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 [33] **Japan**
 [31] **44/80476;**
Sept. 3, 1969, Japan, No. 44/83286; Oct. 8,
1969, Japan, No. 44/79991; Oct. 8, 1969,
Japan, No. 44/95422; Nov. 25, 1969,
Japan, No. 44/112334; Nov. 27, 1969,
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[56]

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[54] CERAMIC CONDENSERS

3 Claims, 18 Drawing Figs.

[52] U.S. Cl..... 317/256,
 317/242, 317/261
 [51] Int. Cl..... H01g 1/03
 [50] Field of Search..... 317/242,
 256, 261

ABSTRACT: A ceramic condenser which comprises a combination of a cylindrical ceramic dielectric member having metal electrodes at both end surfaces and an insulator having a projection to be engaged in central through hole of the dielectric member. The member is provided with a connecting metal fixture as butted against one of the electrodes at the side opposite to the one receiving the insulator. A synthetic resin is molded around outer and inner peripheries of the dielectric member so as to expose the connecting metal member and the other electrode. The connecting fixture has a conductor extending through the central through holes of the dielectric member and the insulator, and threaded at its end so as to be fastened by means of a nut, so that a panel shape metal connecting plate will be held between the dielectric member and insulator as butted against exposed electrode of the member.

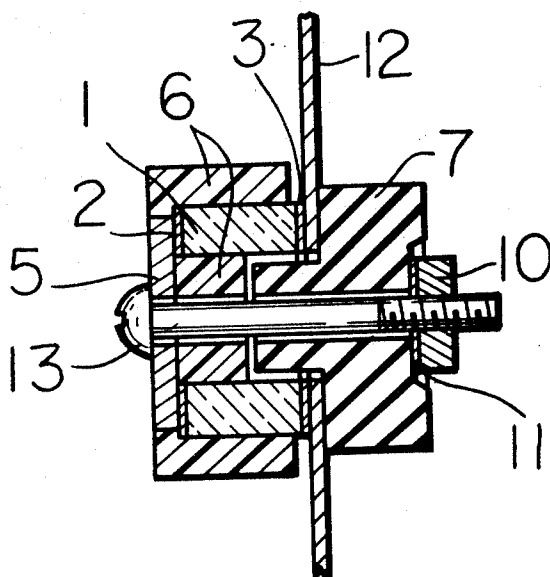


Fig. 1

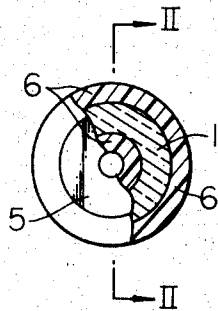


Fig. 2

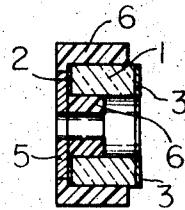


Fig. 3

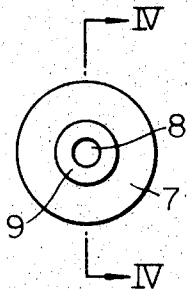


Fig. 4

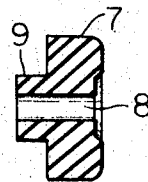


Fig. 5

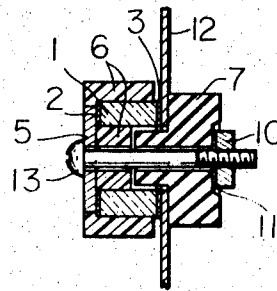
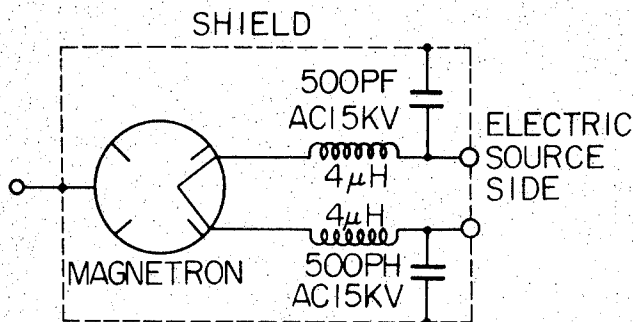


