Jan. 21, 1941. A. ARZMAIER 2,229,433

CARRIER CURRENT RECEIVER

Filed July 13, 1937

Fig. 1

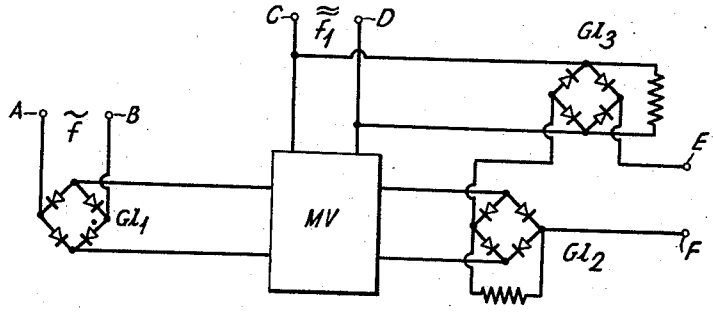


Fig. 2

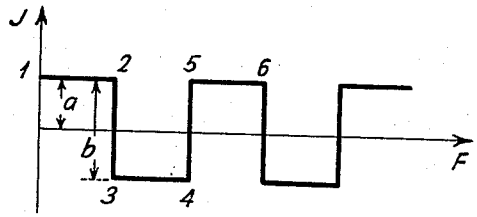
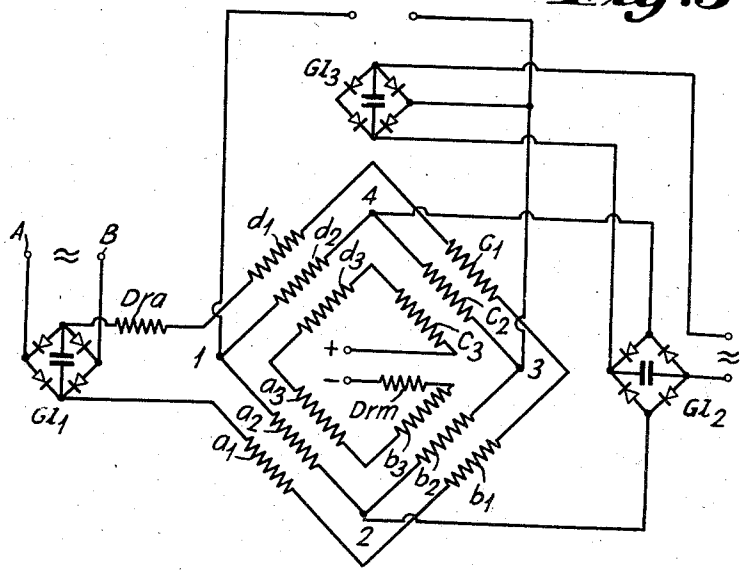


Fig. 3



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CARRIER CURRENT RECEIVER

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5 Claims. (Cl. 178—70)

This invention relates to a receiver amplifier for telegraphy with carrier current in which magnetic amplifiers are utilized.

It has been proposed in the prior art to use magnetic amplifiers as receiving arrangements for the carrier current telegraphy. However, in this case, the signals can be transmitted only as single current signals. In accordance with the present invention an improvement in such arrangements is obtained in that the circuit through which the amplified current of the magnetic amplifier passes, has superimposed thereon a further direct current such that it furnishes output signals of increased amplitude than those obtained by the single current signals produced by the amplifier.

To operate a magnetic modulator, a local alternating current source is required. In accordance with a further feature of the invention, the current is also derived from this alternating current source which is to be superposed on the amplified current after rectification. This affords the advantage that at variations of this local alternating current source, the amplified as well as the superimposed current vary in an identical manner thereby avoiding distortions.

Fig. 1 shows a schematic wiring diagram of a circuit arrangement, while

Fig. 2 is to indicate the current pattern in the output circuit of the amplifier, and

Fig. 3 shows the circuit arrangement with the details of the magnetic amplifier.

