July 3, 1934. N. DEISCH 1,965,281

RADIORECEIVER

Filed Feb. 19, 1931 4 Sheets-Sheet 1

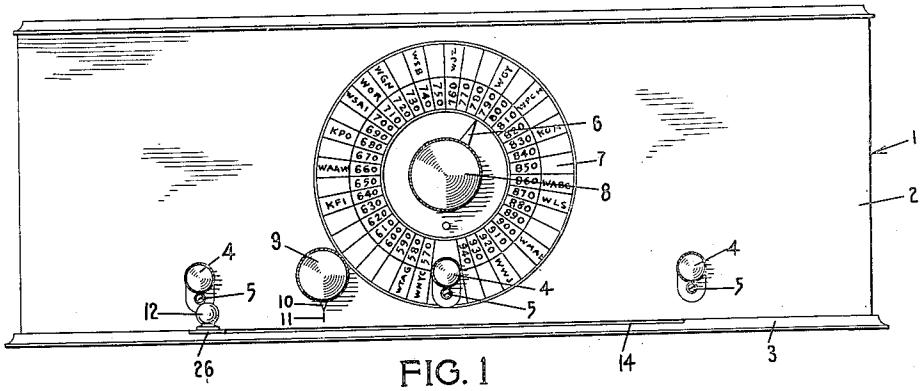


FIG. 1

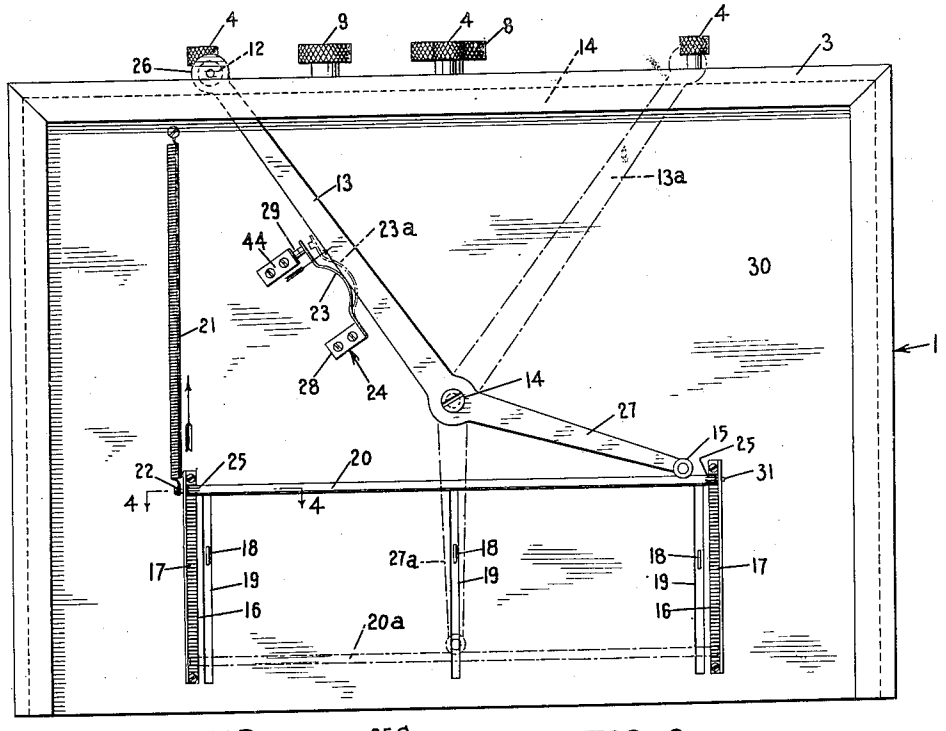


FIG. 2

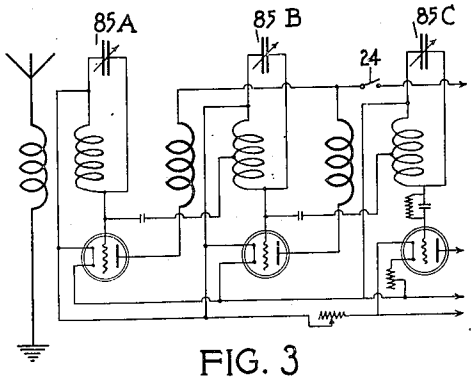


FIG. 3

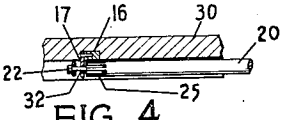


FIG. 4

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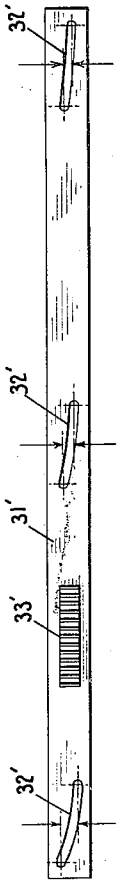


