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2,617,000

CONDENSER

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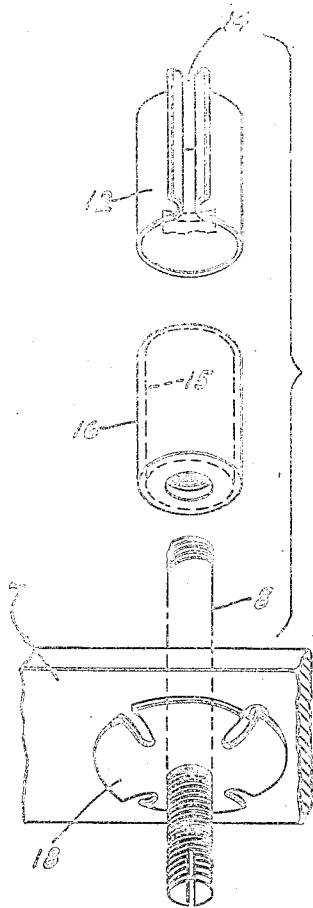
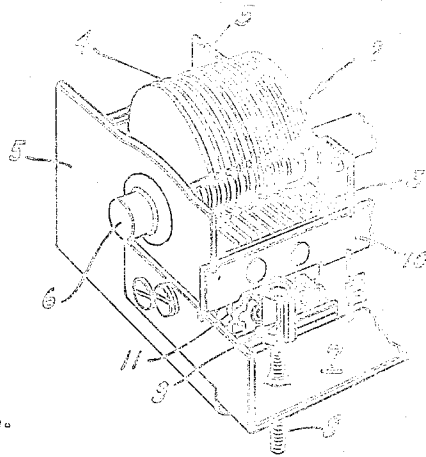
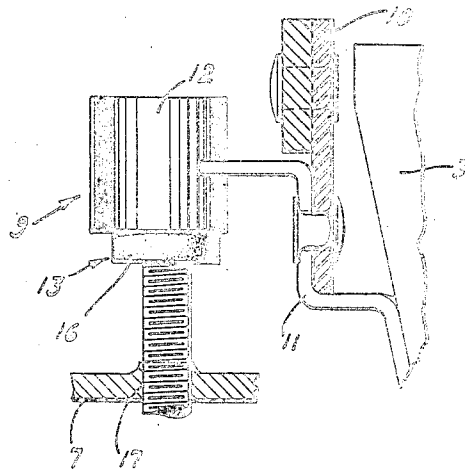


FIG. 4.

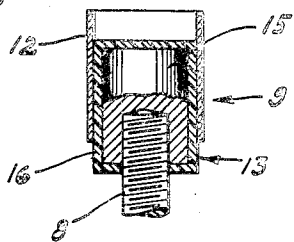


FIG. 3.

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CONDENSER

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2 Claims. (Cl. 175-41.5)

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This invention relates to condensers, and is especially concerned with variable condensers of the type commonly employed as "trimmers," in radio apparatus.

Heretofore, condensers of this general character most frequently have been of the compression, or so-called "book" type, which type has been found to be subject to certain operational difficulties and disadvantages. For example, they have not been satisfactory at high frequencies, due primarily to inductive effects resulting from the relatively large plate size, and also for the reason that the dielectric employed is not satisfactory at high frequencies. Further, the plates are customarily wrapped in such a manner as to bear resiliently against the adjusting member, which results in a lack of accuracy in the supporting of the plates and consequent undesirable "capacity drift." Also, as a result of the fact that air is utilized as a relatively large component of the total dielectric, the capacity at any given mechanical setting may vary with changes in relative humidity.

Accordingly, it is a primary object of the present invention to provide a variable condenser which overcomes the aforesaid difficulties and disadvantages, being of such a nature as to be substantially unaffected by humidity conditions, has a high degree of permanence after adjustment, and is particularly well adapted for application in the field of very high frequencies.

It is also an object to provide a variable condenser that has a high Q , or ratio of reactance to resistance, and a capacity-change curve, which is substantially linear with respect to the adjustment motion of the electrodes.

A further object resides in the provision of a variable condenser having a relatively low inherent inductance.

It is also a feature of the invention that condensers constructed in accordance therewith are substantially unaffected by mechanical vibration.

The invention extends further to certain novel constructional features and arrangements, hereinafter described and illustrated in the attached drawings in which:

Figure 1 is a view in perspective, of a flat-plate type variable condenser assembly incorporating, as a trimmer, a condenser in accordance with the present invention;

Figure 2 is an exploded perspective view of the condenser components, illustrating the mode of adjustment;

Figure 3 is a fragmentary elevational view illustrating attachment of the condenser of the

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present invention, when employed as a trimmer, in the apparatus illustrated in Figure 1; and

Figure 4 is a sectional view taken through the vertical mid-plane of the relatively adjustable capacitor elements.

While the condenser of the present invention is susceptible of broad applicability, it is illustrated and described hereinafter, in its application as a padding condenser utilized to predetermine the resonant frequency to which a circuit is tuned.

Referring now more particularly to Figure 1, there is illustrated a plate type condenser 2, of well-known type, comprising a plurality of stator plates 3 within which are adjustably mounted rotor plates 4, in accordance with usual practice. The apparatus includes a pair of opposed frame members 5-5, within which is journaled the rotor shaft 6, and which serve to maintain the component parts in accurately assembled relation. A forwardly extending bracket 7 is carried by the frame members 5 and is provided with an aperture through which passes the adjusting screw 8 of my novel form of trimming condenser, indicated generally by the reference numeral 9. As best appears in Figure 3, the condenser assembly 9 includes an outer fixed "plate," or electrode, 12, which latter is secured to an insulating cross-brace 10 forming part of the main condenser assembly, by means of a generally S-shaped bracket 11 which further serves to provide electrical connection between said fixed "plate," or electrode 12, and plates 3 of the stator group. It will be understood that the inner movable capacitor element, or electrode 13 is connected to the rotor assembly through the main framing above described.

