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ATMOSPHERIC DISTURBANCE ELIMINATION

Filed July 20, 1929

Fig. 1

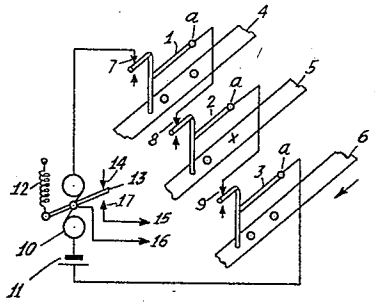
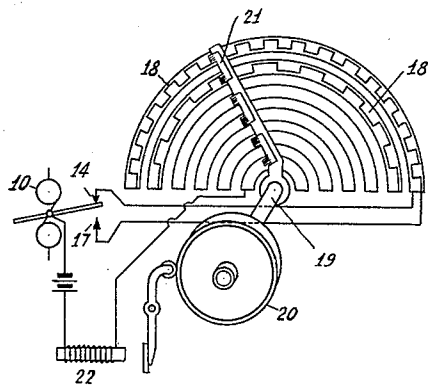


Fig. 2



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ATMOSPHERIC DISTURBANCE ELIMINATION

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Application for this invention filed in Germany February 25, 1928.

In the radio transmission of telegraphic signals, disturbances particularly of an atmospheric origin manifest themselves often to such an extent that complete obliteration and garbling of the transmitted messages is caused. This condition is especially present in high-speed telegraphy the signals of which consist, for instance, of five equally long "current" and "non-current" impulses. A distinction is made herewith between the so-called "positive" disturbances (atmospherics) and "negative" disturbances of the kind mostly occasioned by fading. Positive-acting disturbances change the sent "non-current" impulses into "current" impulses, whereas the negative disturbances cause the opposite effect. It is known in the prior art that the positive atmospheric disturbances which occur mostly in the ranges of medium and long waves, may be eliminated by transmitting the signals several times, say, three times, and receiving them by way of what may be called an accumulation or aggregation means. Since these disturbances occur very irregularly the chances are that at least one of the transmitted non-current impulses will be received as such. The said accumulator or aggregating means, according to this invention, are of a kind that will result in a non-current impulse signal even when only one thereof is properly received. This end is secured by means of having three series-connected contacts which will cause the closing of a local circuit only when the position thereof coincides, with the result that a translator relay or the like is connected in circuit. However, if one thereof has another position then the translator relay will fail to be energized, and the signal appears in the form of a non-current impulse.

Now, while this method is greatly suited for eliminating atmospherics, it is little adapted to the elimination of disturbances caused by fading. These disturbances are only practically absent inside the wave-range between 8 and 20 kilometers, a range of wave-lengths which offers little attraction from an economic viewpoint, and they arise to an increasingly greater extent below the 8 kilometer wave-length as an undesirable accompaniment of atmospherics. Hence, inside this range, with known methods, only partial freedom from disturbances would be practicable.

Means have been provided heretofore whereby the effect of static disturbances and of fading has been eliminated to a certain degree. This is accomplished, as set forth in United States Patent No. 1,770,485, issued July 15, 1930 to August Jipp, by providing means for receiving the signals on three channels and recording them as received in a manner briefly described above. The recording mediums are then utilized to actuate contacting devices in such a manner that the signal that predominates will determine the character of the signal finally recorded. More in detail, this is accomplished by providing a series of circuits having negative and positive portions with a contact controlled by one of the above mentioned tapes associated with each of the circuits in such a manner that if three marking pulses come through the three positive portions of the battery will be connected in series so that full strength current passes through the relay and a pulse is recorded. If positive markings appear on two tapes two of the positive portions of the batteries will be connected in series with one of the negative portions of the batteries so that only one third of the normal electromotive force will be applied to the relay. This, however, actuates the relay to finally record a marking impulse. In other words, an error is introduced into the recorded signal only in the event that a marking impulse is received on but one receiver. Marking spaces act in the same manner to finally record a marking space at all times, except in the event that only one receiver records a marking space.