Fig. 6



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Fig. 7

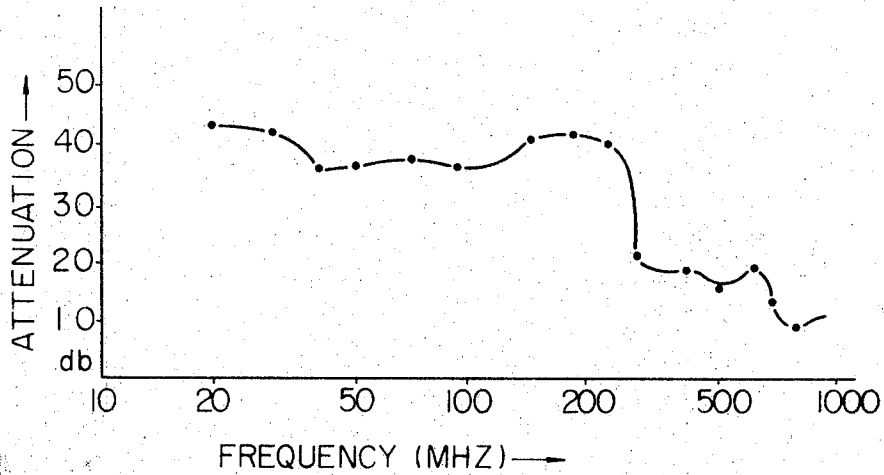
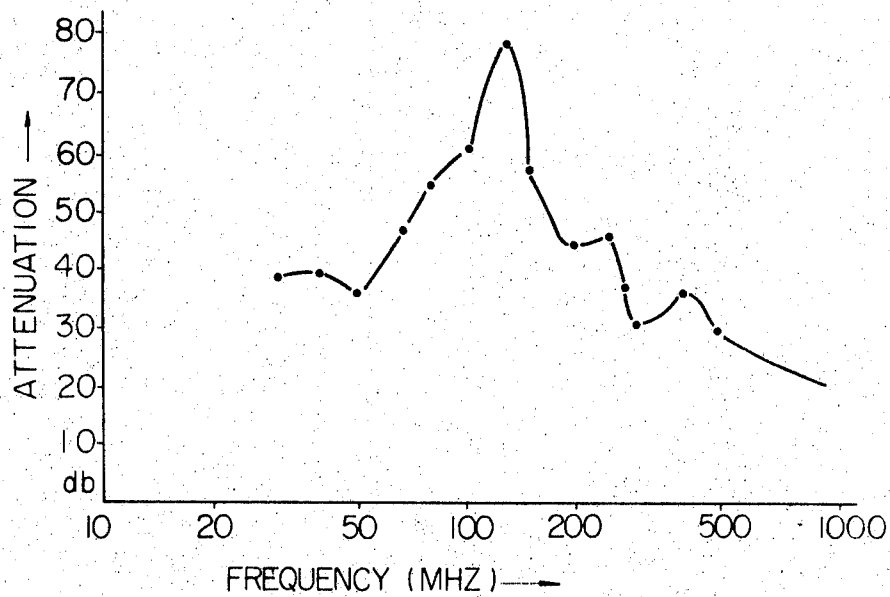


Fig. 8



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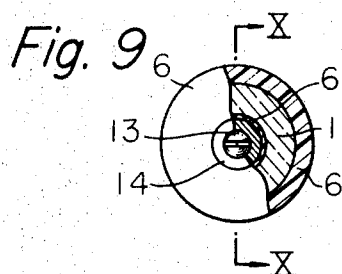
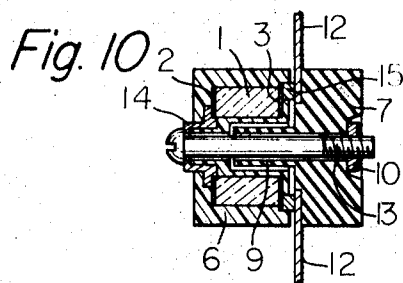
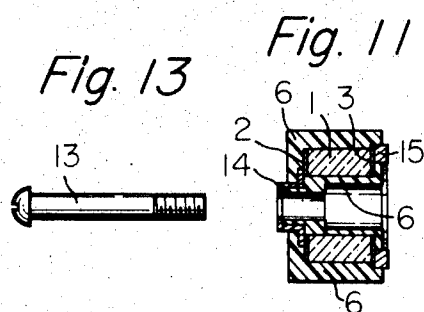
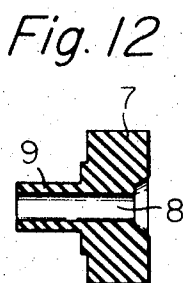
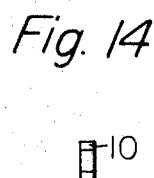
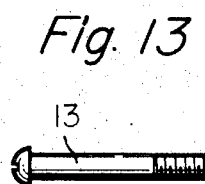