FIG. 5

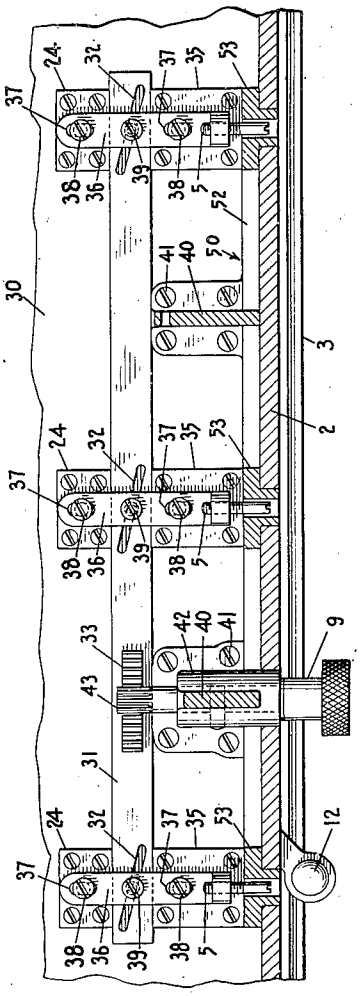


FIG. 6

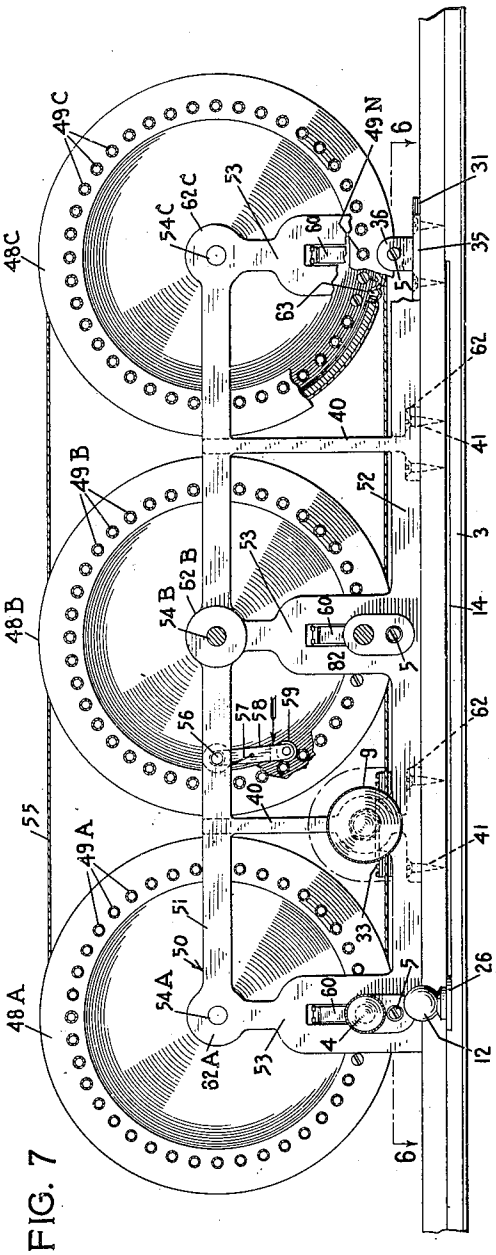


FIG. 7

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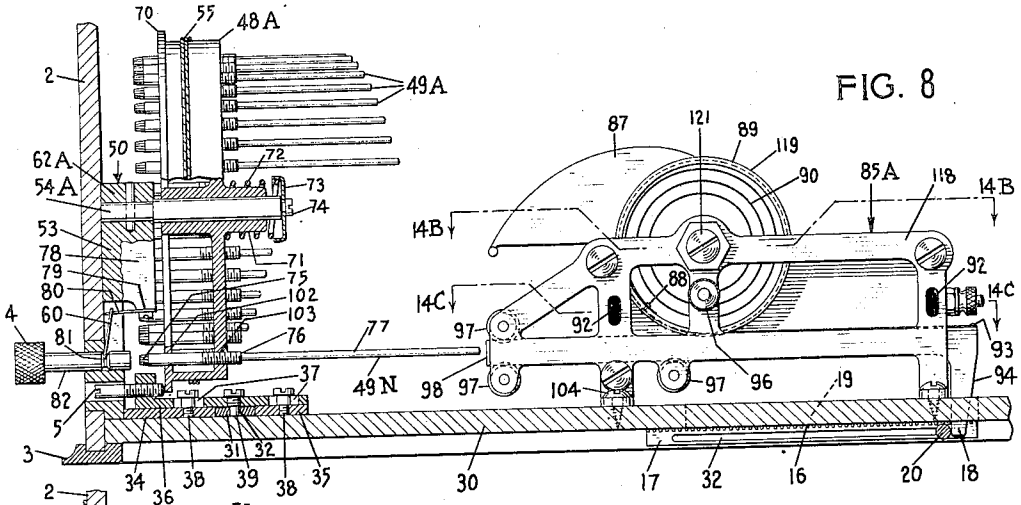


