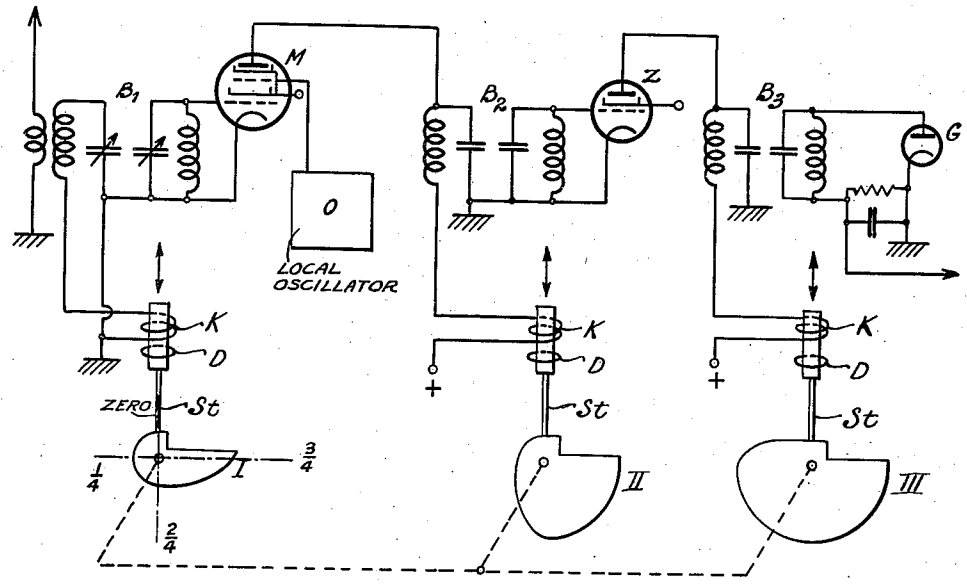
Feb. 25, 1941. K. WILHELM 2,232,833

BAND WIDTH CONTROL

Filed Nov. 14, 1939

Fig. 1.



CAM POSITION	B_1	B_2	B_3
ZERO			
1/4			
2/4			
3/4			

Fig. 2.

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BAND WIDTH CONTROL

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4 Claims. (Cl. 250—20)

Radio receivers have been known to comprise several stages containing oscillatory circuits or band filters and to be equipped with band width control means in the various stages which are coupled with each other. Where it is of interest that in the position for the widest band the received carrier frequency be as much as possible fully admitted while on the other hand in the position for the narrowest band a possibly high sharpness of selection be obtained, it is important that all oscillatory circuits or band filters have their band width controlled. Then it is advisable also to control the first oscillatory circuits of the receiver. But in this case there exists the danger of cross modulation. In the case of a superheterodyne receiver there is the further drawback of the disturbances due to whistling. Now the invention furnishes a solution by which cross modulation and disturbances through whistling are eliminated to the extent in which this is possible at all.

In accordance with the invention it is proposed so to devise the control of the band width that at the control for wider band width the stages situated towards the output of the receiver admit at first gradually or increasing in several steps a wider band and only then, eventually in overlapping relation, the stages situated towards the input admit a wider band gradually or in a manner increasing in several steps. In fact in this case during the control for a wider band no danger of cross modulation and disturbing whistling is next encountered since the first circuits admit no band wider than before. This danger can appear only where a part of the control range is already passed through.

In the superheterodyne receiver a further point is to be considered which renders especially advantageous the mode of control according to the invention. In fact if the preliminary circuits and the intermediate frequency circuits would be controlled simultaneously an advantage exists in that the band width of the preliminary circuits increases generally at higher frequencies also without the operation of the band width control means. Thus if at the shorter waves of the range the intermediate frequency filter and the preliminary circuit are set for a wide band, then at the upper end of the wave range the band width of the preliminary circuit would become narrower so that at this end the band width would be too narrow or at the lower end it would be too wide. Hence, at constructing the receiver it would be necessary to decide beforehand upon one of these two possibilities as to the position for the widest band. When applying the invention this condition is different because in fact at the stepping up of the control to a wide band the intermediate frequency circuits are set at first for the widest band and only then does the control of the preliminary circuits begin. Hence, there exists the possibility of setting as desired the preliminary circuits for a wide or narrow band, depending as to whether a transmitter is received at the upper or lower end of the receiving range.

