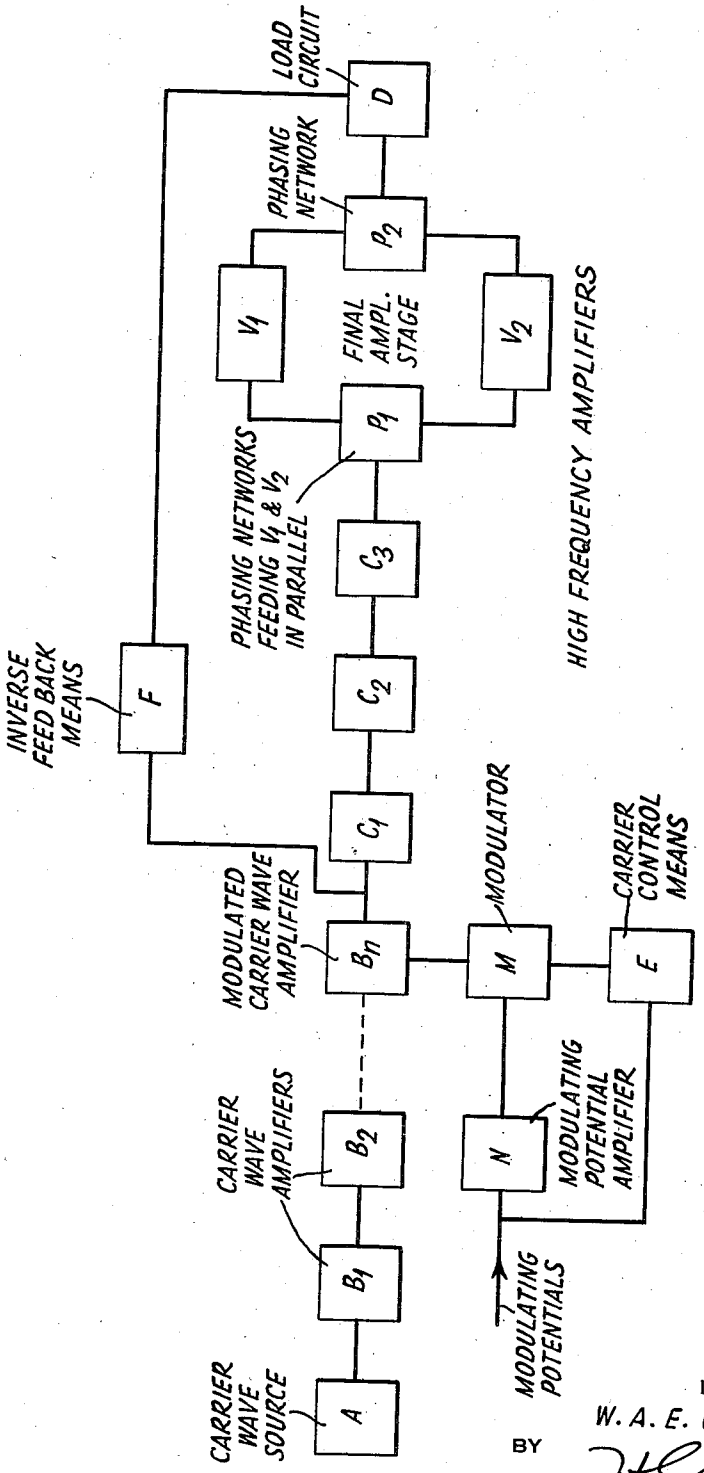
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MODULATED CARRIER WAVE TRANSMITTER

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INVENTOR
W. A. E. QUILTER
BY
ATTORNEY

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MODULATED CARRIER WAVE TRANSMITTER

William Alfred Edward Quilter, Stanmore, England, assignor to Radio Corporation of America, a corporation of Delaware

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1 Claim. (Cl. 250—17)

This invention relates to modulated carrier wave transmitters and has for its object to provide improved transmitters wherein the advantage of high efficiency at low percentages of modulation may be obtained without the introduction of any important or appreciable distortion.

It is known in radio and other modulated carrier wave transmitters to resort to what is now generally termed "floating carrier control," that is to say, automatically to vary the carrier level in dependence upon the intensity of modulation so that when the modulation is deep the carrier level is correspondingly high and when this modulation is shallow the carrier level is correspondingly low. Floating carrier control is obtained automatically in dependence upon the modulation signals themselves.

According to this invention a modulated carrier wave transmitter comprises in combination a source of carrier wave oscillations; means for modulating said oscillations; means for automatically applying floating carrier control so that the carrier level is dependent upon the varying modulation strengths; and two amplifier systems feeding into a common load and having their inputs fed in parallel by modulated oscillations which have already been subjected to floating carrier control, said amplifier systems being so arranged that in the unmodulated condition one system is supplying the carrier power at a high efficiency and is capable of having its output reduced to zero or nearly so while the other system is taking little or no power but is capable of adding power to the common load under the influence of modulation, the arrangement of the two amplifier systems being, therefore, such that the said other amplifier system automatically comes into operation to add the necessary side band power to the output to the common load as the modulation is increased. The two amplifier systems are capable, in combination, of varying the power in the common load from approximately zero to approximately four times the carrier power as necessary for full modulation.

