

April 13, 1937.

H. D. WILSON, JR

2,077,160

RADIO TRANSMITTER

Filed July 14, 1934

5 Sheets-Sheet 1

FIG. 1

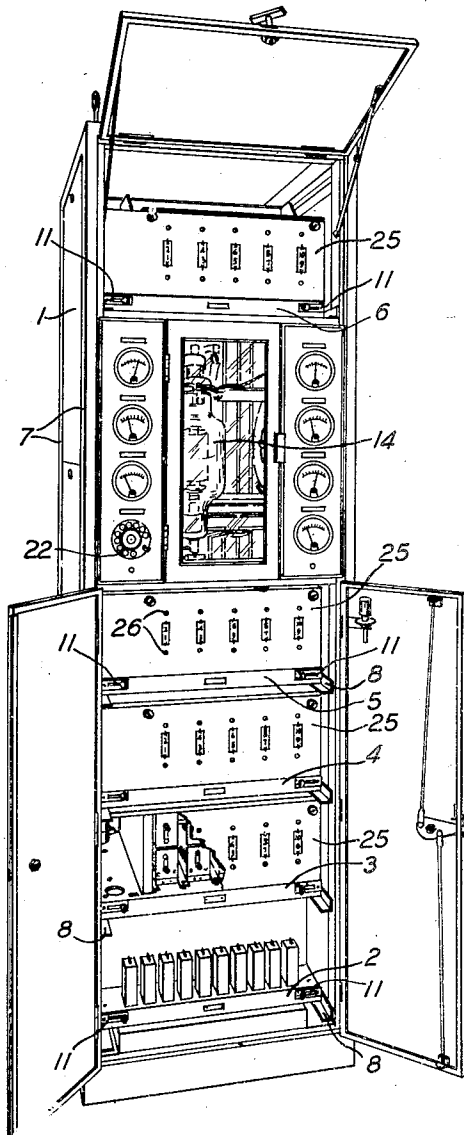
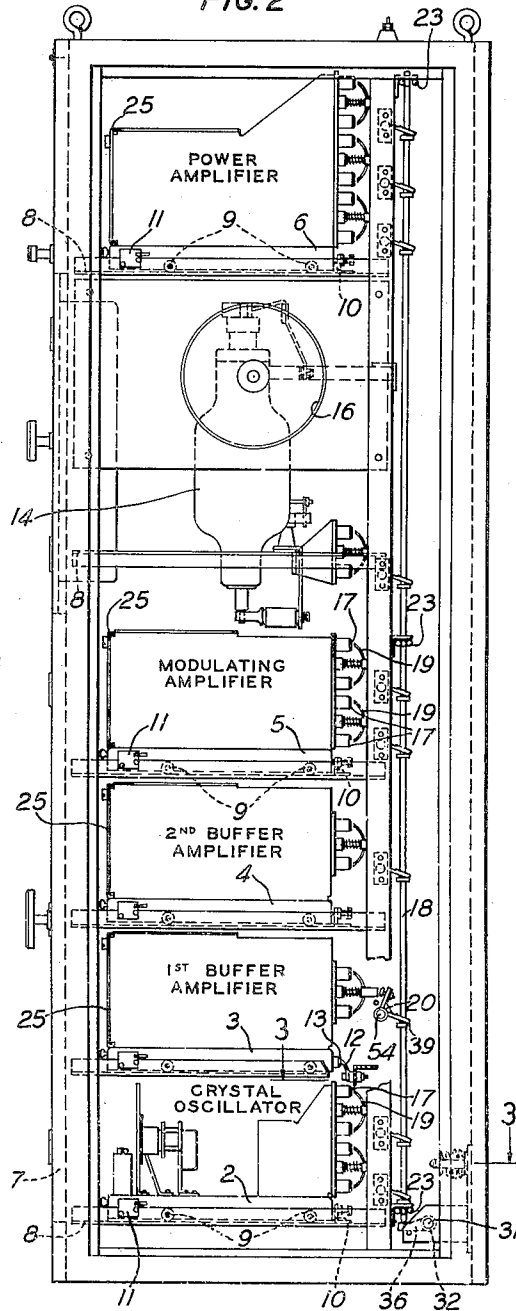


