July 4, 1950 DE WITT R. GODDARD 2,513,796

SWITCH AND TUNING DEVICE FOR RADIO TRANSCEIVERS

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Fig. 1.

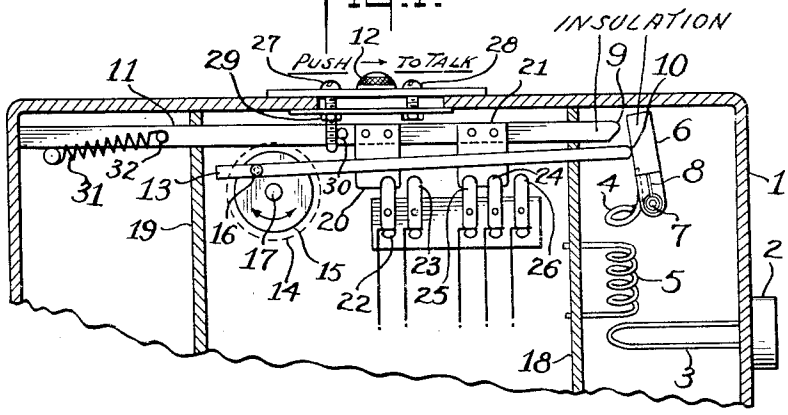


Fig. 3.

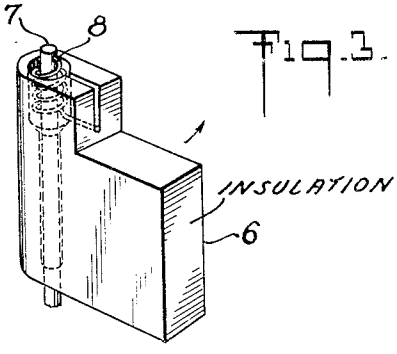
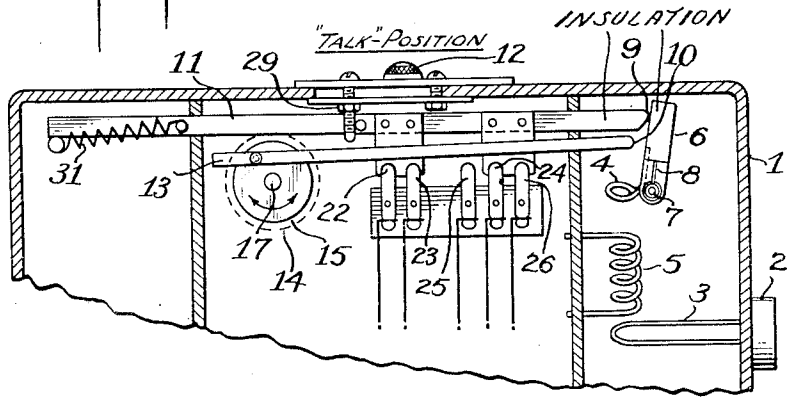


Fig. 2.



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SWITCH AND TUNING DEVICE FOR RADIO TRANSCEIVERS

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4 Claims. (Cl. 250—13)

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This invention relates to means for tuning a transceiver, and for switching the circuits thereof between receiving and transmitting conditions.

In two-way radio telephone sets it is customary to provide a "push-to-talk" key or button whereby the circuits of the transceiver may be altered and at the same time the frequency of the oscillator may be shifted to that of the assigned outgoing carrier wave.

It is an object of my invention to provide a simple mechanical sliding button to substitute for the prior art type of push to talk button. The present invention provides a novel sliding device having the unit-control function of shifting the frequency of an oscillator in a transceiver so as to condition the oscillator for producing the carrier wave when transmitting, and of re-tuning the oscillator for reception so as to produce super-regeneration, the sliding device being simultaneously effective in performing a switching operation.

This application deals with novel means for switching the circuit connections of high frequency transmitters and receivers for operation at one time as a transmitter and at another time as a receiver, such means being combined with a tuning device which is readily adjusted to any desired frequency for reception while being instantly shiftable to another frequency suitable for transmission.

