Feb. 14, 1933. R. H. LANGLEY 1,897,312

RADIO TUNING METHOD

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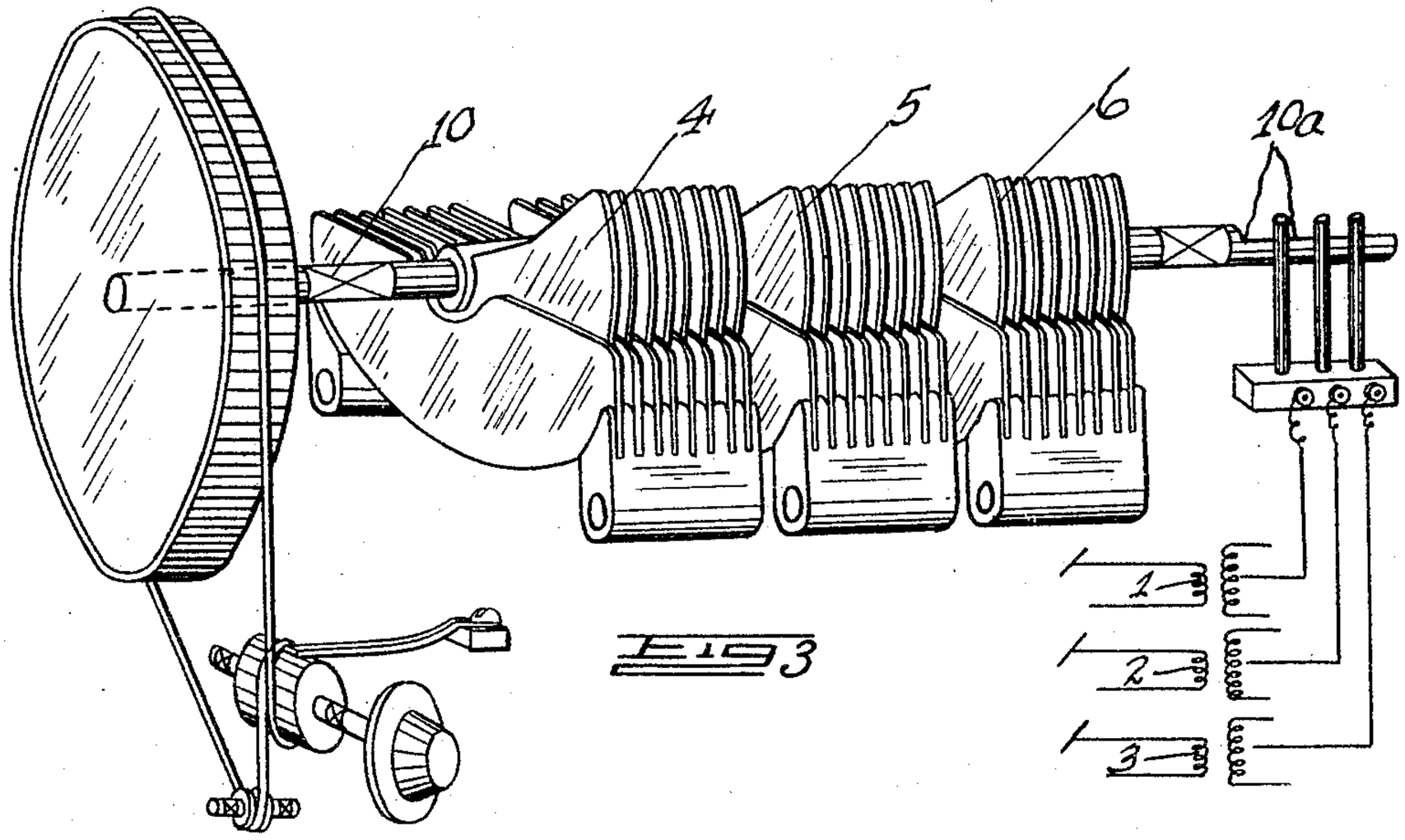

