July 31, 1934.

M. W. KENNEY

1,968,772

RADIO APPARATUS

Filed Jan. 13, 1930

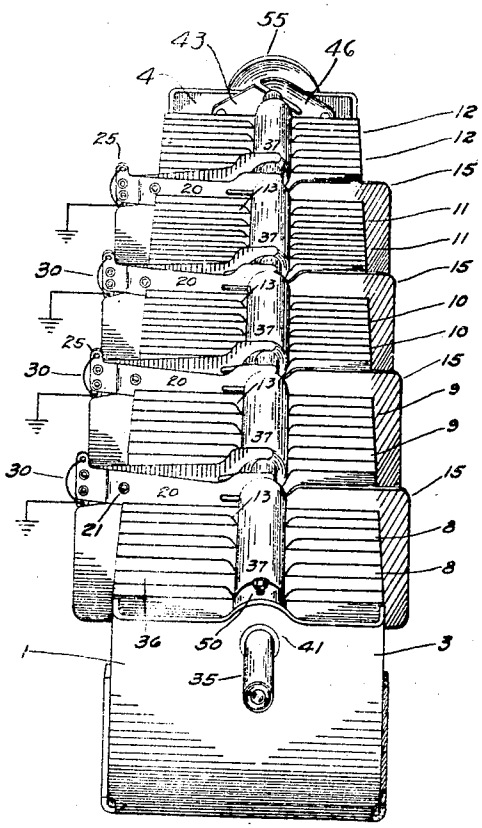


FIG-1

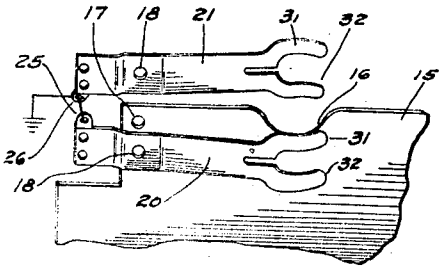


FIG-2

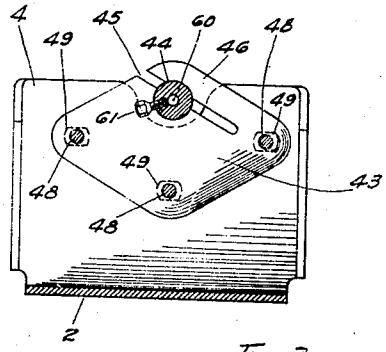


FIG-3

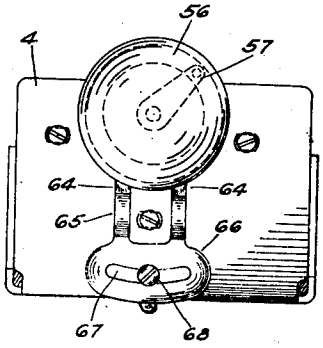


FIG-4

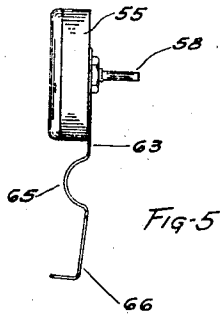


FIG-5

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UNITED STATES PATENT OFFICE

1,968,772

RADIO APPARATUS

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Application January 13, 1930, Serial No. 420,496

4 Claims. (Cl. 175—41.5)

This invention relates to radio apparatus and particularly to a control unit for a radio receiving set. As disclosed and claimed in my co-pending application, Serial No. 361,847, filed May 10th, 1929, substantially constant sensitivity at various frequencies may be obtained from a radio receiving set if the potential of the grid with respect to the cathode in one or more of the radio frequency amplifiers be varied with the variation of tuning condensers. In order to do this, a rheostat may be conveniently mounted on the base of the condenser. The rotating element of the rheostat may be operatively associated with the condenser rotor so that both are simultaneously actuated. A simple way of mounting such a rheostat on a condenser is shown in the above entitled application and consists in the disposition of the rheostat base bearing the resistance element, on the condenser base in such a manner that the stub shaft of the rheostat rotor is coaxial with and coupled to the condenser shaft.

In a construction of this character it is clear that unless perfect alignment of the two shafts is obtained, excessive friction will result and cause undue wear. Furthermore, since the extent of effective angular travel is greater on the rheostat than on the condenser, it is desirable that the extreme positions of the rheostat rotor on the resistance element, be adjustable with respect to the extreme positions of the condenser rotor. While this may be roughly accomplished by proper positioning of the rheostat base on the condenser base, the final adjustment is preferably made when the entire control unit has been assembled.