My invention will now be described in more detail, reference being made to the accompanying drawing in which:

Fig. 1 shows a view of the switch and tuning device as it appears with the instrument cover removed;

Fig. 2 shows another view of the same arrangement but with the switch and tuning device shifted to the "talk" position; and

Fig. 3 shows in perspective the mounting for a short-circuited tuning ring which is variably positionable in relation to the tank circuit winding of an antenna transformer.

Since like parts are given the same reference numerals in different figures of the drawing, reference may be made from one figure to another according to the needs of the description to follow, for best illustrating the invention.

The complete transceiver unit, except for the antenna, earphones and battery, is assembled in compact form within a case 1. At one end of this case is a receptacle 2 into which an antenna may be plugged. The terminals of the receptacle are connected to a loop 3 which constitutes one inductive member of an antenna transformer. The end of this loop is in coupling relation to a tank-circuit winding 5. The terminals of winding 5 are suitably connected between the anode and grid of an oscillator tube (not shown). The other components of the oscillator circuit are conventional and do not constitute essential parts of the instant invention.

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A tuning loop 4 is mounted in coupling relation to the tank coil 5. The mounting is by means of a swiveled insulating block 6. A pivot post 7 for the block 6 is firmly affixed to the casing of the transceiver. Around the post 7 I preferably position a coiled spring 8, one end of which is attached at the top of the post and the other end is secured to the insulating block 6 at a point intermediate its two ends. The tension on the spring 8 is arranged to swing the block 6 counterclockwise and to bring the tuning coil 4 as close to the tank coil 5 as may be permitted by one or the other of two stops 9 and 10.

Stop 9 is at the end of a push rod 11 which is under control of a sliding button 12 to be used as a "push-to-talk" button.

The other stop 10 is at one end of a push-rod 13 which is arranged to be actuated by a rotatable tuning knob 14. The tuning knob is shown dotted because it is outside of the case, but it is swiveled on a shaft which also carries a disc 15 within the case. An eccentric pin 16 on the disc 15 constitutes a pivot bearing for one end of the push-rod 13. Concentric with the disc 15 and mounted thereon is another pin 17 which serves as a stop to prevent over-travel of the push-rod 13 beyond a desirable limit corresponding to the low frequency end of the tuning range for the oscillator as used for super-regenerative reception.

The two rods 11 and 13 are held in position near their ends 9 and 10, respectively, by openings in a supporting plate 18. Another supporting plate 19 has an opening therein for retaining the push-rod 11 in place. These openings in the plates 18 and 19 have sufficient clearance for the sliding action which must be given to the rods 11 and 13 respectively.

The rod 11 carries two slidling contact plates 20 and 21 which serve to interconnect certain switch terminals of a double-pole-double-throw switch. The switching functions performed in order to condition the normally receptive circuit for transmission involve closing a circuit from contact 22 to contact 23, and also transferring the connection of contact 24 from contact 25 to contact 26. The push button 12 performs this

service whenever the thumb of the operator drives this button to the right. Fig. 2 shows the button 12 and associated rod 11 moved to the right, which is the talking position.

In a preferred arrangement of the push-button control for the switch bar 11 the button 12 is mounted on a plate which slips forward and back on the outside of an edge wall of the case cover. Inside of this wall is a retaining strip which is fastened to the outside plate by means of two screws 27 and 28. These screws are fitted with nuts on the inside in order to hold the plates together and allow a free sliding movement of the push-button. Screw 27 is longer, however, than screw 28 in order that it may serve to engage a pin 30 on the push-rod 11. When operating the push-button 12, the push rod 11 is moved to the right in opposition to the tension of a spring 31. Upon releasing the push-button 12, the push-rod is restored by the tension of the spring 31 to the position for receiving.

In the operation of my tuning means as above described, the tuning knob 14 is turned to the correct position for tuning the oscillator circuit to such frequency as will produce super-regenerative reception. This tuning operation sets the short-circuited loop 4 in proper position, to which it will be automatically returned after each release of the "push-to-talk" button. The displacement of the short-circuited loop 4 by operation of the push-button is provided by the swinging of its insulation mounting block 6 to an extreme position, which is determined by the striking of a pin 32 against the partition wall 19. Pin 32 may be the same pin which holds the spring 31, the other end of the spring being mounted on a stationary post affixed to the chassis.