FIG 3

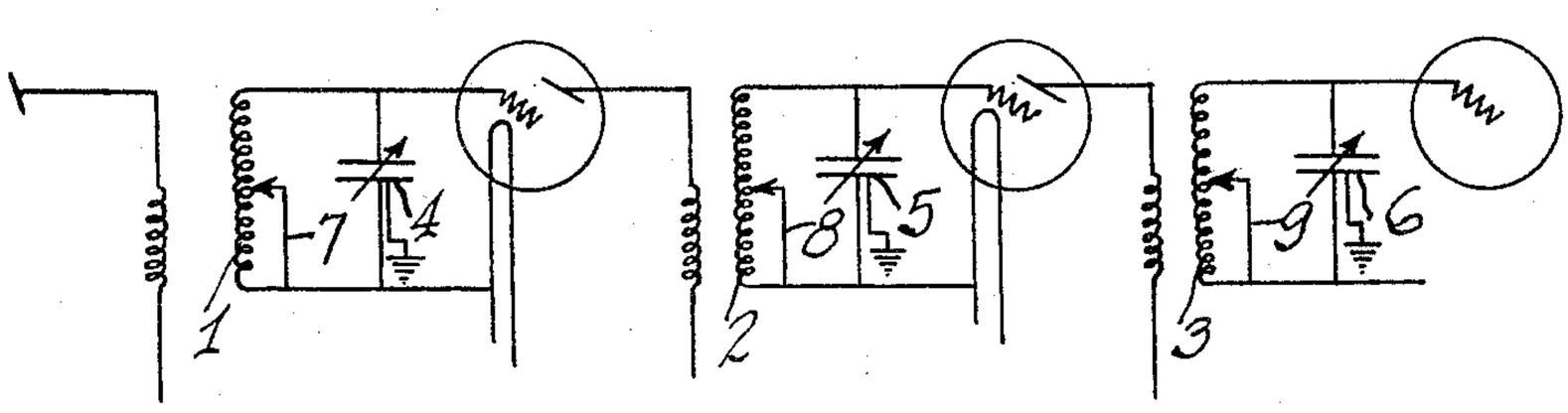

FIG 1

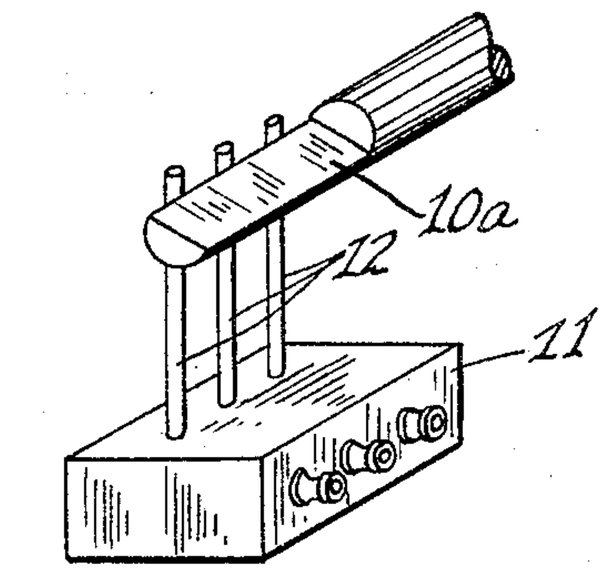

FIG 2

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UNITED STATES PATENT OFFICE

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RADIO TUNING METHOD

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This invention has to do with methods for tuning radio frequency circuits over the broadcast range and more particularly with a method which produces results superior to those obtained in the usual arrangement.

One object of my invention is to produce a system of tuned circuits which will cover the broadcast range of frequencies and yet is materially less expensive than the usual arrangement.

Another object of my invention is to produce an arrangement which will increase the sensitivity on the low frequency portion of the range and at the same time materially increase the selectivity on the high frequency portion of the range.

A further advantage of the invention which results from those just mentioned is that it produces a considerably greater degree of uniformity of both the selectivity and amplification than can be obtained in the usual arrangement.

A still further object of the invention is to materially decrease the difficulty of keeping the amplifying system free from oscillations, thus avoiding the provision of means of neutralization for the system.

A still further advantage of the invention is that it gives a 360° scale on the tuning control, instead of the usual 180 degrees, and in addition makes the scale divisions very much more uniform in size when the indicator is calibrated in frequencies or by broadcast channels.

In the usual tuned radio frequency broadcast receiver, a single condenser is used to tune the grid circuit of each of the radio frequency amplifying tubes throughout the broadcast range or from 550 k.c. to 1500 k.c. This has the disadvantage that the primary of the coupling transformer, if it is made sufficiently large to give good amplification at low frequencies, will result in oscillation at the higher frequencies. Since this oscillation must be avoided, the primaries are not made very large and the sensitivity of broadcast receivers is therefore many times as good at the high frequencies as it is at the low, and the selectivity is much better at the low frequencies than at the high frequencies.

