Jan. 10, 1928.

1,655,877

H. P. PULLWITT

RADIO EQUIPMENT

Filed Sept. 25, 1923

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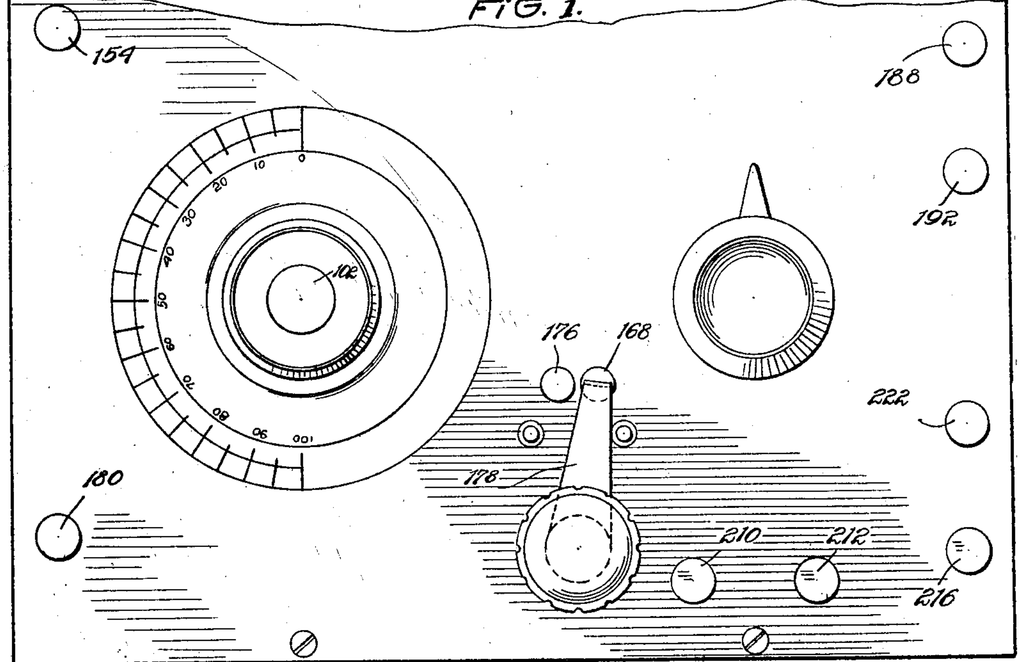
FIG. 1.



