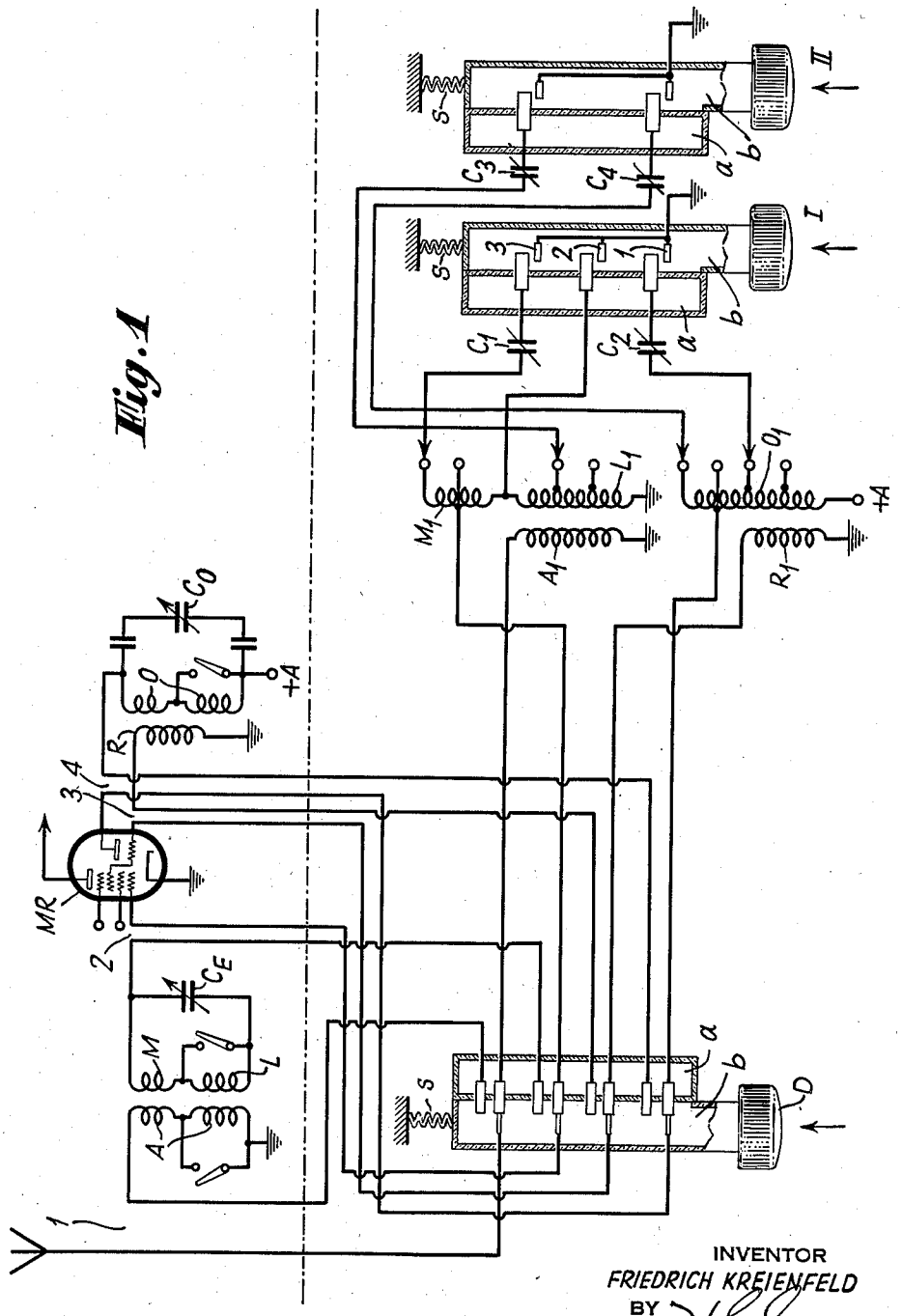
Feb. 17, 1942. F. KREIENFELD 2,273,531

RECEIVER TUNING SYSTEM

Filed May 6, 1939 2 Sheets-Sheet 1

Fig. 1



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Filed May 6, 1939 2 Sheets-Sheet 2