Fig. 15

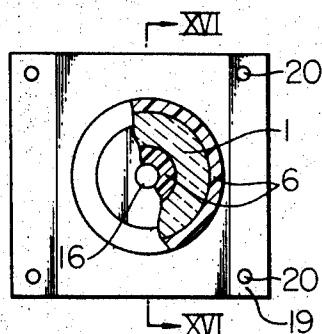


Fig. 16

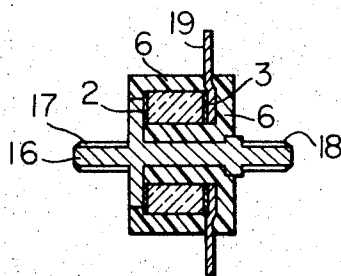


Fig. 17

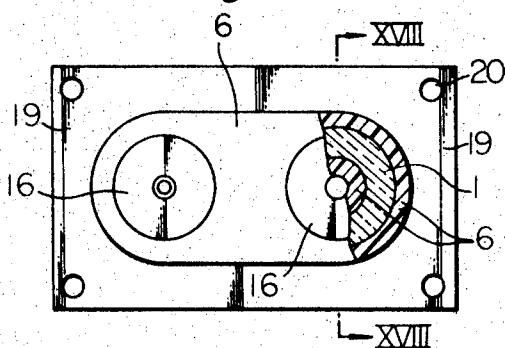
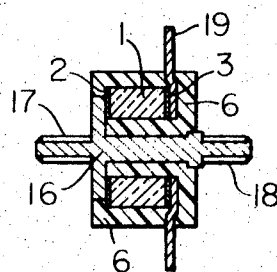


Fig. 18



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CERAMIC CONDENSERS

This invention relates to ceramic condensers.

Recently, high electric powers of UHF or VHF are utilized not only for such industrial purposes as of broadcasting apparatuses and the like but also for such daily uses as of microwave ovens and the like.

However, with the increase of such utilization, the problems of receiving-faults in television and radio apparatuses and field disturbances in general communication apparatuses due to field noises leaking out of such apparatuses have come to be considered important and countermeasures have been taken against them.

That is, there is required a filter which is different in the use from a conventional filter in respect that a high voltage and high electric power are impressed. For such purpose, there has been used a filter combining a disk-shaped ceramic condenser insulatively molded to be high in the voltage resistance with a coil. However, in such disk-shaped ceramic condenser, there is a clearance between the earthing side electrode and chassis and they are connected through a fine metallic terminal. Therefore, at a high frequency, due to the inductance component of the metallic terminal, the condenser does not operate as a capacitor. For such reason as the leakage due to an undesirable radiation, its characteristic as of a filter does not satisfy the requirement. Its early improvement has been required.

The present invention has been suggested to meet the above requirement.

A main object of the present invention is, therefore, to provide a condenser which has a high voltage resistance and can operate at a high efficiency as a capacitor until a high frequency with the earthing side electrode directly in close contact with the chassis.

Another object of the present invention is to provide a condenser adapted to a filter for high voltages.

Other objects and advantages of the present invention will become apparent upon reading the following descriptions set forth with reference to accompanying drawings, in which:

FIG. 1 is a plan view of the mold section of a ceramic condenser according to the present invention, shown partly in section.

FIG. 2 is a sectioned view of the mold section taken along line II—II in FIG. 1.

FIG. 3 is a plan view of an insulator to be combined with the mold section of FIG. 1.

FIG. 4 is a sectioned view of the insulator taken along line IV—IV in FIG. 3.

FIG. 5 is a sectioned view showing the ceramic condenser of the invention as assembled with the mold section and insulator of FIGS. 1-4.

FIG. 6 shows an example of the use of the ceramic condenser.

FIG. 7 shows attenuation characteristics of a filter using a conventional ceramic condenser.

FIG. 8 shows attenuation characteristics of a filter using the ceramic condenser of the present invention.