The application of the invention is especially advantageous in the case of receivers with band width control in which aside from a change of the coupling of oscillatory circuits also an increase in the damping at a closer coupling takes place by means of a damping ring being approached to the oscillatory circuit. In the preliminary circuits the damping ring actually enhances the natural frequency pattern of the band width because it acts as a parallel resistance which is independent of the frequency and therefore it is less effective at the upper end of the wave range at which the resonance resistance is lower than at the lower end. Although in this type of control this drawback exists, there is hereby involved a very simple kind of the gradual band width control.

As already pointed out, the invention is moreover also applicable where the control of the band width takes place automatically in any known manner. If the control takes place in a purely electrical fashion, the delay means can be employed which are known from the fly wheel control.

The invention will best be understood by reference to the following description taken in connection with the accompanying drawing in which Fig. 1 discloses in diagrammatic fashion a superheterodyne circuit embodying the invention, and Fig. 2 illustrates selectivity curves of the several band-pass filters at various positions of adjustment. There is shown a receiver having three band filters B_1, B_2 and B_3. Between the first two filters there is a mixer tube M to which the frequency of the local oscillator O is applied and between the second and third band filter an intermediate frequency tube Z is placed. The third band filter B_3 feeds a detector G.

The control of the band width takes place by the displacement of small coupling coils K which are connected mechanically with a short circuit ring D serving for the damping. The displacement is carried out by means of the rods *St* and cam disks I, II and III. The cams are shown in the position for high selectivity or the narrow-

est band width. The selectivity curves for this or zero position are shown in Fig. 2.

When turning to the right the cam disks I and II are both inactive during ¼ revolution. During this quarter the band filter B_3 is set however for the full band width. During the second quarter of the revolution the band filter B_3 remains at the full band width, while the band width of the filter B_2 is likewise brought to its full value. The band filter B_1 is still set for small band width. It is only during the third quarter of the revolution that also the band filter B_1 comes of full band width. The above mentioned band width curves at the various cam positions are shown in Fig. 2.

The band width control can also be carried out in any other desired manner.

What I claim is:

1. In a radio receiver provided with three successive band pass filter circuits, means associated with each filter circuit for varying its response characteristic from high fidelity to sharp selectivity adjustments, and means, including a differently shaped cam member cooperating with each response varying means, constructed and arranged to simultaneously and gradually adjust the several response varying means between said limits of adjustment but each of said response varying means being adjusted at a rate of change different from each of the other response varying means.

2. In a radio receiver provided with three successive pairs of coupled circuits, means associated with each pair of said circuits for varying the degree of coupling therebetween whereby the response characteristic is caused to change from a high fidelity to a sharp selectivity adjustment, and means, including a differently shaped cam member cooperating with each response varying means, constructed and arranged to simultaneously and gradually adjust the several variable coupling means between said limits of adjustment but each of said coupling means being adjusted at a rate of change different from each of the other variable coupling means.

3. In a radio receiver provided with three successive band pass filter circuits, means associated with each filter circuit for varying its response characteristic from high fidelity to sharp selectivity adjustments, means, including a differently shaped cam member cooperating with each response varying means, constructed and arranged to selectively adjust said response varying means to one or the other of said adjustments, and means for operating said adjusting means in unison, the arrangement being such that in one position of the operating means the several circuits are set to one and the same response adjustment and with continued operation of said operating means the several circuits are successively, at different rates of change and in timed relation brought to the second response adjustment.

4. In a radio receiver provided with successive band pass filter circuits, means including a movable auxiliary winding associated with each filter circuit for varying the response characteristic of the circuit from high fidelity to sharp selectivity adjustments, a cam member for controlling the extent of movement of each of said auxiliary windings thereby to adjust said response varying means between said limits of adjustment, said cam members being operated in unison and being differently shaped whereby at least for one position of adjustment the response characteristics of the several circuits are different.

KARL WILHELM.