Fig. 2

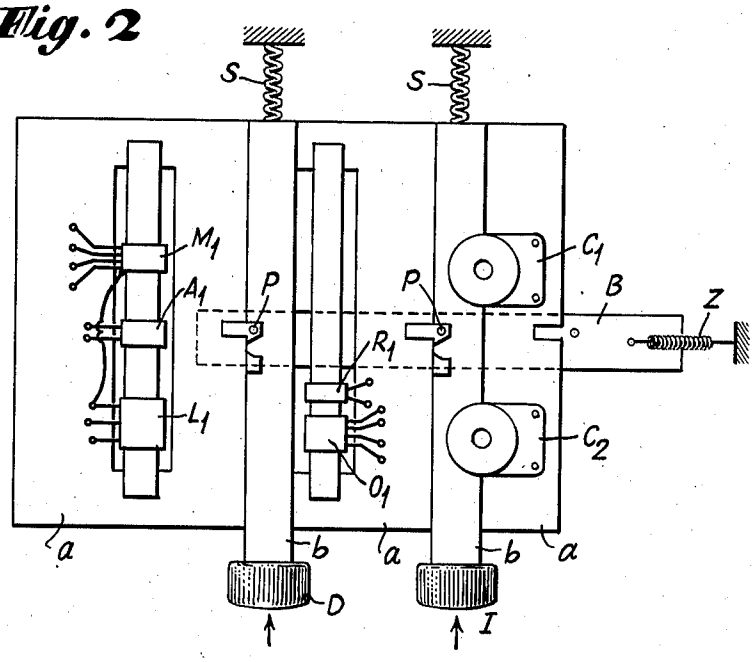
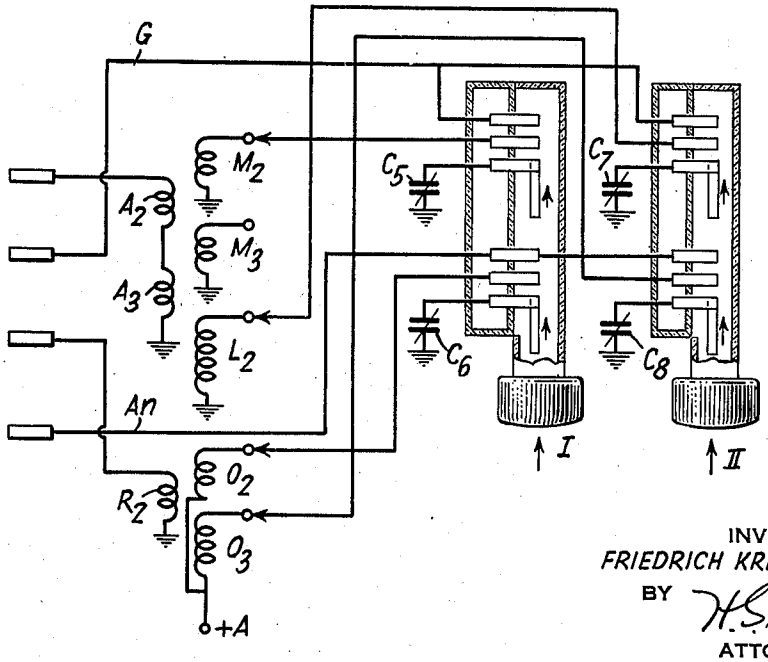


Fig. 3



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RECEIVER TUNING SYSTEM

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5 Claims. (Cl. 250—40)

In order to facilitate the tuning in a receiver it is known to provide in addition to the variable condenser several fixedly set condensers which can be selectively connected by means of a switch. In one of the positions of the switch the variable condenser is connected. It is also known to use in place of a switch several push buttons which serve for the tuning to predetermined transmitters.

The simplification intended through the push button tuning becomes void again where the receiver is equipped with a wave range switch. In fact if the wave range switch happens to be set for the reception of the medium waves it is not possible to receive a transmitter on the long wave range by operating a push button since the additional long wave coil is short circuited. The operator must see to it that the wave range switch is in the proper position.

