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HIGH FREQUENCY TRANSMITTER SYSTEM

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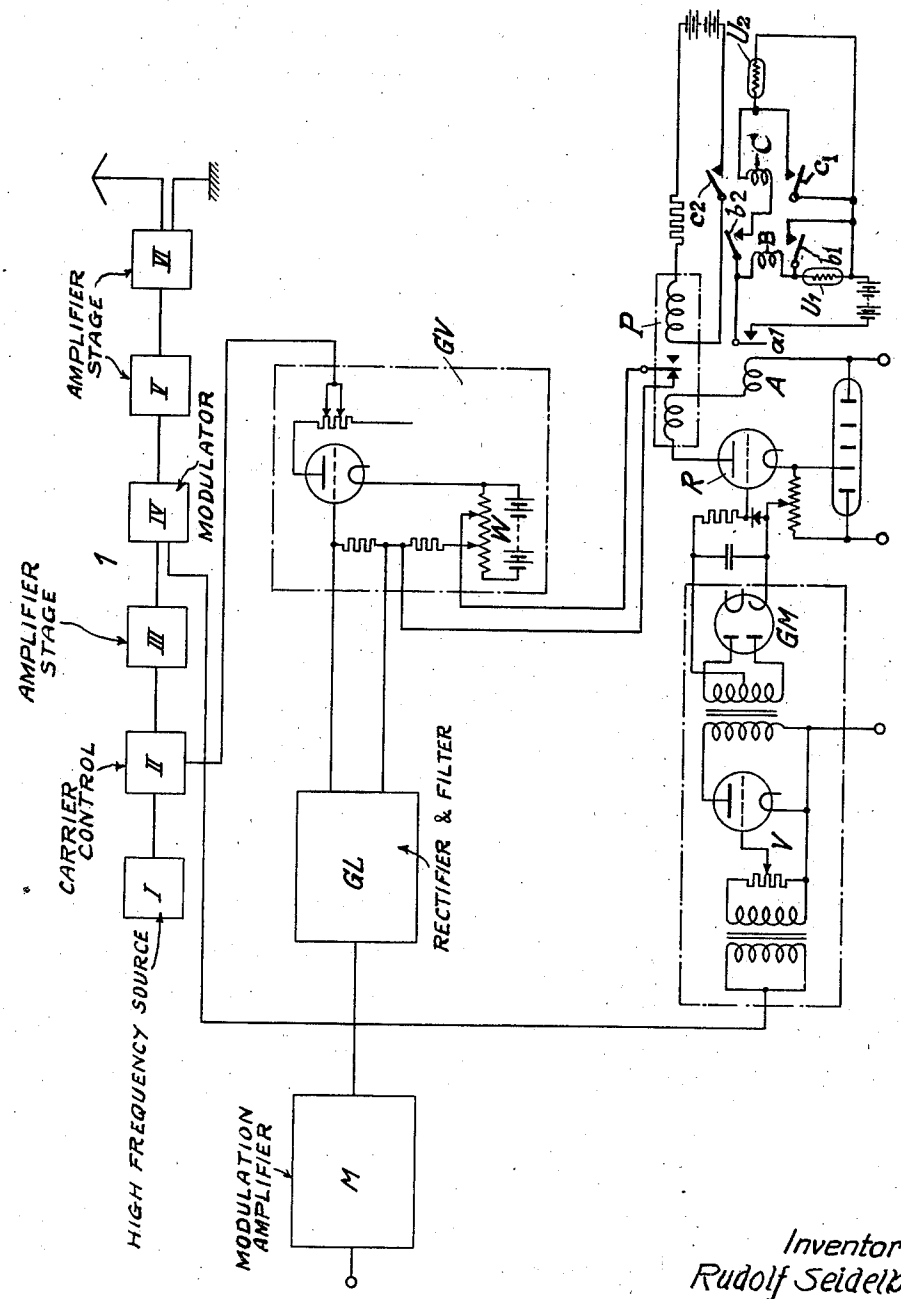

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HIGH FREQUENCY TRANSMITTER SYSTEM

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This invention relates to high frequency transmitter systems, and more particularly to new and useful means for reducing the power consumption of such systems.