FIG. 2



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FIG. 3

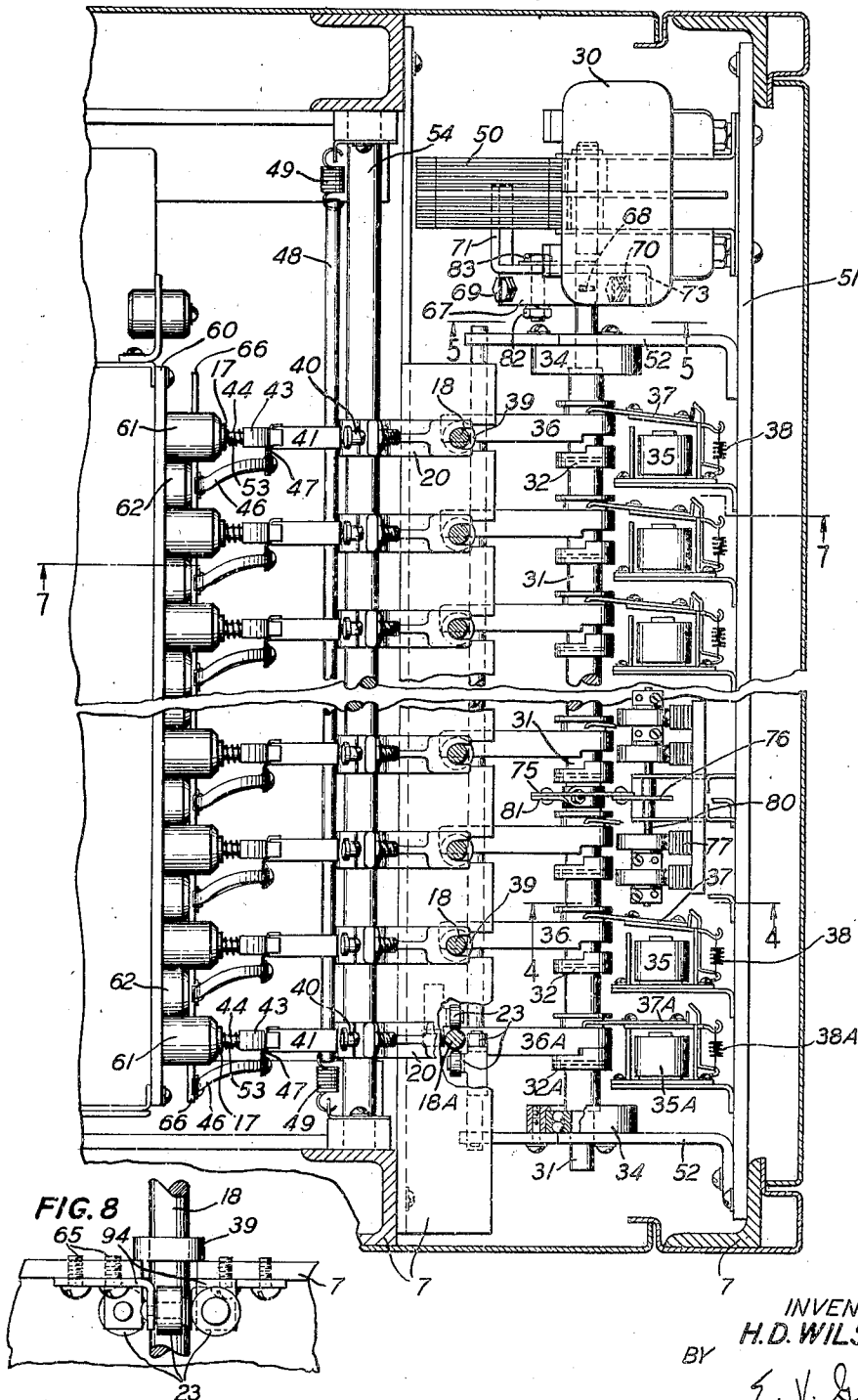


FIG. 8

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FIG. 7

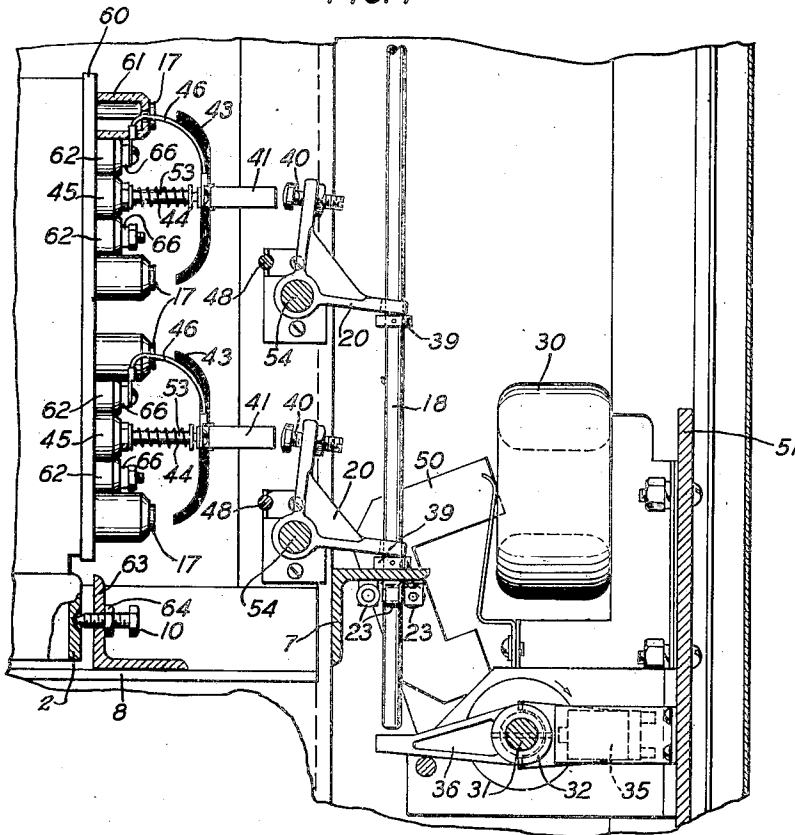


FIG. 4

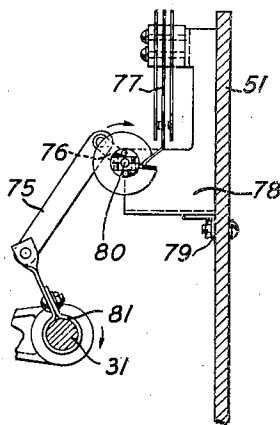


FIG. 5

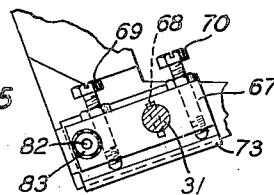
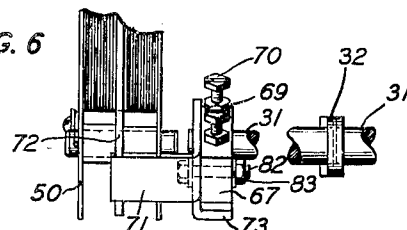