The arrangement comprising the two amplifier systems feeding into the common load, and fed in parallel on the input sides, does not, per se, form part of this invention and is not, per se, claimed herein, the said present invention consisting essentially in the combination of such an arrangement with a preceding floating carrier system. The means for providing floating carrier control may be and preferably is in accordance with the disclosure in British Patent #427,026.

The invention is illustrated in the accompanying drawing which shows in block diagram form one construction of radio transmitter embodying the invention.

Referring to the drawing, A is a carrier frequency master oscillator whose oscillations are fed via one or more carrier frequency amplifiers—B1, B2 are shown—in cascade to a further amplifier B*n* where modulation is effected. This amplifier B*n* which may be termed the "modulated stage" is subjected to modulation by a modulator M to which modulating signals are applied from, for example, a modulating frequency amplifier N and which is also subjected to floating carrier control in any convenient way, for example as set forth in British Patent #427,026 already referred to. E represents the floating carrier control circuit arrangement. In this arrangement the control means E includes a rectifier which derives from the modulating potentials a bias potential for the modulator M to regulate the carrier amplitude in accordance with the mean amplitude of the modulating potentials. The output from the modulated stage will, therefore, be a modulated carrier which has been subjected to floating carrier control and this output is fed via means including any desired suitable number of high frequency amplifiers C1, C2, C3, C4 in cascade to a load circuit D such as an aerial. The final stage of this cascade series—in the example illustrated this is the stage C4—consists of two amplifiers V1 and V2 in parallel, the excitation of V1 being advanced 90° in respect of V2 by means of the phasing network P1. V1 is biassed nearly to cut-off and V2 beyond cut-off. The output circuits of the valves are paralleled to the load D through the network P2 which is such that whereas V1 is connected to the load through the equivalent of a quarter-wave line, V2 is connected direct to the load. Under these conditions the load impedance seen by the valves changes in such a manner with the amplitude of the grid excitation that the system can, at all times, operate with high efficiency when excited with a modulated high frequency wave. Such a system was described in the Proceedings of the Institute of Radio Engineers, September, 1936, pages 1163 to 1187. The amplifier V1 (hereinafter termed the "shallow modulation amplifier") is arranged to operate alone over all inputs at carrier level and below, and also for shallow degrees of modulation. The other amplifier V2 (hereinafter termed the "incrementing amplifier") comes into operation to add the necessary side band power to the output as the

modulation power increases. If desired an inverse feed back loop may be provided as indicated at F between the load D and a suitable high frequency stage. Degenerative or inverse feedback means per se are well known in the art and involve apparatus for feeding back energy from the output of the system to a preceding stage in opposed phase to reduce distortion. The operation of the floating carrier control E has the effect of converting the output from B*n* from a varying modulation of a fixed level carrier to a deeper modulation of a smaller variable carrier which is automatically varied as required by the instantaneous value of the modulation.

The advantage of the combination provided by this invention is not merely that the economy inherent in floating carrier control is obtained, but also that the floating carrier control serves to defer the point in the modulation swing at which the incrementing amplifier comes into operation to a higher effective point and thus to produce a substantial reduction in distortion as well as giving increased efficiency and an important saving in power. It is an important advantage to defer the point in the modulation swing at which the incrementing amplifier comes into operation, for the distortion in the high frequency amplifier portion of the apparatus will be practically negligible when the incrementing amplifier is not supplying power, and such distortion as may occur will be almost entirely due to the incrementing amplifier coming into action as modulation is increased. Accordingly, the later the incrementing amplifier comes into action the better, ceteris paribus, and the effect of the combination provided by this invention is to delay the coming into operation of the incrementing amplifier until a signal level corresponding to a quite high degree modulation is reached. There is thus a great reduction of distortion because the time in which the incrementing amplifier will be in operation in a programme of constantly varying modulation will be much reduced.

I claim:

A modulated carrier wave transmitter system comprising in combination, a source of carrier wave oscillations, a source of modulating voltages, means for modulating said oscillations in accordance with said modulating voltages and for controlling the carrier level in accordance with the mean modulation voltage, a common load, a plurality of amplifier systems supplying voltages to said common load, means for impressing modulated oscillations from said first named means in parallel on the inputs of said amplifier systems, said amplifier systems being biased and excited in such a manner that one system supplies carrier power to said common load at a high efficiency and is modulated substantially to zero while the other amplifier system is supplying little or no power, said other of said amplifying systems adding power to the common load under the influence of modulation, whereby said other amplifier system automatically comes into operation to add the necessary side band power to the common load as the modulation is increased.

WILLIAM ALFRED EDWARD QUILTER.