It is known in connection with high frequency systems to effectively radiate high frequency carrier waves only in presence of modulation voltages which are to be transmitted. It has been common practice heretofore to provide relays for correspondingly controlling the carrier frequency dependent upon the presence or absence of modulation oscillations in such manner that a continuous current derived from the modulation currents is applied to these relays which in response to the presence of modulation oscillations immediately render the carrier frequency generator effective to produce a carrier frequency. This method of carrier frequency control is considerably disadvantageous since it is impossible to secure reliable transmission of the initial part of the modulation oscillations since the carrier frequency transmission lags behind the modulation due to an inevitable delay caused by the mechanically operated switching means, from which follows that arrangements of this type are unsuitable in connection with two-way communication systems, or in cases that the effective transmission is frequently interrupted by silent periods or pauses.

The present invention has for an object to avoid the aforementioned disadvantages by so controlling the carrier frequency in dependency upon modulation oscillations that the effective carrier frequency emission is started with possibly short delay of time, while the carrier frequency becomes suppressed with a considerable delay of time after the modulation oscillations have decayed. The immediate effectiveness of the carrier frequency may by way of an example be achieved by a direct voltage control, while the delayed ineffectiveness may be attained by the agency of a relay arrangement, the individual members of which are rendered slow to operate. An arrangement designed in accordance with this teaching provides the important feature that the carrier frequency immediately involves its desired full amplitude at the very commencement of modulating message or communication current oscillations. Moreover, only transmission interruptions exceeding a predetermined period of time will cause the suppression of the carrier frequency, while this frequency remains effective during short pauses or silent periods of the transmitter. It is thus possible to reduce the power consumption of such transmitter systems in a relevant manner without introducing any possibilities for message transmission distortions or other troubles of any kind.

The useful improvement according to my invention hereinafter more precisely described is particularly well applicable to speech modulated high frequency broadcasting and communication transmitters, in contradiction to the heretofore known systems which operate on the method of controlling the effectiveness and ineffectiveness of the carrier amplitude with the same time constant according to which the carrier becomes entirely suppressed even in response to the shortest interruption of the modulating speech current supply. It is obvious that the transient and frequently occurring suppression of the carrier wave in a transmitter system will inevitably set up distortions and other harmful disturbances in amplitude controlled receiving equipments in which it is desirable to pick up messages being radiated from such system.

In cases that specific operating conditions would so require, means may be provided in order to subject the amplitude of the carrier frequency to an additional control in response to the amplitude of the modulation oscillations during the intervals of radiation, that is to say, when the carrier frequency is actually effective.

My invention may be realized in such manner that a portion of the modulation currents is applied to a rectifier device, thereby causing the resultant continuous current from this rectifier to change the grid bias of a transmitter tube to a less negative value. This rectifier is followed by smoothing elements such as a filter, the time constant of which is short enough to ensure that the carrier amplitude is set up simultaneously with the occurrence of modulation amplitudes. Apparently the step of carrier amplitude suppression would be effected in accordance with the same time constant with which the amplitude of this carrier was rendered effective, but it is an object of this invention to provide means in order to considerably delay the step of carrier frequency suppression.

The invention will be more readily understood from the following description taken in conjunction with the accompanying drawing, the single figure of which diagrammatically shows a transmitter system to which my invention is applied.

In the embodiment shown in this drawing a transmitter I is assumed to have the six stages I, II, III, IV, V and VI. It will be assumed that the stage I consists of a generator for producing a high frequency carrier and that the amplitude of this carrier is subjected to a control in the stage II by any suitable means, so that when no signal is being transmitted the carrier is suppressed. When signal is being transmitted some means, for example a relay or grid bias control, renders the carrier operative for transmission. The high frequency carrier is modulated with modulation oscillations applied to the stage IV in any suitable manner (not shown) from a modulation frequency source. A portion of the

output energy from said source is diverted from the modulation frequency amplifier M following said source and this portion is rectified in the rectifier device GL in which smoothing elements such as filter units are provided. The direct current from the output side of the rectifier GL is applied to a direct current amplifier GV and the output continuous voltage from this amplifier is conveyed to the carrier amplitude control stage II in order to control the carrier amplitude. The potential output from amplifier GV may control the carrier output at II by any known means as outlined above, so that the carrier is transmitted as long as the amplifier GV is operating to produce an output. The time constant of this control is very low in order to effect the above mentioned amplitude control in time coincidence with the displacement of the operating point along the characteristic curve of the amplifier. Simultaneously also a portion of the modulation currents is applied to a further rectifier device GM through an amplifier V. This rectifier may form part of the grid circuit of a tube R having a relay P connected in its anode circuit. In the embodiment of my invention a polarized relay is shown in this position although other types of relays may be used without departing from the scope thereof. It is readily to be observed from the diagram shown that a given potential is applied to the continuous current amplifier GV over the contact or armature of relay P in its lefthand position shown and through the adjustable resistor W, so that the amplitude of the carrier is maintained at a given value in the control stage II.