The invention aims at eliminating this drawback and other disadvantages referred to below and resides in that in a receiver with gradual tuning through a variable condenser and utilizing also push button tuning by means of fixedly set capacitances, special tuning coils are provided which are automatically connected at push button tuning in place of the coils and variable condensers which are in operation in case of the gradual tuning, and to which special tuning coils the various fixedly set capacitances are connected when operating the push buttons. In this way it is accomplished that the push button tuning is independent of the wave range switching of the receiver.

The invention affords the possibility of solving at the same time other problems. In fact if by means of the push button tuning in place of a single wave range several other wave ranges are to be handled then when operating a push button the proper wave range can be switched in automatically by means of a contact.

Furthermore, it is possible subsequently to adjust each of the fixedly set capacitances such that any of the desired transmitters can thereby be received. What is to be accomplished is that the selection of the transmitters receivable by means of the push buttons, can be carried out in any desired manner. It would as such be readily conceivable to use as individual capacitances variable condensers having the variation range of that of the gradual main tuning condenser. However, this would involve the disadvantage of too low an accuracy of setting. Now, in order that capacitances having a smaller variation range and a correspondingly higher accuracy of the setting can be employed, the capacitances are selectively connected, in accordance with a further feature of the invention, to tappings of the additional oscillatory circuit coils. This renders it possible to use as fixedly set capacitances variable condensers having the same variation range for all transmitters but smaller in range as compared with that of the maximum capacitance of the variable condenser of the receiver. The additional oscillatory circuit coils then have obviously a correspondingly higher inductance.

In another example of construction according to the invention, as special oscillatory circuit coils, several coils are provided which are independent of one another and are switched in only when the push buttons provided for the individual transmitters are operated.

The invention will be explained in greater detail with reference to the several figures which will serve to illustrate certain embodiments according to the invention. Figure 1 shows a circuit diagram of the tuning system according to the invention, Figure 2 shows the arrangement for the case where the parts of the push button tuning arrangement are subsequently accommodated in a box to be arranged at the receiver, and Figure 3 shows a modified arrangement of a portion of the system disclosed in Figure 1.

In Figure 1, the circuit of the receiver proper, as far as it is here of interest, is situated above the horizontal dot and dash line and the additional circuit elements required for the push button tuning arrangement are shown below the said line. For example, a superheterodyne receiver is herein assumed and only the self oscillating mixer tube MR as well as a tunable receiver circuit and a tunable oscillator circuit are shown. At the places 1, 2, 3 and 4 the connections between the oscillatory circuits and coupling circuits on the one hand and the tube electrodes on the other hand are interrupted, and placed at the circuit elements for the push button tuning arrangement, which comprise the push buttons D, I and II. The buttons I and II serve for tuning to two predetermined transmitters. The push button D when operated switches the receiver from the push button tuning to gradual tuning in that the interrupted places 1 to 4 are thereby open circuited. The contacts are arranged in part on the movable part *b* of the push button and in part on the stationary part *a*.

When the button D is in the position of rest as shown all coils and variable condensers of the actual receiver are disconnected and the coils

shown below the dot and dash line are inserted. The antenna coil A_1 replaces the two antenna coils A and the medium wave coil and long wave coil M_1 and L_1, respectively, take the place of the coils M and L of the receiver circuit. In the same manner the oscillator coil O_1 takes the place of the two oscillator coils O, and finally the feed back coil R_1 takes the place of the coil R. For both wave ranges only a single antenna coil A_1 (shown at the left in Figure 2) is provided and arranged between the medium wave coil M_1 and the long wave coil L_1. The coil A_1 is so dimensioned that the antenna wave lies between the two wave ranges. The plate circuit coil O_1 of the oscillator is likewise considered for both wave ranges. This can be achieved if the intermediate frequency is relatively high, i. e. for instance 468 kilocycles as compared with 110 kilocycles since in this case the oscillator frequency is in fact substantially higher than the receiving frequencies namely by the intermediate frequency. The comparative frequency range to be covered by the oscillator then has a width such that it can be handled by a single coil. But in the receiver circuit a single coil is thereby not enough since at reception of a transmitter on the medium wave range the freely oscillating end of the grid coil would be too large.

