June 9, 1942. C. G. F. DIETSCH 2,285,499

VARIABLE CONDENSER

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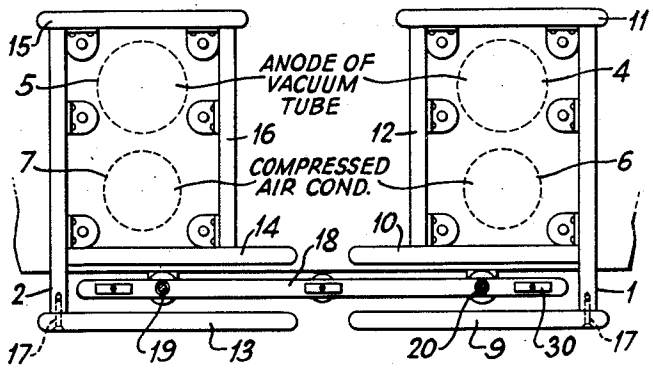


Fig. 1

Fig. 2

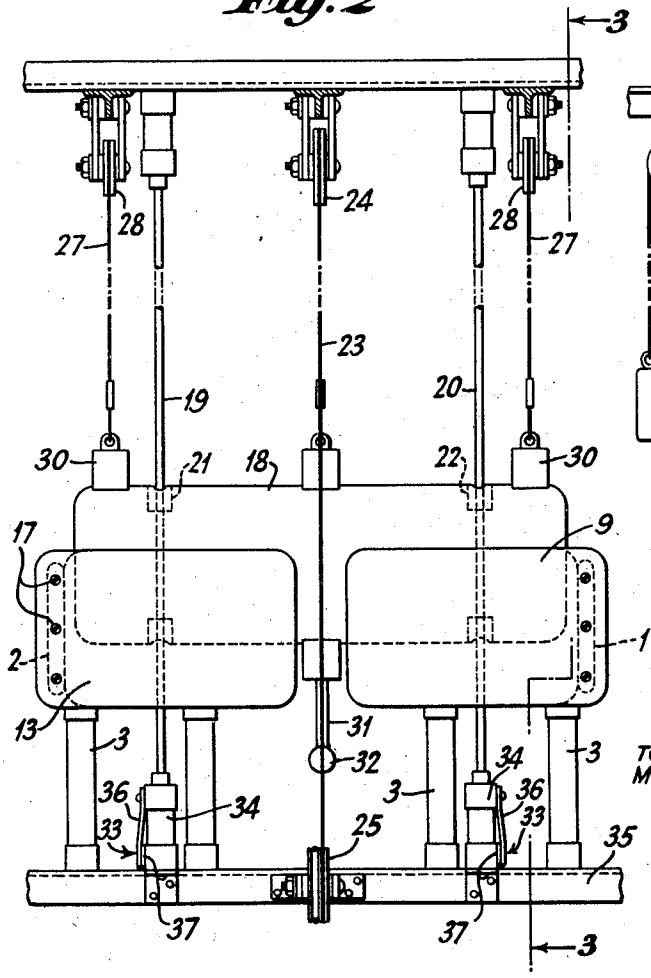
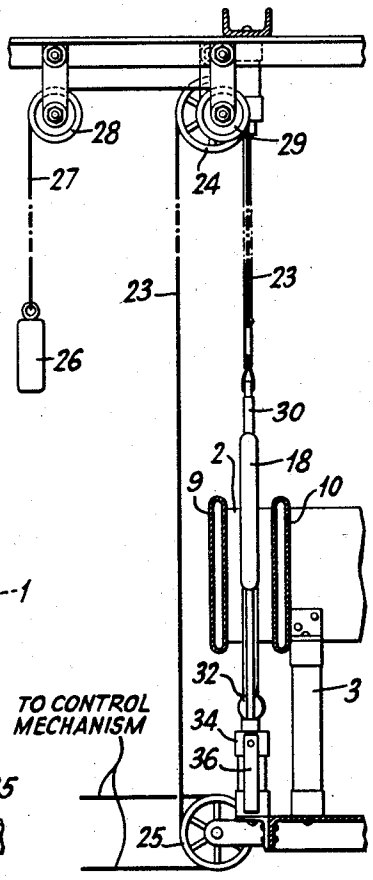


Fig. 3



INVENTOR.
CARL G. F. DIETSCH
BY H. S. Brower
ATTORNEY.