FIG. 6



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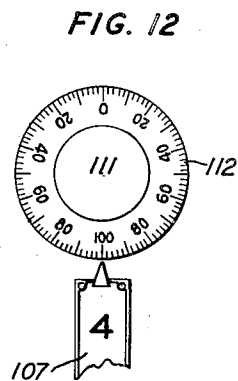
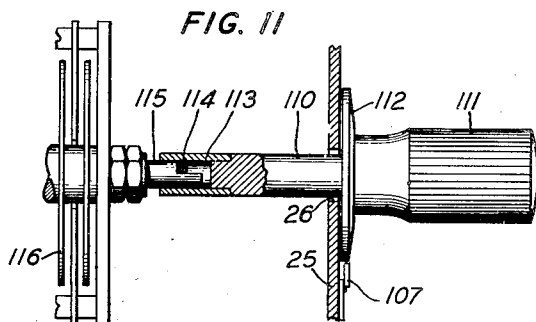
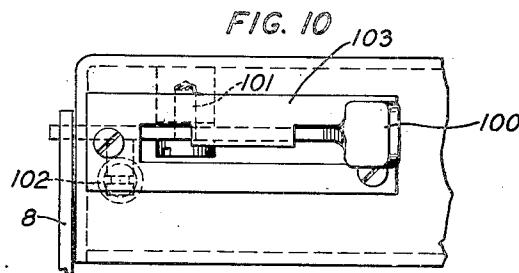
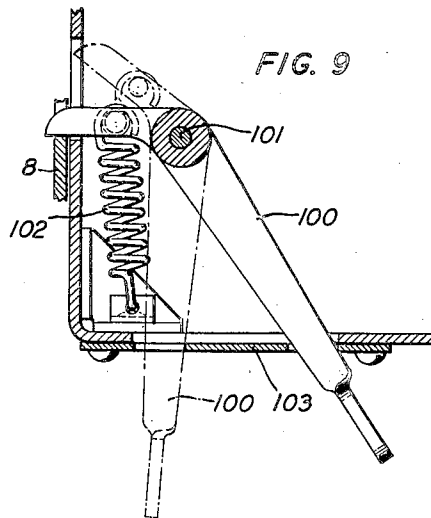
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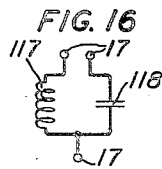
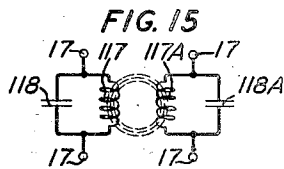
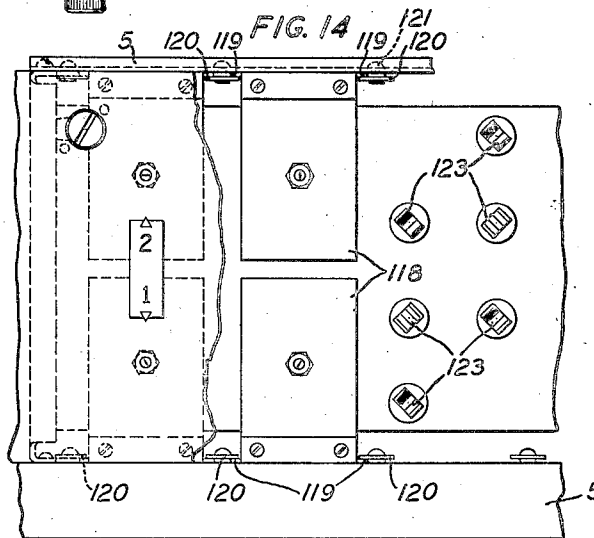
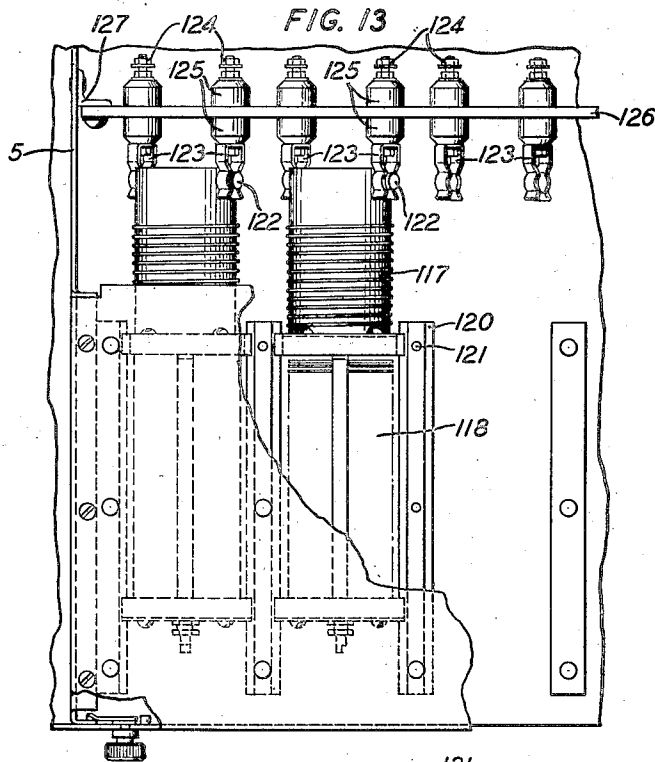
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UNITED STATES PATENT OFFICE

