
FIG. 11B is a table showing the relationship among cabinet sizes and the like for microwave ovens A through E; and
FIG. 11C is a perspective view showing the relationship among width W, height H and depth D of the cabinet of the microwave oven.

Best Mode for Carrying Out the Invention

[0023] An embodiment of the present invention will be described with reference to FIGS. 1A to 4.

[0024] FIG. 1A is a perspective diagram of a microwave oven viewed from the front. FIG. 1B is a partial enlargement of FIG. 1A.

[0025] A microwave oven body 10 comprises a chassis 11 and a cabinet 12. The chassis 11 is made of a folded metal plate, and comprises a chassis bottom panel 11a, a chassis front panel 11b and a chassis rear panel 11c. A heat chamber 13 made of metal plates is fixed to the chassis bottom panel 11a. A heat chamber door 13a is attached to part of the chassis 11 and can be opened and closed. The cabinet 12 is formed by bending a metal plate to a right angled U shape, for example. The cabinet 12 comprises a top wall 12a and side walls 12b and 12c positioned to the right and the left thereof. A magnetron apparatus 14 is disposed near the heat chamber 13.

[0026] The magnetron apparatus 14 comprises a magnetron tube (not shown) and a metal member 16. The magnetron tube has a vacuum inside space and generates a high-frequency electromagnetic wave. The metal member 16 encloses the magnetron tube. The metal member 16 comprises a yoke 16a and a filter box 16b.

[0027] The yoke 16a forms part of the magnetic circuit in combination with a magnet, a pole piece and the like

to form a magnetic field in the magnetron tube. The filter box 16b comprises, for example, a frame b1 adjacent to the yoke 16a and a cover b2 to seal a rectangular opening of the frame b1. The filter box 16b contains the input section 15c of the magnetron tube, for example, a stem of the magnetron tube, an input lead wire and a filter circuit connected to the input lead wire.

[0028] According to the magnetron apparatus 14 in FIGS. 1A and 1B, the cover b2 of the filter box 16b is disposed opposite to a right side wall 12c of the cabinet 12. An electrically conductive member such as an electrically conductive sponge 17 is disposed between the cover b2 and the right side wall 12c to electrically connect the filter box 16b to the cabinet 12. When inner surface of the cabinet 12 is coated on the surface, the coating material is removed in an area in contact with the electrically conductive sponge 17.

[0029] A wave guide tube 18 is provided between the heat chamber 13 and the magnetron apparatus 14 to transmit an electromagnetic wave output from the magnetron apparatus 14.

[0030] According to the above-mentioned configuration, food and the like are placed in the heat chamber 13 of the microwave oven. The magnetron apparatus 14 generates an electromagnetic wave that is then supplied to the heat chamber 13 via the wave guide tube 18 to heat the food in the heat chamber 13.

[0031] The magnetron apparatus 14 will be described with reference to FIGS. 2A and 2B. FIG. 2A is a side view. FIG. 2B shows an aspect viewed from the right of FIG. 2A. The mutually corresponding parts in FIGS. 2A, 2B, 1A and 1B are designated by the same reference numerals and a duplicate description is omitted.

[0032] The magnetron tube 15 comprises a cylindrical anode 15a, an output section 15b and an input section 15c. The metal member 16 is positioned outside the magnetron tube 15 and comprises the yoke 16a, the filter box 16b and a radiator 16c. The yoke 16a encloses the cylindrical anode 15a. The filter box 16b contains the input section 15b. The radiator 16c is positioned between the cylindrical anode 15a and the yoke 16a. The filter box 16b has the frame b1 and the cover b2, for example. The elastically conductive sponge 17 is fixed to the cover b2. The yoke 16a has a plurality of screw holes 19.

[0033] The output section 15b of the magnetron tube 15 protrudes from the yoke 16a upward in the drawing. Part of the input section 15c, e.g., a capacitor, pierces the frame b1 of the filter box 16b.

[0034] The chassis 11 will be described with reference to FIG. 3. FIG. 3 is a perspective diagram of the microwave oven viewed from the rear and shows a state of FIGS. 1A and 1B with the cabinet 12 removed. The mutually corresponding parts in FIGS. 3, 1A and 1B are designated by the same reference numerals and a duplicate description is omitted.

[0035] The chassis 11 comprises the chassis bottom panel 11a, the chassis front panel 11b and the chassis rear panel 11c. The heat chamber 13 is fixed onto the chassis bottom panel 11b. The chassis rear panel 11c has a plurality of screw holes 111. The chassis front panel 11b is provided with a plurality of plate-shaped nail-receiving sections 112.

[0036] The cabinet 12 will be described with reference to FIG. 4. The mutually corresponding parts in FIGS. 4, 1A and 1B are designated by the same reference numerals and a duplicate description is omitted.