In order to support a rheostat having a rotatable wiper in a simple and effective manner, I preferably dispose the rheostat base at the end of a spring member in approximately concentric relation to the condenser shaft. A stub shaft forming a part of the rheostat rotor is then coupled to the condenser shaft. The free end of the spring member comprises a portion having an arcuate slot and is adapted to turn about the condenser shaft as an axis. Since the rheostat base and spring member are rigidly fastened together, it is clear that such turning of the spring member serves to vary the relative positions of the rheostat base and condenser rotor. The spring member is suitably maintained in desired position by a bolt passing through the slot tightened against the spring member. In order to allow for any slight eccentricity existing between the rheostat base and condenser rotor, the spring member may be provided with looped or bent portions which will yield sufficiently to permit the rheostat base to be properly centered at all times.

To properly and quickly assemble the condenser portion of the entire unit, I preferably provide several bearings or supports for the rotor shaft, one of the bearings being fixed, while the other is removable. The removable bearing is preferably provided with adjusting means so that alignment of the two bearings may be quickly and easily obtained. In practice the rotor is actuated by any one of a number of friction devices. Therefore it is essential that the rotor turn in its bearings with sufficient friction for steadiness, but without binding. In order to accomplish this I preferably have the removable bearing in the form of a plate of resilient material, such as brass provided with an undersized shaft aperture and a slot extending from an edge of the plate through the aperture. Since the shaft is of steel the plate will yield sufficiently so that no binding in the bearing will result.

A further provision is a plurality of ground connections for the rotor. In condensers of the variable type it is customary to have the stator plates insulated from the frame upon which they are mounted, while the rotor plates are grounded. Where a plurality of groups of cooperating sets of plates are provided on one base, as in gang condensers for use in multi-stage radio frequency amplifiers, it has been found that there is coupling between various circuits and sufficient difference of potential between various portions of the rotor shaft to result in undesirable oscillation and noise. To avoid this, grounds are provided between each adjacent group of rotor plates. The ground connections are preferably taken from each group of rotor plates by means of pairs of spring connectors having bifurcated ends embracing the rotor shaft. These connectors are preferably supported at one spot on grounded plates so that they may be turned sufficiently to permit the engagement of the shaft and spring members in the process of assembly.

Referring to the drawing;

Fig. 1 is a perspective view of a control unit consisting of a condenser and rheostat.

Fig. 2 is a detail view of a shielding plate with a rotor spring connecting member disposed on each side.

Fig. 3 is an elevation view of the inside end of the condenser.

Fig. 4 is an outside view of the same end of the condenser.

Fig. 5 is a view showing the rheostat and supporting spring member.

The condenser comprises a base 1 consisting of a bottom portion 2 and upstanding side portions 3 and 4. Insulatingly supported on the base between side portions 3 and 4 are groups of stator plates 8 to 12 inclusive having semi-circular clearance indentations 13. Between adjacent groups of stator plates are grounded shielding plates 15 provided with similar semi-circular clearance indentations 16 and having apertures 17 at the corners of the plates. On each side of each shielding plate 15 are spring connectors 20 and 21 both identical and provided with apertures 18 adapted to register with apertures 17 in the shielding plate. Each pair of spring connecting members 20 and 21 is secured to its corresponding shield plate by a metallic eyelet 21. In this way the spring connectors may be turned about the eyelets as an axis.

All spring connectors are provided with connecting lugs at one end, connectors 20 having lugs 25 and connectors 21 having lugs 26. Since all connectors are identical in shape, it is obvious that in pairing two connectors, the lugs will come at opposite sides. Lugs 25 and 26 may easily be connected by wires 30 which are suitably grounded. The free end of every spring connector is bifurcated so that two spaced fingers 31 and 32 are provided at the end.

The condenser rotor comprises a steel shaft 35 having a plurality of rotor plates 36 cast into cylindrical hubs 37 surrounding the shaft at spaced intervals. The bifurcated ends of spring connectors 20 and 21 are adapted to embrace the steel shaft between hubs 37 and by virtue of the tendency of the connectors to spring outwardly a firm, sliding contact against the hub edges is maintained. Condenser shaft 35 is rotatively mounted in side portion 3 of the base plate by means of a suitably fixed bearing 41. The other end of shaft 35 is supported by a removable plate 43 having an undersized shaft aperture 44 therethrough and an elongated slot 45 passing from an edge of the plate through aperture 44 and providing a yielding resilient portion 46. Plate 43 is preferably of a soft metal such as brass and because of resilient portion 46 will not bind the steel shaft. In this way a uniform frictional drag of the rotor will result preventing vibration or jars from changing the setting of the condenser.

