

Dec. 1, 1936.

McMURDO SILVER

2,062,379

RADIO RECEIVER

Filed Nov. 30, 1934

2 Sheets-Sheet 1

Fig. 1.

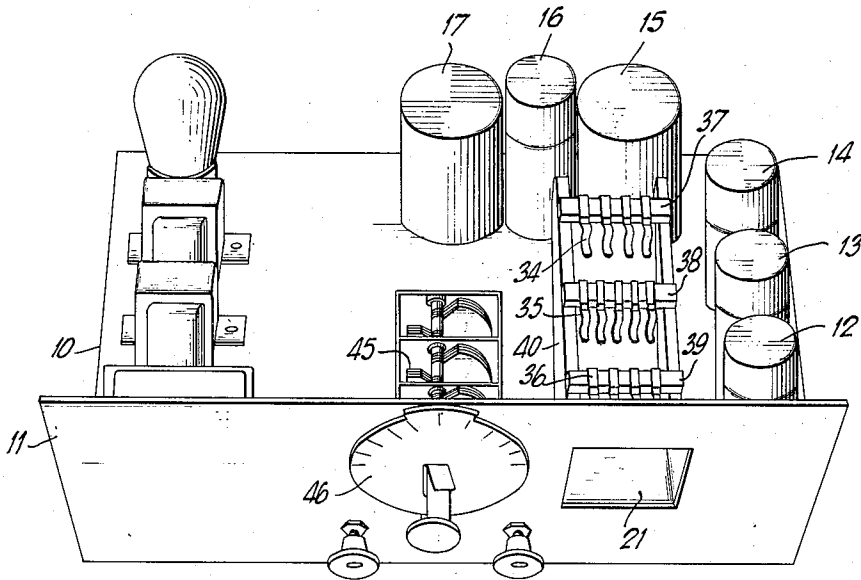


Fig. 2.

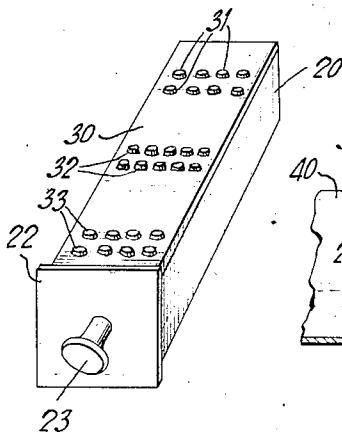
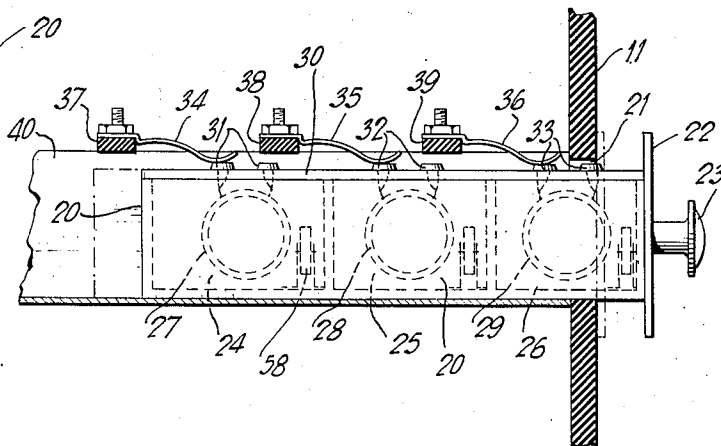


Fig. 3.



