

April 26, 1938.

F. A. EISENMANN

2,115,624

FIXED CHANNEL SELECTING SYSTEM

Filed Aug. 12, 1935

3 Sheets-Sheet 1

Fig. 1

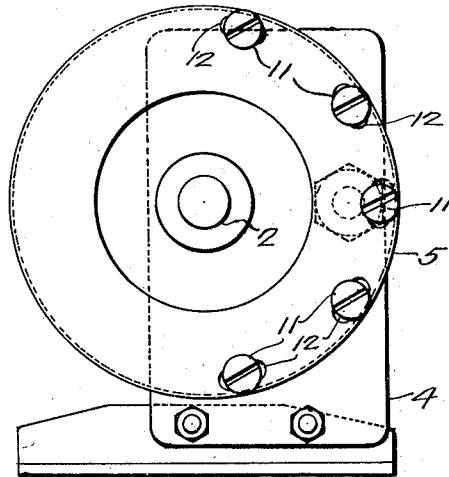
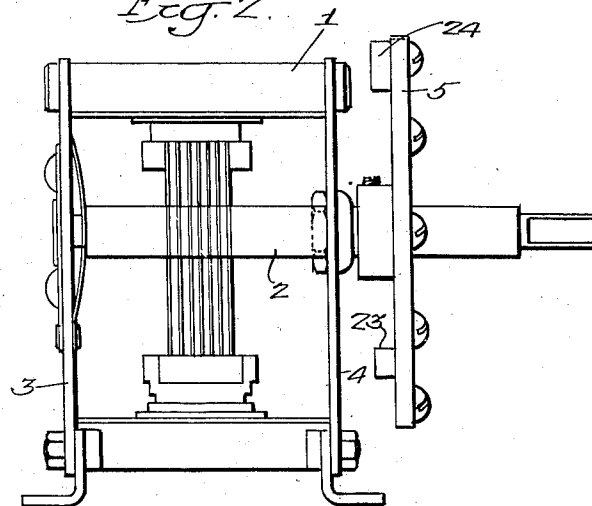


Fig. 2



Inventor:
Frederick A. Eisenmann
by his Attorneys
Snowden & Snowden

April 26, 1938.

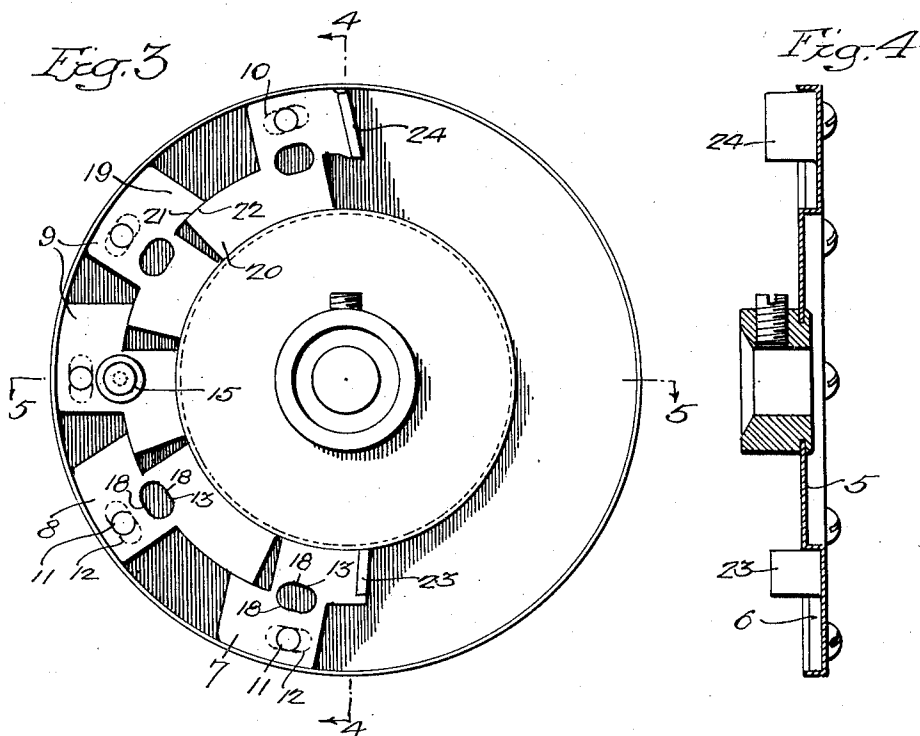
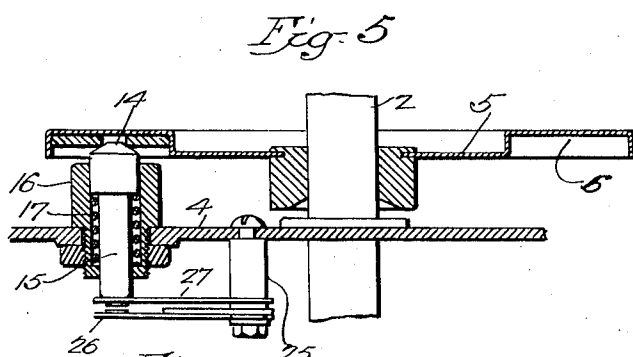
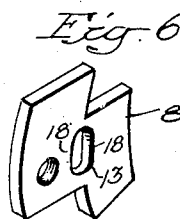
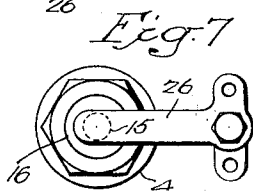
F. A. EISENMANN