2,077,160

RADIO TRANSMITTER

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Application July 14, 1934, Serial No. 735,177

7 Claims. (Cl. 250—17)

This invention relates to radio transmitters adapted to be operated at any one of a plurality of frequencies and has for one object the simplification in operation and the economical construction of such apparatus.

In a specific preferred embodiment, this invention comprises a multi-frequency range radio transmitting system comprising a plurality of stages. Associated with each stage are a plurality of elements each capable with the common apparatus of the stage and a corresponding element and common apparatus of the other stages of the system to produce a distinct frequency. The plurality of stages are contained in a cabinet in which are mounted, one above the other, removable chassis each containing the equipment for each stage with their associated elements of the transmitting system. For example, the oscillator of the transmitting system is on the oscillator chassis, the buffer amplifiers are contained on the buffer amplifier chassis, the modulating amplifier on the modulating amplifier chassis and the power amplifier on the power amplifier chassis. An element of each stage may be connected in a circuit with the corresponding elements of each of the other stages and these elements with the associated common apparatus of each stage comprise a transmitting channel.

The stages are normally not connected to each other but are connected by a plurality of switches, all the switches for each transmitting channel being aligned in a straight vertical column. The switches are operated by bell cranks carried by vertical elevator rods, one for each frequency or transmitting channel. The elevator rods are operated by a selector mechanism controlled by a telephone dial. A magnetic clutch for each elevator rod actuated by this selector mechanism, operatively connects a cam to a driven clutch member to operate the selected elevator rod. As a result, the switches connect the elements of a transmitting channel in a circuit to produce a particular frequency.

A more comprehensive understanding of this invention is obtained by reference to the accompanying drawings, in which:

Fig. 1 shows a front view in perspective of a multi-frequency transmitting system embodying this invention.

Fig. 2 is a side elevation of the system shown in Fig. 1.

Fig. 3 is a plan view of the system shown in Fig. 2 along the lines 3—3.

Figs. 4 to 14 are details of the system shown in Figs. 1 and 2.

Figs. 15 and 16 represent circuits, shown schematically, which illustrate the advantage of the construction of a part of the apparatus employed in the system shown in Figs. 1 and 2.

Like numerals in all the figures represent the same parts.

The circuit for the control and operation of this multi-frequency transmitting system is described and illustrated in an application of J. B. Bishop and W. M. Knott filed on September 26, 1935, Serial No. 42,172.

Referring to Figs. 1 and 2, the numeral 1 represents a cabinet in which a multi-frequency radio transmitting system is housed. As described in the above stated copending application of Bishop and Knott, the transmitting system comprises a plurality of stages. In the specific embodiment, the stages are a crystal oscillator, a first and second buffer amplifier, a modulating amplifier and a power amplifier. Associated with each of the stages are a plurality of elements, one element with each stage forming with the common apparatus of the stage with which it is associated and an element of each of the other stages with the common apparatus of the other stages, one transmitting channel capable of transmitting a distinct frequency. For example, the crystal oscillator stage comprises a plurality of crystals, each capable of producing a distinct frequency with the other common apparatus of the stage, while the first buffer amplifier has a plurality of inductances and capacitances, an inductance and a capacitance comprising one element for the production of a definite frequency. All the other apparatus of each stage is common to all the transmitting channels. Each of the stages including their plurality of elements for producing distinct frequencies is mounted on a common chassis. The crystal oscillator stage including the plurality of crystals distinct to each frequency of each of the transmitting channels is mounted on a common chassis 2, while the first buffer amplifier, the second buffer amplifier, modulating amplifier and the power amplifier including their respective variable elements distinct for the production of a particular frequency for each of the transmitting channels are mounted respectively on chassis 3, 4, 5 and 6.

The cabinet 1 comprises a framework or rack 7, a plurality of pairs of brackets or members 8 upon which the chassis may be supported, fixedly attached in a horizontal position to the sides of the rack, each member of a pair being in the same horizontal plane as the chassis with which it is associated. In order to facilitate the quick re-

removal of the chassis from their respectively associated brackets, four rollers 9 are attached to each of the chassis and are in mechanical contact with the brackets, two rollers being associated with each of the pair of brackets. The rollers are positioned on the chassis so that when the chassis is contained within the cabinet, its bottom is in a plane parallel to the horizontal position of its respectively associated pair of brackets. The inner limits of movement of all the brackets is determined by an adjustable stop 10 fixedly mounted to the bracket member 8. A manually operated latch 11 located on both front sides of each of the chassis prevents the outward movement of the chassis. A plurality of brushes 12 supported by a bracket attached to the frame 7 and corresponding contacts 13 contained on the chassis are provided for connecting the apparatus into the transmitter circuit. An amplifying space-discharge device 14 common to all transmitting channels is part of the power amplifying stage. A rotating electric fan 16 circulates fluid medium around the device 14 and with the cooler medium drawn from the atmosphere tends to maintain the temperature of the device 14 relatively uniform.

