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RADIO RECEIVER CIRCUIT

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Fig. 1

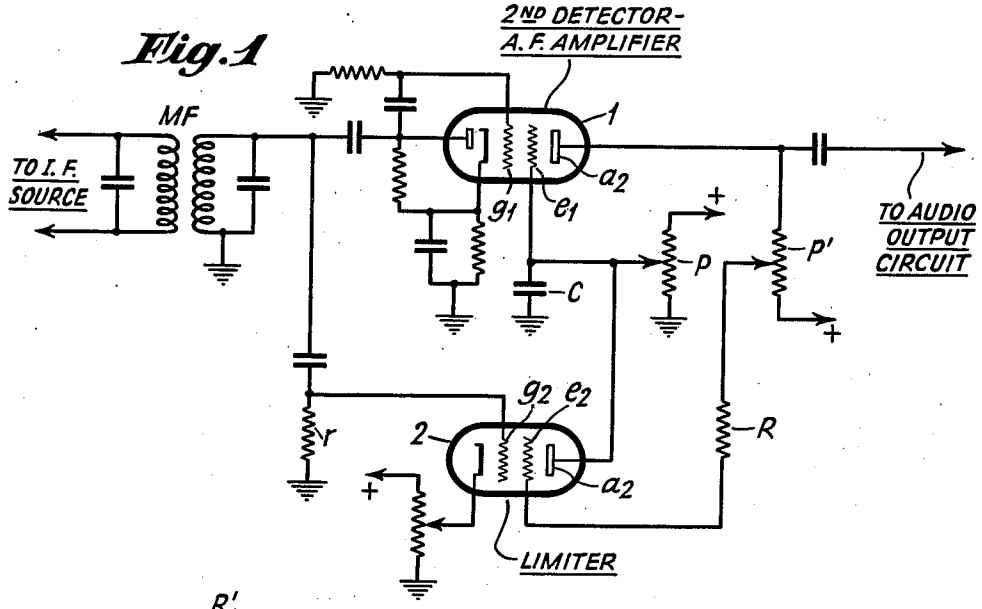
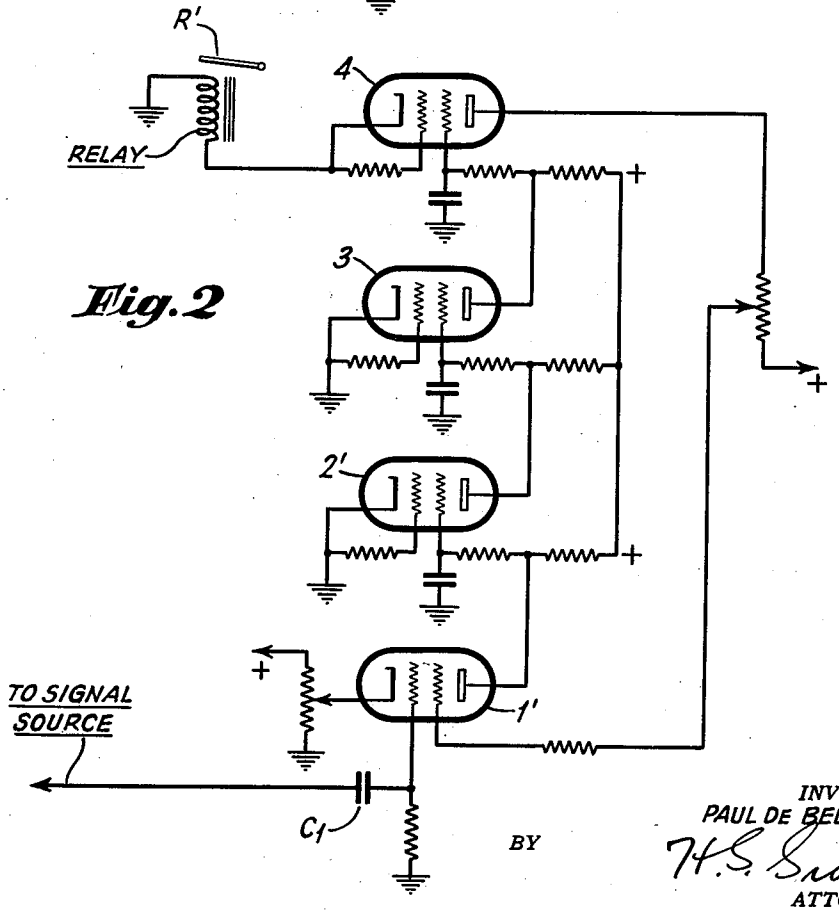