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FIXED CHANNEL SELECTING SYSTEM

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3 Sheets-Sheet 2



Inventor
 Frederick A. Eisenmann
 by *James H. Sproun* Attorney

April 26, 1938.

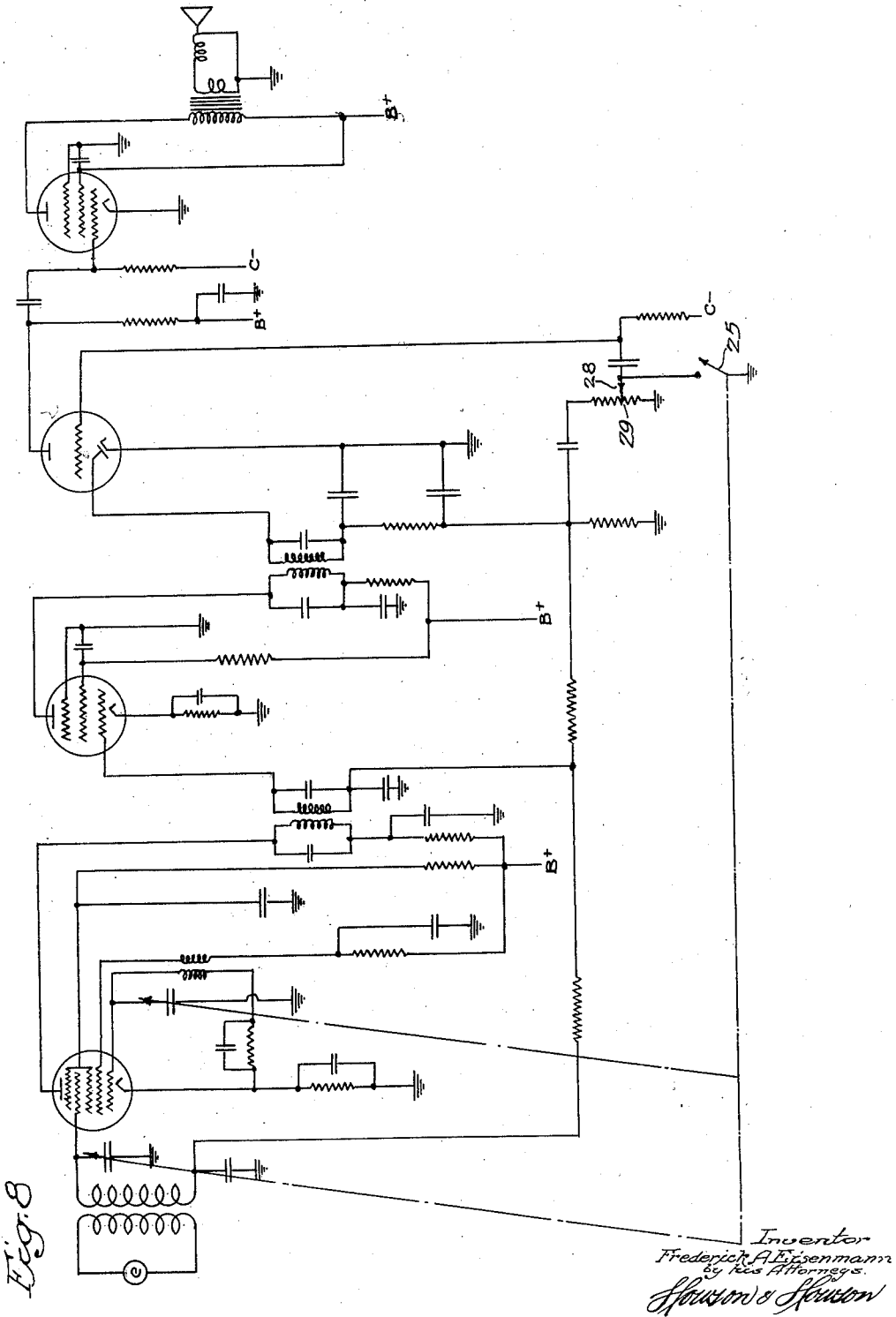
F. A. EISENMANN

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FIXED CHANNEL SELECTING SYSTEM

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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,115,624

FIXED CHANNEL SELECTING SYSTEM

Frederick A. Eisenmann, Philadelphia, Pa., assignor to Philco Radio & Television Corporation, Philadelphia, Pa., a corporation of Delaware

Application August 12, 1935, Serial No. 35,871

13 Claims. (Cl. 250—20)

This invention relates to radio receivers wherein it is desirable to permanently adjust the receiver to receive signals on a plurality of different frequency channels and to have some simple means for switching from one frequency channel to another. In a conventional system of this type, it is necessary to provide a plurality of tuned circuits and means for switching from one circuit to another, or to provide means for varying the tuning of at least one circuit to correspond to the different frequency channels.

The principal object of the invention is to provide novel means for this purpose; in particular the invention provides means which may be used in cooperation with a variable tuning element, by which said element may be approximately set in one of several positions, further tuned manually to the exact position desired and may easily be adjusted from one channel to another. More specifically, the invention provides a mechanism which may be associated with the tuning element, which may be a variable condenser drive shaft, and which will permit the shaft to be rotated, stopped in approximate adjusted position and then manually set in accurate adjustment.

The invention further provides means by which the acoustic output of the receiver may be cut off during the switching process so that silent switching may be obtained.

The invention may be fully understood by reference to the accompanying drawings illustrating one embodiment, it being understood, however, that this disclosure does not limit the invention.

In the drawings:

Fig. 1 is an end elevational view of the device;