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Fig. 4

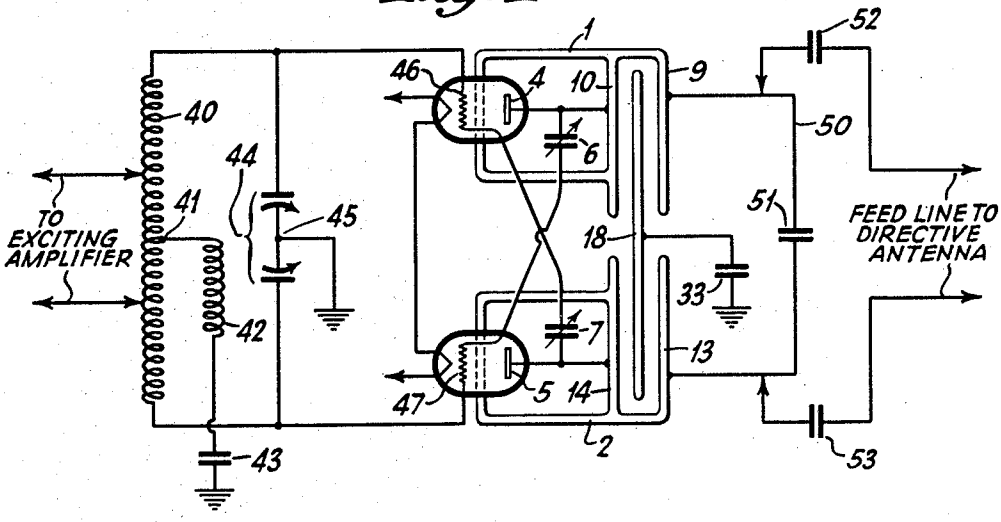
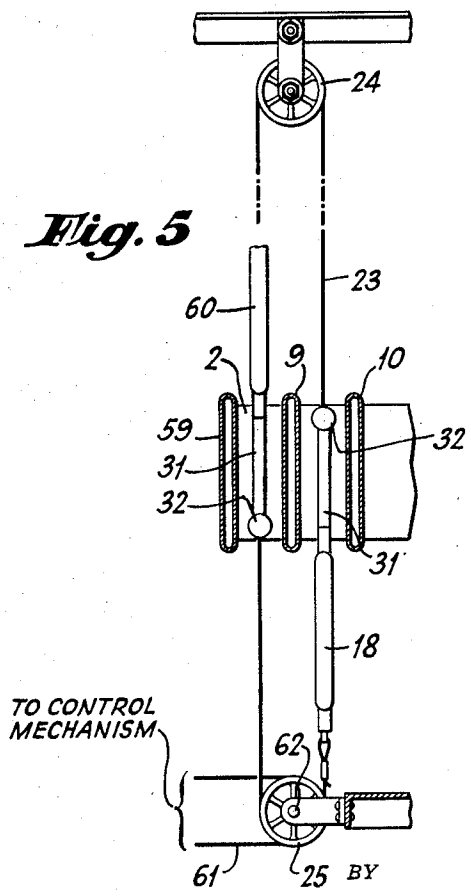


Fig. 5



INVENTOR.
CARL G. F. DIETSCH
BY
H. S. Grover
ATTORNEY.

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VARIABLE CONDENSER

Carl George Frederick Dietsch, Leonia, N. J., assignor to Radio Corporation of America, a corporation of Delaware

Application May 31, 1939, Serial No. 276,504

4 Claims. (Cl. 250—16)

This invention relates to a new and useful high voltage variable air capacitor having a small minimum capacity and wide range of variation.

An object of this invention is to simplify and improve high voltage variable condensers for a radio transmitter.

Another object of this invention is to provide a variable air condenser for use in a push-pull tank circuit of a power amplifier.