Referring now in detail to Fig. 1 of the drawing, the incoming telegraph signals are applied to the terminals A and B in the form of chopped alternating current signals. They are detected in the rectifier G11 and impressed upon the magnetic amplifier MV as direct current signals, the specific circuit of which will be explained more in detail in connection with Fig. 3. At the terminals C, D, the local alternating current source is connected and keyed in the magnetic amplifier MV by the direct current signals arriving across the detector G11. In the rectifier G12 the keyed alternating current signals of the local alternating current source are detected by the frequency *f1*, as explained in the German patent mentioned above, and applied to the output circuit of the amplifier. In accordance with the invention, a part of the alternating current of the local current source is immediately branched off at the terminals C, D and likewise superposed on the output circuit of the amplifier across the detector G13. A current will thus pass through the telegraph recording apparatus connected with the terminals E, F, said current being composed of the two direct currents produced in the detectors.

The values of the currents are suitably chosen according to the relationship shown in Fig. 2, which shows substantially a 1 to 2 ratio, so that the current passing through the detector G13 is one-half as large as the current derived from the magnetic amplifier across the detector G12. During the signal pause, a current will then pass in the output circuit across the terminals E, F such as represented by the line 1, 2, 5, 6. However, as soon as signals having twice the amplitude and the reversed sign, arrive across the magnetic amplifier, a pattern according to the line 1, 2, 3, 4, 5, 6 will be obtained. The shape of the signals, according to Fig. 2, results from the fact that in Fig. 3 alternating current signals are fed to terminals A and B. They are to be considered as a chopped or hashed alternating current train. After rectification by rectifier $G1_1$ they constitute the one half wave of said alternating current train, the envelope curve of which is determined by the signals of the amplitude *a*. Thus, there appears in the output circuit of the amplifier a current of increased amplitude which is of particular advantage to certain types of telegraphic operation.

In Fig. 3, the currents rcetified by the rectifier G11 are supplied to the magnetic amplifier windings *a1*, *b1*, *c1*, *d1* of a bridge circuit consisting of four chokes. Each of these chokes has three windings. Across one of the other two windings, the local carrier current is supplied for which the magnetic amplifier is normally maintained in equilibrium for the state of rest or no signal response. Across the third winding a local direct current is superposed which takes care of the preliminary magnetizing of the magnetic amplifier, so that the working point of the amplifier can be set to its most favorable value by means of the preliminary magnetizing. When a telegraph signal arrives across the windings *a1*, *b1*, *c1*, *d1* of the magnetic amplifier, the equilibrium of the bridge (not shown) for the local carrier current and indicated at terminals C, D will be disturbed so that across the points 2, 4 an alternating current begins to flow which will be detected by the detector G1, 2 and applied to the output circuit. From the following it will be now explained how rectifier $G1_3$ of Fig. 3 operates.

Rectifier $G1_3$ is parallel to the local input terminals C, D. As the local alternating current of frequency F_1 is permanently applied to terminals C, D, there will be permanently present at

the output terminals of rectifier Gl_3, a direct potential of a certain magnitude absolutely independent of whether signals are received at A, B or not. If now a weak alternating current is received and applied to input terminals A, B, rectifier Gl_2 will furnish a direct potential of certain magnitude. The direct potentials furnished by rectifier Gl_3 and Gl_2 will have a certain ratio in regard to one another, that is, the potential at Gl_3 is related to the potential at Gl_2 as an 1 to 2 ratio. The potentials furnished by rectifier Gl_3 and Gl_2 are connected in series, however, not so that the single potentials furnished by the rectifiers add up, but oppositely so that a current of increased amplitude develops at the output terminals E, F. This is done in the following manner:

It is assumed that rectifier Gl_3 is arranged to be able to furnish a potential of two volts. According to the above 1 to 2 ratio, rectifier Gl_2 furnishes double the potential of rectifier Gl_3, that is, in the present example a potential of four volts. If no potential is applied to terminals A, B, then at the output terminals E, F, a potential of two volts derived from rectifier Gl_3 will exist, for instance, + at terminal E and − at terminal F. When signals are received at the input terminals A, B, rectifier Gl_2 furnishes a potential of four volts but of opposite direction from rectifier Gl_3, that is, at terminals E, F a potential of +2 volts (derived from rectifier Gl_3) and −4 volts (derived from rectifier Gl_2) exists. Thus, at the output terminals E, F a potential of 2−4=−2 volts exists; however, so that now the minus pole is at terminal E and the plus pole is at terminal F. The development of the increased current at the output terminals E, F which was explained above it will now be seen by referring to Fig. 2, that rectifier Gl_3 furnishes, independent of whether or not an alternating current is applied to terminals A, B, a direct potential of an amplitude *a*, that is, at the output terminals E, F, there is applied a current represented by points 1, 2, 5, 6. When signals are received at A, B, rectifier Gl_2 furnishes double the potential of rectifier Gl_3 of an amplitude *b*. Thus, at the instant the signals begin to occur, the current drops from point 2 to point 3, and as the potential is preserved at the output terminals E, F until the signal received at A, B is terminated, the current proceeds from point 3 to point 4 of Fig. 2. At the instant of termination of signal, that is, at the instant where no potential exists at terminals A, B, also the potential furnished by rectifier Gl_2 is lacking and now again the potential from Gl_3 is alone effective so that point 4 drops to point 5. Till the indicated beginning of the signal, the current proceeds again above the time line F. As in the Fig. 1, a direct current is branched off from the local carrier current, and conducted across the detector Gl, 3, said direct current being superimposed on the direct current keyed in the output circuit.

What is claimed is:

1. A circuit arrangement for the amplification of incoming alternating current telegraph signals comprising a magnetic amplifier having an input and an output circuit, a first rectifier connected to the input of said magnetic amplifier for rectifying the incoming alternating current telegraph signals, a second rectifier connected to the output of said magnetic amplifier, and a third rectifier connected to a source of local alternating currents and combined with the outputs of said magnetic amplifier and said second rectifier so that a direct current will appear in the output circuit, the direct current having an increased amplitude over that obtained by the outputs of said first and second rectifiers.

2. A circuit arrangement according to claim 1 characterized in that a portion of the source of said local alternating current is connected to the magnetic amplifier and branched off after rectification so as to be continuously superimposed on the direct current output circuit of said magnetic amplifier.

3. A circuit arrangement according to claim 1 characterized in that the value of direct current which is supplied by said source of local alternating currents and connected to the output circuit of the magnetic amplifier is half as large and of an opposite direction as compared with the direct current from the output of said first rectifier.

4. A circuit arrangement for the amplification of incoming alternating current telegraph signals comprising a magnetic amplifier having an input and an output circuit, said magnetic amplifier having four choke coils each having three windings, said coils arranged as a bridge which is balanced for a source of local alternating current, a first rectifier connected to the input of said magnetic amplifier for rectifying the incoming alternating current telegraph signals, a second rectifier connected to the output of said magnetic amplifier, and a third rectifier connected to said source of local alternating currents, the balance of said bridge being upset by telegraph signals rectified by said first rectifier such that the amplified current in the output circuit is of a greater amplitude than that obtained by the outputs of said first and second rectifiers.

5. A receiver amplifier circuit for carrier current receivers with means to avoid distortions due to variations of local input currents and the superimposed signals comprising a magnetic amplifier having an input and an output circuit, a first rectifier connected to the input of said magnetic amplifier for rectifying the incoming alternating current signals, a second rectifier connected to the output of said magnetic amplifier, and a third rectifier connected to a source of local alternating currents, the outputs of said second and third rectifiers connected in series to form an output circuit so the signal potentials add to give an increased amplitude over that obtained by the outputs of the first and second rectifiers.

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