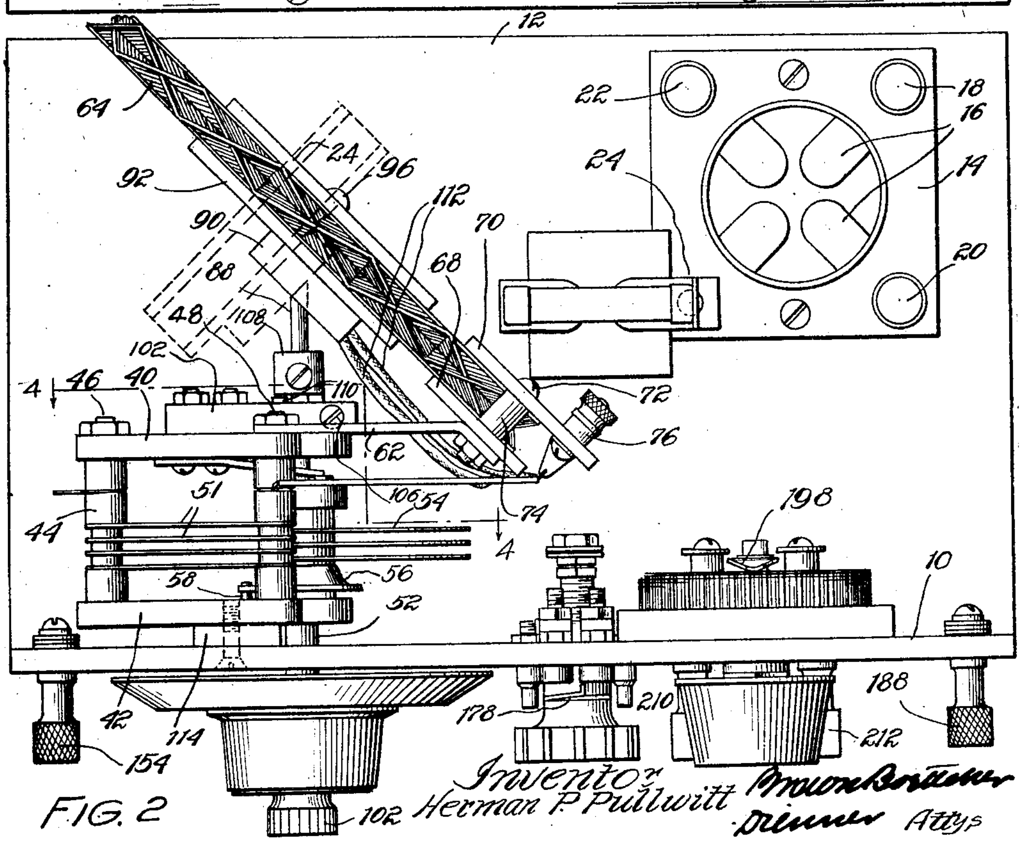


FIG. 2

Inventor
Herman P. Pullwitt

Brown Boettcher
Dienner Attys

H. P. PULLWITT

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Fig. 5.

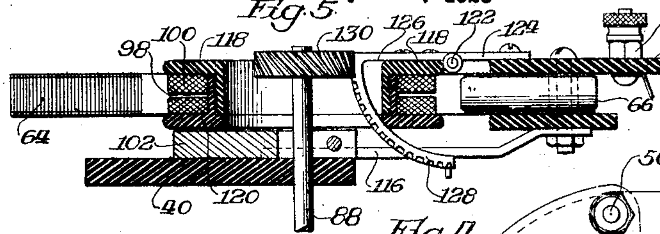


Fig. 4.

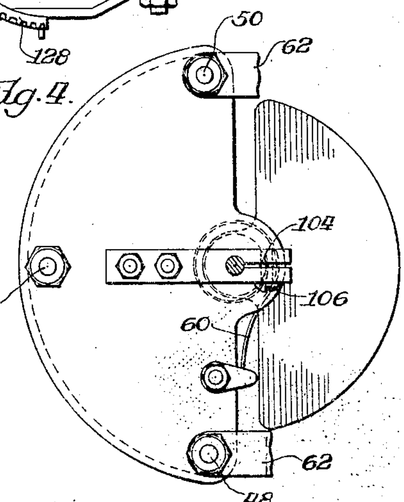


Fig. 3.

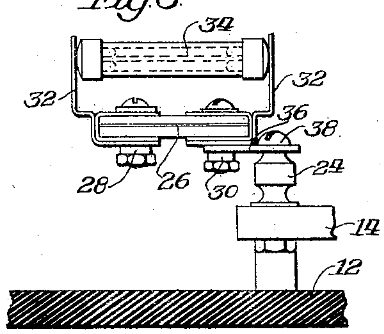


Fig. 6.

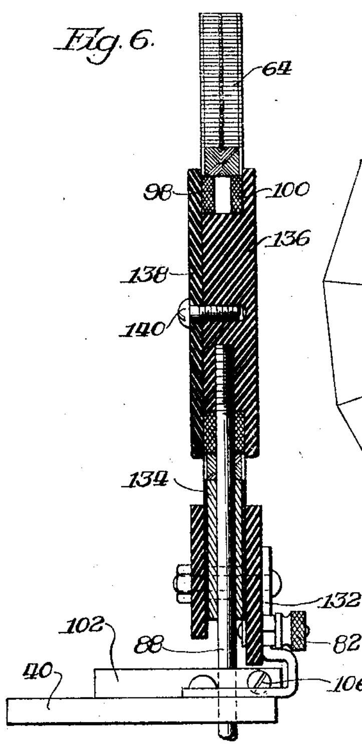
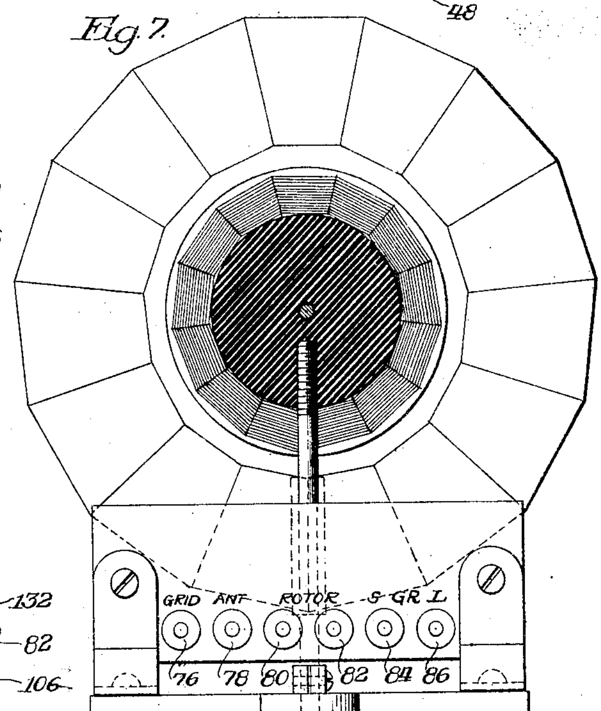