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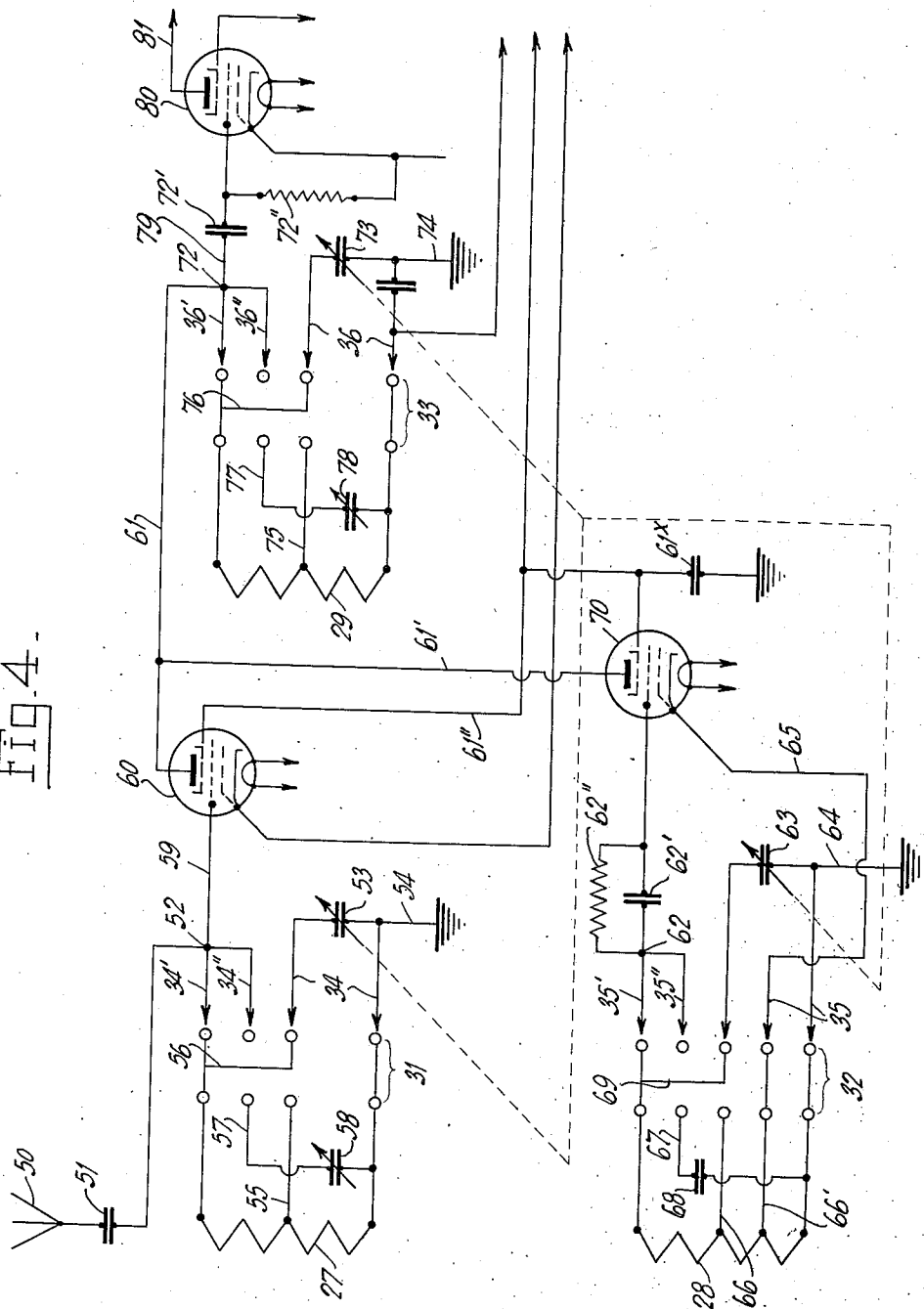
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FIG. 4



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RADIO RECEIVER

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6 Claims. (Cl. 250—20)

This invention relates to radio receivers which are arranged to be responsive to a plurality of bands of radio wave lengths and particularly to radio receivers in which the parts are compactly arranged and movable parts are employed to effect a change from a given band to a portion thereof for normal movement of the tuning agent.

The invention has for its object generally an improved construction and arrangement of circuit elements in radio receivers of the character indicated whereby the desired change in reception of a band of wave lengths is achieved in all associated circuits by a minor movement of the incorporated elements without the use of separable parts that are liable to become lost or otherwise interfered with, thereby providing a single receiver useful over wider and narrower ranges of frequencies respectively.

Another and more specific object is to provide a radio receiver with means for effecting a quick change from one set of circuit elements in multiple or cascade to another, such as a change in the set of inductances connected in the radio amplifying stages, by mechanically associating the parts to be changed, so as to effect a change from full band to so-called "band spread" tuning, and vice versa, by one movement. The use of separate sets of plug-in coils in such stages, as was heretofore provided for each band of wave lengths that it was desired to pick up and required to be individually inserted and removed when a change in wave length band was desired, is thus avoided.