The present invention has the purpose and solves the problem of rendering high speed traffic not only free from disturbances, but also of placing it upon a more economic basis by utilizing the circumstance that inside the short wave range fading phenomena occur predominantly, that is to say, negative

disturbances, whereas positive atmospheric actions happen to a practically negligible extent inside the same range.

According to the present invention, the signals are therefore transmitted on short waves, while the accumulation or aggregation means of the receiver are combined with means adapted to eliminate negative disturbances.

To obviate fading, several systems have been disclosed in the prior art, said systems usually consisting principally of complicated and cumbersome schemes of disposing antenna separated far apart, so that these schemes have failed to be adopted to any practical extent. The scheme which has almost exclusively been used in practice consisted in the amplification of the transmitter energy, and the result has been a conscious sacrifice and impairment of the economy of transmission of messages on short waves by Morse-code or voice modulation.

The purpose of this invention is to provide a very simple means for eliminating fading in short wave traffic, and the same consists in that, contrary to the means hereinbefore referred to for the neutralization and elimination of positive disturbances, the accumulation or aggregation means are so modified that, when a corresponding group of non-current impulses are coincidently received, a circuit for the purpose of energizing an electromagnet, as for instance, a conveniently polarized translator relay, is closed. This simple circuit scheme eliminates with a high degree of probability such disturbances in high speed telegraphy as are due to fading actions, while in addition it makes it feasible to minimize the transmitter energy to the value required for transmission with the result that a better economy is attained.

Using, for instance, as the accumulation means three keying members for five-unit combinations transmitted three times and individually impressed upon distinct perforated strips and explored synchronously by the keying members, then the bodies of the latter conjointly with the respective contacts in the non-current impulse position will be connected in series so that, when the position of the keying members coincides, a circuit is closed. The latter contains a translator relay which, for instance, when simple current impulses are concerned, makes a current in the de-energized position of its keeper, while the latter is opened as soon as at least one of the three levers happens to be on a hole in the perforated strip, with the result that the energizing circuit is interrupted. The relay could also be used as a polarized relay for the operation of a combiner disk in combination, for instance, with four additional and similar relays identically controlled each by three keying members. In this case one works with a standard Siemens high speed telegraph of known construction for five-unit signals and reversed currents.

The invention is diagrammatically illustrated by way of example in the accompanying drawing in which

Figure 1 shows a preferred embodiment of our invention, and

Figure 2 illustrates another modification thereof in which certain current reversing features are utilized.

Referring to the drawing Figure 1, 1, 2, 3 denote the hinged keying members of the perforated strips 4, 5, 6 into which the three corresponding signals have been punched consecutively. The perforated strips travel in the direction of the arrows as indicated below the keying members. The keying members have contacts 7, 8, 9 which are closed in the non-current impulse position of the levers as shown. The body of member 1 is associated with contact 8 of the following member 2, and the latter with contact 9 of member 3. Connected with contact 7 of the member 1 and the body of member 3 is an electromagnet relay 10 and a source of current 11 in series therewith so that, in the position of the keying members as shown, a current is caused to flow through the winding of the said relay. The latter is so polarized and its contacts are so disposed that the keeper, when the winding is de-energized, closes the local circuit of the relay as indicated by the spring 12. Since the relay is shown in energized condition, the keeper 13 closes the contact 14 for the purpose of establishing connection, for instance, with a translator relay (not shown). The contacts of relay 10 could also be constructed for the production of plus-minus signals. In this case the contacts 14 and 17 are united with the two poles of a battery, from the middle of which a wire is brought to the polarized relay. As shown in Figure 2, another scheme would be to cause the relay 10 to act in the usual way upon a translator device of the kind known from the Siemens high speed telegraph, said device consisting, for instance, of five contact rings 18 (of which only one is shown), and a shaft 19 driven from a motor and upon which is seated a type disk or wheel 20 and the brush 21. The contact rings are divided into segments according to a certain system which are alternately brought in connection with the two contacts of its relay. When all of the five contact dittons of each of the relays provided for each ring occupy a definite position corresponding to the telegraph signal, then the imprinting of the signal will be caused at the instant when a path for the current is established by way of segments, brushes, relay contacts relay keepers and printer magnet.