It should be noted that the means provided for switching from "listening" to "talking" conditions is combined with the adjustment of the short-circuited loop 4 in a very simple but novel manner. It is well known that a short-circuited loop may be used in this fashion to vary the frequency of an oscillator.

The range of frequencies available for tuning the receiver is that which is obtained by the movement of the short-circuited loop 4 under spring tension between two limits. The highest frequency of the oscillator is obtained when the loop 4 is nearest to the tank coil 5. This position is determined by the stop 9 on the end of the push rod 11 when the latter is held in normal position by the tension of spring 31. The lowest frequency to be used for reception is obtained when the insulating block 6 is rotated clockwise by the rod 13 until the latter butts against the pin 17 at the center of the disc 16. The extent of movement of the insulating block 6 may, however, be exceeded under compulsion of the "push-to-talk" bar 11. In this way the tuning of the tank circuit may be instantly adjusted to the proper point for producing the desired transmitting carrier wave.

One drawback of the past which has been overcome by the adoption of my invention is that there is no longer any tendency for two transceivers in communication to "walk" the frequency up. This difficulty was caused by retuning the transceiver each time it started to receive. Then, upon transmitting, the oscillator delivered a higher frequency than before, due in part to the higher anode voltage applied to the oscillator when talking, and eventually the carrier wave passed out of the assigned communication channel. In other words, each time a shift was made from receiving to talking the previous adjustments were lost, and attempts to restore the assigned frequencies were not always successful. With the aid of the invention herein disclosed, the carrier frequency remains fixed for two transceivers in communication, and there is no tendency for tuning adjustments to be displaced when operating the push button.

In practice my system will allow a plurality of transceivers to be adjusted so that they all transmit on a predetermined assigned frequency. These transceivers may then be operated independently, maintaining communication with each other without deviating from the original frequency.

What is claimed is:

1. In a radio transceiver, a transformer coil in a tank circuit which is tunable to a radio frequency carrier wave, a closed loop disposed in reactive coupling relation to said coil, pivoted means for supporting said loop, a resilient member for urging said pivoted means and its loop toward the tank circuit, two push-rods effective to press against said pivoted means in opposition to the force of said resilient member, a tuning device manipulatably operable to set one of said push-rods, thereby to fix the degree of coupling between said coil and said closed loop suitably for obtaining a super-regenerative receiving condition in said transceiver, and a sliding mechanism operable upon the other of said push-rods to cause that amount of diminution in the degree of coupling, whereby the tank circuit is tuned to the frequency of the carrier wave which is to be transmitted.

2. In a device according to claim 1 a plurality of stationary and movable switch components constituting means for conditioning the circuits of said radio transceiver either to receive or to transmit, the movable switch components being mounted on that one of the push-rods which is operable by said sliding mechanism.

3. In a two way radio apparatus, a sliding operating member, a spring tensioned pivoted arm disposed so as to be actuated by an end of said member, movable switch contact means carried by said member, a movable tuning loop located on an end of said arm, a tuning coil inductively coupled to said loop, fixed contact means for engaging said movable contact means, said member acting to shift said arm to thereby vary the tuning of said apparatus, resilient means secured to said member and acting to oppose the movement of said member, and a transmit-receive system controlled by said contact means, said system including an oscillator whose tank circuit includes said tuning coil.

4. In a two-way radio apparatus, the combination with a manipulatable sliding mechanism of switching means operable by such mechanism to condition the circuits of said apparatus for transmitting a modulated carrier wave of predetermined frequency, a short-circuited loop coupling member inductively coupled to a tank circuit which is one of the components of said radio apparatus, said member being adjustably mounted with respect to said tank circuit and being adjustable to a normal position relative thereto which permits of super-regenerative reception of signals having the frequency of said carrier wave, means operable by said mechanism for adjusting said member relatively to said tank circuit to a position which fixes the frequency of the transmitted carrier wave, and resilient means for biasing said member toward said normal position, said resilient means operating in response to

release of said mechanism to restore said member to said normal position.

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