Any change subjected to either of the modulation voltages applied to the direct current amplifier GV through the modulation frequency amplifier M would immediately cause the decay of the carrier amplitude on account of the resultant voltage change in the first mentioned amplifier, and this decay would be performed with a time constant which corresponds to the time constant of the smoothing means forming part of the rectifier GL. However, in the arrangement under consideration the aforementioned voltage change cannot take place since a constant voltage is applied to the amplifier GV over the armature of the polarized relay P in its position shown and through the resistor W to maintain an output current from GV, so that the amplitude of the carrier frequency, e. g. once adjusted to its full value or to 60 per cent of this value, will be maintained at constant magnitude.

The time constant of the polarized relay control circuit may be fixed to approximately 20 to 30 seconds. The desired timing is attained by the agency of a further relay A likewise included in the anode circuit of the heretofore mentioned tube R in series with one winding of the polarized relay P. This relay A closes its contact *a1* as soon as the cathode-anode path of tube R is rendered non-conductive in response to a modulation frequency decay. Contact *a1* in its right hand position prepares a function circuit for a further relay B through a timed resistor U1 of uranium dioxide, for example, the resistance value of which becomes strongly reduced after the elapse of several seconds so as to complete the function circuit in which the relay B is caused to operate. Relay B energized closes its contacts *b1* and *b2*. The contact *b1* bridges the resistor U1 and contact *b2* prepares a similar function circuit for a further relay C through a timed resistor U2 which likewise may consist of uranium dioxide. After a predetermined period of time the resistance value of resistor U2 has been sufficiently decreased to cause relay C to operate and to close its contacts. Contact *c1* bridges resistor U2 and contact *c2* closes a circuit for a second winding of the polarized relay P. It is obvious that the number of function circuits may be arbitrarily selected in accordance with the delay time desired between the decay of modulation oscillations and the energization of the second winding of relay P. The energization of this second winding moves the armature of relay P into its right hand position thereby interrupting the direct current supply to the resistor W of the continuous current amplifier GV with the result that the carrier amplitude is brought down to zero value after a predetermined interval of time.

What is claimed is:

1. A high frequency transmitter system comprising, a generator for producing a high frequency carrier, means to control the amplitude of said carrier, a modulation frequency source means to modulate said carrier with modulation oscillations from said source, means for diverting a first portion of modulation oscillations from said source, mean to rectify and filter said first portion, an amplifier tube having a grid and an anode, said grid being controlled by said rectified and filtered first portion of modulation oscillations, said anode being connected with said carrier amplitude control means to immediately bring the amplitude of said carrier to its desired full value in response to the presence of modulation oscillations, means for diverting a further portion of modulation oscillations from said source, and means responsive to said further portion to maintain the bias of said grid constant for a predetermined period of time subsequent to a modulation oscillation decay for holding the amplitude of said carrier at its desired full value during this period.

2. A high frequency transmitter system as defined in claim 1, in which said means responsive to the further portion of modulation oscillations comprise an amplifier followed by a rectifier, a discharge tube having a grid and an anode, said grid being controlled in response to modulation oscillations from said rectifier, a polarized relay having two windings, and a slow operating relay chain having a time constant of 20 to 30 seconds and comprising a first, a second and a third relay, one winding of said polarized relay and the winding of said first relay being serially connected with said anode to cause said polarized relay to establish a circuit for holding the grid bias of said amplifier tube and thus the amplitude of said carrier constant during the presence of modulation oscillations and to start the operation of said second and said third relay in response to a decay of modulation oscillations for causing said last mentioned relays to energize the second winding of said polarized relay for interrupting said holding circuit and thus suppressing the amplitude of said carrier after the elapse of a predetermined period of time as defined by the end of the timed operation of said relay chain.

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