FIGS. 9 through 14 shown another embodiment of the present invention, in which:

FIG. 9 is a plan view partly in section of a ceramic condenser;

FIG. 10 is a sectioned view taken along line X—X in FIG. 9;

FIG. 11 is a sectioned view of a mold section of the ceramic condenser in FIGS. 9 and 10;

FIG. 12 shows in section an insulator of the ceramic condenser in FIGS. 9 and 10;

FIG. 13 shows a bolt used in the same; and

FIG. 14 shows a nut in the same;

FIGS. 15 and 16 show another embodiment of the present invention, in which:

FIG. 15 is a plan view partly in section of the same; and

FIG. 16 is a sectioned view taken along line XVI—XVI in FIG. 15.

FIG. 17 and 18 show a further embodiment of the present invention, in which:

FIG. 17 is a plan view shown partly in section; and

FIG. 18 is a sectioned view taken along line XVIII—XVIII in FIG. 17.

While the present invention shall now be disclosed in detail with reference to certain embodiments as illustrated, it should be understood that the invention is not to be limited to the particular embodiment but is rather intended to include all of possible modifications, alterations and equivalent arrangements to be included in the scope of appended claims.

In FIG. 1 to 5, 1 is a thick cylindrical ceramic dielectric and 2 and 3 are electrodes formed on both end surfaces of it. Any of the following methods is used in forming the electrode:

1. A method wherein flit glass as mixed with a metallic silver powder of silver oxide powder and kneaded to be pasty is screen-printed, sprayed with a spray gun or manually applied with a brush on the dielectric, is dried and is baked at a temperature above 500° C., to be an electrode.

2. A method wherein a metallic lamina is punched on the dielectric and is bonded thereto with a conductive binder to form an electrode.

3. A method wherein a conductive resin is screen-printed, sprayed with a spray gun or manually applied with a brush on the dielectric and is baked above 150° C. to be an electrode.

4. A method wherein a nonelectrolytic plating of Ni is applied to the dielectric surface and the plating in the unnecessary part is scraped off with a centerless grinder or the like.

5. A method wherein an Ni—Cr alloy or the like is vacuum evaporated on to the dielectric.

6. A method wherein Mn—M4 is baked on the dielectric.

Of the electrodes provided as mentioned above, the electrode 3 becomes an earthing side electrode and a disk-shaped connecting metal fixture 5 having a through hole in the center is bonded to the other electrode 2 by soldering or with a conductive binder.

6 is such synthetic resin as an epoxy resin, silicone resin or the like, or a mixture of such synthetic resin with SiO₂, TiO₂, Al₂O₃, Fe₂O₃ or the like as a filler, as molded by casting on the inner and outer peripheral surfaces of the ceramic dielectric one in order to improve the insulation and such reliabilities as the voltage resistance and damp-proofness. In such case, the end surfaces of the electrode 3 and connecting metal fixture 5 are exposed out of the molded part 6.

As shown in Fig. 3 and 4, 7 is an insulator having a through hole 8 and a projection 9 and made of such ceramic insulator as steatite, forsterite or the like, or such synthetic resin as an epoxy, phenol resin or the like.

13 is a bolt which is a through conductor made by threading such a metal easy to work as brass and plating it with such metal as Ni, Ag, Cr, Cd or the like, and is to hold the molded and through ceramic condenser part to a chassis. 10 is a nut screwed to the bolt 13 and 11 is a washer.

FIG. 5 shows an assembly in which the earthing side electrode 3 is kept in close contact with one side of a chassis 12, the projection 9 of the insulator 7 is inserted into the center hole of the molded part 6 and the nut 10 is screwed through the washer 11 to the forward end of the bolt 13 put into the center hole of the molded part 6.

Thus, according to the present invention, the earthing side electrode is pressed into contact directly with the chassis 12 through the connecting metal fixture 5 so that no inductance component will be contained even at a high frequency and a condenser having little undesirable radiation can be obtained.

Fig. 6 shows an example of the use of the present invention.

Fig. 7 shows an example of the frequency-attenuation characteristics of a filter using a conventional condenser.

Fig. 8 shows attenuation characteristics of a filter made by combining another inductor with a capacitor of the present invention. An attenuation of about 80 db. is obtained therein. The characteristics by the same inductor and a conventional capacitor are such as in Fig. 7 at most. Even in the light of this, it will be understood that, in 100 to 1,000 MHz., an attenuation about twice as large as by the combination of the conven-

tional capacitor is obtained when the capacitor according to the present invention is used. Thus, according to the present invention, the leakage of electromagnetic waves out of the apparatus can be prevented very effectively.

Further, an electronic circuit which is resistant to a high-voltage and high-electric power is obtained. The gain of the circuit is high. Thus, the practical advantage when it is used for microwave ovens or the like is very high.