FIG. 8

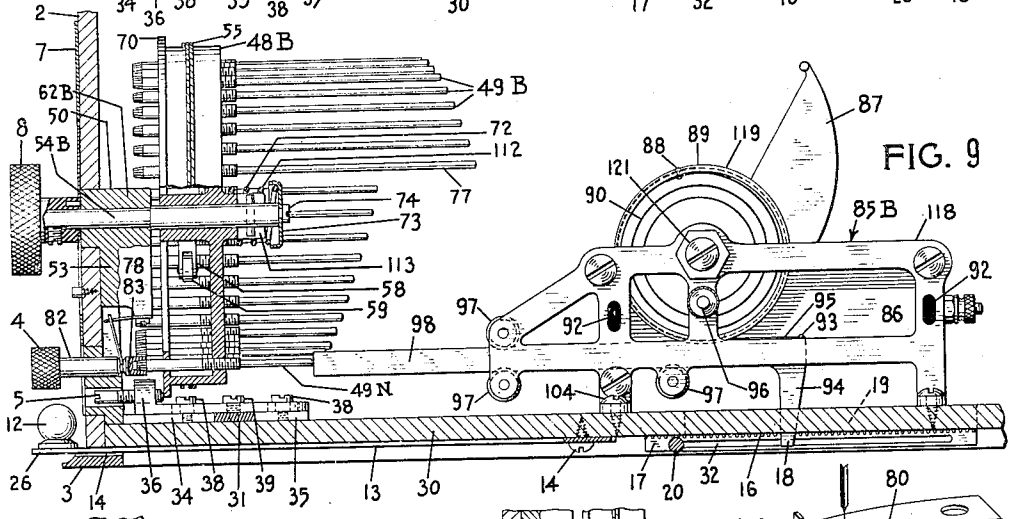


FIG. 9

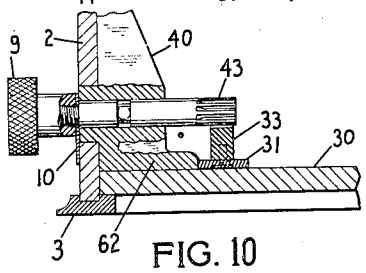


FIG. 10

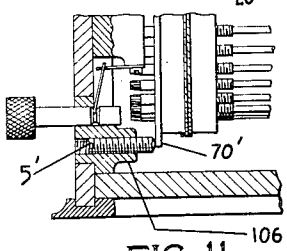


FIG. 11

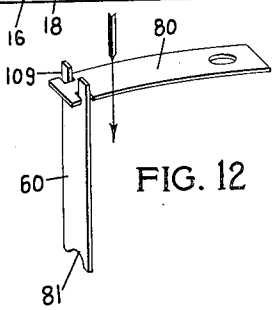


FIG. 12

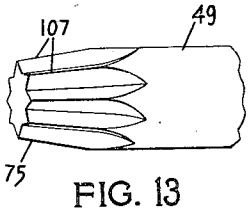


FIG. 13

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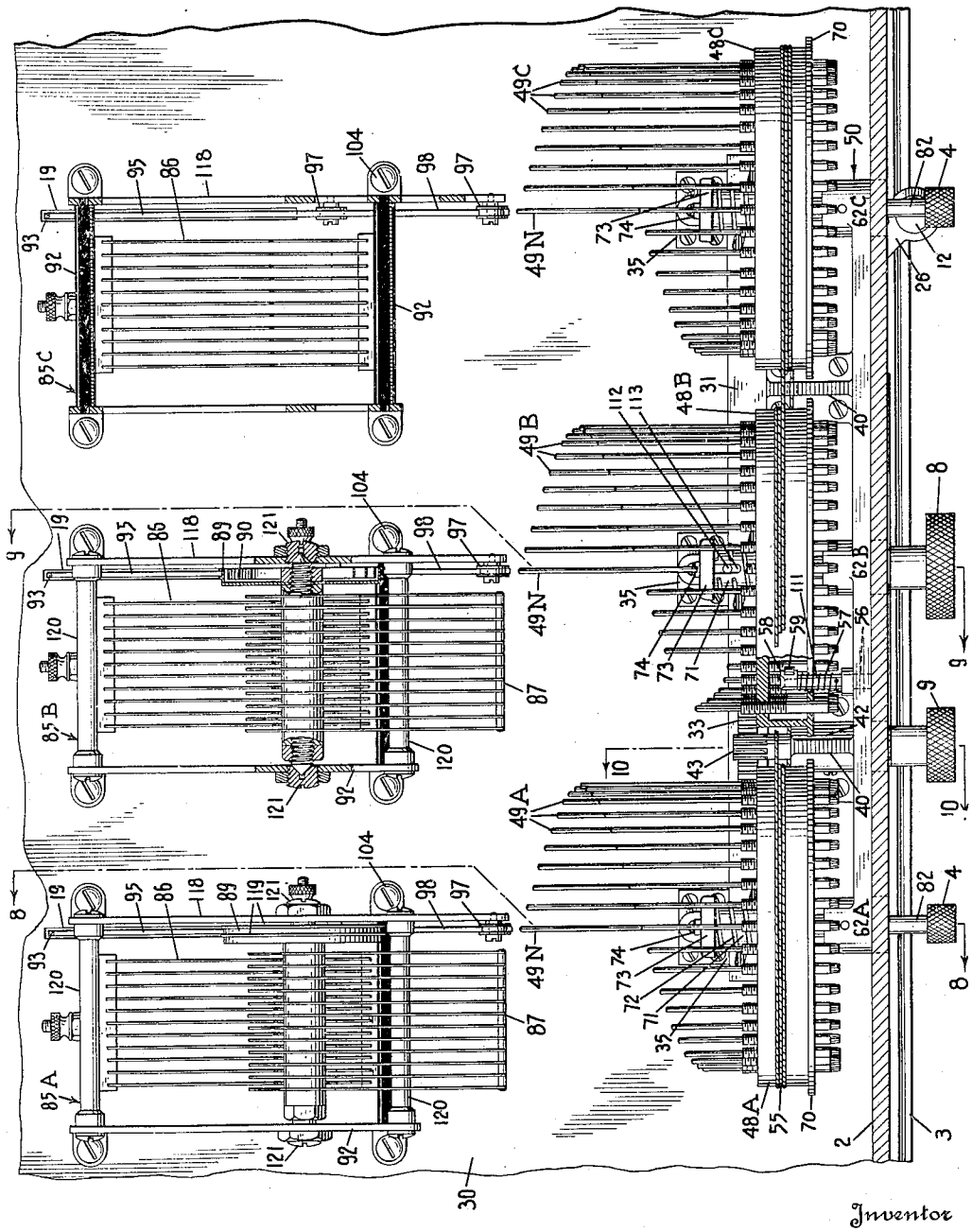


FIG. 14

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Patented July 3, 1934 1,965,281

UNITED STATES PATENT OFFICE

1,965,281

RADIORECEIVER

Noel Deisch, Washington, D. C.

Application February 19, 1931, Serial No. 517,067

7 Claims. (Cl. 250—40)

The invention relates to operators for the movable parts of radio tuning units, and more particularly to operators by which oscillatory circuits may be tuned automatically.

Broadly stated, it is the general object of the present invention to provide apparatus by which a circuit, or the several circuits of a multi-tuned system of circuits, may be conveniently and accurately tuned to a prearranged number of set frequencies, and further to provide means by which the frequency settings can be given a stable adjustment, and, in the case of a multi-tuned circuit, an independent or a coordinate stable adjustment, or a coordinate temporary adjustment. Other more particular objects and advantages of the invention bearing on the construction, relation, and function of the various parts will become apparent as the description proceeds.

In the drawings:

Fig. 1 is a front elevational view of apparatus forming the subject of the invention, and shows especially the disposition of the indicators and electrical controls.

Fig. 2 is a bottom plan view of the apparatus illustrated in Fig. 1, and shows parts of the condenser rotor retracting mechanism and the cut-out switch.