Fig. 7.



Inventor:
Herman P. Pullwitt.
By Brown Boettcher Dienner
Attys

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H. P. PULLWITT

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Fig. 8.

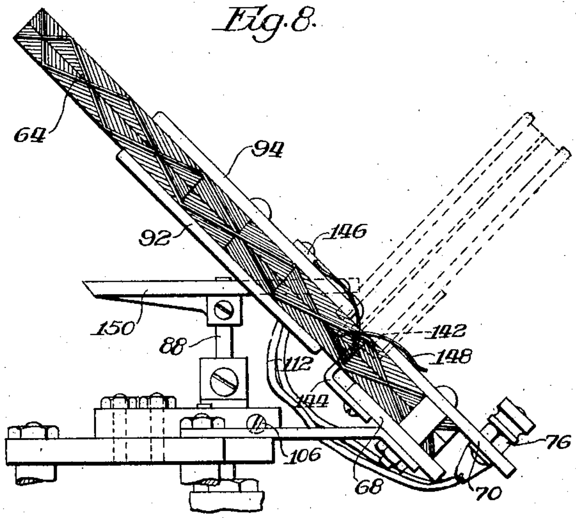
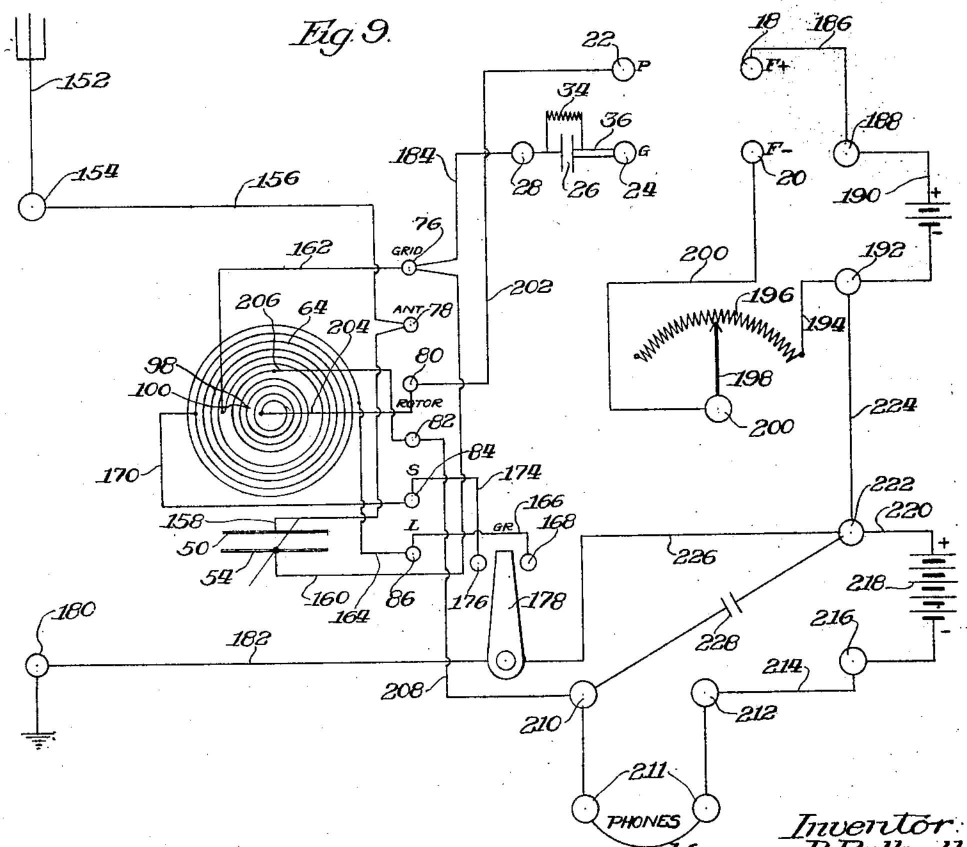