Referring more particularly to the condenser assembly 9, and in special accordance with the present invention, it will be seen that the outer metallic electrode 12 (preferably formed of Phosphor bronze) is of cylindrical form, is slotted longitudinally (as shown at 14 in Figure 2) and is adapted to snugly fit and resiliently embrace the inner assembly 13. As will clearly appear from a consideration of Figures 2 and 4, the inner electrode assembly 13 comprises a slug or cylinder 15, of suitable conducting material and an outer nonconducting coating 16 having a satisfactory dielectric constant. This material should be of such a nature that it will withstand a certain amount of mechanical abrasion, without appreciable wear. From a manufacturing and operational standpoint, it is important that the coat-

ing be of uniform thickness and outside dimensions.

The nature of the outer electrode 12, and the manner in which it resiliently bears against the inner electrode assembly 13 is an important feature of the present invention, in that it contributes largely to the achievement of the desired permanence of setting and the aforementioned linearity of adjustment in capacitance. This will be appreciated when it is understood that if the plate, or electrode 12 were not split and adapted to resiliently bear against the assembly 13, the diameter of said outer electrode would have to be larger, possibly by several thousandths of an inch, than the outside diameter of the inner assembly, to permit relative adjustment movements of the two electrodes. If it were not so split, when the inner electrode is adjusted axially, the capacity would tend to vary in an erratic manner, due to cocking, and displacement movements of the inner assembly with respect to the outer cylindrical element. In prior devices, not incorporating the concepts of the present invention, attempts have been made to overcome this difficulty by extreme accuracy in the manufacture of component parts, and by so mounting the adjusting screw as to attempt to maintain the inner and outer cylinders in exact concentricity. Such attempts have not resulted in satisfactory devices and, in addition, are prohibitively costly.

On the other hand, by splitting the electrode 12, and making it of an inside diameter several thousandths of an inch smaller than the diameter of the inner assembly, highly satisfactory results have been obtained, the snug resilient fit excluding the possibility of the formation of any appreciable air gap between the two capacitor members, and not permitting any undesired axial movement of the inner adjustable electrode.

In accordance with another important feature of the invention, the adjusting screw 8 is so mounted in the bracket 7 that while no undesired axial movement of the inner electrode is possible, the mounting is of such a nature as not to interfere with freedom of the inner electrode to align itself with said outer member 12 during adjustment. Such a mounting is readily and inexpensively provided in the following manner.

The threaded aperture 17 in bracket 7 (see Figure 3) is tapped in such a manner as to comprise what is commonly referred to in machine work as a "class 1 fit." That is, in order to promote ease of production, and to permit assembly without maintaining critical concentric alignments, the threaded aperture is of such a nature as to provide appreciable clearance between the outside diameter of the adjusting screw and the inside diameter of said aperture. This arrangement is employed in cooperation with a spring washer, shown at 18, which is adapted to react against the lower face of bracket 7 to prevent undesired axial movement of the screw and associated electrode, without interfering with freedom of the screw for slight lateral rocking movement. As brought out above, such freedom, in cooperation with the resilient nature of electrode 12, makes it unnecessary to maintain exact concentricity in assembling and adjusting the condenser structure. It will be recognized that, if desired, the upper end of the adjusting screw 8 may be formed integrally with the inner electrode, or element, 15, rather than being tapped therein.

From the foregoing, it will be appreciated that the present invention provides an improved con-

denser which is susceptible of ready and inexpensive manufacture, and is capable of both precise adjustment and permanence of setting.

While the preferred constructional embodiment and application of the device of the present invention has been illustrated and described, it will be evident that modifications may be made therein, without departing from the spirit of the present invention. However, it will be understood that such changes and modifications are contemplated as may come within the scope of the appended claims.

I claim:

1. In variable condenser construction: two cylindrical concentric conducting members disposed in axially adjustable telescoped relation and having insulation therebetween, the outer of said members comprising an inherently resilient structure bearing against said inner member through said insulation; framing to which said outer member is secured; a threaded rod the axis of which is aligned with that of said members, said rod having one end portion rigidly connected with said inner member and adapted to impart adjustment movements thereto; and threaded mounting structure carried by said framing and with which said threaded rod is cooperable to impart axial displacement to said rod and inner member in response to rotation of the rod, said threaded structure being oversize with respect to the threaded portion of said rod to provide freedom for limited lateral movement of the rod to accommodate alignment of the axes of said members.

2. In variable condenser construction: two cylindrical concentric conducting members disposed in axially adjustable telescoped relation and having insulation therebetween, the outer of said members comprising an inherently resilient clip-like structure bearing against said inner member through said insulation; framing to which said outer member is secured; a threaded rod the axis of which is aligned with that of said members, said rod having one end portion rigidly connected with said inner member and adapted to impart adjustment movements thereto; threaded mounting structure carried by said framing and with which said threaded rod is cooperable to impart axial displacement to said rod and inner member in response to rotation of the rod, said threaded structure being oversize with respect to the threaded portion of said rod to provide freedom for limited lateral movement of the rod to accommodate alignment of the axes of said members; and a resilient retaining element threadedly engaged with said rod and bearing against said framing, said resilient element preventing axial displacement of the rod in the absence of rotation thereof.

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