

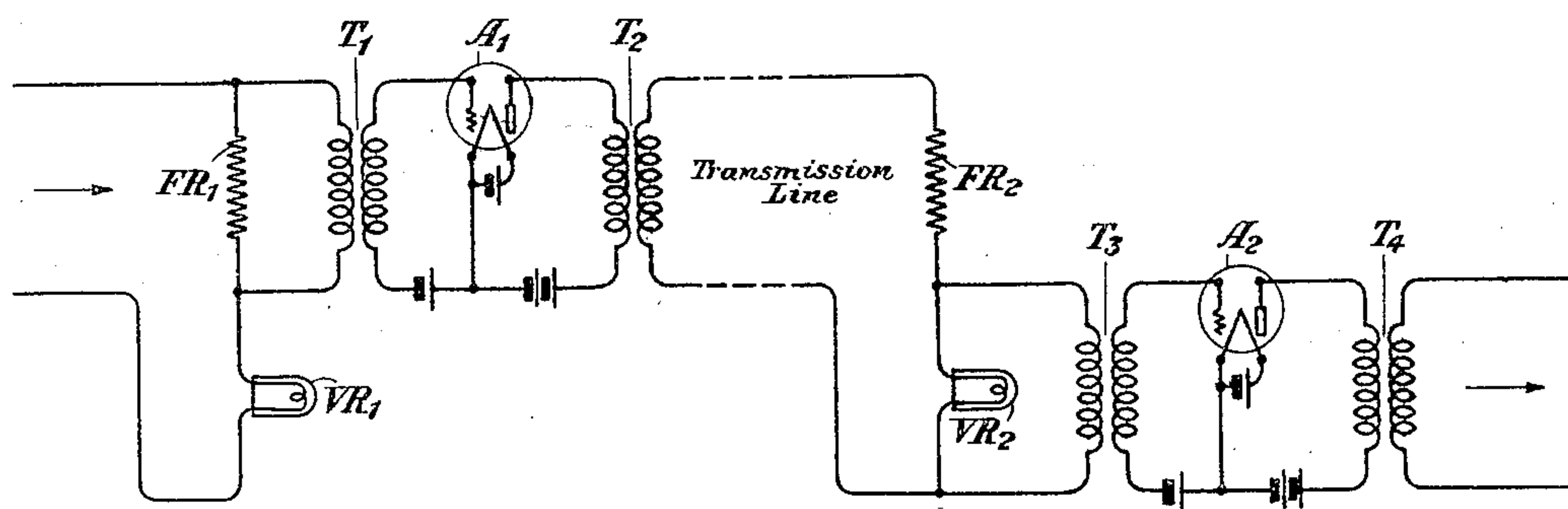
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COMPRESSION AND EXPANSION OF RANGE OF ENERGY LEVEL

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VR₁ and VR₂ are short, fine tungsten filaments in evacuated bulbs.

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COMPRESSION AND EXPANSION OF RANGE OF ENERGY LEVEL

Application filed June 29, 1929. Serial No. 374,920.

This invention relates to circuits for the communication of intelligence, and more particularly to methods of and means for compressing and expanding the range of energy level in a transmission system.

The principal object of the invention is to accomplish in a simple manner the compression of energy level range which is often desirable—when, for instance, a broadcast program is transmitted over a telephone circuit—and the restoration of the normal range.

In general, in accomplishing the above-stated object, there may be employed an arrangement of an amplifier and of two resistances connected in series, one of the resistances having a low temperature coefficient and the other a high temperature coefficient. This use of resistances having different temperature coefficients is disclosed in a different arrangement in my application filed of even date herewith and given Serial No. 374,919.

The present invention will be clearly understood when the following detailed description is read with reference to the accompanying drawing, which shows diagrammatically the circuit arrangements involved.

As indicated above, in the transmission of broadcast programs over telephone circuits, it is often desirable to compress the range of energy level of the currents in the telephone circuit. This may be accomplished by causing the currents of high energy level to be amplified less than those of low energy level at the input or sending end of the telephone circuit, whereby the differences of level transmitted over the circuit are made as small as is practicable. This compression demands, of course, a corresponding expansion at the output or receiving end of the telephone circuit in order that the normal range of energy level may be restored and transmitted.

In the drawing there is shown a transmission line, which it is understood may be a telephone line over which it is desired to transmit broadcast programs. At the left or input end of this line, an arrangement of resistances FR_1 and VR_1 is connected through a transformer T_1 with the grid-filament circuit

of a vacuum tube amplifier A_1 , and the plate-filament circuit of this amplifier is connected with the line through the transformer T_2 . At the right or output end of the transmission line, the resistances FR_2 and VR_2 are associated through the transformer T_3 with the grid-filament circuit of the amplifier A_2 , and the plate-filament circuit of this amplifier is connected through a transformer T_4 to the output of the circuit.

The resistance FR_1 is a resistance of low temperature coefficient. The resistance VR_1 is a resistance of high positive temperature coefficient and may take the form, as is indicated on the drawing, of a short, fine, tungsten filament in an evacuated bulb. Another form of resistance which may be employed is a hydrogen-iron ballast lamp designed to consume less energy than the ordinary commercial lamp of the type. This resistance VR_1 presents a relatively low impedance to currents of low energy level and a relatively high impedance to currents of high energy level. The two resistances FR_1 and VR_1 are connected in series as shown. It will be noted that the voltage drop across the resistance FR_1 is the one impressed through transformer T_1 upon the input of amplifier A_1 . It will be understood by those skilled in the art that, given this circuit arrangement, the apparatus at the input end of the line will function as a compressor of the range of energy level, giving less gain for the currents of high energy level than for the currents of low energy level. In other words, the difference of energy level is considerably diminished.

At the receiving end of the line, the resistances FR_2 and VR_2 are connected in series, as is the case at the sending end, but here the voltage drop across the high temperature coefficient resistance VR_2 is impressed upon the input of amplifier A_2 . Since the voltage drop across VR_2 is relatively greater for currents of high energy level than for currents of low energy level, the apparatus at this end of the circuit introduces more gain for the high energy currents than for the low energy currents and accordingly acts as an expander of the range of energy level.

Given a line substantially free from dis-

tortion, it will be obvious to those skilled in the art that the resistances FR_1 , VR_1 , FR_2 and VR_2 may be so chosen that the combination of the compressor, the line and the expander will introduce substantially no distortion.

The true scope of the invention is determined by the appended claims.

What is claimed is:

1. In a transmission circuit, a fixed resistance and a resistance varying with the energy level of currents flowing through it connected in series at the sending end of the circuit, a translating device at the sending end of the circuit, means for impressing on the input of said translating device the voltage drop across said fixed resistance, a second fixed resistance and a second resistance varying with the energy level of currents flowing through it connected in series at the receiving end of the circuit, a second translating device at the receiving end of the circuit, and means for impressing on the input of said second translating device the voltage drop across said second varying resistance.

2. In a transmission circuit, two resistances of substantially different temperature coefficients connected in series at the sending end of the circuit, a translating device at the sending end of the circuit, means for impressing on the input of said translating device the voltage drop across one of said resistances, two resistances of substantially different temperature coefficients connected in series at the receiving end of the circuit, a second translating device at the receiving end of the circuit, and means for impressing on the input of said second translating device the voltage drop across one of said resistances at the receiving end of the circuit, the resistance of which the voltage drop is utilized at the receiving end being of relatively different temperature coefficient from the resistance of which the voltage drop is utilized at the sending end.

In testimony whereof, I have signed my name to this specification this 28th day of June, 1929.

LELAND C. ROBERTS.