Plate 43 is adjustably mounted on the inside end 4 of the base by a plurality of bolts 48 passing through enlarged slots 49 in end plate 4 and engaging bearing plate 43. There is a sufficient degree of adjustment in all directions to permit alignment of aperture 44 with bearing 41 so that shaft 35 may turn properly. A collar 50 provided with a suitable set screw is disposed around shaft 35 on the inside of plate 3 to adjust the longitudinal position of the rotor element.

The condenser rotor is preferably disposed in the stator by having the rotor plates clear of the stator plates. Each of the spring connectors are turned upwardly and the bifurcated ends sprung over the shaft between hubs 37. Plate 43 is put over the rear end of shaft 35 and the front end is inserted into bearing 41. The rotor is turned into the position shown in Fig. 1 and allowed to drop down into its normal position. Plate 43 is then positioned so that proper alignment of the bearings results and rigidly maintained by tightening bolts 48. Collar 50 may then be properly adjusted to space the rotor plates between the stator plates.

The rheostat unit comprises a rheostat base 55 bearing a resistance element 56 thereon and a wiper 57 attached to a stub shaft 58. The end of condenser shaft 35 has a recess 60 therein into which the free end of stub shaft 58 is inserted. A set screw 61 is tightened down upon stub shaft 58 so that both shafts turn together. In order to support the rheostat base a spring member 63 is rigidly secured to rheostat base 55. This member is preferably provided with legs 64 having bent portions 65 and terminating in an end portion 66. The end portion is provided with an arcuate slot 67 whose center of curvature is at the stub shaft 58. Bolt 68 engages plate 4 and passes through slot 67 and is adapted to firmly secure spring member 63 in any desired position. It is clear that a limited amount of adjustment of rheostat base 55 with respect to condenser rotor may be obtained by loosening bolt 68 and turning spring member 63 and rheostat base 55.

By providing the spring loops or portions 65 in the spring members 63 a sufficient amount of flexibility is provided so that the rheostat base may adjust itself to any slight eccentricity with respect to the condenser shaft.

What I claim is:

1. A gang condenser comprising a base, a plurality of groups of stator plates insulatingly secured on said base, shielding members electrically connected to said base and parallel to said stator plates, one shielding member being disposed between adjacent groups of stator plates, a plurality of groups of rotor plates fixedly secured to a shaft, means for rotatively mounting said shaft on said base, and contact members between said shielding members and shaft, said members comprising a pair of spring members for each shielding member, and means for securing each spring member on opposite sides of a shielding member, each contact member having a bifurcated end embracing the shaft and pressing against adjacent rotor surfaces to make contact therewith.

2. A variable gang condenser comprising a base plate, a plurality of groups of stator plates insulatingly mounted on said base plate, rotor plates fixedly secured to a shaft and adapted to co-operate with said stator plates, means for rotatively securing said shaft on said base plate, a grounded shielding plate between adjacent stator groups, and means for securing good electrical contact between each of said shielding plates and adjacent rotor groups, said means comprising a spring member disposed on each side of said shielding plate and firmly secured thereto at one spot to permit said spring members to be turned about said spot as an axis, each of said members having a bifurcated end embracing said shaft and pressing against a rotor surface.

3. A variable gang condenser comprising a base plate, a plurality of groups of stator plates insulatingly mounted thereon, rotor plates adapted to co-operate with said stator plates fixedly secured on a shaft, means for rotatively mounting said shaft on said base plate, a shielding plate between adjacent stator groups, a spring member on each side of said shield plate, means comprising an eyelet for securing said spring members to said shielding plates whereby said members may turn about said eyelet, each of said

members having a bifurcated end embracing said shaft.

4. A variable gang condenser comprising a base plate, a plurality of groups of stator plates insulatingly mounted thereon, rotor plates adapted to co-operate with said stator plates fixedly secured to a shaft, means for rotatively mounting said shaft on said base plate, shield plates between adjacent stator groups, a pair of spring members for each shield plate, one of said members being on either side of said plate, and an eyelet for securing said pair of members to said shield plate, each of said members having a bifurcated end embracing said shaft and a connecting terminal at the other end whereby each pair may be connected by a single wire.

MAHLON W. KENNEY.