[0037] The cabinet 12 is formed by bending a metal plate to a right angled U shape, for example. A fold 121 is provided for each of three edges at the front. A plurality of nails 122 are formed on each of the folds 121. Each of the nails 122 is formed by making a right-angled U-shaped cut in part of the fold 121 and raising a free edge of an inside portion enclosed by the cut. When viewed sideways, an acute-angled narrow gap is formed between the inside portion of the raised cut and an outside portion thereof. At the rear of the cabinet 12, a bend 123 is provided by bending inward each of the three edges. The bends 123 are provided with a plurality of screw holes 124.

[0038] At the front, the cabinet 12 is fixed to the chassis 11 so that the nail-receiving section 112 of the chassis front panel 11b is inserted into the triangular gap of the cabinet nail 122. At the rear, the cabinet 12 is screwed to the chassis by threading a screw into the screw hole 124 of the cabinet 12 and the screw hole 111 of the chassis 11.

[0039] When the cabinet 12 and the chassis 11 are fastened to each other, the inner surface of the cabinet 12 contacts with the electrically conductive sponge 17 attached to the cover b2 of the filter box 16b. Thus, electrical connection is made between the filter box 16b and the cabinet 12.

[0040] According to the above-mentioned configuration, the chassis 11 of the body 10 is electrically connected to the heat chamber 13 by means of welding or caulking. The heat chamber 13 is electrically connected to the anode of the magnetron tube 15. The anode of the magnetron tube 15 is grounded. Accordingly, the chassis 11 is grounded, providing excellent shielding characteristics.

[0041] The cabinet 12 is also electrically connected to the anode of the magnetron tube 15 via the electrically conductive sponge 17 or the filter box 16b and is grounded. Accordingly, the cabinet 12 can be restrained from an antenna function in respect of radiation noise, ensure excellent shielding characteristics, and decreases the radiation noise.

[0042] Another embodiment of the present invention will be described with reference to FIGS. 5A and 5B. FIG. 5A shows the microwave oven viewed from the front. FIG. 5B is a partially enlarged view of FIG. 5A. The mutually corresponding parts in FIGS. 5A, 5B, 1A and 1B are designated by the same reference numerals and a duplicate description is omitted.

[0043] According to this embodiment, the magnetron

apparatus 14 is configured so that the input section 15c of the magnetron tube 15 protrudes toward the front of the body 10. In this case, one surface of the yoke 16a faces to the right side wall 12c of the cabinet 12. The electrically conductive sponge 17 is placed between the surface of the yoke 16a and the right side wall 12c facing to each other.

[0044] Also in this case, the cabinet 12 is connected to the anode of the magnetron tube 15 via the electrically conductive sponge 17 and the yoke 16a and is grounded. Accordingly, the cabinet 12 can be restrained from an antenna function in respect of radiation noise, ensures excellent shielding characteristics against the radiation noise, and decreases the radiation noise.

[0045] Radiation noise was measured for microwave ovens A through E in which the magnetron apparatus 14 is disposed in the body 10 as shown in FIGS. 1A, 1B, 5A or 5B. FIGS. 6A through 6E show measurement results. The microwave ovens A through E correspond to those listed in FIG. 11B. In FIGS. 6A through 6E, the abscissas denote frequency (MHz); the ordinates denote radiation noise intensity (dB μV/m); and reference symbol S denotes a standard value. The method of measuring radiation noise complies with CISPR (International Special Committee on Radio Interference) 11: 1997 + Amendment1: 1999. Circles (O's) mark characteristics of the structure according to the present invention in which the cabinet 12 and the magnetron apparatus 14 are electrically connected. Crosses (X's) denote characteristics of conventional structures, in which the cabinet 12 and the magnetron apparatus 14 are not electrically connected.

[0046] As shown in FIGS. 6A through 6E, the structures according to the present invention (marked with O's) indicate better characteristics than the conventional structure s (marked with X's) with respect to all of the microwave ovens A through E in the range from 30 to 1000 MHz. The noise suppression effect improves especially in bands between 30 and 500 MHz.

[0047] These bands correspond to frequency bands that allow cabinet widths and the other sizes to function as quarter wavelength antennas. This can be considered to result from a decrease in the antenna function for radiation noise.

[0048] With respect to the microwave ovens A and B as shown in FIGS. 6A and 6B, the conventional structure (marked with X's) indicates values exceeding standard value S compliant with CISPR11. On the other hand, the structure according to the present invention (marked with O's) indicates values below the standard value S.

[0049] The microwave oven E suppresses radiation noise as follows. A ferrite ring is attached to two high-voltage lead wires connected to a penetrating capacitor provided in the input section of the magnetron apparatus according to the conventional structure. Accordingly, as shown in FIG. 6E, the radiation noise is suppressed even for the conventional structure (marked with X's). For example, for the band between 50 and 70 MHz, the conventional structure provides better characteristics than the structure according to the present invention (marked with O's). However, when the ferrite ring is removed from the traditional structure, the noise becomes worse (as marked with □s) than for the structure according to the present invention (marked with O's).

