Sept. 14, 1943. C. D. KENTNER 2,329,625

MODULATION MEASURING SYSTEM

Filed Jan. 31, 1942

Fig. 1.

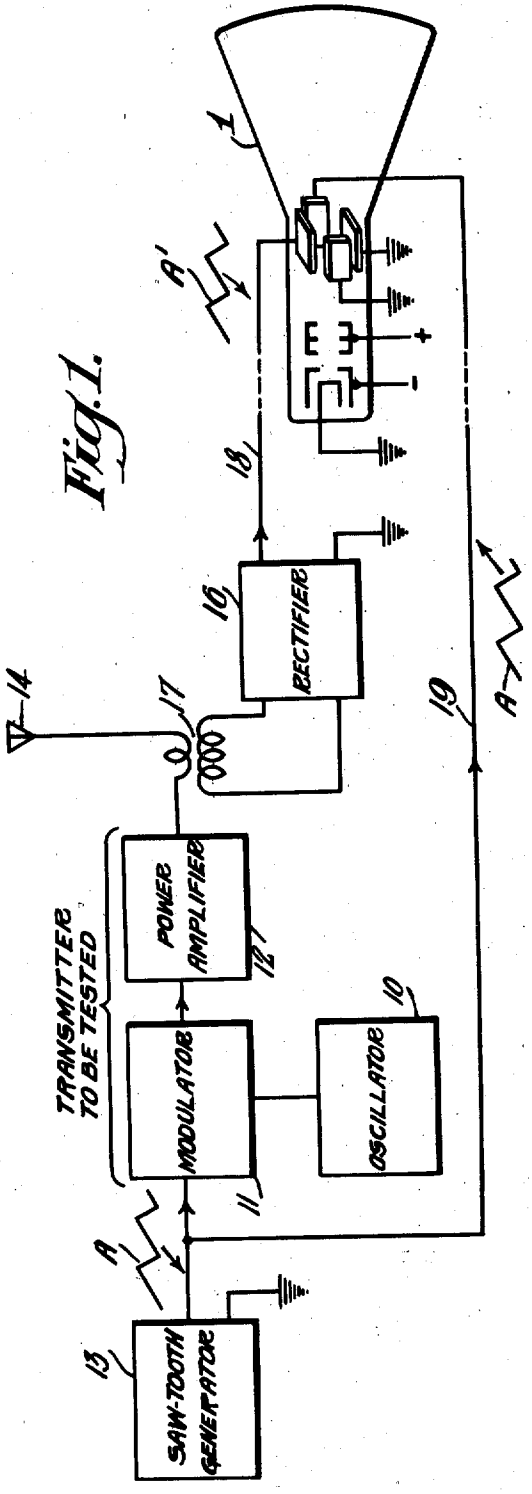
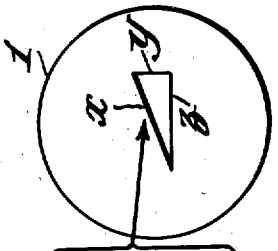


Fig. 2.



THE TRACE X WILL BE A STRAIGHT LINE IF THE ORIGINAL SAW TOOTH A IS STRAIGHT AND IF THE TRANSMITTER DOES NOT DISTORT.

Inventor

Carroll D. Kentner

By C. D. Tuska

Attorney

Patented Sept. 14, 1943 2,329,625

UNITED STATES PATENT OFFICE

2,329,625

MODULATION MEASURING SYSTEM

Carroll D. Kentner, Medford Lakes, N. J., assignor to Radio Corporation of America, a corporation of Delaware

Application January 31, 1942, Serial No. 429,002

6 Claims. (Cl. 250—17)

My invention relates to a system and method for measuring or indicating the modulation characteristic of a radio transmitter.

An object of the invention is to provide an improved means for or method of obtaining a trace, a record or other indication of the modulation characteristic of a system which can be easily interpreted in terms of said characteristic.

A further object of the invention is to provide an improved system and method particularly adapted for measuring the modulation characteristic of a radio transmitter or the like where the carrier wave has a frequency so high that the capacity of a cable or of long conductors carrying such a carrier wave is not negligible.