Fig. 3 is a schematic view of an illustrative circuit such as may be used in connection with the invention.

Fig. 4 is a fragmental transverse vertical sectional view taken on the line 4—4 of Fig. 2.

Fig. 5 is a plan view of a modification of the coordinate drum adjusting bar shown in Fig. 6.

Fig. 6 is a horizontal sectional view taken on the line 6—6 of Fig. 7.

Fig. 7 is a front elevational view corresponding to Fig. 1, the front panel of the instrument cabinet being however removed, and parts being shown in fragmental section.

Fig. 8 is a vertical, longitudinal, largely sectional view taken substantially on the line 8—8 of Fig. 14.

Fig. 9 is a vertical, longitudinal, largely sectional view, taken substantially on the line 9—9 of Fig. 14.

Fig. 10 is a fragmental, vertical, largely sectional view taken substantially on the line 10—10 of Fig. 14.

Fig. 11 is a fragmental, vertical, largely sectional view corresponding to a portion of Fig. 8, and shows a modification wherein the coordinate drum adjustment is not used.

Fig. 12 is a perspective view of the spring-and-link mechanism shown in Figs. 8 and 9.

Fig. 13 is a perspective view of the clutching or socket-engaging head of one of the adjustable tuning stops.

Fig. 14 is a partly plan view and partly horizontal sectional view of the assembly of apparatus comprising the invention, the top panel of the instrument containing cabinet being removed by horizontal section of the front panel, the fragmental sections of second and third condensers being substantially on the lines 14^B—14^B and 14^C—14^C of Fig. 8, the condenser rotors and tuning-stop drums being shown in the position of Fig. 8.