In the practice of the present invention, a set of parts to be changed, such as a set of inductances, is disposed in a suitable mechanical assembly, with or without shielding, in a manner capable of movement through a limited path into a plurality of positions corresponding in number to that of the full band of frequencies together with one or more sections thereof to be picked up. A convenient form of assembly comprises a container provided with compartments for each part or coil of the set. The container thus provided is adapted to be moved as a unit and for this purpose is arranged to slide in a suitable recess or socket provided in the receiver and through which the assembly is moved as a unit in order to effect simultaneous switching of the terminals from one set of inductances or their connections to another when desired. By means of such assembly one entire group of coils may be moved by a single operation preferably through the front panel or other convenient part and to permit the full band or a desired portion thereof being covered at will by the full movement of the tuning agent by vir-

tue of change of connections effected by a minor movement of the inductance assembly in the socket.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts, which will be exemplified in the construction hereinafter set forth and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description, taken in connection with the accompanying drawings, in which:

Fig. 1 is a perspective view of a radio receiving set having a movable coil assembly provided in accordance with the invention;

Fig. 2 is a perspective view of the casing housing the coil assembly removed from the receiver of Fig. 1;

Fig. 3 is a side elevation, parts being broken away, further illustrating the coil assembly shown in Fig. 2; and

Fig. 4 is a diagrammatic view showing a typical wiring arrangement employed in receivers of type shown in Fig. 1.

Referring now to the drawings, and particularly to Figs. 1 and 2, 10 denotes the chassis of a portable radio receiver which supports a front panel 11 and has associated with it a plurality of suitable stages of amplification conveniently arranged. In the arrangement shown, an oscillating stage is included with the radio and first detector amplifying stages to provide a beat frequency in the manner well known in the so-called superheterodyne receivers. Thermionic tubes are employed in such stages, the tube of the first stage of radio frequency being shown at 12 on the chassis 10. An oscillating tube is shown adjacently disposed at 13 and a first detector is shown at 14. A shielding housing is shown at 15 for the inductance of the first stage of intermediate frequency and a tube therefor at 16. Another stage of intermediate frequency is also indicated as provided with a shielding housing for its inductance at 17. It will be understood that any convenient number of stages of audio and intermediate frequency may be provided in the receiver shown, and the reference to "radio and audio amplifying stages" will be understood to include stages of intermediate frequencies when employed.

The unitary assembly for the parts to be

changed, here shown as a set of coils for the radio, oscillating, and first detecting stages, comprises a rectangular casing 20 arranged to provide three compartments in which the set of coils are separately housed, and shielded when desired; the stages mentioned being merely an illustrative selection of stages in which it is desired to effect circuit changes. The casing 20 is arranged to be inserted through an opening 21 formed in the panel 11 at a convenient point, for example, adjacent to the tubes 12, 13 and 14. A plaque 22 and a knob 23 are associated with the end of the casing 20 that protrudes through the opening 21. The compartments provided are shown at 24, 25 and 26, and have respectively disposed therein the coils 27, 28 and 29, which are in the radio, oscillator, and first detecting stages. The casing also has a cover 30 of suitable material, such as insulation, which protects the coils when in place in the compartments. Protruding from and preferably supported by the cover 30 are groups of terminal contacts for each of the coils; one group of contacts 31 is shown at the end of the casing for the coil 27; a similar group being shown at 32 for the coil 28; and a group 33 for the coil 29. These contacts are arranged to engage selectively with resilient contact fingers that are stationarily mounted in the receiver above the casing 20 and disposed so as to contact with predetermined ones of each group of contacts when the casing 20 has been inserted through the opening 21 and rests in one of the plurality of positions in which it is intended to operate. A group of fingers adapted for this purpose is shown at 34 in Figs. 1 and 3, which engage with one row of the two-row group of contacts at 31. A second group of contact fingers 35 engage with one row of the group of contacts 32, and a third group of contact fingers 36 engage with one row of the group of contacts 33, these contact fingers being secured to suitable supports such as cross rods of insulation shown respectively at 37, 38 and 39, that are supported by side frames 40, mounted on the chassis 10. Such frames also serve as guides for constraining the movement of casing 20 to "straightline" motion in the recess or socket provided in the receiver. While two-row groups of contacts are here illustrated and provide two operative positions to which the coil assembly may be moved, it will be understood that other arrangements may be used and more than two rows may be employed, the number of rows corresponding to the number of operative positions that it is desired to provide.