[0050] Still another embodiment of the present invention will be described with reference to FIGS. 7A, 7B and 7C as fragmentary views. FIGS. 7A, 7B and 7C show the same disposition of the magnetron apparatus 14 as that in FIGS. 1A and 1B. The mutually corresponding parts in FIGS. 7A, 7B, 7C and 1 are designated by the same reference numerals and a duplicate description is omitted.

[0051] According to the structure in FIG. 7A, the yoke 16a of the magnetron apparatus 14 contacts with the top wall 12a of the cabinet 12. Screw holes 71 are provided in the yoke 16a and the top wall 12a at corresponding positions. Both are screwed to tightly contact with each other for electrical connection.

[0052] In FIG. 7B, one end of a lead wire 72 is fixed to the yoke 16a with a screw 73. The other end of the lead wire 72 is fixed to the top wall 12a with a screw 74. An electrical connection is made between the yoke 16a and the cabinet 12.

[0053] In FIG. 7C, the electrically conductive sponge 17 is placed between the yoke 16a and the top wall 12a on respective opposing surfaces. An electrical connection is made between the yoke 16a and the cabinet 12.

[0054] Yet another embodiment of the present invention will be described with reference to FIG. 8 as a fragmentary view. FIGS. 8A, 8B and 8C show the same disposition of the magnetron apparatus 14 as that in FIGS. 5A and 5B. The mutually corresponding parts in FIGS. 8A, 8B, 8C 5A and 5B are designated by the same reference numerals and a duplicate description is omitted.

[0055] According to the structure shown in FIG. 8A, the yoke 16a of the magnetron apparatus 14 contacts with the right side wall 12c of the cabinet 12. Screw holes 81 are provided in the yoke 16a and the right side wall 12c at corresponding positions. Both are screwed to tightly contact with each other for electrical connection.

[0056] In FIG. 8B, one end of a lead wire 82 is fixed to the yoke 16a with a screw 83. The other end of the lead wire 82 is fixed to the right side wall 12c with a screw 84. Electrical connection is made between the yoke 16a and the cabinet 12.

[0057] In FIG. 8C, the electrically conductive sponge 17 is placed between the cover b2 of the filter box 16b and the top wall 12a on respective opposing surfaces. Electrical connection is made between the cover b2 and the cabinet 12.

[0058] Still yet another embodiment of the present invention will be described with reference to FIGS. 9A through 9D as fragmentary views. FIGS. 9A through 9D show the same disposition of the magnetron apparatus 14 as that in FIGS. 1A and 1B. The mutually corresponding parts in FIGS. 9 A through 9D and 1A and 1B are

designated by the same reference numerals and a duplicate description is omitted.

[0059] In FIG. 9A, a leaf spring 91 made of an electrically conductive material is used. One end of the leaf spring 91 is fixed to the yoke 16a with a screw 92. The other end of the leaf spring 91 contacts with the inner surface of the top wall 12a. Electrical connection is made between the yoke 16a and the cabinet 12.

[0060] In FIG. 9B, one end of the leaf spring 91 made of an electrically conductive material is fixed to the inner surface of the right side wall 12c of the cabinet 12 with a screw 93. The other end of the leaf spring 91 contacts with the outer surface of the cover b2. Electrical connection is made between the cover b2 and the cabinet 12.

[0061] In FIG. 9C, a coil spring 94 made of an electrically conductive material is used instead of the leaf spring 91 in FIG. 9A. In this case, one end of the spring 94 is screwed to the yoke 16a. The other end of the spring 94 contacts with the inner surface of the top wall 12a of the cabinet 12.

[0062] In FIG. 9D, the coil spring 94 made of an electrically conductive material is used instead of the leaf spring 91 in FIG. 9B. In this case, one end of the coil spring 94 is screwed to the right side wall 12c. The other end of the coil spring 94 contacts with the inner surface of the cover b2.

[0063] When the inner surface of the cabinet 12 is coated in FIGS. 7A through 9D, electrical connection is ensured by removing the coating material from a surface in contact with the electrically conductive sponge 17, the lead wire 72, the leaf spring 91, or the coil spring 94.

[0064] The above-mentioned embodiments use the electrically conductive sponge, the lead wire, the coil spring and the leaf spring as electrically conductive members. Instead of these members, other flexible electrically conductive bodies such as electrically conductive aluminum tapes, steel plates, aluminum plates and the like can be used. Thus, even when the gap between the magnetron apparatus and the cabinet 12 has changed, sufficient electrical contact can be maintained.

[0065] There have been described the cases of electrically connecting the cabinet with the magnetron apparatus using the yoke or the cover of the magnetron apparatus. Further, the same effect may be provided by making a connection between the anode of the magnetron tube and the other electrically conductive metal members such as the filter box frame and the radiator.