Referring more particularly to the drawings, there is shown a cabinet, indicated at 1, having a base portion 3, a floor panel 30, and a front panel 2. Contiguous to the front panel 2 is the adjustable stop assembly supporting-frame, indicated at 50 (Fig. 7), which comprises roughly upper and lower transverse bracing members 51 and 52, and upright supporting members 53 and 40, the latter terminating in feet 62, by which the frame 50 is secured to the floor panel 30 by means of screws 41. Spaced at intervals along the upper part of frame 51 are the shaft retaining bosses 62A, 62B, 62C, between which and the uprights 53 extend stiffening webs 78 (Fig. 8). Bosses 62A and 62C hold fixedly secured therein end portions of shafts 54A and 54C, respectively, whereas boss 62B is bored to constitute a bearing member, receiving a portion of shaft 54B which turns freely therein (Fig. 9), and which can be moved by means of the milled hand screw 8. This last holds an index 6 which may be made to register with points on the graduated and tabulated dial 7 (Fig. 1).

Supported on the shafts 54A, 54B, and 54C are the drums 48A, 48B, and 48C. Drums 48A and 48C rotate freely on their respective supporting shafts; they are also permitted a certain amount of longitudinal movement thereon. Drum 48B is free to move longitudinally on shaft 54B, but is prevented from rotating with respect thereto by the pin 112, which moves in the slot 113 (Figs. 9 and 14). The three drums are caused to rotate in unison by any suitable means, as by a cable or belt 55, which passes about and is fastened to each drum, as at 63 (Fig. 7).

Arranged circularly and at equal intervals about the drums 48A, 48B, 48C are the adjustable tuning stops 49A, 49B, 49C, each provided with a head or clutch portion 75 (Fig. 8), a threaded portion 76, and a shank portion 77. The length of the shank portion 77 may be different for different stops, and generally speaking will progress regu-

larly from the least to the greatest length, as shown. Holes 102 and 103 (Fig. 8) are provided in the drums 48A, 48B, 48C for receiving the adjustable stops 49A, 49B, 49C, the holes 103 being tapped to mate with the corresponding threaded portions 76 of the adjustable stops.

These adjustable stops 49A, 49B, 49C are made to have secure frictional engagement with the walls of their receiving holes in drums 48A, 48B, 48C, so that they may be turned with some little difficulty and hence will retain any position of adjustment they may be given.

At a point 56 (Figs. 8 and 14) on the upper transverse bracing member 51 of the frame 50 is secured a shouldered pin 111, on the outer end of which is pivoted for swinging movement the arm 58 carrying at its free extremity a roller 59. A spring 57 having its origin in the pin 111 and its insertion in the arm 58 urges the latter outwardly in the direction of the arrow, holding the roller 59 in firm engagement with the stops 49B, and thus constituting a multipoint centering device for the drums 48A, 48B, 48C by which any selected set of stops 49A, 49B, 49C such as stops 49N may be held in a desired position of alignment at any setting of the coordinately moving drums.

In alignment with selected members 49N of the series of stops 49A, 49B, 49C are the tuning stop adjusting or clutch members 82 (Fig. 9), which move freely in a bearing in the frame 51, and have at their inner end an engaging head or clutch portion 83, and at their outer end a milled head 4 by means of which they may be given a forward and back, or a rotating movement, as desired. The adjusting members 82 are held firmly in their engaged position (shown in Fig. 9) or disengaged position (shown in Fig. 8) by means of a two point centering device, the principal parts of which are shown enlarged in Fig. 12. This comprises a spring member 80 held at one end to the gusset portion 78 (Fig. 8) of the frame 50 by a screw 79, and a link member 60, the latter pivoting at 109 to the free end of spring 80, and whose lower end 81 is actively urged into engagement with the adjusting or clutch members 82 by pressure thereon at the bottom of groove 81. The clutch head 83 is internally toothed or ribbed complementarily to the engaging heads 75 of the tuning stops 49A, 49B, 49C, an enlarged view of which engaging heads 75 is shown in Fig. 13, where it will be seen that the teeth 107 are incined to facilitate engagement. It is thus apparent that by pushing on the thumb-screw 4, when the latter is initially in the disengaged position shown in Fig. 8, the engaging head 83 of the adjusting clutch 82 may be brought into operative engagement with the engaging head 49 of the corresponding adjustable tuning stops 49N. By turning the milled head 4 the corresponding stops may be turned and screwed inwardly or outwardly in the drums 18A, 48B, 48C to vary the stop position of the engaging ends of said stops. It is thus possible to adjust the stop position of any one of the said stops. By pulling on the heads 4 of the adjusting or clutch members 82, the latter are disengaged from their corresponding adjustable stops, and will be held in the disengaged position by the centering device 60, 80, above described, which in this position exerts a force tending to retain the clutch in the disengaged position.