The stabilizing means or neutralization in such a receiver must be sufficient to prevent oscillations with the particular primary used, the size of which is a compromise at the best. Several electrical methods have been proposed for increasing the uniformity of the selectivity of broadcast receivers throughout the range, but while these approach the desired results, they are inherently more expensive than the simple arrangement of my invention.

A variable air condenser, having semi-circular rotor plates can be rotated continuously if the stops are removed. Starting at a point where the rotor plates are not meshed with the stator plates, the first 180° of rotation (in either direction) carries the condenser from a condition of minimum capacity to a condition of maximum capacity. The next 180° of rotation in the same direction takes the condenser from its maximum capacity back to its minimum capacity. If, at the point between the first 180° of rotation and the second 180° of rotation, the inductance of the associated secondary coil could be appropriately reduced, this will result in lessening the inductance of the transformer at the higher frequencies when the capacity of the condensers is greatest, thus eliminating the undesirable oscillation and permitting the use of primaries of sufficient turns to give proper amplification at low frequencies.

The secondaries of the interstage transformer are arranged with a tap at each appropriate point which is brought out to a contact, which is grounded by a switching mechanism driven by the tuning condenser and actuated at the point between the first and second half of the 360° rotation.

In the drawing:—

Figure 1 is a diagram illustrating in simple form the arrangement of radio frequency amplifying circuits of a broadcast receiver.

Figure 2 is a perspective detail illustrating one type of switch mechanism.

Figure 3 is a view of a condenser gang illustrating an arrangement of my invention, partially in diagram.

I have indicated the interstage coupling transformers at 1, 2, and 3, and the tuning

condensers for each stage at 4, 5, and 6. The taps from the secondaries of the transformers are shown at 7, 8, and 9.

Referring to Figure 3, it will be noted that the rotor shaft 10, of the condensers 4, 5, and 6, is provided with an end, which is cut off to half cylindrical shape as at 10*a*. A suitable dielectric base 11, is provided with three pins, or brushes 12, which will engage the end 10*a*, during half of its revolution, but will be out of engagement during the remainder of its revolution.

The condensers used in such an arrangement may be of approximately one third the capacity that is required to tune through the broadcast range when a single coil is used.

The arrangement will be such that with the condenser at maximum capacity, and the coil at full inductance in each stage of amplification, the tuning will be at approximately 550 kilocycles. With the capacity at the minimum and the inductance at the maximum, the tuning will be to around 900 kilocycles. With the condenser at the maximum capacity and the inductance at approximately half, the tuning will still remain at approximately 900 kilocycles, and finally with the capacity at the minimum and the inductance at approximately half, the tuning will be at 1500 kilocycles.

The amplification or sensitivity at the lower end of the range, will be quite satisfactory, the stability and selectivity at the higher end of the range will be excellent, in the arrangement shown.

The exact location of the grounding connection on the several transformer secondaries will be determined for the receivers to give the result of equal amplification from 550 k.c. to 1500 k.c., without danger of serious oscillations. It should also be noted that, a better ratio of inductance to capacity is maintained in the upper range, thus providing for better selectivity over this range, than is practical in receivers in which the transformers are the same at all times.

It is apparent that the mechanical arrangement shown can be variously modified to accomplish the results set forth.

Having thus described an embodiment of my invention, and set forth the advantages inherent therein, what I claim as new and desire to secure by Letters Patent is:

1. In a broadcast receiver, a series of amplifying stages for radio frequency, transformers coupling said stages, said stages having ground connections, tuning condensers for said stages operated from a common shaft, and means mechanically operated with the movement of the condenser rotors for grounding a portion of the secondaries of the transformers, said means comprising a portion of said shaft forming a switch portion, cut away over half its circumference, and brushes bearing on said shaft.

2. In a radio receiver, a vacuum tube circuit including a ground connection and an input transformer, and a tuning condenser, and means operated with the condenser rotor for grounding a portion of the transformer secondary, said means comprising a portion of said shaft forming a switch portion, cut away over half its circumference, and brushes bearing on said shaft.

3. In a radio receiver, a plurality of vacuum tube circuits each comprising a tapped input transformer and a tuning condenser, the condensers for the several circuits operated by a common rotor shaft, an extension on said shaft to serve as a contact drum, said drum cut away in part to provide a non-contact portion, and a plurality of brushes connected to the taps of the several transformers respectively and arranged to contact said drum.

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