[0066] It is preferable to shorten a distance between the cabinet and the magnetron apparatus for electrical connection therebetween. Therefore, it is desirable to make a connection between the cabinet and the magnetron apparatus on their surfaces opposite to each other.

[0067] It is desirable to make a connection to the magnetron apparatus at a position near the magnetron tube such as the metal member enclosing the magnetron apparatus. The full effect cannot be achieved if the cabinet is connected to the other parts than the metal member such as the wave guide tube, the heat chamber, the chassis bottom panel, the chassis rear panel and the chassis front panel. Accordingly, it may be effective to make direct connection between the cabinet and the magnetron tube as a noise generation source by using the electrically conductive member and the like.

Claims

1. A microwave oven comprising:

(i) a magnetron apparatus to output an electromagnetic wave, the magnetron apparatus including:

a magnetron tube as a source of generating the electromagnetic wave, the magnetron tube having an input section and an anode;
an electrically conductive yoke constituting part of a magnetic circuit to form a magnetic field in the magnetron tube;
an electrically conductive filter box to enclose the input section of the magnetron tube; and
an electrically conductive radiator to cool the magnetron tube;

(ii) an electrically conductive heat chamber supplied with the electromagnetic wave;
(iii) an electrically conductive chassis for the heat chamber to be mounted on; and
(iv) an electrically conductive cabinet constituting a body to cover the magnetron apparatus and the heat chamber in combination with the chassis;

the microwave oven **characterized in that** at least one out of the yoke, the filter box and the radiator are electrically connected to the anode and the cabinet.

2. A microwave oven comprising:

a magnetron apparatus including a magnetron tube having an anode to generate an electromagnetic wave, and a metal member which is electrically connected to the anode and encloses the magnetron tube;
an electrically conductive heat chamber supplied with the electromagnetic wave;
an electrically conductive chassis for the heat chamber to be mounted on; and
an electrically conductive cabinet constituting a body to cover the magnetron apparatus and the heat chamber in combination with the chassis;
the microwave oven **characterized in that** the

metal member and the cabinet are electrically connected.

3. The microwave oven according to Claim 2, wherein the metal member and the cabinet are electrically connected with a direct contact therebetween.

4. The microwave oven according to Claim 2, wherein a gap is formed between the metal member and inner surface of the cabinet, and the metal member and the inner surface of the cabinet are electrically connected by a conductive contact member.

5. The microwave oven according to Claim 4, wherein the metal member and the inner surface of the cabinet are electrically connected where the metal member and the inner surface of the cabinet are facing each other.

6. The microwave oven according to Claim 4, wherein the contact member includes flexible material which changes shape corresponding to changes in the gap.