The drums 48A, 48B, 48C, as above stated, are free to move on their respective shafts 54A, 54B, 54C, in the direction of the axes of said shafts. They are however urged inwardly or in the direction of the supporting frame 50 by springs 72 (Fig. 8), whose inner ends press against the drums and whose outer ends are held in the retaining caps 73 secured to the ends of shafts 54A, 54B, 54C, by screws 74.

Each drum 48A, 48B, 48C bears an abutment flange 70 (Fig. 8), which engages one of the adjustable abutment screws 5, the latter adapted to be turned by means of a suitable tool, such as a screwdriver. By this means it is possible to adjust the normal position on their respective shafts of the drums 48A, 48B, 48C, and of all the tuning stops 49A, 49B, 49C supported by them. These screws 5 have secure frictional engagement with their receiving holes, and any device well known in the mechanical arts to increase their frictional coefficient (not shown) may be used.

The adjustable abutment screws 5 are carried by brackets 36 (Figs. 6 and 8) provided with slots 37 through which pass shoulder screws 38, which latter hold the brackets 36 against guide plates 34, 35, secured to the floor-panel 30, in a way to allow free longitudinal movement of the brackets 36 over a distance limited by the length of the slots 37.

Passing between the guide plates 34, 35, is the coordinate adjusting bar 31 provided with slots 32 into which fit pins formed at the outer end of screws 39 secured in brackets 36. The bar 31 bears a rack 33 mating with a pinion 43 adapted to be moved by the milled head 9 and provided with an index 10 (Fig. 1) which may be brought to register with a fiducial mark 11.

It will be seen that by turning the milled head 9 the bar 31 can be made to move in the direction of its main axis, whereupon the inclined walls of the slots 32, engaging the pintel ends of screws 39, causes these last to carry the bracket 36 and its adjustable abutment screws 5 backwardly or forwardly through a limited distance, thus coordinately moving the three drums 48A, 48B, 48C and their attached adjustable stops 49A, 49B, 49C in the direction of their axes, to achieve a simultaneous overall adjustment. The slots 32 may of course be given any shape desired, as may be required by the characteristics of a particular associated circuit. In Fig. 5 for example the holes 32' are shown as curved rather than straight; they are also of different transverse sweep. The system may be returned to the original position of adjustment by turning the milled head 9 until its index 10 coincides with the fiducial point 11.

In a modification, shown in Fig. 11, the adjustable stops 5' are threaded directly into the frame 50 as at 106, and the coordinate adjusting apparatus described in the foregoing paragraphs dispensed with.

Attached to the floor panel 30 by means of screws 104 (Figs. 8 and 14) are the tuning units, here variable condensers, 85A, 85B, 85C. These comprise the frame members 118, joined by spacing rods 120, as also by the insulating spacers 92, which last support and hold in alignment the stators 86.

The frame members 118 also hold pivot members 121 on which freely turn the rotors 87. Fixed at one end of the rotors 87 are the combined guiding wheels and spring barrels 89, which carry at their periphery the guiding flanges 119. The spring barrels 89 contain the spiral springs 90, one end of the last being attached to the spring barrels at 88 and the other end to the frames at 96. The springs 90 act to urge the rotors of their

respective condensers in the direction of greatest overlap with the corresponding stators.

The condenser frame members 118 also hold the flanged antifriction guide-wheels 97, which together with the flanged guide-wheels 89 hold the condenser stop bars 98, which last are free to move longitudinally between the guide wheels 97, 89, being held in a desired position by the flanges thereof. The stop bars 98 bear a spur or downward extension 94, the foot portion 18 of which projects through a slot 19 in the floor panel 30 of the cabinet 1, for a purpose presently to be described. A thin belt or flexible connecting strip 95, which may consist of a length of steel or phosphor-bronze ribbon, is secured to the spring barrel at 88 and to the stop bar at 93.

From the above description, it will be plain that the spring 90 of any of the condensers, in turning the rotor 87 to positions of greater overlap, simultaneously causes the stop-bar 98 to move outwardly toward the tuning stops 49N, the connecting strip 95 winding up in the process over the circumference of the drum 89, and between the flanges 119 thereon. This movement continues until the condenser stop bar 98 abuts against the adjustable stops 49, the length of which last determines the position of the condenser rotor 87 with respect to the stator 86 when movement has been arrested. In other words, the position of overlap of the rotor with the stator is determined by the degree of extension of the condenser stop bar 98. It will furthermore be clear that if, conversely, mechanical pressure be brought to act on the stop bar, as at the foot portion 18, the stop bar may be retracted from the stops 49 and the condenser rotors simultaneously brought to their position of least or any intermediate degree of overlap.