Fig. 2 is a side elevational view of the device;

Fig. 3 is a face view of a disk assembly forming a part of the invention;

Fig. 4 is a sectional view along line 4—4 of Fig. 3;

Fig. 5 is a sectional view along line 5—5 of Fig. 3;

Fig. 6 is a perspective view of one of the adjustment members carried by the disk of Fig. 3;

Fig. 7 is a face view of a switch which may be provided; and

Fig. 8 is a diagrammatic illustration of a conventional superheterodyne radio receiver having the invention embodied therein.

In Figs. 1 and 2 of the drawings, the invention is illustrated in a simple application thereof to a single variable or tuning condenser but it will be understood that the invention may be ap-

plied to a multi-condenser unit, for example, a unit having a plurality of condensers associated with a single rotatable shaft. Referring to Figs. 1 and 2, the condenser shown may be of conventional form comprising a stationary frame 1 carrying the stationary condenser elements or plates and a rotating shaft 2 journaled in the end plates 3 and 4 of the stationary frame and carrying the rotating elements or plates of the condenser. In accordance with the present invention, there is provided a disk 5 mounted upon the drive shaft 2 adjacent the end plate 4 of the condenser unit. The disk 5, which may be formed of sheet metal or of any other suitable material, preferably takes the form illustrated more clearly in Figs. 3 and 4, the disk being formed in a manner to provide an annular channel portion 6 within which there are seated locking members or plates 7, 8, 9 and 10. These plates are secured to the disk by screws 11 which extend through slots 12 provided in the disk. The slots enable adjustment of the locking plates in desired positions upon the disk 5, the screws 11 riding in the said slots during adjustment.

Each of the locking plates is provided with an elongated hole or aperture 13 which is adapted to receive the tapered end 14 (see Fig. 5) of a locking pin 15 carried by the end plate 4 of the condenser unit. The aperture 13 of each locking plate establishes a fixed adjustment position for the locking pin, thereby locking the rotor of the condenser in a desired range, but allows for limited manual adjustment thereof as will be described more fully hereinafter.