Still another object of this invention is to provide a novel high voltage balanced air capacitor having a single movable plate which is interposed between two separate groups of stationary plates, the stationary plates in cooperation with the movable plate being arranged with additional metallic members to form a partial shielded portion to electrically shield from parasitic oscillations the anode of a vacuum tube and other associated apparatus, such as, for example, a compressed air condenser, the shielded portion acting as a corona shield and to eliminate circulatory currents reaching the vacuum tube and compressed air condenser. It has been found by interposing the fixed and movable plates between the output tank circuit and the grid circuits of the power amplifier that a substantial ground shield results in reducing undesirable feedback from the anode to the grid circuits, thus permitting greater amplification stability. Since the movable plate is at ground potential, it therefore assists in this shielding action in its position between the anode and grid circuit elements.

Briefly, the variable air condenser of this invention comprises two groups of stationary plates mounted upon insulators and a movable plate so guided by a plurality of guide rods as to pass between the two groups of fixed or stationary plates, the mechanism for controlling the motor of the movable plate being remotely located, such as upon the panel of a radio transmitter. Also, for ease of operation of the movable plate, counterweights are provided.

This invention will best be understood by referring to the accompanying drawings, in which:

Fig. 1 is a plan view of the variable condenser of this invention;

Fig. 2 is a front elevation of Fig. 1;

Fig. 3 is a cross-section of Fig. 2, the section being taken on line 3—3; and

Fig. 4 is a wiring diagram of a tank circuit portion of a radio transmitter showing the location of the condenser with the associated apparatus; while

Fig. 5 is another embodiment of Fig. 2 showing a balanced pair of movable plates.

Referring now in detail to Figs. 1, 2 and 3 of the drawings, the two groups of stationary plate support members 1 and 2 are mounted upon a plurality of high voltage insulators 3, the insulators also serving to insulate the mountings for two or more water-cooled power amplifier tubes 4 and 5, the anodes of which are shown in Fig. 1, and are preferably connected in a push-pull circuit arrangement, as shown in Fig. 4. Closely associated with anodes 4 and 5 are compressed air condensers 6 and 7, of the type disclosed in the Hansell et al. Patent #2,192,062, patented Feb. 27, 1940. Secured to support member 1 is a front fixed condenser plate 9, a rear fixed condenser plate 10, a rear shielding plate 11 and mid shielding plate 12, members 1, 10, 11 and 12 completely surrounding the anode of the vacuum tube and the compressed air condenser. The support member 2 is arranged in a similar manner to that mentioned above and comprises front fixed plate 13, rear fixed plate 14, rear shield plate 15 and mid shield plate 16, the stationary plates and shielding members being bound together by any suitable means, such as a plurality of screws 17 or, if desired, the various elements may be cast in one piece or welded together. Interposed between condenser plates 9, 10, 13 and 14 is a single movable condenser plate 18, having guiding means in the form of two rods 19 and 20, which rods slide in bushings 21 and 22. Movement of condenser plate 18 is accomplished by means of a cord 23 which passes over pulleys 24 and 25, the cord arranged to pass to the operating panel or to any other suitable control mechanism remotely located, and although the movable plate is shown in the drawings as being controlled by means of the cord and pulley mechanism, it may also be moved by any other suitable means coupled to the operating panel and control mechanism. To provide easy control and to insure free motion of plate 18, a pair of counter-weights 26 is secured by means of cord 27 passing over pulleys 28 and 29 and secured to the extreme ends of plate 18 by straps 30 which preferably are of insulating material. To prevent brushing between control cord 23 and the stationary plates, a metallic tube 31 and a metallic spherical member 32 is provided at the lower portion of plate 18. Movable plate 18 may be either insulated from ground or tied directly to ground; however, I have found it desirable to maintain the movable plate at substantially ground potential for the radio frequencies but insulated therefrom for low

voltage direct currents by forming two condensers 33 and securing the same to the lower insulators 34 which secure guide rods 19 and 20 to the angle iron frame 35. Condensers 33 comprise a metallic plate 36 which is insulated from ground by means of an insulating plate 37.