Mounted on the under surface of the floor panel 30 by the shoulder screw 14 (Fig. 2), on which it pivots, is the retracting hand lever 13, the outer end of which passes through a slot 14 formed in the base portion 3 of the cabinet 1 and bears an operating knob 12, whereas the opposite end 27 bears a roller 15 adapted to engage with the condenser stop bar retracting roller 20. This last, which is cylindrical in form, has teeth constituting pinions 25 formed at its opposite ends, which pinions mesh with corresponding racks 16, the latter being sunk into and secured to the floor panel 30. The opposite ends of the retracting roller 20 (Figs. 2, 4, 8) are reduced in diameter, forming pins 22, which pass through guide slots 32 formed in guide pieces 17, by which the pinions 25 are held in engaging relation with the racks 16, and by which endwise motion of the roller 20 is limited. A coil spring 21 tends to draw the retracting roller 20 in the direction of the arrow.

Beneath the floor panel 30 is also mounted a cut-out switch indicated at 24, consisting of a spring arm 23 secured to the floor panel 30 at one end, at 28, by means of screws, which last may also serve as binding screws for electrical connection, and whose free end is adapted to contact at 29 with a fixed member 44, likewise secured to the floor panel 30 by screws, which may also serve as binding screws for electrical connection.

From the above description it will be seen that if the retracting arm 13, which normally is held in the position shown in full lines in Fig. 2 by the action of the spring 21, be moved over to the position shown in dot-and-dash lines at 13^a in the same figure, the retracting roller 20 will simultaneously be pushed to the position shown at 20^a, engaging meanwhile the foot portions 18 of the condenser abutment bars 98 and retracting the rotors 87 of the several condensers to the position shown in Fig. 8. In the earliest phase of motion of the hand lever 13, the spring arm 23 of the switch 24 moves to the position shown in dot-and-dash lines at 23^a in Fig. 2, and the contacting portions at 29 separate, breaking the electrical circuit.

Since the inner end 27 of the retracting lever 13, when in the position shown at 27^a of Fig. 2, is "on center" with respect to the direction of application of the force exerted by the retracting roller 20, or somewhat past the "on center" position, the arm 13 will remain in position 13^a until started back towards its normal position by manual action.

As stated, the apparatus above described is designed to facilitate the tuning of multi-tuned circuits. A schematic illustrative receiving circuit of a conventional neutralized radiofrequency amplifying type is shown in Fig. 3, the position of insertion of the condensers 85A, 85B, 85C, and of the switch 24 being clearly shown. It is however not intended that the application of the present invention be limited to the circuit shown, or to the number of stages of amplification shown, or to any particular type of circuit. In order to simplify the presentation of the essentials of the invention the various elements of the electrical circuit associated with the apparatus, other than the tuning condensers 85A, 85B, 85C, and the switch 27, have been carefully eliminated from all of the drawings except Fig. 3.

The operation of making a particular tuning, or selecting a particular sending station, or changing from one selected sending station to another, using the apparatus illustrated, is performed as follows:

The knob 12 of the retracting hand lever 13 is grasped and the lever pushed from the position shown at 13 to the position shown at 13^a in Fig. 2, that is (as referred to in Fig. 1) from the left to the right. This operation opens the switch 24 cutting off reception, and retracts the condenser rotors and the condenser stop bars 98. As above mentioned, the lever 13 and attached mechanism is stable in the position 13^a; hence the hand may be removed from the knob 12. The station selecting hand wheel 8 is now turned until its pointer 6 indicates the desired position on the dial 7. In this operation the drums 48A, 48B, 48C are coordinately turned, so that selected members 49N of the tuning stops are brought into position for engagement with the condenser stop bars 98. The lever 13 is now returned to its first position, as shown at 13, which operation acts to allow the stop bars 98 of the several condensers to move into abutting relation with the selected tuning stops 49N (Fig. 9), and also to close the switch 27 (Fig. 2), turning on the current to allow reception.

Should it now be found that the three circuits are not in proper tuning relation, the three condensers may be adjusted independently as follows: The three thumb screws 4 are pushed inwardly until their clutch heads engage with the clutch heads of the tuning stops 49N, as shown in Fig. 9. These milled heads 4 are turned independently to vary the effective length of the tuning stops 49N, and thereby the positions of the three corresponding rotors of the tuning condensers to tune the associated circuits. When the desired tuning relation has been obtained,

the milled heads 4 of the clutches 82 are pulled outwardly, disengaging their clutching heads from the clutching heads of the tuning stops 49N, as shown in Fig. 8.

The adjustment so effected is of course stable, and hence if the dial of the receiving set is subsequently turned to the same setting, the circuit will be properly tuned without further adjustment. Similar independent local adjustments may be made for all other members of the sets of tuning stops 49A, 49B, 49C, and it will be understood that the same number of selective settings may be made as there are tuning stops on each barrel (in the illustrative case, 38).