Figs. 9 to 14 show another embodiment of the present invention. In the drawings, 1 is a cylindrical ceramic dielectric, 2 and 3 are electrodes and 14 is a connecting metal fixture having a through hole in the center, disk-shaped in the bottom, cylindrical in the body and bonded to the electrode 2. 15 is a ring-shaped connecting metal fixture bonded to the electrode 3. 6 is an insulating mold made cylindrical so as to enclose the ceramic dielectric 1, electrodes 2 and 3 and connecting metal fixtures 14 and 15. But, the outside (left side in the drawings) of the connecting fixture 14 and the inside of the ring-shaped connecting fixture 15 are not enclosed with the mold 6. This state is shown in Fig. 11. 7 is an insulator having a through hole 8 and a projection 9. 10 is a washer, 13 is a nut, and 12 is a chassis. They are assembled substantially the same as in the preceding embodiment. The assembly is shown in Fig. 10.

Fig. 15 and 16 show a further embodiment. In the drawings, 1 is a ceramic dielectric, and 2 and 3 are electrodes. 16 is a connecting metal fixture having a through conductor at right angles with the body in the middle and threaded 17 in the respective end parts. This connecting metal fixture 16 is inserted and bonded to the electrode 2. 19 is a square panel-shaped connecting metal fixture having a hole in the center. The earthing electrode 3 is bonded to the outer periphery of this hole. A small fitting hole 20 is made in each of the four corners of this connecting metal fixture 19. The connecting metal fixtures 16 and 19 are molded so as to form the molded part 6 as bonded to the electrodes on the respective end surfaces of the ceramic dielectric 1. The molding material to be used is the same as in the case of the first embodiment.

Fig. 17 and 18 show another embodiment. An electrode is formed at each end of each of two cylindrical ceramic dielectrics 1, a connecting metal fixture 16 having a through conductor and threaded in the end parts 17 and 18 is bonded to one electrode 2, a common connecting metal fixture 19 having two holes is bonded to the other electrode 3 and the ceramic dielectrics 1 are molded so as to form a synthetic resin molded part 6.

What is claimed is:

1. A ceramic condenser comprising in combination a cylindrical member of a ceramic dielectric, a pair of first and second metallic electrodes formed independently on the

respective end surfaces of said ceramic dielectric member, a connecting metal fixture having a through hole in the center and an outer surface and being bonded to said first electrode, a molded part of a synthetic resin enclosing circumferentially said ceramic dielectric and said first metallic electrode, said second electrode and said outer surface of said connecting metal fixture being spaced outside of said molded part, said molded part being provided in the center with a through hole, and a cylindrical insulator having a flange provided in the center with a projection to be inserted in said through hole of the molded part and with a through hole in the center, said insulator being adapted to hold a chassis member between its surface around said projection and the exposed second electrode on the ceramic dielectric member.

2. A ceramic condenser comprising in combination a cylindrical member of a ceramic dielectric, a pair of first and second metallic electrodes formed independently on the respective end surfaces of said ceramic dielectric member, a first connecting metal fixture bonded to said first electrode, said metal fixture having a through hole in the center and having a disk-shaped inner member and a cylindrical-shaped outer member, a second ring-shaped connecting metal fixture bonded to said second electrode and having an outer surface, a molded part of a synthetic resin enclosing circumferentially said ceramic dielectric, a portion of said cylindrical-shaped outer member of said first connecting metal fixture and said outer surface of said second connecting metal fixture being spaced outside of said molded part, said molded part being provided in the center with a through hole, and an insulator provided in the center with an axial projection to be inserted in said through hole of the molded part and with an axial through hole in the center, said insulator being adapted to hold a chassis between its surface around said axial projection and the exposed second metal fixture on the ceramic dielectric member.

3. A ceramic condenser comprising in combination a cylindrical member of a ceramic dielectric, a pair of first and second metallic electrodes formed independently on the respective end surfaces of said ceramic dielectric member, a first connecting metal fixture inserted into the ceramic dielectric member and bonded to said first electrode, said first connecting metal fixture having an axial through conductor threaded on both extended end parts, a second panel-shaped connecting metal fixture bonded to said second electrode and having means to connect the second fixture to a chassis, and a molded part of a synthetic resin insulator enclosing circumferentially said ceramic dielectric, said threaded end parts of the first metal fixture and said connecting means of the second metal fixture being spaced outside of said molded part.

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