FIG. 1A

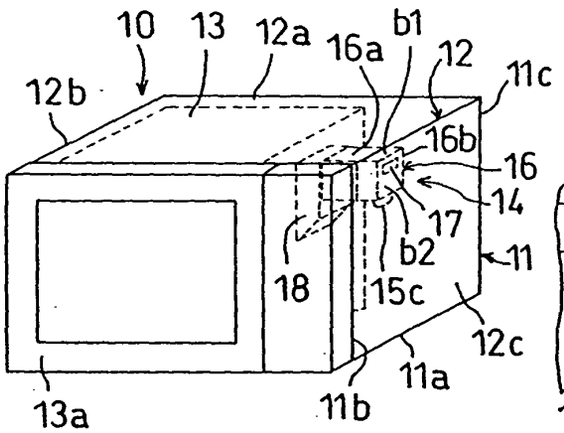


FIG. 1B

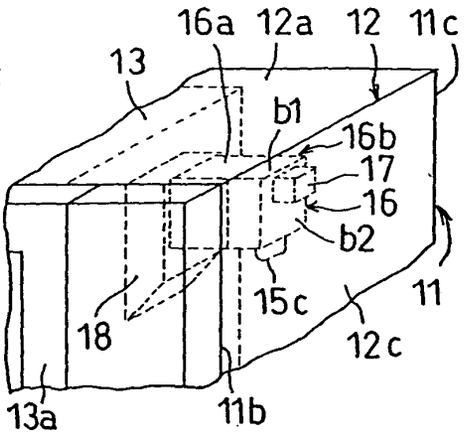


FIG. 2A

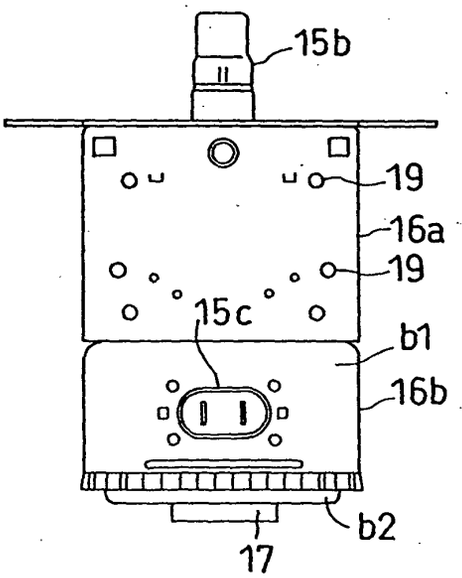


FIG. 2B

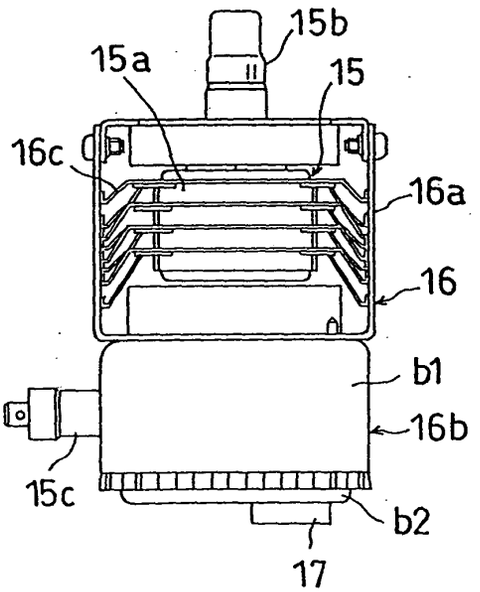


FIG. 3

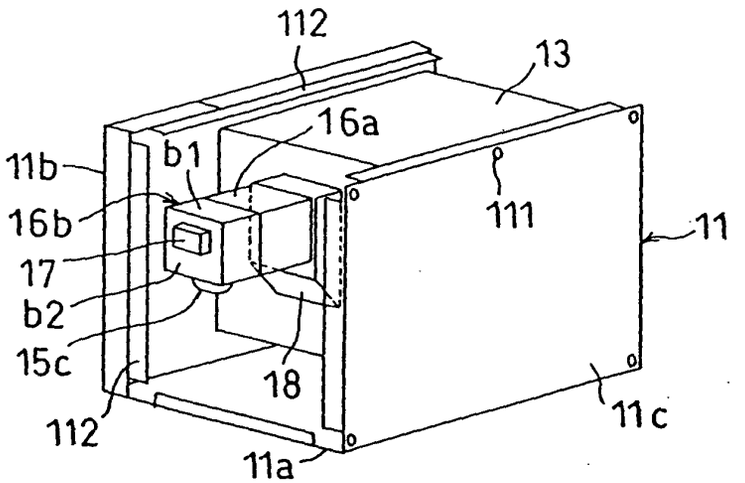


FIG. 4

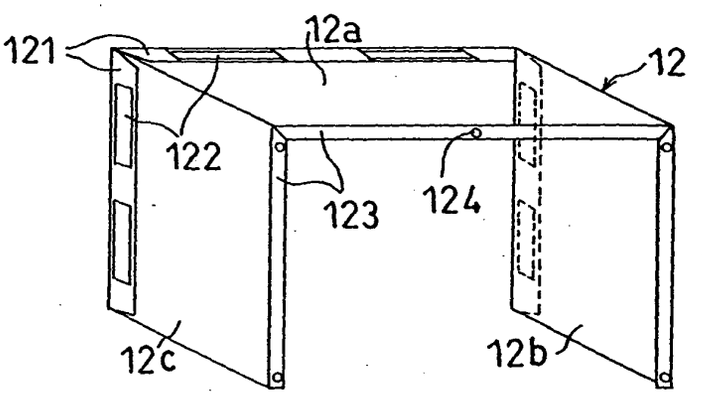


FIG. 5A

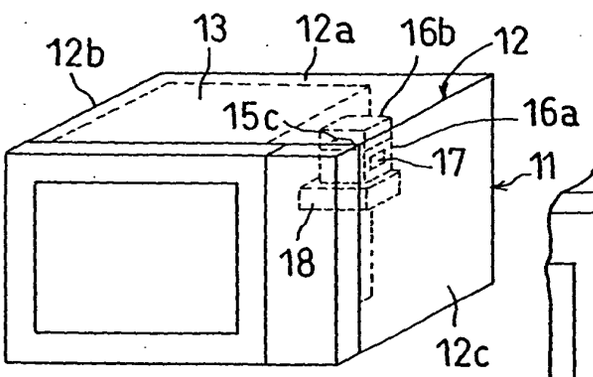


FIG. 5B

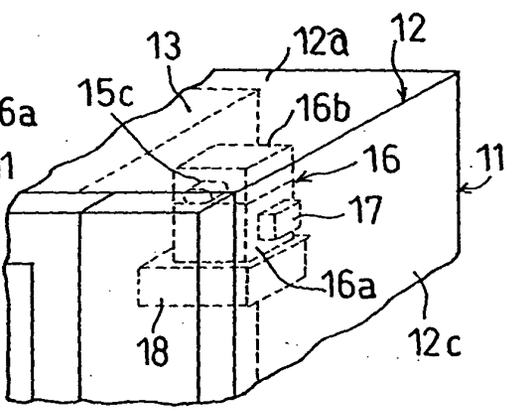


FIG. 6A

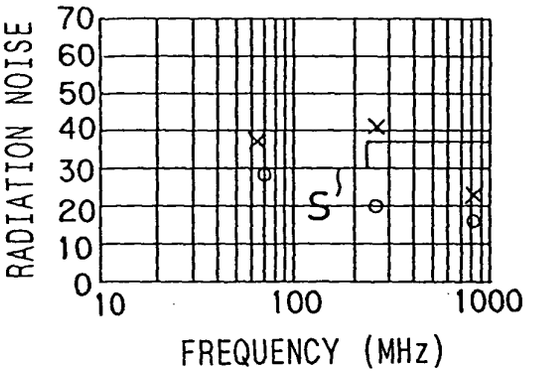


FIG. 6B