Each of the elements distinct for each frequency of the transmitting channels terminates in a plurality of contacts 17 at the rear or back of the chassis. The contacts of all the elements of a single transmitting channel are aligned in the same vertical plane. The corresponding contacts of each of the variable elements of all the transmitting channels of each stage are preferably aligned in the same horizontal plane. A plurality of vertically mounted elevator rods 18 are located in the rear of the cabinet. Switches 19 connect the contacts 17 of the variable elements of a transmitting channel to produce the desired frequency. A plurality of bell cranks 20 which rotate on a shaft 54 control the engagement of the switch 19 with the contact 17. A collar 39, fixedly attached to each of the elevator rods 18, is associated with, in engageable relation with, and controls the movement of each of the bell cranks 20. The upward movement of one of the elevator rods 18 with the corresponding movement of the collars 39 contained thereon actuates the bell cranks of the elevator rod with which the particular elevator rod is associated to close the switches 19 of that channel. A clutch driven member 36 in engageable relation with each of the elevator rods and a cam 32 associated with each clutch driven member control the movement of their respectively associated elevator rod. The engagement of the clutch driven member and cam results in the upward movement of the elevator rod. The elevator rod 18 is supported near the top, bottom and center of the rack by two pairs of oppositely disposed cylindrical rollers 23 mounted in a plane perpendicular to the rod and normally in contact with the rod. The chassis of the first buffer, second buffer amplifier, modulating amplifier and power amplifier are provided with removably mounted covers 25 comprising aluminum. A plurality of holes 26 in each of these covers provide means by which a tool, to be more completely described hereinafter, may be inserted to manually adjust the apparatus of each of the variable elements of a transmitting channel as required. A telephone dial 22 located on the front panel of the cabinet serves to control selector mechanism which actuates an electromagnet (not shown) associated with any one of the plurality of trans-

mitting channels to engage the cam 32 with the driven clutch member 36 of that unit.

When a particular frequency is desired, the dial 22 is rotated to the designation corresponding to that particular frequency and a controlled selector mechanism, the circuit for which is described in the above stated copending application of Bishop and Knott results in the engagement of the cam 32 and clutch driven member 36. The elevator rod 18 moves in an upward position, actuating the bell cranks 20 to engage the switches 19 with their contacts 17 to produce the desired frequency.

Fig. 3 showing the clutch mechanism by which the elevator rods are actuated is a sectional view along the line 3—3 shown in Fig. 2. Fixedly attached to the framework 7, by means of a plate 51, is an electromagnet 30 which is actuated by the selector mechanism (not shown) the circuit for which is described in the above stated copending application of Bishop and Knott. An armature 50, the movement of which is determined by the energization and deenergization of the electromagnet 30 is in engageable relation with a rotatable shaft 31 by means of an L-shaped metallic member 71. On the shaft 31 are a plurality of cams 32 and 32—A. Two ball bearings 34 at each end of the shaft 31 provide means in which the shaft 31 rotates. These ball bearings are fixedly attached to the plate 51 by means of a pair of brackets 52. A plurality of clutch driven members 36—A and 36 are in engageable relation with the plurality of elevator rods 18—A and 18 respectively. A plurality of electromagnets 35—A and 35, one corresponding to each of the transmitting channels employed in the system, are associated with each of the clutch driven members. Armature 37—A or 37 of each of the electromagnets 35—A or 35 is normally biased away from its respective electromagnet by a spring 38—A or 38. When an electromagnet of a transmitting channel is energized, its respectively associated armature produces the engagement of the cam 32 and the driven clutch member 36 of that unit. The armature 37—A of the electromagnet 35—A in Fig. 3 is shown in the energized position with the engagement of the driven clutch member 35—A and its respectively associated cam 32—A. The engagement of the driven clutch member 36—A and the cam 32—A and the subsequent rotation of the shaft 31 results in the elevation of the push rod 18—A with the consequential actuation of the plurality of bell cranks contained on the push rod 18—A. The electromagnet 30 is shown in the drawings in the deenergized position.

A plurality of collars 39 are fixedly attached to each of the push rods. A bell crank 20 rests on each of these collars. The bell cranks 20 rotate on a shaft 54 fixedly attached to the frame 7. On the end of the bell crank other than that in engagement with the collar 39 is a screw member 40. The switch 19 shown in Fig. 2 comprises an insulator 41, several layers 43 of a conducting material such as phosphorous bronze and a phosphorous bronze rod 53. The insulator 41 is in engageable relation with the screw member 40 of the bell crank 20 and in alignment therewith. The switch is normally biased towards the screw member 40 by a spring 44, the convolutions of which surround the phosphorous bronze rod 53. The rod 53 is capable of moving in piston like fashion in the bushing or bearing (not shown) contained on the chassis. The horizontal movement of the switch comprising the insulator 41, 75

the metallic conductor 43 and the rod 53 is dependent upon the corresponding movement of the screw member 40 of the bell crank 20. To provide connection between some parts of the stage supported by the chassis and the metallic switch member 43, a conducting flexible connector 46 is fastened to a terminal or bus bar of the chassis and connected to the metallic member 43 by means of a tab 47. A horizontal metallic rod 48 is suspended by means of two springs 49 attached to the framework 7 immediately under and perpendicular to the insulated members 41 of the switch. This rod 48 prevents the bell crank 20 from rotating too far in a counter-clockwise direction when a chassis has been removed from the frame.

