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TELEGRAPH DISTORTION MEASURING MACHINE

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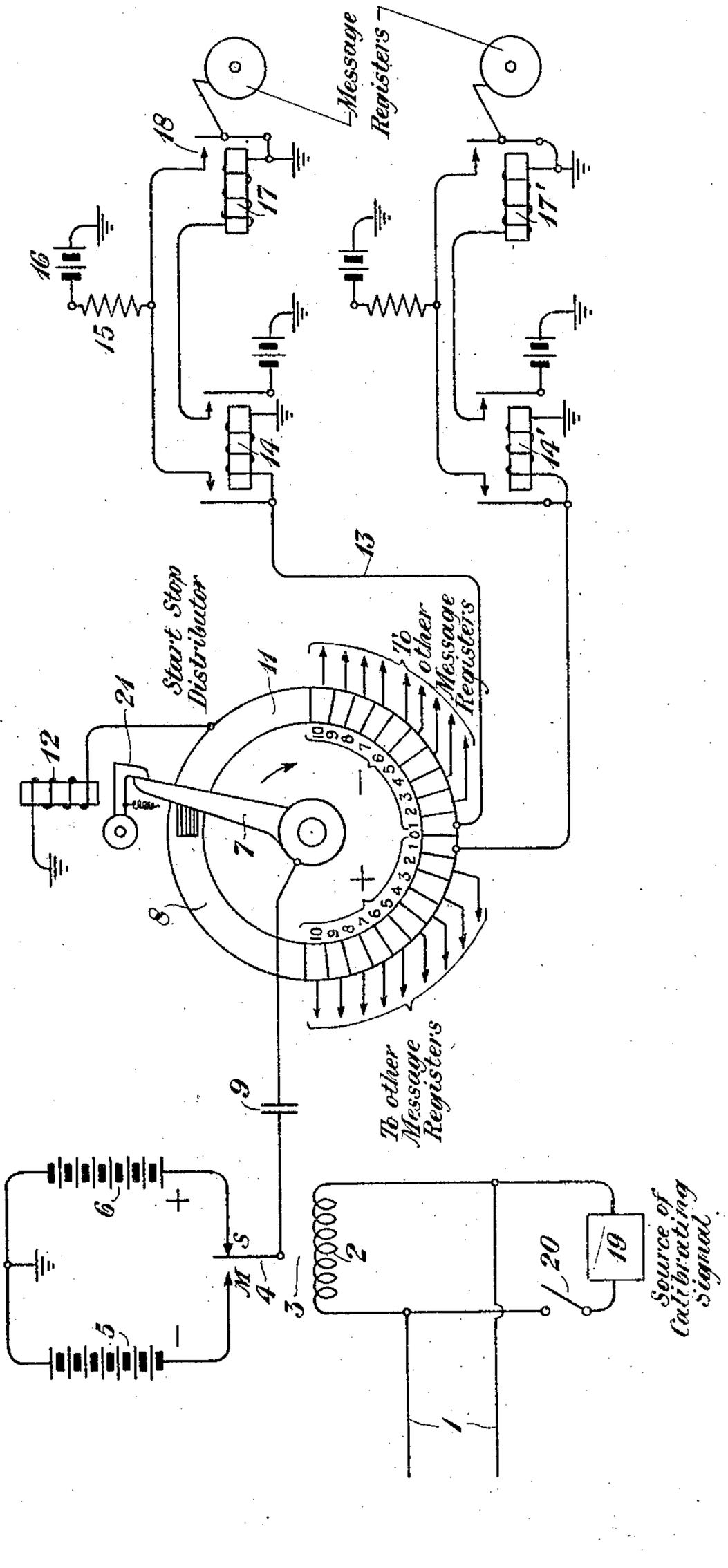

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TELEGRAPH-DISTORTION-MEASURING MACHINE.

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This invention relates to means for measuring telegraph distortion and particularly to a system in which the length of each unit, mark or space transmitted over a telegraph circuit may be measured and recorded.