The embodiment shown by Fig. 5 is generally similar to Figs. 1 to 3, inclusive, except for the addition of a second movable plate 60 and the omission of the counter-weight 26, also pulleys 28 and 29. It will be noted that the second movable plate 60 as arranged on movable cord 23 is just balanced by movable plate 18. Also, to prevent brushing to the fixed plates 9, 10 and 59, both movable plates 18 and 60 have secured thereto metallic tubes 31 and spherical members 32, and as mentioned above, movable plates 18 and 60 may be grounded or insulated from ground. The control mechanism may be coupled by means of either a cord 61 rotated on a second groove cut on the outer periphery of pulley 25 or may be by means of any suitable gearing mechanism (not shown) attached directly to shaft 62.

Referring now to Fig. 4 of the drawings, the utilization of this improved condenser in the tank circuit of a power amplifier for a radio transmitter will be briefly disclosed, although it is to be distinctly understood that this invention is not limited thereto.

A grid tank inductance 40 has its input connected to an exciting amplifier with its mid-point tap 41 connected through a choke 42 and a condenser 43 to ground. Connected in parallel with the grid tank inductance 40 is a variable tuning split stator condenser 44, the fixed plates of which are connected to grids 46 and 47. The rotor portion of both condensers is generally grounded at 45. The anode 4 is connected to fixed condenser plates 9 and 10 and fixed plate support member 1. Likewise, anode 5 is connected to fixed condenser plates 13 and 14 and fixed plate support member 2. Neutralization of grid 46 is accomplished by compressed air condenser 7 connected to anode 5. Neutralization of grid 47 is accomplished in a similar manner by means of compressed air condenser 6 connected to anode 4. Variable condenser plate 18 is shown interposed between the two groups of fixed condenser plates and insulated from ground for low voltage direct current but maintained at substantially ground potential for the radio frequencies by means of condenser 33 as previously disclosed. Other parts of this circuit comprise long lines tank circuit 50 having a coupling capacitor 51, the tank circuit being coupled to the antenna feed line by means of coupling condensers 52 and 53.

A condenser of this invention is capable of withstanding peak voltages of 500,000 volts when placed in a tank circuit as shown in Fig. 4, and although only two embodiments of variable condensers are shown, it is to be distinctly understood that this invention should not be limited to the precise arrangements shown and described.

What is claimed is:

1. A variable condenser having a fixed and a movable plate, a compressed air condenser and an anode of an electron discharge device associated therewith, insulated support means for said fixed plate, said fixed plate and said insulated support means arranged to form a box-like structure to surround and partially electrically shield said condenser and anode, said movable plate maintained substantially at ground radio frequency potential, and means to vary the capacity of said condenser by moving said movable plate.

2. A variable condenser for use with a radio transmitter comprising a plurality of fixed plates and a movable plate, a condenser and an anode of an electron discharge device associated therewith, a plurality of insulators for supporting said fixed plates, supporting means for said fixed plates secured to said insulators, said support means and said fixed plates cooperating to form a box-like structure for enclosing a portion of said condenser and anode associated with said fixed plates, each of said fixed plates divided into two groups to surround both ends of said movable plate and a substantial portion of the face thereof, and means adjacent said fixed plates to move said movable plate to vary the capacity of said condenser.

3. A variable condenser for use in a push-pull amplifier tank circuit of a radio transmitter having a grounded frame comprising a movable plate, a plurality of fixed plates arranged in pairs, a pair of fixed plates located at each end of said movable plate and surrounding a major portion thereof, means including a pair of guide rods for retaining said movable plate in a fixed plane, an insulator supported at one end of said guide rods, a fixed and movable plate condenser located adjacent said insulator and having its movable plate connected to an end of said guide rods and its fixed plate to the grounded frame of said transmitter for maintaining said first mentioned movable plate substantially at ground radio frequency potential, and means coupled to said movable plate to change the capacity of said condenser.

4. A variable condenser comprising a fixed plate, electrical apparatus located adjacent said fixed plate, insulated support means for said fixed plate, said fixed plate and said insulated support means arranged to form a box-like structure to surround and partially shield said electrical apparatus, a flexible loop member surrounding said fixed plate, means for moving said loop around said fixed plate, a movable plate secured to said loop to vary the condenser capacity by passing at least one surface of said fixed plate.

CARL GEORGE FREDERICK DIETSCH.