Fig. 2



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RADIO RECEIVER CIRCUIT

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2 Claims. (Cl. 250—20)

This invention has as its main object amplifier or current limiter circuits comprising the use of screen grid tubes.

It relates more particularly to circuit arrangements comprising in parallel two screen grid tubes, or several groups of such an assembly, in which the screen grid of one of the tubes is connected, directly or by way of interposed resistances, with the plate of another tube, and vice versa.

If operating conditions have been judiciously chosen, such an arrangement insures a limiting effect which is readily adaptable to means designed to combat atmospherics or fading actions, for instance, in radio receiver apparatus. The invention is also adapted to amplifiers capable of working a relay, to actuate and control signal or alarm devices, etc., when subject to the action of signals or variations of signals of rather low intensity.

The invention shall be first described in connection with its application to an anti-stray or interference elimination device for radio receivers.

To diminish in a radio receiver apparatus the disturbances which are caused by stray or parasitic signals whether of atmospheric or man-made or industrial origin (electrical storms, elevator motors, etc.), recourse may be had, as known in the prior art, to circuits which, under the action and influence of interference, will momentarily block or cut off certain stages of the apparatus, more particularly the I. F. stages in a superheterodyne apparatus, or which momentarily cut down the output of the detector. These circuits in general have the drawback that they are complicated or are of low efficiency. The invention, on the contrary, makes it possible to insure interference elimination by ways and means both simple and efficacious.

The basic idea of the invention essentially is to dispose in the apparatus, in shunt relation to a screen grid tube connected in a resistance amplifier circuit scheme, more particularly the detector and audio input amplifier of a superheterodyne receiver, a second screen grid tube acting as a limiter; that is to say, connected in a way so that there will be no action on the amplification of the first tube as long as the level (signals or noise or stray) stays below a certain threshold value, while producing a cut-off action thereon as soon as this level is reached.

A circuit arrangement of this kind may be created very simply by connecting the two tubes in parallel relation, while crossing their screen grid and plate connections in such a way that the screen current of one thereof becomes added to the plate current of the other tube, and vice versa.

Fig. 1 and Fig. 2 of the appended drawing show by way of example two embodiments of the invention. Referring to the arrangement of Fig. 1, there is indicated at 1 the second detector and audio input amplifier stage of a conventional type of superheterodyne receiver set. The tube 1 is a screen grid tube with a diode detector, for instance, a tube of the type known as 6B7. The limiter tube 2 is a simple screen grid tube, for instance, a tube of the 6C6 type.

The control grids $g1$ and $g2$ of the said two tubes 1 and 2 are fed in parallel from the intermediate frequency (IF) stages of the receiver. The plate $a2$ of the limiter tube 2 is fed with direct current in parallel with the screen grid $e1$ of the amplifier tube by means of a potentiometer P. The screen grid $e2$ of the limiter tube is fed also with direct current from a suitably chosen point on the plate resistance P' of the amplifier tube, with optional interposition of a resistance R.

The operating point of tube 2 is regulated in such a way that the currents of its screen grid $e2$ and plate $a2$ will be of zero value under normal working conditions, that is to say, in the absence of interference or noise signals. The amplifier tube 1 will then operate as if the limiting tube 2 did not exist at all; hence, the signals received from its IF stages are detected and fed on to the audio stages with normal amplification.

If, on the contrary, a stray, or noise, signal of sufficient intensity happens to be superposed upon the incoming signals, the operating point of tube 2 is shifted to the righthand side of its characteristic plotted in the usual way. As a result, plate current and screen grid current are caused to arise, and these currents tend to neutralize the plate current and the screen current of tube 1 the amplification of which is cut down appreciably. Hence, the transmission of signals are blocked until the instant when the interference has disappeared and the arrangement is restored to its normal amplification.