Normally, the armature 37 of the electromagnet 35 is not engaged with the electromagnet. When the frequency of one of the transmitting channels is desired, the selector mechanism, the circuit for which is described in the above stated application of Bishop and Knott, first operates the electromagnet associated with the particular channel the frequency of which is desired. A short delay ensues and the electromagnet 30 is then energized. The energization of electromagnet 30 actuates its armature 50 to rotate the shaft 31 in a clockwise direction. When an electromagnet of a transmitting channel is energized as illustrated by magnet 35—A, the armature 37—A produces the engagement of the cam 32—A and the driven clutch member 36—A. When the shaft 31 is rotated in a clockwise direction, rod 18—A is, as a result, elevated in a vertical position. The upward movement of the collar 39 results in a counter-clockwise rotation of the bell crank 20. The corresponding movement of the adjusting screw 40 effects the movement of the switch comprising the insulator 41, metallic conductor 43 and rod 53 to the left with a consequential engagement of the contacts 17 supported by an insulator 61. When the elevator rod 18—A is in the elevated position, the friction between the end of the elevator rod 18 and the driven clutch member 36 and that between the cam 32 and the clutch driven member 36 is such as to prevent disengagement of the cam 32 and the driven clutch member 36. Consequently, the electromagnet 35—A need be actuated only momentarily. Once actuated the driven clutch member 36—A remains engaged with the cam 32—A until the electromagnet 30 is deenergized. As explained in the copending application of Bishop and Knott, the electromagnet 30 remains energized as long as any channel of the system is in operation. When the electromagnet 30 is deenergized the shaft 31 rotates in a counter-clockwise direction and the cam 32—A and the driven clutch member 36—A return to the position shown by cam 32 and driven clutch member 36.

A disc 76 actuates a switch (not shown) the circuits for which are described in the above stated application of Bishop and Knott to deenergize any of the plurality of electromagnets 35 or 35—A after any of the elevator rods is in a raised position. The disc 76 is rotated by means of a lever 75 attached at one end to the disc and at the other end to a collar 81 which is fixedly attached to the drive shaft 31.

A side elevation of this mechanism appears in Fig. 4 along the lines 4—4 shown in Fig. 3. A switch 77 mounted on a block 78 which is fixedly attached to the bar 51 by a bracket 79 is controlled by the rotation of the disc 76. The

disc 76, rotates on a shaft 80 supported by the block 78. The rotation of the disc 76 among other functions as described in the above stated application to Bishop and Knott, actuates the switch 77 to deenergize any of the plurality of electromagnets 35 or 35—A which have been energized when its respectively associated rod 18 or 18—A is in an elevated position. When the driving electromagnet 30 is energized, the drive shaft 31 is rotated clockwise. This action results in a corresponding movement of the collar 81. The lever 75 moves to the right and the disc 76 rotates in a clockwise direction. The clockwise movement of the disc 76 actuates the switch 77 to deenergize the plurality of electromagnets 35 and 35—A by a circuit described in the above stated copending application of Bishop and Knott. A decided advantage of deenergizing the electromagnets 35 and 35—A shortly after they have been energized is that electromagnets having a higher current rating for momentary operation may be employed than if electromagnets of the same physical size for prolonged energization were necessary. In addition, there is less current drain by the system.

As described above, the friction between the cam 32 and the driven clutch member 36 and the friction between the elevator rod and the driven clutch member 36 is sufficient to hold the cam and driving clutch member in the position shown by the cam 32—A and the clutch driven member 36—A shown in Fig. 3 as long as the electromagnet 30 remains energized.

In Figs. 5 and 6, means by which the cams 32 are aligned with their respective clutch driven members 36 are shown, Fig. 5 representing a section along the line 5—5 of Fig. 3. A bar 67 is fixedly attached to the shaft 31 by means of a pinion 68. Two screws 69 and 70, preferably in a plane parallel to the transverse section of the shaft 31, are threaded through the bar 67. The ends of the screws 69 and 70 are adapted to protrude below the bar 67. An L-shaped metallic member 71 is fixedly attached to the armature 50 of the electromagnet 30 (not shown) by means of a slot 72 on the armature and an elevated portion on the L-shaped member, the elevated portion (not shown) fitting into the slot. The other portion of the L-shaped member has two circular holes cut therein and a flange 73 perpendicular to that portion. The flange 73 is in engageable relation with the protruding portion of the screws 69 and 70. Through one of these holes, the shaft 31 passes while a bolt 82 passes through the other, the bar 67 and L-shaped member being held together by means of a nut 83. By loosening one of the screws 69 or 70 and tightening the other, or vice versa, the shaft 31 may be rotated within limits in a clockwise or counter-clockwise direction. Bolt 82 and nut 83 are then tightened and the flange 73 is held firmly in position in relation to the bar 67. When adjusted, the movement of the armature 50 starts the rotation of the shaft 31 from the point on the shaft at which the shaft is adjusted. By this means the cam 32 can be adjusted to align with the driven clutch member 36 (not shown) as required.

