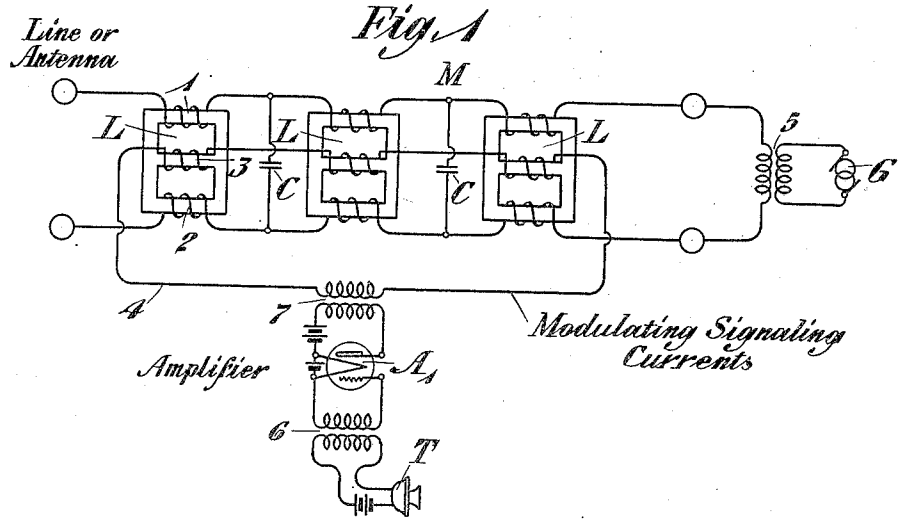
K. S. VAN DYKE.

MAGNETIC MODULATOR.

APPLICATION FILED SEPT. 27, 1919.

1,357,264. Patented Nov. 2, 1920.

Fig. 1



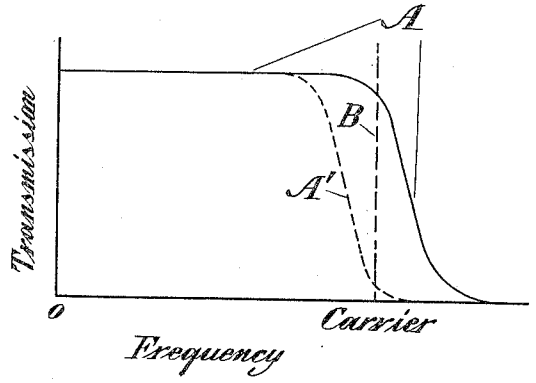


Fig. 2

INVENTOR.

K. S. Van Dyke

BY

ATTORNEY.

UNITED STATES PATENT OFFICE.

KARL S. VAN DYKE, OF CHICAGO, ILLINOIS, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

MAGNETIC MODULATOR.

1,357,264. Specification of Letters Patent. Patented Nov. 2, 1920.

Application filed September 27, 1919. Serial No. 326,741.

To all whom it may concern:

Be it known that I, KARL S. VAN DYKE, residing at Chicago, in the county of Cook and State of Illinois, have invented certain Improvements in Magnetic Modulators, of which the following is a specification.

This invention relates to carrier transmission and more particularly to means for modulating carrier currents in accordance with signals.

One of the features of this invention resides in the provision of a magnetic modulator having as the modulating element a broad band filter of the general type disclosed in the U. S. patents to George A. Campbell, Nos. 1,227,113 and 1,227,114, issued May 22, 1917.

This feature, as well as other features more fully hereinafter appearing, are realized in accordance with the arrangement disclosed in the following description and illustrated in the accompanying drawing, Figure 1 of which is a circuit diagram of one embodiment of the invention and Fig. 2 of which is a curve illustrating the operation of the modulating apparatus.

Referring to Fig. 1, M indicates generally a modulating apparatus which consists of a filter of the Campbell type, comprising a plurality of sections, each section including a shunt capacity element C and a series inductance element L. The inductance comprises three windings upon a common core, the windings 1 and 2 being included in the two sides of the transmission line and the third winding 3 being included in a local circuit 4, upon which the modulating signaling currents are to be applied. A source of carrier currents G is associated with the filter through a transformer 5, while modulated signaling currents are supplied by means of a telephone transmitter T, connected through a transformer 6 with an amplifier A_1, which in turn is associated through a transformer 7 with the circuit 4.

It will be seen that by means of this arrangement the filter will freely pass the carrier frequency generated by the source G, provided the frequency of said source is within the free band of transmission of the filter. It will also be clear that the inductance L of each section will be varied in accordance with the telephone currents supplied by the transmitter T, since the amplified telephone currents will flow through the windings 3 of each inductance element.

The manner in which the modulation takes place may be understood from a consideration of the characteristics of a filter of this type. Referring to Fig. 2, the curve A represents the transmission efficiency at different frequencies. It will be seen that as the frequency increases from zero up to a certain point the transmission remains constant, but after reaching a point in the neighborhood of the dotted line B, the transmission rapidly falls off with increase in frequency, until for a frequency slightly above that represented by the dotted line B, the transmission is practically negligible. The dotted line B may be considered the cut-off point of the filter in its normal condition, with no current flowing into the circuit 4. If now the frequency of the generator G_1 is chosen so as to coincide with the cut-off point indicated at the dotted line B, this frequency will be freely transmitted by the filter. When the transmitter T is operated and an amplified telephone current is applied to the circuit 4, the inductance of each section of the filter is changed by means of the telephone current flowing through the winding 3 of the several inductance elements. This results in changing the cut-off point of the filter so that the transmission-frequency curve may be changed as indicated by the dotted line A′. The transmission of the carrier frequency is therefore greatly decreased, as indicated by the intersection of the dotted line B with the dotted line A′.

By means of this characteristic of the filter it will be readily apparent that the instantaneous amplitude of the carrier current transmitted through the filter will be varied in accordance with the instantaneous amplitude of the telephone currents supplied by the transmitter T and that a very efficient modulation will result.

It will be obvious that the general principles herein disclosed may be embodied in many other organizations widely different from those illustrated, without departing from the spirit of the invention as defined in the following claims.

What is claimed is:

1. A modulator comprising a plurality of sections, each section including series and

shunt impedance elements, said elements being so proportioned that the system freely transmits with uniform attenuation a definite band of frequencies in the neighborhood of a carrier frequency, and means to vary the impedance of the elements of each section in accordance with low frequency signaling currents, thereby varying the cut-off point of the system of sections so as to modulate the carrier current transmitted.

2. A modulating system comprising a source of carrier current, a source of modulating current and a band filter comprising a plurality of sections, each section having series and shunt impedance elements so proportioned that the filter will freely transmit with uniform attenuation a definite band of frequencies, and means controlled by said modulating current for varying the impedance of one of the elements of each section, thereby varying the cut-off of the filter to modulate the transmitted carrier current.

3. A modulating system comprising a source of carrier current, a modulating current, a filter comprising a plurality of sections, each section including series inductance and shunt capacity so related and proportioned that the filter will pass a band of frequencies extending from zero to a cut-off frequency in the neighborhood of the carrier frequency, and means controlled by said modulating current to vary the inductance of each section, thereby varying the cut-off point of the filter and varying its impedance to the carrier current.

4. A modulating system comprising a source of carrier current, a filter comprising a plurality of sections, each section including series inductance and shunt capacity, the inductance of each section being wound upon a common core with a coil included in a local circuit, and means for supplying low frequency modulating currents to said local circuit.

In testimony whereof, I have signed my name to this specification this 24th day of September, 1919.

KARL S. VAN DYKE.