By choosing desirable values for the various elements of the circuit it is possible to obtain in tube 1 a more or less considerable decrease in amplification. One of the outstanding merits of this circuit arrangement is its great responsiveness and sensitivity. This is ascribable to a reaction effect of the two tubes produced

upon each other. If, as a matter of fact, the operating point of tube 2 happens to be slightly to the right of the bend in its characteristic, in other words, if its current ceases to be negligible, then the screen-grid potential of tube 1 diminishes and this results in an increase of plate potential for the plate is fed across a resistance. Now, since the last named potential is also applied to the screen of tube 2 it will be seen that, finally, the fact that a plate current is set up in tube 2 causes a rise of potential of its own screen grid, which, in turn, tends still further to increase the plate current of this tube. The existence of the said reaction makes this circuit very sensitive.

The capacity c which is interposed between the grid $e1$ and ground serves normally to prevent the arising of audio oscillations in the system. A condenser of a size of fifty one thousandths (50/1000) of a microfarad, for instance, will prove sufficient for this purpose. It will be noticed that by making the said condenser of an appreciably greater value (say, several mfd.) a certain delay element may be introduced in the unblocking or opening of the system.

It will, also, be noticed that in order to preclude untimely or inadvertent operation of the interference eliminating arrangement as a result of a fluctuation of the level of the signals to be received, an anti-fading potential may be impressed upon the grid $g2$ arrangement. To this end it would be sufficient, for instance, to connect the end of the leak resistance r to the means designed to furnish the anti-fading potential rather than to ground (as shown in Fig. 1).

Instead of using the plate current variations of a screen grid tube as illustrated in the embodiment shown in Fig. 1, to the end of altering, while the interference lasts, the gain level of a receiver, it would also be feasible to utilize these current variations for the object of actuating a relay as hereinbefore indicated, or for the purpose of rendering operative signal or alarm means, etc., by the action of signals or signal variations of rather reduced intensity. In this case recourse would be had more particularly to the D. C. amplifying effect which a screen grid tube circuit organization as here disclosed offers.

An application of this object of the invention is illustrated by way of example in Fig. 2 of the appended drawing. Referring to Fig. 2 it will be seen that a screen grid tube 1' operating as a detector is fed by way of a condenser c_1 with signals, the variations of which are to control a relay R'. The detected signals, act as previously, though by the intermediary of an even number of screen grid tubes 2' and 3 upon a power screen grid tube 4 whose output circuit includes the relay R. The tubes which are interposed and indicated at 2' and 3 here act as intermediate amplifiers. While only two are here shown it will be evident that it would also be feasible to provide four or six thereof, or even a greater number.

What I claim is:

1. In a signal transmission system comprising a source of modulated carrier energy, a first tube comprising input electrodes, an output electrode and at least one auxiliary cold electrode, a device for minimizing the transmission of undesired impulses above a predetermined amplitude, said device comprising a second electron discharge tube having input electrodes and at least two cold electrodes, one of said last two cold electrodes being an output electrode and the other being an intermediate electrode, a source of direct current connected to said first tube output electrode and said intermediate cold electrode of the second tube to apply positive potentials thereto, and a second source of direct current independent of the first direct current source connected to the first tube auxiliary electrode and the output cold electrode of said second tube for applying positive potentials thereto, and means for preventing the current flow to the two cold electrodes of the second tube in the absence of electrical impulses of a predetermined undesired amplitude.

2. In a signal transmission system, a signal amplifier of the screen grid type, a noise control tube of the screen grid type, means impressing signals on the input electrodes of both tubes, a direct current source connected to the output electrode of the amplifier and screen grid of the control tube, a second direct current source independent of the first source connected to the plate of the control tube and screen grid of the amplifier tube and means for biasing said noise control tube to prevent screen grid and plate current flow thereof in the absence of undesired noise impulses.

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