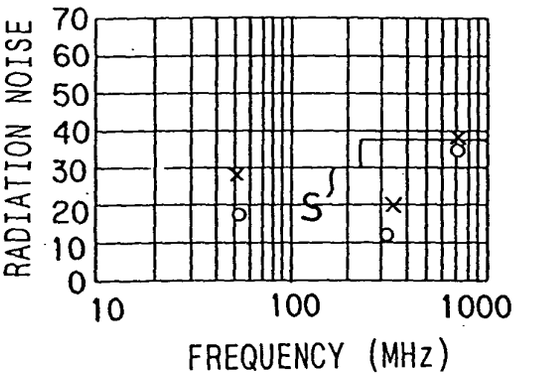


FIG. 6C

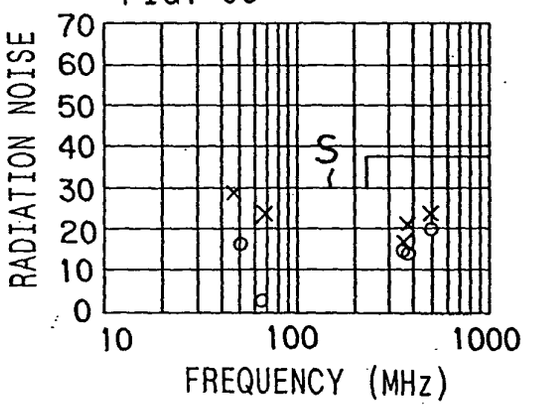


FIG. 6D

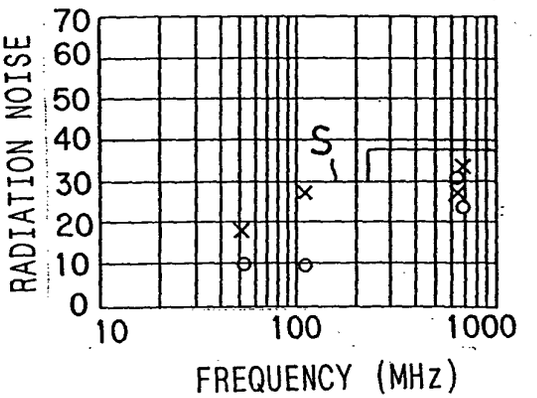


FIG. 6E

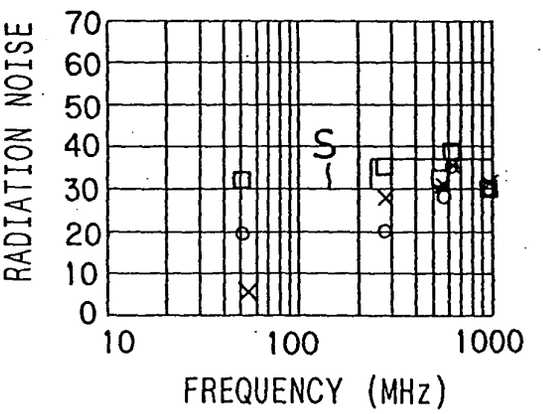


FIG. 7A

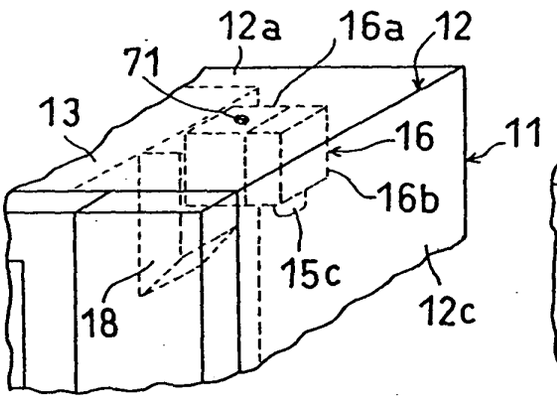


FIG. 7B

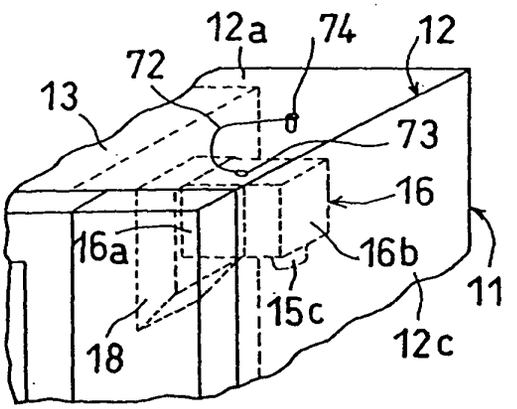


FIG. 7C

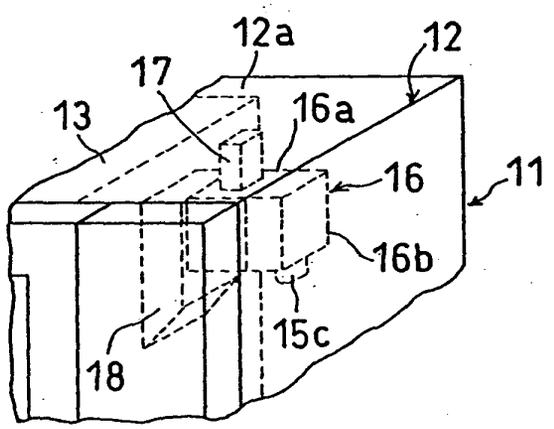


FIG. 8A

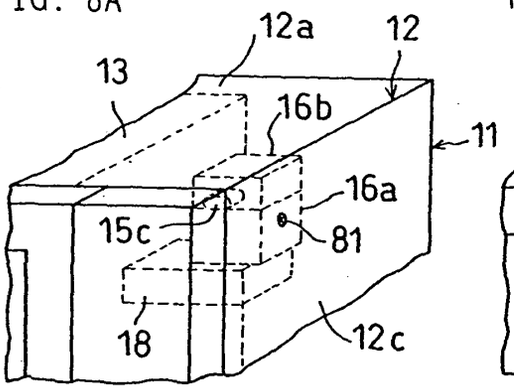


FIG. 8B

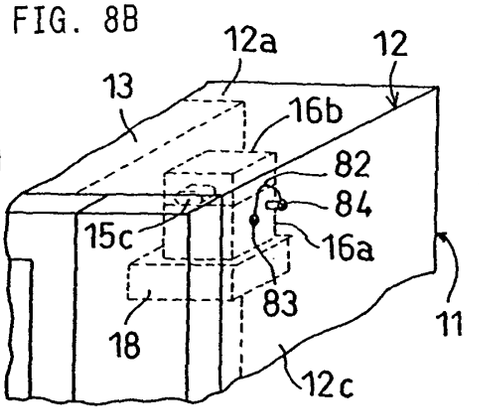


FIG. 8C

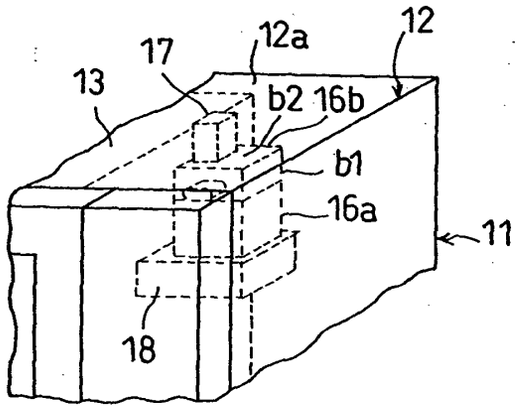