The receiving system has a main tuning element for the set of circuits whose receptivity is to be changed. For the set of coils in the casing 20, this main tuning element advantageously comprises a set of adjustable capacitances arranged for simultaneous adjustment. To this end a gang condenser is preferably employed and such is shown on the chassis at 45. The component condensers (shown at 53, 63 and 73 in Fig. 4) of the gang are connected respectively in the circuits of each of the coils in the compartments and are actuated by a dial 46 on the front of the panel 11. In this manner, full rotation of the main tuning element at 45 may be had over the full frequency range or a desired portion thereof depending upon which of the coil positions is employed, while connections of the coil assembly for the desired frequency range is maintained by the position of coil and casing 20 in socket 43.

Additional adjustable capacitance, for example, auxiliary condensers, such as shown at 58, 68 and

78, are associated with the coils preferably in each of the compartments 24, 25 and 26, the adjustment being advantageously effected through apertures in cover 30. In the wiring arrangement shown in Fig. 4, the auxiliary condensers are indicated as connected across a pair of contacts in the left-hand row in each group carried by the casing, one of which is connected to the ground end of the coil. It is thus made possible by a relatively small movement of the entire coil assembly in its socket to shift from one row of contacts to another and change the circuit connections in the radio receiver so that the same coil assembly will cover a plurality of ranges, for example, a 2-to-1 and a 1.2-to-1 frequency range for "band spread" tuning.

In Fig. 4, a typical receiver circuit having an arrangement of coils and terminal contacts for connecting with external circuit elements is shown whereby the coil assembly in the casing 20 may be moved to either one of two positions and effect the desired change in frequency range to which the receiving set is to be made responsive. Here, an antenna connection 50 is connected in series with a condenser 51 and thence in series with the common terminal 52 for a pair of contact fingers 34' and 34'' of the group depicted in Figs. 1 and 3 at 34. The two remaining contact fingers of this group are shown as connected to the terminals at each side of the main condenser element 53, one of which terminals is connected to ground through conductor 54.

Contacts 31 are here depicted as two parallel rows of four, the pair at either end being connected together and connected to the terminals at the ends of the coil 27. A midpoint of coil 27 is shown as connected by the conductor 55 to a contact in the left-hand row of the group 31. The corresponding terminal in the right-hand row is shown as connected by a conductor 56 to the pair of contacts which connect with the antenna end of the coil 27. The remaining contact in the left-hand row is shown as having a conductor 57 leading to one terminal of the adjustable auxiliary condenser 58, the other terminal of which is connected to the pair of contacts in group 31 that are connected to the ground end of coil 27. From the terminal 52 a conductor 59 leads to the grid of a tube which in the arrangement shown is the first stage of radio amplification and corresponds to the tube in Fig. 1 shown at 12. This tube may be of any suitable type, a pentode being here shown at 60 as a suitable tube for a system where it is desired to obtain a relatively large ratio of amplification with a relatively small number of tubes.

A conductor 61 leads from the plate of the pentode 60 for connection with a common terminal 72 of a pair of fingers 35' and 35'' in the group 35. The two remaining fingers of this group are shown as connected to the terminals at each side of the main condenser element 73, one of which terminals is connected to ground through conductor 74.

The contacts 33 which connect the parts of coil 29 of the first detector in circuit comprise the group which cooperates with the group of fingers 36, these contacts being shown as connected in the same manner as those at 31, the pair at either end being connected together and connected to the terminals at the ends of coil 29. A midpoint of coil 29 is connected by a conductor 75 to a contact in the left-hand row of the group 33. The corresponding terminal in the right-hand row is shown as connected by a conductor

76 to the pair of contacts which connect with the plate end of coil 29. The remaining contact in the left-hand row has a conductor 77 leading to one terminal of the adjustable auxiliary condenser 78, the other terminal of which is connected to the ground end of coil 29. From terminal 72 a conductor 79 leads to the grid element of the first detector tube, a grid condenser 72' shunted by a suitable grid leak resistance 72'' being preferably interposed. The detector tube is shown at 14 in Fig. 1, but is depicted as a pentode 80 in Fig. 4. A conductor 81 leads from the plate of this tube for connection to succeeding stages of amplification, the showing of which has been omitted from Fig. 4 in the interest of clearness of illustration since none of the circuit elements thereof are involved in the movable coil assembly.