Fig. 9.



Inventor:
Herman P. Pullwitt.
By Brown Boettcher - Dienner
Attys.

Patented Jan. 10, 1928. 1,655,877

UNITED STATES PATENT OFFICE.

HERMAN P. PULLWITT, OF OAK PARK, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO JOHN H. NEWMAN, OF NEW YORK, N. Y.

RADIO EQUIPMENT.

Application filed September 25, 1923. Serial No. 664,763.

My invention relates broadly to a device used for tuning oscillatory circuits such as those used in radio communication, and for other purposes. One of the main objects is to provide a tuning device where the necessary parts required for tuning are securely fastened to each other forming an efficient arrangement for selective tuning with the least number of controls.

Another object is to provide a tuning arrangement having a large electromagnetic and a minimum electrostatic coupling with adjustment to vary the electromagnetic coupling.

Another object is to have a tuning arrangement that may be used for various tuning purposes without altering the construction of the same.

Another object is to provide a single tuning arrangement comprising the necessary parts for tuning oscillatory circuits, namely capacity, stationary and movable inductances with connecting terminals in the form of binding posts for solderless connections.

In the accompanying drawings:

Figure 1 is a front elevation and Fig. 2 a plan view of a set according to the invention;

Fig. 3 is an enlarged side elevation of the grid condenser and its support;

Fig. 4 is a section on line 4—4 of Fig. 2;

Fig. 5 is a partial horizontal section on the condenser axis, of a modified form of construction;

Fig. 6 is a similar section of another modified construction;

Fig. 7 is a side elevation of the parts shown in Fig. 6;

Fig. 8 is a plan view of still another modification; and

Fig. 9 is a wiring diagram.

In the embodiment of the invention selected for illustration, the set comprises the usual front panel 10 and baseboard 12 on which the various parts of the set are mounted. A standard tube socket 14 having contact fingers 16 for the terminals of the tube and binding posts 18 and 20 for the filament, 22 for the plate and 24 for the grid. The grid condenser 26 is provided with spaced binding posts 28 and 30, each binding post supporting a bracket 32. The grid leak 34 is supported by these brackets and also electrically connected in shunt across the condenser.

Most of the sets at present in use are rather sensitive and apt to have their adjustment disturbed by the changes in capacity due to slight physical displacement of the grid condenser. Binding post 30 fastens the condenser and leak both rigidly on a supporting strip 36, which strip is in turn rigidly fastened on terminal 24 by fastening screw 38. In this way the grid condenser is made a rigid portion of the tube socket assembly, and moving or jarring the set in use will not shift its position and destroy the adjustment of the same.

The condenser employed is of standard construction, and, per se forms no part of my present invention. It comprises, briefly, the spaced insulating plates 40 and 42 separated by suitable sleeves 44 on three fastening bolts 46, 48 and 50, which bolts, together with the plates 40 and 42 constitute a rigid frame. A plurality of fixed plates 51 are telescoped on the bolts, with the necessary spacing sleeves. The plates support a tubular axle 52 carrying the movable condenser plate 54, and the stop plate 56 having suitable notches to engage the stop pin 58. Electrical connection to the movable plate is through the usual pigtail 60.