The device operates in the following manner: Suppose that, as indicated on the perforated strips in Figure 1, the first impulse that has been sent three times, is a non-current im-

pulse. The perforation strips will then not be punched. A disturbance of this non-current impulse signal cannot arise in short-wave work since here only negative (fading) disturbances occur. Hence, the signals have arrived coincidentally and correctly, and the tactile levers 1, 2, 3 when the imperforated paper strips 4, 5, 6 pass through are in the position as shown. Hence, the energizing circuit for the relay 10 is closed, and the keeper is attracted against the action of the spring 12 against the idle contact 14. If a puncher were connected therewith, then the same would produce the signal correctly, i. e., as a non-current impulse in that it would fail to punch its strip. Suppose the next signal to be sent is a regular current impulse. This impulse appears upon the strips 4, 5, 6 as holes, it being here supposed that this signal has been correctly indicated upon the three strips as a punch mark or hole. In this case, all of the three keying members trip and open the relay circuit by which the local circuit is closed, with the result that the perforator contained therein is caused to operate. Suppose the next signal again is a current impulse which, however, is disturbed by fading in that the signal sent out as the second has failed to come in. Hence, the strip 5, at the spot marked by a cross, has failed to be perforated. If, then, the strips travel past underneath the keying members, in spite of the non-coincident position of the keying members, a current-impulse signal will be punched by the perforator contained in the local circuit by opening of the relay energizing circuit. The same situation, of course, will arise when two signals, for instance, the first and the second, or the first and the third, or else the second and the third, signals have come in incorrectly. It is only when all of the three signals are improperly received that a non-current impulse will be recorded. But this case is of no practical importance, since according to probability the number of incorrect letters, referred to as 1%, drops to one hundredth.

The embodiment shown in Figure 2 substantially operates along the same lines, however, with this distinction that the relay keeper results in current reversal signals (plus and minus). These impulses produced by five relays of the type described are then fed in a manner well-known in the art to the translator device whereby the signals are converted into letters.

Repetition of the signals need not occur after each impulse, indeed, it could also happen after a complete series or combination of, say five signal impulses, or even after a still larger interval or section. The longer the time interval between repetitions, the greater the likelihood that less than three signals will come in disturbed.

We claim:

1. In a device of the kind described, a plurality of recording mediums each thereof having signal records impressed thereon in accordance with signals received from a short wave transmitting station transmitting the same signal a plurality of times, one message as received therefrom being impressed on each of said mediums, an electrical circuit comprising a single source of power and a plurality of contacts in series, said contacts being adapted to control the flow of current in said circuit, a relay device in said circuit, said relay device being operative to record the signal when said circuit is open, and a plurality of feeler devices connected to said contact devices and adapted to sense the signal records on said recording mediums, said feeler devices being adapted to open said contacts when a perforation in the associated tape passes.

2. The method of eliminating the effect of fading disturbances on signal reception which includes the steps of receiving the signals on a plurality of channels, producing indications on a recording medium characteristic of the signals received on each channel, and utilizing said readings simultaneously to produce a positive impulse when a positive impulse is produced on one or more of said mediums and a negative impulse when no current is received on any of said channels.

3. The method of signalling free of atmospheric and fading effects which includes the steps of transmitting signals composed of current impulses separated by intervals, on a plurality of channels, receiving said signals, and recording said current impulses when current impulses are received on one or more channels, and recording said intervals only when said intervals appear simultaneously on all channels.

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