The oscillator shown in Fig. 1 as at 13 is depicted in Fig. 4 as a pentode 70, the plate of which is connected to conductor 61 by a conductor 61'. Conductor 61'' connects similar auxiliary electrodes of the pentodes 60 and 70, a desired potential being preferably impressed upon conductor 61'' from a suitable source of E. M. F. such as a pole of a B-supply. This conductor is preferably shunted to ground through a fixed condenser 61'x.

The oscillating circuit for the oscillator 70 includes coil 28, the parts of which have the circuit connections changed with the change in connections previously described, since in this manner the range of the beat frequency in the amplifying stages may be kept substantially uniform, separated for whatever band of frequencies is selected by movement of the coil assembly. Associated with the coil 28 are contacts 32 which engage with the group of fingers 35, which are shown as a group of five, two of which denoted 35' and 35'' are connected with the common terminal 62 that is connected to the grid of pentode 70 preferably through a grid condenser 62' when shunted by a suitable grid leak resistance 62''. Two of the remaining fingers are connected respectively to the terminals of the main condenser element 63, one terminal being connected to ground through conductor 64. The fifth finger is connected by a conductor 65 to the cathode of the pentode 70.

The contacts 32 comprise two parallel rows of five, the pair at either end being connected together and connected to the terminals at the ends of coil 28. A midpoint of coil 28 is connected by a conductor 66 to a contact in the left-hand row of contacts 32. A tap from another point of coil 28 has a conductor 66' leading to the pair of contacts which engage with the extra finger connected to conductor 65. The other contact in the left-hand row is shown as having a conductor 67 leading to one terminal of the adjustable auxiliary condenser 68, the other terminal of which is connected to the pair of contacts connected to the ground end of coil 28. A conductor 69 leads from the contact in the right-hand row, corresponding from the one in the left-hand row connected to the midpoint of coil 28, to the pair of contacts which connect with the grid end of coil 28.

In operation, the assembly in the casing 20 is such that in one operative position the set of fingers 34, 35 and 36 engage with all of the rows in the contact groups which are here shown at the right but in practice may be the front rows, while in a second operative position, these fingers engage with all the other rows which are here

shown as left-hand rows and in practice may be rear rows. In the first position, it is seen that the coils have the whole of their windings in series to receive incoming radio energy, with the common electrodes 52, 62 and 72 and with ground, the main condensers being connected in parallel therewith to ground, thereby accommodating the tuning to a range of frequencies in one band.

Another range is attained by grasping the knob 23 and shifting the casing 20 to the second operative position, the set of fingers being thereby made to engage with the several rows of contacts shown on the left. In such position, the coils 27, 28 and 29 are still in series with the common electrodes and with ground. In this position, the auxiliary condensers, instead of the main condensers, are connected in parallel with the coils to ground. The connections of the main condensers are, however, made to the midpoints of the coils thereby changing the values of the inductances and capacitances in the circuits so as to accommodate tuning to a narrower band of frequencies than covered by the range of the first coil position.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An amplifying system adapted for use in radio receivers, comprising, in combination, a selected set of stages each having removable inductive windings, a tuning agent having variable elements of capacitance associated individually with said removable windings, said removable windings being provided with terminal contacts disposed in sets of groups, the number of groups in a set corresponding to a predetermined number of desired operative positions of said removable windings, one group of each set of terminal contacts providing for the connection of an element of capacitance with the whole of the associated inductive winding, another group of each set providing for the connection of said element of capacitance with a part of said associated inductive winding, a set of stationary contact members disposed to make contact selectively with a set of groups, and means for mounting said set of removable windings to be movable as a unit into one or another of said operative positions whereby said windings may be moved at will from a position for tuning by full movement of said tuning agent over a full band of selected frequencies or only a desired portion thereof.