When operating the push button I at first the additional long wave coil L_1 will be short circuited by the movable center contact **2**. Furthermore, the capacitance C_1 will be placed in parallel to the coil M_1 by the contact **3** and the capacitance C_2 is placed in parallel to the oscillator coil O_1 by the contact **1**. The small condensers C_1 and C_2 are set once. In this example of construction they are fixedly connected with high frequency carrying points of the appertaining coils and are placed at and disconnected from ground whereby only a single movable connection with the contacts is required. It would also be possible to arrange between the high frequency carrying ends of the coil and the capacitances the switching contacts which would offer the advantage that the capacities of the condensers against ground would not continuously lie at the coils whereby the initial capacity of the oscillatory circuit would otherwise be increased. Since the tube capacities already cause too high an initial capacity, the tube electrodes are placed, as shown, at tappings of the coils M_1 and O_1.

In the example shown it is assumed that the push button II is provided for the reception of a transmitter on the long wave range. For this reason no contact is provided for the wave range switching through short circuiting of the coil L_1. The connection lines for the coils lead to other tappings. Hence the tappings are so chosen that the desired transmitter can be received with the small capacitances. If all the desired transmitters are side by side close to one another the lead-ins instead of being placed at various tappings are naturally connected with the same tapping if the variation range of the condensers is just sufficient.

In the arrangement according to Figure 2, only the push buttons D and I are shown. The capacities C_1 and C_2 consist of small variable condensers with ceramic disks and which can be set by means of a screw driver. They are mounted to the stationary part *a* and protrude beyond the movable part *b* in order to save space. In order to avoid confusion the leads and contacts are not represented. The coils have the same reference characters as in the case of Figure 1. The push buttons are provided with compression springs S in order that at operation of one of the buttons a previously depressed button jumps out of its position. To this end there is provided a bar B with tension spring Z having pins P fixedly secured thereto which hold the push buttons in the depressed position and cause the release thereof in a manner known as such. This principle is also applied to the push button D so that when the buttons I, II etc. appertaining to the individual pins are operated the push button D jumps automatically out of its position if it happens to have been previously depressed thus switching the receiver to the button tuning. The bar B may be so constructed that it serves at the same time for shielding the capacitances C_1 and C_2 against one another.

If at the wave range switch of the receiver a position for record playing is provided a special contact may be additionally provided at the button D which contact connects the pick up when the push button D is at rest so that the wave range switch can also be placed into the position for record playing and yet a setting to the preselected transmitters is possible through the operation of the push buttons I and II.

In Figure 3 only the part is shown which differs from Figure 1, namely, the lower part at the right of Figure 1. Figure 3 starts at the left with the stationary contacts of the button switch D not shown. The grid coils are not connected in series and instead several independent oscillatory circuit coils M_2, M_3, L_2 are provided which are switched-in only when the push buttons assigned to the various transmitters and designated by I, II, etc. are actuated.

By this method of construction the following phenomenon which takes place in the example of Figure 1 is eliminated. The switching capacitances existing between the upper ends of a tapped coil and ground appear stepped up at the lower tappings. The initial capacity for the shorter waves then becomes easily too high so that the variation range of the condensers once fixedly set, will be greatly limited. This drawback is eliminated when providing separate coils which are independent of one another. Special contacts for the wave range switching are then not required. The leads having an arrow in Figure 3 are once connected to the respective coils appertaining to the wave range on which the desired transmitter lies. When actuating the push button I the end of the grid circuit coil M_2 is placed simultaneously at the grid lead-in G and at the condenser C_5 which is set once.

In this example the intermediate wave range and long wave range are divided into three parts by using three coils M_2, M_3 and L_2. The condenser C_5 is so chosen that it suffices to take care of all transmitters in these ranges. For instance a condenser with ceramic disks having a variation range of 20 to 80 μf. may be employed. The switch capacities will furthermore be added to the initial capacity. Hence the setting to a transmitter is not as critical as in the case of the sub-division of the total wave range into two parts and using a variable condenser of 450 μf.