FIG. 9A

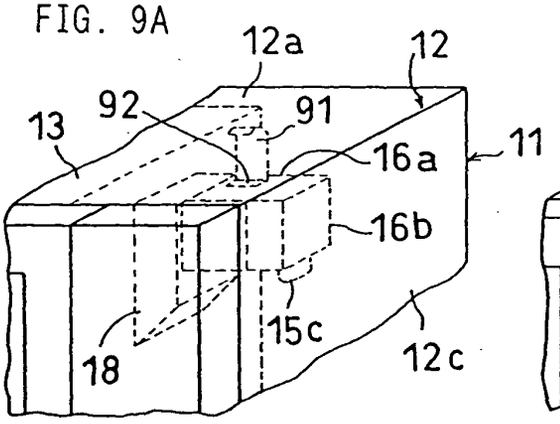


FIG. 9B

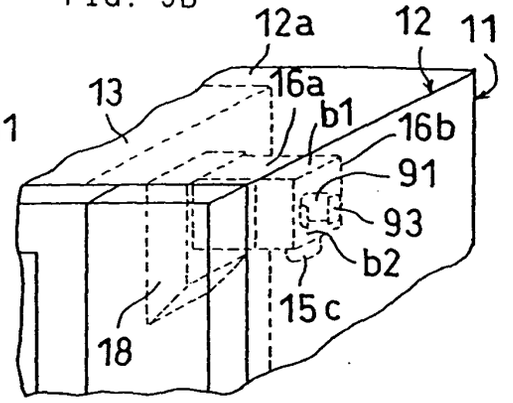


FIG. 9C

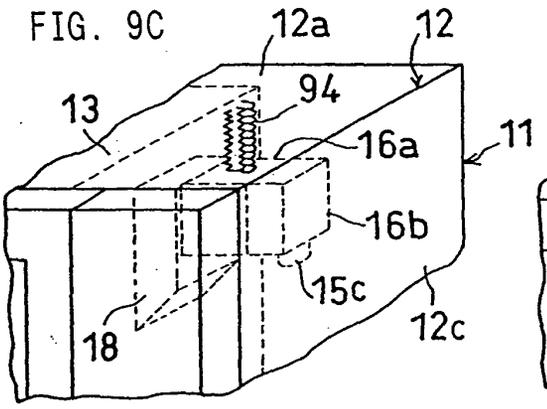


FIG. 9D

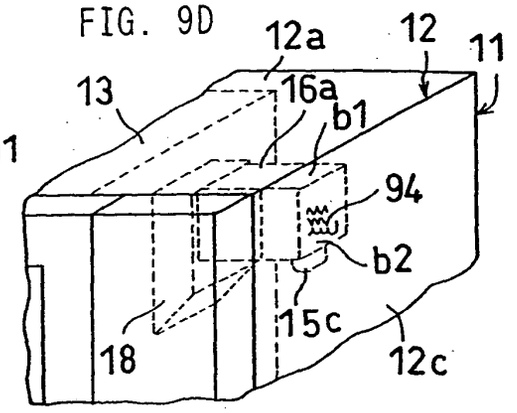


FIG. 10

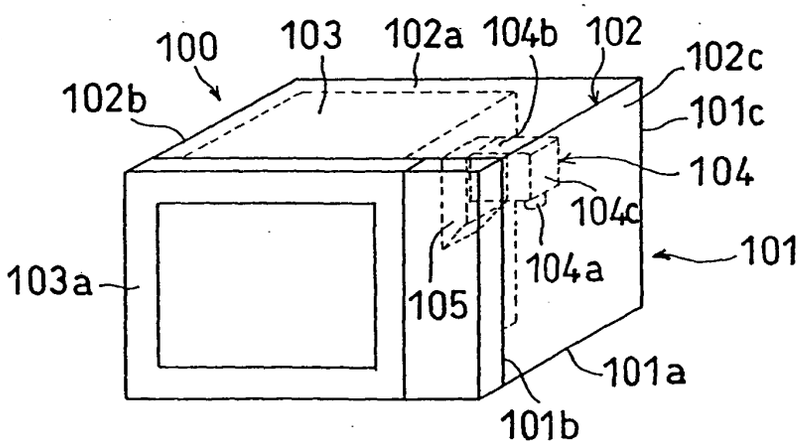


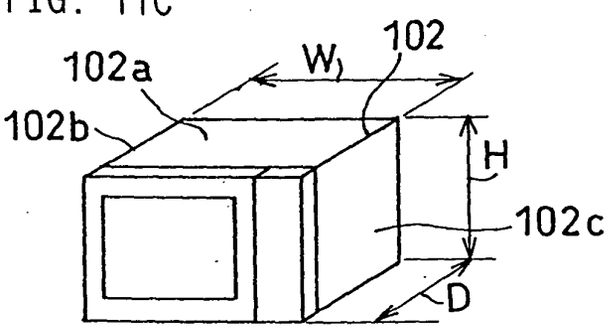
FIG. 11A

f (MHz)	50	100	200	300	400	500	600	700	800	900	1000
λ (mm)	5996	2998	1499	999	749	600	500	428	375	333	300
λ/4(mm)	1499	749	375	250	187	150	125	107	94	83	75

FIG. 11B

MICROWAVE OVEN	W (mm)	H (mm)	D (mm)	W+2·H (mm)	f_W (MHz)	f_H (MHz)	$f_{W+2\cdot H}$ (MHz)
A	455	276	275	1007	164.7	271.6	74.4
B	520	275	350	1070	144.1	272.5	70.0
C	485	260	297	1005	154.5	288.3	74.6
D	450	272	296	994	166.6	275.5	75.4
E	485	260	299	1005	154.5	288.3	74.6

FIG. 11C



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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 December 2004	Gea Haupt, M

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