Fig. 7 is a side elevation along the line 7—7 of Fig. 3 and illustrates the manner of connecting the elements of each stage distinct to each transmitting channel. Connections from the elements (not shown) mounted on a chassis such as the crystal oscillator chassis 2 are led through a panel 60 and an isolantite insulator 61 to terminate in

the plurality of contacts 17. To afford greater insulation between the rod or wire lead from the element to the contact 17 through the panel 60, the inside of the insulator 61 is hollow. This construction results in a material air space between the rod and the solid portion of the insulator 61. The switch 19 (shown in Fig. 2) and comprising an insulator 41, several layers 43 of a conducting material such as phosphorous bronze and a phosphorous bronze rod 53 connects the contacts 17 associated with the elements of a transmitting channel to produce the desired frequency. The rod 53 is capable of movement in piston like fashion in the nickel silver bushing 45. The metallic conducting member 43 is normally disengaged from the contacts 17 by the bias produced by the spring 44.

A plurality of bus bars 66 extending horizontally in a plane parallel with the back of the cabinet are employed for connecting certain apparatus of each stage in addition to the elements connected to the contacts 17. These bus bars are supported by insulator 62 through which a connection (not shown) may or may not lead to apparatus of each of the stages. Connection between any of the metallic members 43 of the switch or another bus bar may or may not be made as required by the frequency of the channel desired by means of the flexible connection 46 fixedly attached to the bus bars and a tab (not shown). The desirability of these connections is described in the above stated copending application of Bishop and Knott.

The armature 50 of the electromagnet 30 is shown in a deenergized position. The energization of electromagnet 30 results in a clockwise movement of both the armature 50 and the shaft 31 with a corresponding movement of the driven clutch member 36. The clockwise movement of the driven clutch member 36 produces an upward movement of the elevator rod 18 and the collar 39 fixedly attached thereto. The bell crank 20 is rotated on the shaft 54 in a counter-clockwise direction by this change in position of the elevator rod 18. The corresponding movement of the screw member 40 on the bell crank 20 effects a movement to the left of the switch comprising the insulator 41, the conducting member 43 and the rod 53 with a resulting engagement of the conducting member 43 with its associated contacts 17. To insure the proper engagement of the metallic member 43 with the contacts 17, the screw 40 may be adjusted from time to time as required.

The adjustable screw stop 10 prevents the inward movement of the chassis 2. The stop 10 is fixedly attached to the bracket 8 by a bracket 63. After the screw member 10 has been adjusted as desired, the adjustment may be maintained by means of a nut 64 through which the screw member 10 passes.

The manner of mounting the cylindrical rollers 23 for supporting the elevator rod 18 is shown in Fig. 8. The two pairs of oppositely disposed cylindrical rollers are mounted in a plane perpendicular to the elevator rod and normally in contact with the rod. The roller in a plane parallel to and located nearest the rear of the cabinet is fixedly attached to part of the framework 7 by a pair of brackets 94. The brackets 94 are secured to the framework 7 by means of four screws 65. When the removal of any elevator rod is desired, these screws may be removed and the elevator rod may be taken from the frame without disturbing the other rollers or other parts of the system.

The latch 11 shown in Fig. 1 employed for holding each of the chassis in the rack is shown in detail in Figs. 9 and 10. The metallic member 100 rotates within a predetermined range on a pivot 101. The pivot 101 is fixably attached to the chassis in the position shown in Fig. 9. Member 100 is in contact with the indentation cut in the bracket 8. The dotted configuration of the member 100 shows its position when it is desired to remove the chassis from the rack. The member 100 is normally biased by the spring 102 in a forward and upward position which tends to insure its engagement with the bracket 8 when desired.

In Fig. 10 a front view of the latch is shown. A plate 103 with a rectangular slit cut therein provides a means by which the member 100 may be changed from one position to the other. A smaller rectangular piece of metal in the center of the plate together with the forward and upward bias of the spring 102 results in the member 100 remaining in either of the positions shown in Fig. 9 but not in any position intermediate between those shown. A small portion of the member 100 is bent at the front end perpendicular to the remaining portion to facilitate convenient manual operation.

When the chassis is placed in the frame, the member 100 is in a position shown by the dotted line in Fig. 9 and the front perpendicular position of the member 100 is at the extreme left-hand side of the rectangular slit shown in Fig. 10. When the chassis is in place on the bracket 8, the member 100 shown in Fig. 10 is moved down and over to the extreme right. After the member 100 passes the small rectangular piece of metal of the plate 103 in its movement to the right, the bias of spring 102 pushes it into an upward position. When the front portion of the member 100 is at the extreme right, the member 100 engages with the bracket 8 as shown by the solid line in Fig. 9.

Figs. 11 and 12 show the detailed structure of the tool employed for tuning the unit. The tool consists of an insulated shaft 110 to which a dial 112 and a handle of insulating material 111 are fixedly attached at one end. At the other end a metallic cylinder 113 is attached. A pinion 114 is fixedly inserted in the cylinder 113 parallel to the transverse section thereof. A shaft 115 of the condenser 116 or other tuning unit of the system is constructed to be adaptable to engage the tuning tool. The removal of one-half of a small longitudinal portion across the diameter at the end of the shaft 115 is satisfactory for this purpose. To facilitate closer engagement of the shaft 115 with the cylinder 113, the removed portion of the shaft is slightly tapered. A plate 107 with arrow indexes and the channel designations is fixedly attached to the cover 25 between two channels of a stage.