According to the invention, brackets 62 are mounted on the ends of bolts 48 and 50 to support the main inductance 64, herein illustrated as a flat annular coil. The coil shown is wound on a set of radial plugs projecting like the spokes of a wheel from a central hub. The wire is laid across the plane of the wheel between spokes only in each alternate opening, and the use of an odd number of spokes alternates the crossings on successive terms. In this way sections of wire lying parallel at either face of the coil are separated by the thickness of one wire, and the slanting portions are also spaced, so that a minimum of capacity between the windings results. Such coils are old and well known in the art as spider web or diamond wound coils, and per se form no part of the present invention.

I have also eliminated any large flat plate of dielectric, thereby further reducing the capacity effect. A filling pin 66 is inserted in one of the radial openings of the coil, and the gripping plates 68 and 70 are drawn snug against the outer faces of the coil by bolts 72 passing through the plate and intermediate spacer sleeves 74, to engage the end of brackets 62. The filling pin 66 prevents the clamping plate from collapsing the coils, and makes it possible to draw them tight enough to provide a firm clamping action. These plates cover only a small fraction of the face of the coil, as clearly indicated in Fig. 7.

Plate 70 is wider than plate 68, and its projecting edge carries six binding posts, 76, 78, 80, 82, 84 and 86.

In the modification illustrated in Figure 2, a shaft 88 telescopes in sleeve 52 and at its end enters a suitable attachment block 90 to which plates 92 and 94 are attached by a suitable bolt 96. Between the plates, (see Fig. 6) are two small annular diamond wound coils 98 and 100. The use of two coils gives a specified inductance with less wire and less resistance and capacity than a single coil of the same number of turns and as nearly as possible the same dimensions, because if the axial dimension of the single coil were the same as the total axial dimensions of the two coils, the reaches of wire crossing between spokes would lie at a much greater angle and more wire would be wasted in crossing. It should also be noted that the two coils provide four planes of reticulated reaches of wire instead of two, and that no similarly wound coil could be made of the same size wire and the same number of turns without materially changing the radial dimension and sacrificing compactness.

Rotation of shaft 88 by means of finger piece 102 through 180° will rotate the coils into the position shown in dotted lines in Fig. 2. In the full line position, the main magnetic field of the coil 64 passes through coils 98 and 100, whereas in the dotted line position the coil stands edgeways to the lines of force. Friction block 102 is suitably slotted at 104 and may be adjusted by setscrew 106, (see Fig. 4) to grip shaft 88 with a light and constant friction to hold the parts in any adjusted position. A stop block 108 may be fastened on shaft 88 and partly cut away to provide shoulders to engage stop 110 and limit the rotation of shaft 88 to 180°.

Lead wires 112 from the rotor coils 98 and 100 run to binding posts 80 and 82 on plate 70. The entire unit, comprising the complete condenser, the complete main coil 64 and the complete rotor, may be made up in stock for use in assembling any one of a large variety of radio sets, and may be mounted on any suitable panel or baseboard by means of two fastening screws passing through spacer blocks 114.

Referring now to Figure 5, I have illustrated a much more compact arrangement of the parts than that shown in Figure 2. Brackets 116 support coil 64 perpendicular to the condenser axis, parallel to and close behind the plate 40. The holder for coils 98 and 100 is made annular, in telescoping sections 118 and 120. The hinge at 122 is supported by leaf 124 fastened on plate 70, and carries the leaf 126 fastened to section 118. From leaf 126 an arcuate gear sector 128 projects, meshing with gear 130 on shaft 88. The teeth of the gears are spiral, and the pitch of the teeth, and the relative diameters of the gear 130 and sector 128 are such that 180° rotation of shaft 88 will swing coils 98 and 100 through 90° around pintle 122.

Referring now to Figs. 6 and 7, I have illustrated a construction requiring no angular mounting or intermediate transmission. Brackets 132 are turned parallel to the plane of shaft 88, and support coil 64 in the plane of the condenser axis. Pin 66 is replaced by sleeve 134 which provides an extended bearing for shaft 88, which shaft threads directly into block 136 co-operating with cover plate 138 held in place by fastening screw 140 to properly support coils 98 and 100.

