Oct. 22, 1935. H. LADNER 2,017,977

AUTOMATIC BIAS ELIMINATOR

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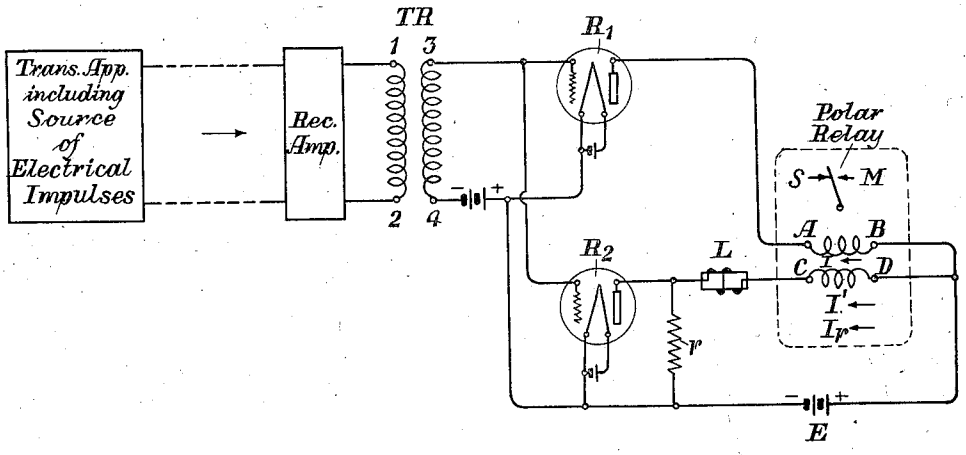


Fig. 1

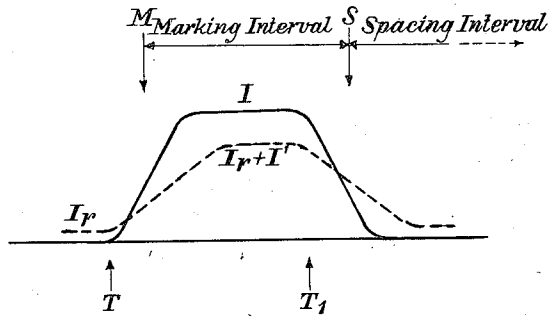


Fig. 2

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AUTOMATIC BIAS ELIMINATOR

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1 Claim. (Cl. 178—88)

This invention relates to telegraph systems and more particularly to carrier telegraph systems, and has for its object the elimination of biased signals caused by the varying level or magnitude of the received current.

In most carrier systems in use today the received current is rectified and then sent through the marking or operating winding of a polar relay, one of the other windings of which is known as the biasing or spacing winding and through which a fixed current flows. When no carrier current is being received no rectified current flows in the operating winding and the current flowing in the biasing winding is of such a magnitude and in such a direction as to hold the relay on its spacing contact. When carrier current is received the rectified current which flows through the operating winding is in such a direction and of such a magnitude as to overcome the effect of the current in the biasing winding and the relay armature is pulled over to its marking position.

If the received current had a vertical wave front the receiving relay would operate to its marking contact as soon as the first pulse of carrier current was received and the time during which it was operated would be independent of the level of the received current. The wave front of the received carrier current in most carrier systems, however, is not vertical but is sloped and the higher the level of the received current the greater the slope. For received current levels greater than normal the current in the operating winding reaches a value sufficient to operate the relay sooner than it should and, conversely, for received current levels smaller than normal the current in the operating winding reaches the level necessary to operate the relay later than it should. The same considerations hold for the tail of the envelope of the received current as for the front, that is, since the current does not drop to a zero value immediately the relay will remain operated for a greater length of time than it should when the received current is greater than normal and conversely for a shorter length of time when the received current is less than normal.

The applicant's system eliminates the tendency of a varying level of received current to produce bias signals by substituting for the fixed current in the spacing winding of the polar relay a current comprising a small fixed component and a variable component dependent at any instant of time on the level of the received current.

The invention will be clearly understood when the following description is read with reference to the accompanying drawing, of which Figure 1 shows diagrammatically, and in part schematically, one desirable embodiment, while Fig. 2 is a graphic disclosure of certain current relations obtaining in the operation of the system of Fig. 1.