The pin 15 is slidably mounted within a housing 16 carried by the end plate 4 of the condenser and a spring 17 is arranged to urge the pin toward the disk 5, as clearly shown in Fig. 5. The major axes of the elongated openings 13 lie on a common circle or circumference and the pin 15 is arranged so that its center is aligned with the said circle or circumference. Thus when the tapered or beveled end 14 of the pin enters one of the openings 13, diametrically opposite points of the beveled end 14 engage the opposed radially spaced edges of the opening 13 at points 18. The pin thus locks the disk 5 and the condenser shaft within a certain range, allowing accurate manual adjustment of the shaft within the range defined by the circumferential length of the opening 13, the pin riding in the opening during this manual adjustment.

The locking plates are formed and arranged as clearly illustrated in Fig. 3 so as to provide overlapping arcuate portions 19 and 20 with the

edges 21 and 22 of said portions in substantially abutting relation along the above-mentioned circle or circumference. By reason of this construction, the pin 15 is enabled to ride along the locking plates from one of the apertures 13 to another of said apertures without seating in any other aperture or space. It will be clearly seen from Fig. 3 that as the pin rides from one aperture to another, it rides along on at least one of the locking plates. It will be noted also that the particular formation of the plates and the disposition thereof in the channel 6, permits the location of the screws 11 to one side as illustrated. The bevel or tapered surface of the pin serves as a cam surface enabling the pin to be moved readily away from disk 5 during adjustment of the device from one position to another.

As delineated more specifically below there may be certain frequency bands or channels which it is desired to select, which channels correspond to certain angular displacements of the tuning means. The locking plates may be adjusted by means of screws 11 (Fig. 3) to hold the tuning means in the approximate positions required to select the desired channels. It will be noted that the locking plates are shaped so as to fit in the annular channel of the disk 5, and are adapted to be moved to the desired angular position with reference to the tuning shaft. As the several frequency channels may require irregular locations of the locking plates about the disk, they are shown of different shapes and sizes. It will be understood, however, that in some instances, the locking plates may be substantially alike in size and shape and in other instances they may differ in varying manners, depending upon the particular frequency bands or channels which it desired to select. In any case, in the preferred form of the invention, the sides of adjacent plates will overlap each other as clearly shown at 21 and 22 of Fig. 3. The locking plates 7 and 10 may have their ends turned out laterally as shown at 23 and 24 respectively to provide stops for the pin 15, thus limiting the range of movement of the device.

In further accordance with the invention, there is provided a switch 25 which may be mounted upon the end plate 4 of the condenser unit and which comprises spring contact fingers 26 and 27. This switch is mounted in cooperative relation with the pin 15, as clearly illustrated in Fig. 5, the switch being open as illustrated when the pin is seated in an aperture 13 and the contact finger 27 being actuated by the pin to close the switch when the pin moves out of the opening 13, as will be obvious. Thus, the switch 25 is maintained closed while the device is being adjusted. The purpose of this switch is explained below.

In Figure 8 is shown a wiring diagram of a conventional superheterodyne receiver in which the invention may be used; and, as the circuit is largely conventional, it will not be described in detail. It will be noted, however, that the input may be energized by any convenient signal source which might, for example, comprise a conventional antenna and ground or which might comprise any other source of modulated carrier signals. The input signals are transferred to the first amplifier stage by means of a coupled tuned circuit which serves to select signals within the desired channel and to discriminate against undesired signals which may be in other channels. The first amplifier stage may comprise a conventional radio frequency stage or it may comprise a first detector-oscillator as in a conven-

tional superheterodyne receiver, in which case the frequency of the local oscillator may be adjusted by a second tuned circuit by means of which beat-frequency oscillations of the intermediate frequency may be obtained as is well known in the art. The tuned circuits of the intermediate frequency amplifier also serve to discriminate between the desired signal and the undesired signals which may occur in other channels. For example, the input signal source *e* may comprise a plurality of modulated carrier signals, the carrier frequency of the signals being different and occurring in different frequency channels. For example, one channel might comprise a carrier signal having a frequency of 400 kilocycles and having side bands extending 10 kilocycles in each direction so that the channel would extend from 390 kilocycles to 410 kilocycles. The next or adjacent channel might include a similar modulated carrier signal in which the carrier frequency was 420 kilocycles, and in which the channel extended from 410 to 430 kilocycles. The tuned circuits of the input system would then be adjusted so as to transmit signals having a frequency within one channel but to discriminate against signals in the other channels. Further, the beat frequency obtained from the first detector, for the case of signals in the desired channel, would correspond to the frequency to which the intermediate frequency amplifier is tuned whereas beat frequencies from other channels would not correspond to the intermediate frequency and would be rejected in that amplifier. The positioning means provided by the invention may be used with the tuning condensers associated with the tuned circuits to permit the proper positioning of the several condensers so as to receive signals within one channel and to discriminate against signals of another channel.