In the United States of America the frequency at which licensed radio transmitting stations may broadcast is assigned by law, the present practice being to fix these frequencies at points separated by a difference of ten kilocycles on the frequency band. It is moreover prescribed that the emitted carrier wave be held to the alloted frequency within very close limits. This is not the case with some stations broadcasting outside the jurisdiction of the United States, in which "wandering" of the carrier-wave frequency is not uncommon. It may be desirable, when "listening in" to such stations, to retune all three circuits from time to time to follow the wandering above referred to. This may easily be done with the present arrangement by turning the milled head 9, by which the three drums 48A, 48B, 48C, and their attached tuning stops 49A, 49B, 49C, and thus, the three condenser rotors 87 are coordinately moved to tuning positions corresponding to higher or lower frequencies. The original or normal position of adjustment may be had by again setting the pointer 10 to the fiducial mark 11. When it is not desirable to incorporate this adjustment in the apparatus, the construction shown in Fig. 11, and above described, is used.

It may happen that, on making some change in the circuit, as by changing the length or disposition of the aerial, or a thermionic vacuum tube, the electrical constants of the three circuits are disturbed and their tuning relation unbalanced. A simple stable adjustment of the three drums 48A, 48B, 48C and of all their associated tuning stops can be made by turning the screws 5 (or 5' Fig. 11) until proper tuning is had for one single station (say a station of intermediate frequency). The adjustment will extend to all the other stops of the three drums, and (more especially when the condensers 85A, 85B, 85C have straight-line frequency characteristics) eliminate the necessity, when such a change of the constants of the circuit has been made, of separately readjusting all of the tuning stops 49A, 49B, 49C.

While I have shown and described in detail the preferred embodiment of my invention, it will be understood that the disclosure is merely an exemplification of the principles involved, and that the right is reserved to make such substitution of equivalents, or such changes in the details of constructions, as do not depart from the spirit and scope of the invention defined in the appended claims.

What I claim is:

1. In a radio receiver, a condenser including a rotor, a spring motor tending to move the rotor from inoperative position through a series of frequency settings, a sliding stop bar operated by said motor, a rotary drum having a series of pins of successively increasing lengths arranged in circular series normal to one face of said drum and parallel with the axis of the drum and adapted to be selectively interposed in the path of move ment of said stop bar, means for adjusting the extent of projection of the individual pins relatively to the drum, and means for bodily adjusting the drum in the direction of its axis of rotation.

2. In a radio receiver, a tuning device including a relatively movable member, means for shifting the movable member from inoperative position through a series of frequency settings, a setting member including a stop support carrying a plurality of stops of different lengths, means connected with and operated by said means for shifting the movable tuning member and cooperating with the stops of said setting member for arresting the movable tuning member at predetermined frequency settings, and means to move said stop support in a direction parallel to the length of said stops, whereby the effective length of said stops is coordinately altered and the frequency settings corresponding to said stops are coordinately adjusted in the same sense.

3. In a radio receiver, a series of tuning devices each including a relatively movable member, means for shifting the movable members from inoperative position through a series of frequency settings, a setting member for each of said tuning devices including a stop support carrying a plurality of stops of different lengths, means connected with and operated by said means for shifting the movable tuning members for arresting the movable tuning members at predetermined frequency settings, and means to independently move said stop supports in a direction parallel to the length of said stops, whereby the effective length of said stops is coordinately altered and the frequency settings corresponding to said stops are coordinately adjusted in the same sense.

4. In a radio receiver, a series of condensers each including a rotor, a spring motor tending to move the rotor to operative position and a sliding stop bar operated by said spring motor; stop devices for cooperating with said stop bars, each stop device including a rotating drum having a series of pins of successively increasing lengths arranged in circular series normal to one face of the drum and parallel with the axis of the drum and adapted to be selectively interposed in the path of movement of the corresponding stop bar, said drums being mounted on separate shafts and connected together for simultaneous movement, and means for rotating one drum.

5. In a radio receiver, a series of condensers each including a rotor, a spring motor tending to move the rotor to operative position and a sliding stop bar operated by said spring motor; stop devices cooperating with said stop bars, each stop device including a rotating drum having a series of pins of successively increasing lengths arranged in circular series normal to one face of the drum and parallel with the axis of the drum and adapted to be selectively interposed in the path of movement of the corresponding stop bar, and means for adjusting the drums longitudinally of their axes.

6. In a radio receiver, a series of condensers each including a rotor, a spring motor tending to move the rotor to operative position and a sliding stop bar operated by said spring motor; stop devices cooperating with said stop bars, each stop device including a rotating drum having a series of pins of successively increasing lengths arranged in circular series normal to one face

of the drum and parallel with the axis of the drum and adapted to be selectively interposed in the path of movement of the corresponding stop bar, and means for adjusting the drums individually and coordinately in directions longitudinally of their axes.

7. In a radio receiver, a series of condensers each including a rotor, a spring motor tending to move the rotor to operative position and a sliding stop bar operated by said spring motor; stop devices cooperating with said stop bars, each stop device including a rotating drum having a series of pins of successively increasing lengths arranged in circular series normal to one face of the drum and parallel with the axis of the drum and adapted to be selectively interposed in the path of movement of the corresponding stop bar, and a pivoted detent cooperating with the pins of one drum to hold the same in its various positions of adjustment.

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