As may be seen in Fig. 1, the above-stated result is accomplished by the use of two rectifiers, which preferably take the form of the vacuum tubes R_1 and R_2. Fig. 1 represents the detector or rectifying circuit of a carrier telegraph system, with the transmitting apparatus (at a distant point) and the receiving amplifier schematically indicated. The potential induced in winding 3—4 of the transformer TR from winding 1—2 is impressed on the detectors or rectifiers R_1 and R_2. One tube is used to rectify the current flowing through the marking winding A—B while the other tube is used to rectify the current flowing through the spacing winding C—D. In the output circuit of the rectifier tube R_2, used to rectify the current for the spacing winding, is placed an inductance L designed to retard the growth and the decay of the rectified carrier signal. In addition to the flow of the rectifier carrier current in the spacing winding C—D of the polar relay there is also, as indicated, a small fixed spacing current from the source E which flows at all times through the resistance r. The value of this small fixed spacing current is of such a magnitude that when no signal is being received it is just strong enough to hold the relay on the spacing contact S, thus preventing contact chattering. The total value of the fixed spacing current I_r plus the final magnitude of the rectified spacing current I' can best be determined by experiment and will probably be from one-half to three-quarters of the total marking current I.

Fig. 2 shows graphically the relation of the spacing and the marking current plotted against time for a single marking pulse. The solid line represents the rectified marking current I while the dotted line represents the sum of the steady fixed current I_r and the rectified spacing current I'. The operation of the system is as follows: When no carrier current is being received the relay armature is held on its spacing contacts due to the current in the spacing winding C—D which flows through resistance r. Soon after the start (at T) of a pulse of carrier current the relay armature is pulled over to the marking position (at M), since the current I builds up at a greater rate than current I' because of the inductance L in the circuit traversed by I'. After the received carrier

pulse ceases (at T_1) the relay is pulled back to the spacing position (at S) due to the fact that the current I' in the spacing winding C—D decays more slowly than the current I in the marking winding A—B.

When the received carrier current level is above normal, the rectified current in the marking winding A—B increases at a greater rate than if the carrier current were normal but the rectified current in the spacing winding C—D also increases at a greater rate. The effect of these two increases works in opposite directions and tends to make the relay armature go over to its marking position M at the same time that it would have if the carrier signal were at a normal level. When this pulse of carrier current, assumed to be at a higher than normal level, ceases the rectified current in the marking winding A—B tends to decay at a rate slower than normal, but this tendency to hold the relay armature in its marking position for a longer than normal interval is offset by the fact that the rate of decay of the current in the spacing winding C—D is also slower than normal. The relay armature, therefore, will go over to its spacing contact S at approximately the same time it would have if the carrier pulse were of normal value.

The same reasoning holds if the received carrier pulse is of less than normal value except that the rate of growth and decay of the marking and the spacing current is less than normal. Thus the use of rectified carrier current, to provide the major part of the spacing current as well as all of the marking current, tends to produce telegraph signals from the polarized relay which are free from bias over a wide range of level of the incoming carrier signals.

While the invention has been disclosed as embodied in certain specific arrangements which have been deemed desirable it is understood that it is capable of use in many other widely varied forms without departing from the spirit of the invention as defined by the appended claim. For example, it is understood that other than vacuum tube detecting devices shown in the figures, such as other electrical and mechanical rectifiers, may be used in conjunction with this invention so as to yield substantially the same results. Furthermore, while in the specification the invention has been described in connection with its use in carrier telegraph systems it is understood that it may be used in D. C. telegraph systems and elsewhere where the time of operation of a receiving relay is to be independent of the shape of the front or the tail of the envelope of the received current wave.

What is claimed is:

In an electrical transmission system, a source of electrical impulses, a relay at a point distant from said source, said relay including an armature and two windings oppositely poled, the first of said windings being adapted to operate the armature to a position indicative of the start of the electrical pulse and the second of said windings being adapted to operate the armature to a position indicative of the termination of said pulse, a first rectifier adapted to impress rectified received energy on said first winding, a second rectifier adapted to impress rectified received energy on said second winding, and means in the output circuit of said second rectifier for retarding the growth and decay of the energy in said circuit.

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