By providing a plurality of positions in which the tuning condensers may be fixed, switching from one channel to another may be quickly and easily accomplished. It has been found, however, that due to slight variation with temperature, age and other factors, the precise adjustment of the tuning element to receive a particular channel may vary slightly from time to time. The invention therefore provides for a slight movement of the tuning means within the selected channel. This precise adjustment may be made manually and may be accurately made by ear or by the use of any of the conventional tuning meters operating in automatic volume control circuits or similar systems well known in the art.

If desired, the switch 25 described above may be connected between the adjustment arm 28 of the volume control device 29 and the grounded end of the volume control, as shown clearly in Fig. 8. By arranging the switch as above described, it is actuated simultaneously with the tuning condensers as indicated by the broken-line representation of Fig. 8. It will be seen that the switches function to cut off the audio output of the receiver during the process of switching from one frequency channel to another. Furthermore, if the volume control device is so positioned in the circuit that no unidirectional current flows through the said device, the switching operation may be effected without introducing any annoying or undesirable clicking or bumping sounds in the audio output. Obviously, switching might be obtained in other parts of the circuit.

It will be seen from the accompanying illustrations and the above description that the present invention provides a novel device for switching

from one frequency channel to another and enabling precise and accurate tuning of the frequency to the desired frequency channels. Moreover, the invention provides means for rendering the receiver inoperative while the switching operation takes place, thus eliminating undesirable noise as above described. Although a specific embodiment of the invention has been illustrated and described for the purpose of disclosure, it will be understood that various changes and modifications may be made without departing from the spirit and scope of the invention.

I claim:

1. In a tuning device for an electrical carrier wave system, means for varying the tuning of said system from one carrier frequency to at least one other carrier frequency, means associated with said tuning means for positioning said tuning means in predetermined adjustment, signal transfer means in said system, an impedance in said transfer means adapted to transfer said signals, means actuated by said positioning means for short-circuiting at least a portion of said impedance during adjustment of said tuning means to a predetermined adjustment, and means for preventing the flow of unidirectional currents in said signal transfer means due to the short-circuiting of at least a portion of said impedance during the adjustment of said tuning means.

2. In a tuning device for an electrical carrier wave system, a supporting member, a plurality of elements adjustably carried by said supporting member and movable transversely relative to one another, a detent member arranged for selective cooperative engagement with said adjustable elements, and means for effecting movement of one of said members with respect to the other of said members to bring said detent member into cooperative engagement with a desired one of said elements, said elements having complementary surfaces providing continuous engagement of said detent member therewith during the relative movement of said members regardless of the adjusted positions of said elements.

3. In a tuning device for an electrical carrier wave system, a supporting member, a plurality of elements adjustably carried by said supporting member, a detent member arranged for selective cooperative engagement with said adjustable elements, and means for effecting movement of one of said members with respect to the other of said members to bring said detent member into cooperative engagement with a desired one of said elements, said elements having overlapping arcuate edge portions upon which said detent member rides during said movement.

4. In a tuning device for an electrical carrier wave system, a supporting member, a plurality of elements adjustably carried by said supporting member, a detent member arranged for selective cooperative engagement with said adjustable elements, and means for effecting movement of one of said members with respect to the other of said members to bring said detent member into cooperative engagement with a desired one of said elements, said elements having arcuately arranged apertures for receiving said detent member and overlapping arcuate edge portions aligned with said apertures for engagement with said detent member continuously during said movement.

5. In a tuning device for an electrical carrier wave system, a supporting member, a plurality of elements adjustably carried by said supporting member, a detent member arranged for selective

cooperative engagement with said adjustable elements, and means for effecting movement of one of said members with respect to the other of said members to bring said detent member into cooperative engagement with a desired one of said elements, said elements having arcuately arranged elongated apertures for receiving said detent member and overlapping arcuate edge portions aligned with said apertures for engagement with said detent member continuously during said movement.