2. An amplifying system adapted for use in radio receivers, comprising, in combination, a selected set of stages each having removable inductive windings, a tuning agent having variable elements of capacitance associated individually with said removable windings, said removable windings being provided with terminal contacts disposed in sets of groups, the number of groups in a set corresponding to a predetermined number of desired operative positions of said removable windings, one group of each set of terminal contacts providing for the connection of an element of capacitance in shunt with the whole of the associated removable winding, another group of each set providing for the connection of said

element of capacitance in shunt with a part of said associated removable winding, a set of stationary contact members disposed to make contact selectively with a set of groups, and a movable casing for mounting and housing said set of removable windings and arranged to support said set of groups of terminal contacts in a manner such that when moved into one or another of desired operative positions the full windings or desired portions only thereof are employed.

3. An amplifying system adapted for use in radio receivers, comprising, in combination, a selected set of stages each having removable inductive windings, a tuning agent having variable elements of capacitance associated individually with said removable windings, said removable windings being provided with terminal contacts disposed in sets of groups, the number of groups in a set corresponding to a predetermined number of desired operative positions of said removable windings, one group of each set of terminal contacts providing for the connection of an element of capacitance in shunt with the whole of the associated removable winding, another group of each set providing for the connection of said element of capacitance in shunt with a part of said associated removable winding, a set of stationary contact members disposed to make contact selectively with a set of groups, and a slidable housing provided with a set of shielding compartments adapted to house the individual windings composing said set of removable windings and provided with a cover affording support for said sets of groups of terminal contacts; the arrangement being such that when said casing is moved from one operative position to another the tuning range is changed at will from that of the full band for a full movement of the tuning agent to provide band spread tuning or vice versa.

4. An amplifying system adapted for use in radio receivers, comprising, in combination, a selected set of stages each having removable inductive windings, a tuning agent having variable elements of capacitance associated individually with said removable windings, said removable windings being provided with terminal contacts disposed in sets of groups, the number of groups in a set corresponding to a predetermined number of desired operative positions of said removable windings, one group of each set of terminal contacts providing for the connection of an element of capacitance in shunt with the whole of the associated removable winding, another group of each set providing for the connection of such element of capacitance in shunt with a part only of said associated removable winding while an additional element of capacitance is connected in shunt, a set of stationary contact members disposed to make contact selectively with a set of groups, and a unitary assembly of a set of shielding compartments mounted for rectilinear movement from one to another of the predeter-

mined desired operating positions, said compartments individually housing one of said removable windings and corresponding in number to the number of removable windings in said set thereof and provided with an insulating covering affording support for said sets of groups of terminal contacts; the arrangement of said assembly being such that a minor movement thereof shifts the set of windings to change the connection in all of said circuits simultaneously from a tuning range for a full swing of said tuning agent over a full band to a tuning range for a full swing of said tuning agent confined to a desired portion of the band and vice versa.

5. An amplifying system adapted for use in radio receivers comprising, in combination, a plurality of amplifying stages disposed in operative relation, each having variable inductive windings, a set of ganged variable elements of capacitance in variable association with each of said variable inductive windings, switching means associated with each of said ganged variable capacitance elements for connecting the same alternately either in shunt with the whole of its associated variable inductive windings or in shunt with a part only, a set of manually adjustable elements of capacitance associated with said variable inductive windings and arranged to be connected in shunt thereto by said switching means only when said ganged variable elements of capacitance are connected in shunt with a part only of said variable inductive windings, and means for actuating said switching means simultaneously throughout said amplifying stages for changing from said first-named shunt connections to said second-named shunt connections and vice versa.

6. An amplifying system adapted for use in radio receivers, comprising, in combination, a selected set of stages each having a desired amount of inductive windings, a tuning agent having variable elements of capacitance associated individually with said windings, said windings being provided with terminal contacts disposed in sets of groups, the number of groups in a set corresponding to a predetermined number of desired operative positions into which said windings may be moved, one group of each set of terminal contacts providing for the connection of an element of capacitance in shunt with the associated winding, a set of stationary contact members disposed to make contact selectively with a set of groups, and movable means for mounting said windings and associated capacitances as a unit and provided with a set of shielded compartments, each adapted to house one of said windings composing said set and having supports for said sets of groups of terminal contacts; the arrangement being such that when said unit is moved from one operative position to another the tuning range is changed.

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