The form shown in Figure 8 has the advantage that the position stops for shaft 88 may be omitted if desired. In this construction the main coil 64 is mounted as in Figure 2, but the secondary coils 98 and 100 are pivoted about pintle 142 supported by leaf 144 fastened on plate 68. The other leaf 146 supports the plates 92 and 94, and a light spring 148 normally resiliently holds the secondary coil in the plane of the main coil 64. An eccentric 150 on shaft 88 rubs against the face of plate 92, and will move it to the dotted line position shown in Figure 8 against the force of spring 148 upon 180° rotation of shaft 88. Because leads 112 run from plate 92 to the binding post 80 and 82 and continuous rotation of shaft 88 merely oscillates the secondary coils from full line position to dotted line position and back again, the position stop for shaft 88 may be omitted if desired, and it is relatively out of the question to injure the adjustment of these parts by using too much force in turning shaft 88.

Referring now to Figure 9, one of the sets which can be made according to the invention, and one of the ways in which the set shown in Figures 1 and 2 can be wired, is as follows: From the antenna 152 connection is made to binding post 154, and from there through wire 156 to binding post 78. From binding post 78, wire 158 runs to the fixed condenser plates 50. From the movable condenser plate 54 wire 160 runs to the grid binding post 76. Following the antenna circuit we have wire 162 to the inner terminal of main coil 64. From the outer terminal wire 164 runs to binding post 86 and wire 166 connects binding post 86 with a contact 168, which is grounded when receiving the longer wave lengths. For the shorter wave lengths wire 170 leads from an intermediate step of coil 64 to binding post 84, and wire 174 connects this binding post with contact 176. Finger 178 may engage either contact 168 or 176 to connect the same to the ground binding post 180 through wire 182. Contacts 176 and 168, as well as finger 178 are provided with suitable binding post connections for the wires leading to them.

The grid connection is from binding post 76 through wire 184 to binding post 28. The connections beyond this point to the grid binding post 24 on the tube socket have already been described.

The filament circuit runs from binding post 18 through wire 186, binding post 188, A battery 190, binding post 192, and wire 194 to the controlling resistance 196 which is a standard unit carrying the movable finger 198 and binding post 200 connected through wire 202 to the other filament terminal 20. The plate circuit runs from terminal 22 through wire 202, to binding post 80, wire 204 to the inner terminal of the secondary 98—100, from the outer terminal through wire 206, to binding post 82 and through wire 208 to binding post 210. Telephones 211 are connected between binding posts 210 and 212. Wire 214 connects to binding post 216 and with B battery 218 connected by wire 220 with binding post 222, from which wire 224 runs to binding post 192 completing the circuit. Binding post 222 is also grounded through wire 226 running to finger 178, and the by-pass condenser 228 is connected between binding posts 210 and 222 to bridge both the phones and B battery.

The setting of the coils at the angle to the plane of the panel, as shown in Fig. 2 of the drawings, also positions the flux of each of a series of coils to secure a minimum of interference or interconnection between the successive units, and also facilitates arranging the wiring necessary for connecting each unit to adjacent parts to secure a minimum of magnetic interlinkage. It should also be noted that if the coils were parallel to the panel, or set at an angle to the horizontal instead of the vertical, the dimensions of each unit parallel to the panel would be seriously increased.

Without further elaboration, the foregoing will so fully explain the gist of my invention, that others may, by applying current knowledge, readily adapt the same for use under various conditions of service. It will, for instance, be obvious that any number of coils such as 98 from one up may be employed to give the proper value of inductance, if desired. These and many other modifications and alterations may readily be made without eliminating certain features which may properly be said to constitute the essential items of novelty involved, which items are intended to be defined and secured to me by the following claims.

I claim:—

1. In a tuning arrangement, in combination, a variable condenser, bracket means thereon, terminal board means carried by said bracket means, an annular flat inductance carried by said terminal board means, a movable inductance mounted on said condenser in the center of said first mentioned inductance, and a shaft telescoped at the axis of said condenser for supporting said movable inductance.

2. In combination, in a tuning arrangement, a condenser including a shaft, a flat inductance coil positioned in a plane at an angle to the plane of the condenser, means associated with the condenser shaft for rotating the said coil, a terminal board mounted on the condenser, and a second flat inductance coil positioned in one of the planes into which said movable inductance can be moved and mounted on the said terminal board.

In witness whereof, I hereunto subscribe my name this 24th day of September, 1923.

HERMAN P. PULLWITT.