In a preferred embodiment of the invention, the transmitter to be investigated is modulated by a sawtooth voltage wave which is straight or linear over its gradually sloping portion. The resulting modulated carrier wave is demodulated to obtain the original sawtooth which will not contain any distortion introduced by the transmitter. This is applied to one pair of deflecting plates of a cathode ray tube for deflecting the cathode ray vertically, for example.

Another pair of deflecting plates of the cathode ray tube has applied thereto the original undistorted sawtooth wave for producing horizontal deflection. The resulting trace on the fluorescent screen of the tube will be a straight line if there is no distortion introduced by the transmitter.

The invention will be better understood from the following description taken in connection with the accompanying drawing in which Figure 1 illustrates one embodiment of the invention and Figure 2 shows an end view of the cathode ray tube in Figure 1.

Referring to the drawing, the transmitter to be tested may comprise a high frequency oscillator 10, a modulator 11, and a power amplifier 12. A sawtooth generator 13 of any suitable type supplies a sawtooth voltage wave, indicated at A, to the modulator 11 whereby a carrier wave modulated by the wave A is supplied to the load circuit such as an antenna 14.

The oscillator 10 may operate at a frequency of 500 megacycles, for example, which is so high that the capacity of conductors carrying a signal at such a frequency to an oscilloscope would distort the signal. In the present invention such difficulty is avoided by coupling a rectifier 16 through short leads to the transmitter output circuit, the coupling being through a transformer 17 in the example illustrated. A sawtooth wave A' appears in the rectifier output circuit and this wave is applied over a conductor 18 to one pair of deflecting plates of the cathode ray tube 1. If the transmitter does not introduce distortion, the wave A' will be a straight sawtooth like the original wave A.

The other pair of deflecting plates of the tube 1 have the original straight sawtooth voltage wave A applied thereto over a conductor 19. The conductors 18 and 19 may be fairly long (10 feet for instance) as indicated by the broken line portions.

Fig. 2 shows the triangular cathode ray trace that will appear on the end of the cathode ray tube 1 if the transmitter is nondistorting. If there is no distortion, the heavy slanting line x will be straight. Otherwise, this line will have a certain curvature depending upon the kind and amount of transmitter distortion. The faint vertical and horizontal lines y and z, respectively, comprise the return line portion of the trace.

I claim as my invention:

1. The method of indicating the modulation characteristic of a transmitter which comprises modulating the carrier wave of said transmitter by a sawtooth wave, rectifying or demodulating the resulting modulated carrier wave, deflecting a cathode ray along one coordinate in accordance with said demodulated wave, and deflecting said cathode ray along another coordinate in accordance with said modulating sawtooth wave whereby there is produced a trace indicating said characteristic.

2. The method of indicating the modulation characteristic of a transmitter which comprises producing a straight sawtooth wave, modulating the carrier wave of said transmitter by said sawtooth wave, rectifying or demodulating the resulting modulated carrier wave, deflecting a cathode ray in one plane in accordance with said demodulated wave, and deflecting said cathode ray substantially at right angles to said one plane in accordance with said modulating sawtooth wave.

3. Apparatus for indicating distortion of the modulated carrier wave output of a transmitter unit, said apparatus comprising a cathode ray tube, means for demodulating said carrier wave, means for deflecting the cathode ray of said tube in one plane in accordance with the output of said demodulating means, and means for simultaneously deflecting said cathode ray in a different plane in accordance with the original modulating signal.

4. The invention according to claim 3 wherein the modulating signal is a sawtooth wave.

5. The invention according to claim 3 wherein the modulating signal is a sawtooth wave and wherein the two deflections are at right angles to each other whereby there appears a triangular trace on the screen of said tube.

6. Apparatus for indicating distortion in a radio transmitter, said apparatus comprising means for producing a straight sawtooth wave, means for modulating the carrier wave of said transmitter by said wave, a cathode ray tube, means for demodulating said modulated carrier wave, means for deflecting the cathode ray of said tube in one plane in accordance with the output of said demodulating means, and means for deflecting said cathode ray in a plane substantially at right angles to said one plane in accordance with the original modulating signal whereby there appears a triangular trace on the screen of said tube.

CARROLL D. KENTNER.