When using a high intermediate frequency, for instance 468 kilocycles, the oscillator for the reasons already mentioned above requires but a smaller number of oscillatory circuit coils, in the present example two coils O_2 and O_3 to which the condensers C_6 and C_8 will be connected respectively.

The antenna coupling coils A_2 and A_3 and the feed back coil R_2 are placed always between two oscillatory circuit coils.

When actuating the push button II the capacities C_7 and C_8 are connected to the coils and at the same time also to the grid lead G and to the anode lead A*n*.

In Figure 3 the circuit is so arranged that no movable lead wires need be connected to the switches since in both cases the three contacts are connected to one another.

What is claimed is:

1. In a multi-band radio receiver, a circuit including variable tuning means for adjusting the receiver to receive signals in one of a plurality of bands, band switching means for enabling said circuit in cooperation with said variable tuning means to adjust the receiver to receive signals in a second band, a plurality of fixedly tuned circuits, each adapted for adjustment to a particular frequency in any of the bands, and push button means disconnecting entirely the first mentioned circuit and selectively controlling the operation of the fixedly tuned circuits whereby the receiver will receive signals in all bands independently of the band switching means.

2. In a multi-band radio receiver, a circuit including variable tuning means, band switching means for conditioning the circuit to be operative in any one of a plurality of bands and under the control of said variable tuning means, a plurality of fixedly tuned circuits, each adapted for adjustment to a particular frequency in any of the bands, selector means operatively associated with the respective fixedly tuned circuits whereby the receiver may be conditioned to instantaneously receive the frequency corresponding to the operated selector means, and additional selector means disconnecting entirely the first mentioned circuit and simultaneously conditioning the receiver for subsequent operation of the first mentioned selector means whereby the receiver is converted from the condition of variable tuning to that of instantaneous tuning.

3. In a multi-band radio receiver, a circuit including variable tuning means, band switching means for conditioning the circuit to be operative in any one of a plurality of bands and under the control of said variable tuning means, a plurality of fixedly tuned circuits, each comprising an inductance and a condenser separate from the first mentioned circuit and having such variation range in capacity capable of resonating said inductance to a particular frequency in any of the bands, a push button operatively associated with the respective fixedly tuned circuits whereby the receiver may be conditioned to instantaneously receive the frequency corresponding to the operated push button, and an additional push button disconnecting entirely the first mentioned circuit and simultaneously conditioning the receiver for subsequent operation of the first mentioned push buttons whereby the receiver is converted from the condition of variable tuning to that of instantaneous tuning.

4. In a multi-band radio receiver, a circuit including an inductance and a variable tuning condenser for adjusting the receiver to receive signals in one of a plurality of bands, band switching means for utilizing a portion of said inductance in cooperation with said variable tuning condenser to adjust the receiver to receive signals in a second band, a first selector means for disconnecting the above circuit and simultaneously connecting a plurality of auxiliary inductances, a plurality of fixed condensers each adapted for connection to one of said auxiliary inductances to form fixedly tuned circuits which are capable of responding to signals in all the bands, and a plurality of additional selector means, one for each fixedly tuned circuit, adapted to selectively complete the connection between one of the auxiliary inductances and its associated fixed condenser.

5. In a multi-band radio receiver, a circuit including an inductance and a variable tuning condenser for adjusting the receiver to receive signals in one of a plurality of bands, band switching means for utilizing a portion of said inductance in cooperation with said variable tuning condenser to adjust the receiver to receive signals in a second band, a tapped auxiliary inductance, a plurality of fixed condensers adapted for connection to various taps on said auxiliary inductance to form fixedly tuned circuits which are capable of responding to signals in all the bands, a first selector means for disconnecting the first mentioned circuit and simultaneously connecting the tapped inductance, and a plurality of additional selector means adapted to selectively complete the connection between the auxiliary inductance and a predetermined one of the fixed condensers.

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