

Feb. 21, 1933.

O. BÖHM

1,898,477

FADING ELIMINATION

Filed Dec. 16, 1929

Fig. 1

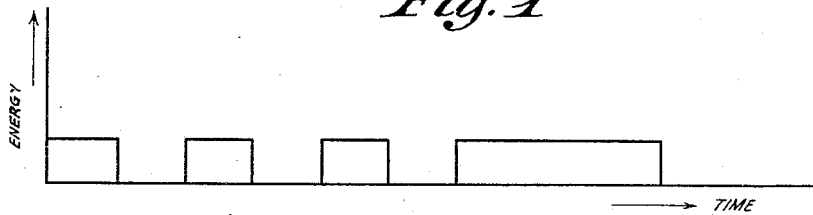


Fig. 2

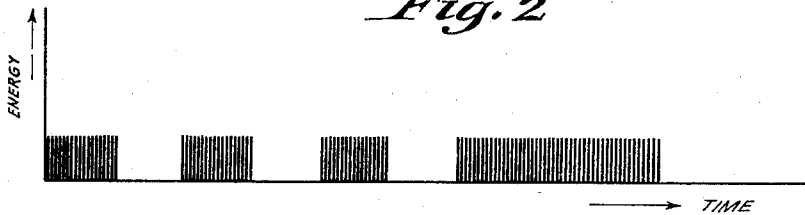
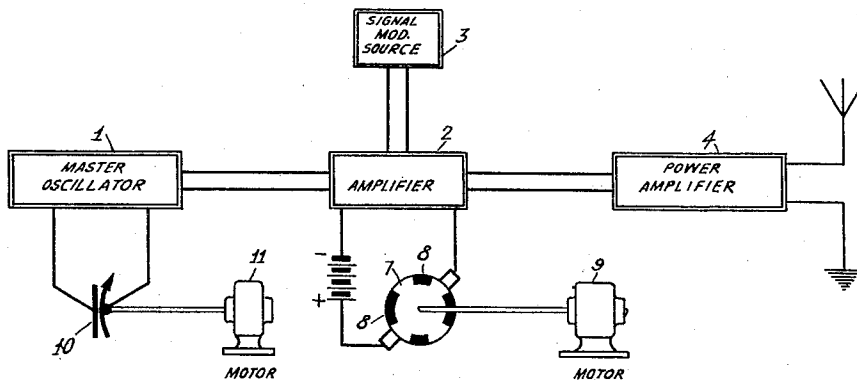


Fig. 3



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FADING ELIMINATION

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Fading phenomena associated with and observed in the transmission of signals on short waves are in part due to extinction or alteration of the incoming energy at the receiving station owing to interference actions between the waves transmitted over different routes. The waves reaching the receiving station over different paths do not arrive at the receiving end simultaneously, indeed, there is a difference in time of arrival proportional to the difference in paths. Interference, of course, will be able to arise only when the wave-trains belonging to the same signal coincide in time at the receiving end.

But if the difference in transit length is very great or if the duration of the signal is sufficiently small, then the signal that has travelled over the shorter route will have died out before the one over the longer path has arrived at the receiving station. Hence, words, the duration of a dot, for instance, is unable to occur.

However the length of a signal, in other words, the duration of a dot, for instance, is generally so great that, for the differences in path observed in practice, overlapping of signals coming in over different paths takes place so that a beat action makes itself felt in the form of fading.

According to the present invention, the chances for interference between waves transmitted to the receiving station over different paths are prevented by subdividing the signals into constituent impulses of substantially shorter duration or length, and transmitting the subdivided impulses consecutively. According to the invention, therefore, a dot, for instance, is to be transmitted in the form of one continuous wave-train, but rather is transmitted in the shape of a number or plurality of consecutively radiated wave-trains, each of such wave-trains being of very short duration, say, 1/1000th second, so that the dot is built up of a large number of such wave-trains separated or interrupted by time intervals amounting likewise to around one-thousandth of one second.

The invention may be understood more fully by referring to the accompanying drawing wherein,

Figure 1 shows the energy time relation of the ordinary transmission of the letter "V" for example.

Figure 2 illustrates the energy time relation when transmission is done according to the present invention, and

Figure 3 indicates apparatus for producing the transmission of Figure 2.

The present method is diagrammatically illustrated in the accompanying drawing wherein Figure 1 the letter *v* in the usual way consists of dots and dashes, each such dot or dash being produced by an uninterrupted wave-train. In Figure 2, on the contrary, the constituent signal is subdivided. To insure in practice such subdivision, the radiations of the transmitter may suitably be broken up at a fast rate or rhythm. Since the differences in path in actual traffic are different, and since they vary also during operation, it is particularly suitable to effect subdivision not in accordance with a regular rule or law, but rather to apply the present method in such a way that the duration and also the number of interruptions are subject to constant changes. The method hereinbefore described constitutes an effective and suitable addition of the means and ways heretofore known in the art with a view to eliminate fading, indeed, it can be carried into practice in combination with other known methods such as the method based upon changing the fading by varying the transmission frequency.

Figure 3 indicates apparatus for carrying out the invention. Numeral 1 indicates a master oscillator feeding energy to a low power amplifier 2 whose output is controlled according to a signal modulating source 3 which may be a hand key or high speed tape keyer. The output of amplifier 2 is then fed into a high powered amplifier 4 the output of which is radiated by any suitable radiating means such as an antenna 6 which is preferably given a directive characteristic.

By means of a motor driven commutator 7 biasing potential is supplied to amplifier 2 so that the resultant output of amplifier 4 appears as shown in Figure 2. By inserting insulating segments 8 of variable length, the

character of the interruptions as to length may be varied and they may also be varied by varying the speed of motor 9, in any predetermined fashion.

- 5 In order to increase the fading elimination effect, the frequency of the carrier wave may be slightly wobbled by means of a condenser 10 placed in the control circuit of master oscillator 1. By means of motor 11
10 the capacity of condenser 10 is varied so that the carrier is given a slight frequency wobble to reduce fading but not sufficient a wobble to require material enlargement of the frequency band occupied by the transmitter.

- 15 Having thus described my invention, what I claim is:

- In a transmission system for eliminating fading of electromagnetic waves, in combination, a master oscillation generator, a variable condenser for changing the frequency
20 of said oscillation generator, and motor driving means connected to said condenser, an amplifier associated with said oscillation generator for amplifying the currents generated thereby, an antenna connected to the
25 output of said amplifier, a signal modulating element connected to said amplifier for modulating the energy received by said amplifier from said oscillation generator, a rotary commutator having unequal insulating length
30 segments around its periphery, additional motor driving means for said commutator, connections from said commutator to said amplifier including a source of direct current
35 potential, said commutator being arranged to bias said amplifier through said connections so as to interrupt the transmitted output energy to said antenna, said interruptions being of unequal time duration in accordance
40 with the length of said unequal insulating segments on said rotary commutator.

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CERTIFICATE OF CORRECTION.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, line 21, strike out the words "words, the duration of a dot, for instance," and insert instead "in this case extinction due to interference"; line 38, after "is" insert the word "not"; and line 78, for "ot" read "to"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of May, A. D. 1933.

M. J. Moore.

(Seal)

Acting Commissioner of Patents.