In order to perform the necessary tuning required of the particular frequency channel employed, the tool is inserted in the hole 26, the pinion 114 contained within the cylinder 113 engages the shaft 115 and the shaft 115 is rotated by means of the handle 111 until the desired tuning is obtained as indicated by the dial 112 and the arrow of plate 107.

Figs. 13 and 14 show variable elements distinct to each frequency channel and the manner of mounting them within each of the chassis. Fig. 13 is a plan view partly in section of the elements, while Fig. 14 is a front elevation partly in section of the elements. Some of these plurality of elements, such as those employed on the modulating

amplifier, supported on the chassis 5 comprise an inductance 117 and a capacitance 118. Both the capacitance 118 and the inductance 117 are fixedly attached to each other to form an integral unit. Two longitudinal strips of metal 120 running from the front to the rear of each of the chassis, such as the modulating amplifier chassis 5, are fixedly attached by means of screws 121 to the chassis and are adapted to hold a pair of strips 119 fixedly attached to each of the units. Each unit is slidably movable by this means.

Connection between each unit and the contact 17 is provided by a metallic plug 122 which fits into a spring socket 123. The socket 123 is connected to a terminal 124 which passes through a pair of insulators 125 similar in construction to the insulator 61 shown in Fig. 7. The pair of insulators 125 insures adequate insulation from the panel 126 fixedly attached to the frame of the chassis 5 by means of a bracket 127. The construction of each tuning element comprising a capacitance and an inductance in one integral unit affords a means of quickly substituting one transmitting channel for another when desired.

Three plugs with three corresponding sockets instead of two are provided for connecting each unit to the contacts 17 (not shown). The advantage of employing three terminals instead of two is shown in Figs. 15 and 16. In Fig. 15 two tuning units one comprising a capacitance 118 and an inductance 117 and another unit comprising an inductance 117—A and a capacitance 118—A are shown schematically. The inductance and capacitance of each unit are connected to each other and terminate in a pair of contacts 17. In Fig. 16 an inductance 117 and a capacitance 118 are shown schematically. The inductance 117 and capacitance 118 in this figure, however, terminate in three contacts which are normally not connected to each other. The circuit shown in this figure represents the arrangement employed in the transmitting system described. Until a transmitting channel is operated, the capacitance and inductance of any of the elements are not connected to each other. The advantage of employing this type of connection is appreciated by referring to Fig. 15. If the capacitance 118 and the inductance 117 resonate at or near, or at a harmonic of the resonant frequency of the capacitance 118—A and inductance 117—A, a magnetic field is set up between the two inductances which results in an absorption of energy from the particular transmitting channel which is operated.

While a preferred embodiment of this invention has been illustrated and described, various modifications therein may be made without departing from the scope of the appended claims.

What is claimed is:

1. In a radio transmitter adapted to generate oscillations of a plurality of frequencies, a plurality of transmitting units, each unit generating oscillations of a different band of frequencies, a group of switches associated with each of said units for operating its respectively associated unit, an elevator rod associated with each of said

groups, a plurality of bell cranks actuated by each elevator rod, one bell crank operating each switch of the group, and means for actuating any one of said elevator rods as desired.

2. In a radio transmitting system adapted to be operated at a plurality of frequencies, a group of switches for producing oscillations of each frequency, an elevator rod associated with each group of switches, a plurality of bell cranks actuated by each elevator rod, one bell crank operating by contact only each switch of the respective group, a drive shaft, a cam for each elevator rod, a magnetically operated clutch for operatively connecting each of said cams to said drive shaft, and an electromagnet for rotating said drive shaft.

3. A combination according to claim 2, in which each clutch is mechanically maintained in engagement when the corresponding elevator rod is in position to operate the switches and a switch operated by the drive shaft when in the operated position to open the clutch circuit of the clutch.

4. A radio transmitter comprising a mounting frame having a plurality of vertically arranged racks, a plurality of chassis removably mounted on said racks, each of said chassis having mounted thereon equipment for a respective stage of the transmitter and including a plurality of plug-in tuning units and switches individual to the respective tuning units, a plurality of terminals on each of said chassis, corresponding terminals carried by said frame and adapted to contact with the chassis terminals when the chassis are in place, and selective switching means mounted on the frame for operating said switches.

5. A radio transmitting system comprising a plurality of transmitting units normally inoperative, switching means comprising an elevator rod and a clutch electromagnetically actuated individual to each of said units for operating its respectively associated unit to produce oscillations of a particular frequency.

6. A radio transmitting system comprising a plurality of transmitting units normally inoperative and automatic switching means comprising an electromagnet and an elevator rod actuated by said electromagnet for each unit for operating one of said units, and means for rendering said electromagnet inoperative after the actuation of said elevator rod.

7. In combination, a plurality of stages, a plurality of units, each unit comprising a plurality of elements associated with said stages to produce waves of a band of frequencies corresponding to a radio channel, one of said elements of each unit comprising a capacitance and inductance forming a slidable removable integral unit, a group of switches for each unit for connecting the elements of said unit and said plurality of stages, an elevator rod associated with each of said units for operating the group of switches of its respectively associated unit, and an electromagnetic clutch for each elevator rod for actuating its respective associated elevator rod.

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