6. In a tuning device for an electrical carrier wave system, a supporting member, a plurality of elements adjustably carried by said supporting member and movable transversely relative to one another, a tensioned member arranged for selective cooperative engagement with said adjustable elements, said elements having seating means for said tensioned member, means for effecting movement of one of said members with respect to the other of said members to bring said tensioned member into cooperative engagement with a desired one of said elements and to cause said tensioned member to move to a seating position in the seating means of said one element, means comprising surfaces on said elements for maintaining said tensioned member in another position during the relative movement of said members, and means for rendering said system operative or inoperative comprising a switch actuable to opened and closed condition by said tensioned member during movement thereof to its said positions.

7. In a tuning device for an electrical carrier wave system, a supporting member, a plurality of elements adjustably carried by said supporting member, a tensioned member arranged for selective cooperative engagement with said adjustable elements, said elements having seating means for said tensioned member, means for effecting movement of one of said members with respect to the other of said members to bring said tensioned member into cooperative engagement with a desired one of said elements and to cause said tensioned member to move to a seating position in the seating means of said one element, means on said elements for maintaining said tensioned member in another position during the relative movement of said members, and means for rendering said system operative or inoperative comprising a switch actuable to opened and closed condition by said tensioned member during movement thereof to its said positions.

8. In a tuning device for an electrical carrier wave system, a supporting member, a plurality of elements adjustably carried by said supporting member, a tensioned member arranged for selective cooperative engagement with said adjustable elements, said elements having seating means for said tensioned member, means for effecting movement of one of said members with respect to the other of said members to bring said tensioned member into cooperative engagement with a desired one of said elements and to cause said tensioned member to move to a seating position in the seating means of said one element, means comprising complementary surfaces on said elements for maintaining said tensioned member in another position during the relative movement of said members, and means for rendering said system operative or inoperative comprising a switch actuable to opened and closed condition by said tensioned member during movement thereof to its said positions.

9. In a tuning device for an electrical carrier wave system, a supporting member, a plurality of elements adjustably carried by said supporting member and movable transversely relative to one another, a detent member arranged for selective cooperative engagement with said adjustable elements, means for effecting movement of one of said members with respect to the other of said members to bring said detent member into cooperative engagement with a desired one of said elements, and means on said elements for providing a continuous surface over which said detent member may ride during the relative movement of said members regardless of the adjusted positions of said elements.
10. In a tuning device for an electrical carrier wave system, a supporting member, a plurality of annularly arranged elements adjustably carried by said supporting member and movably annularly relative to one another, a detent member arranged for selective cooperative engagement with said adjustable elements, means for effecting movement of one of said members with respect to the other of said members to bring said detent member into cooperative engagement with a desired one of said elements, and means on said elements for providing a continuous surface over which said detent member may ride during the relative movement of said members regardless of the adjusted positions of said elements.
11. In a tuning device for an electrical carrier wave system, a supporting member having an annular channel therein, a plurality of elements slidably seated in said channel and adjustably carried by said member, a detent member arranged for selective cooperative engagement with said adjustable elements, means for effecting

movement of one of said members with respect to the other of said members to bring said detent member into cooperative engagement with a desired one of said elements, and means on said elements for providing a continuous surface over which said detent member may ride during the relative movement of said members regardless of the adjusted positions of said elements.

12. In a tuning device for an electrical carrier wave system, a detent member, positioning means having a plurality of spaced elongated recesses each adapted to receive said member, and means for effecting relative movement between said member and said positioning means to bring said member into cooperative relation with a selected one of said recesses, each of said recesses being elongated along the path of travel of said detent member during the tuning operation, thus defining a predetermined range of relative movement between said member and said positioning means while said member is seated in the selected recess, whereby accurate tuning may be effected.

13. In a tuning device for an electrical carrier wave system, a detent member, positioning means having an elongated recess adapted to receive said detent member, and means for effecting relative movement between said member and said positioning means to bring said member into cooperative relation with said recess, said recess being elongated along the path of travel of said detent member during the tuning operation, thus defining a predetermined range of relative movement between said member and said positioning means while said member is seated in said recess, whereby accurate tuning may be effected.

FREDERICK A. EISENMANN.