Heretofore, in the measurement of telegraph distortion it has been customary to use a bridge, such, for example, as that disclosed in the patent to Nyquist, No. 1,435,328, which issued November 14, 1922. Bridges of that type or of any type heretofore used measure only the average distortion of the transmitted signal and are of little use where the distortions are largely variable. Since the variable distortions determine to a considerable extent the grade of telegraph service which can be given over a circuit, it is desirable to have a simple means for measuring such variable distortion.

It is the object of this invention to provide a distortion measuring device which will indicate the maximum distortion prevailing in any telegraph system and the frequency with which a specified amount of distortion is exceeded.

This invention will be clearly understood from the following description when read in connection with the attached drawing, showing schematically one form of embodiment of the invention.

In the drawing, a telegraph circuit 1 is connected with the winding 2 of the receiving relay 3. The armature 4 of this relay is adapted to move between marking and spacing contacts with which are connected the negative and positive batteries 5 and 6 respectively. The armature of this relay is connected with the arm 7 of the distributor face 8, which is somewhat similar to that used in the present start-stop printing telegraph system. Connected between the armature 4 and the arm 7 is a condenser 9, the function of which will be stated hereinafter. This distributor face comprises a plurality of segments, equal in size. The segments to the right of the division marked zero are designated minus 1 to 10 and those to the left of the zero dividing line are designated plus 1 to 10. As will appear hereinafter, a greater number of segments, similar to those designated 1 to 10, might be included if desired. The segment designated 11, which constitutes the rest of the circumference of the distributor face, is connected with the winding of the magnet 12 which controls the release of the arm 7. Segment minus 1 is connected by conductor 13 with the winding of relay 14. The left-hand contact of this relay is connected through the resistance 15 with the direct current source 16. The right-hand contact of relay 14 is connected with the winding of the message register 17, the armature of which controls the register dials and also effects the release of relay 14 whenever the armature of the message register closes its contact 18. The segment plus 1 is shown connected with a circuit similar to that just described and in like manner each of the plus and minus segments will be connected with circuits similar to those shown connected with the segments plus 1 and minus 1.

The manner in which this circuit is operated in order to determine the magnitude of distortion of a signal is as follows: At the outset, the circuit is calibrated by applying to the winding 2 an undistorted signal such, for example, as the E signal, which consists of a single dot and a much longer space. This is applied by means of a source 19 connected with the winding 2 through the switch 20. The speed of the arm 7 of the distributor is then adjusted so that the time required to make half a revolution is equal to the dot length to be measured. In other words, the brush speed of the distributor in cycles per second is equal to the signaling speed in cycles per second.

During the spacing interval of the E signal applied to the winding 2 by the source 19, the armature 4 remains upon its spacing contact and the condenser 9 is charged positively by the flow of current from the source 6, through the spacing contact, the condenser, the arm 7 and its associated brush, and the winding of the magnet 12. When the marking impulse is applied by the source 19 to the winding 2, the armature 4 moves to its marking contact, thereby connecting the negative battery 5 with the circuit containing the condenser 9. The resultant current causes the magnet 12 to release the brush arm 7. This arm will then continue to travel over the segments of the distributor face in the direction represented by the arrow. Since the speed of rotation of this arm has been adjusted with refernce to the length of the dot of the impressed signal, the brush will be resting upon one of the segments in the vicinity of the zero dividing line at the end of

the marking impulse. At this time, that is to say, when the armature 4 moves to its spacing contact an impulse of current will be transmitted through the condenser 9 and the arm 7 and its associated brush to the circuit connected with one of the segments. Let us assume that this is segment minus 1. Accordingly, relay 14 will be energized and through its right-hand contact it will energize the winding of the message register 17 and cause the recording upon the dial of that register an indication of such operation. The relay 14 would also be locked up by current flowing from the source 16 through the left-hand contact of the said relay. However, as soon as the message register 17 operates the source 16 is shunted through the contact 18, and the relay 14 is released for further use. The releasing of relay 14 also releases the message register.

If the brush of the arm 7 rests upon the segment plus 1 at the instant the armature 4 moved to its spacing contact, the relay 14′ would be operated, which would, in turn, operate the message register 17′ and cause the registration of such operation upon the dial thereof. Since the signal applied by the source 19 to the winding 2 was a perfect signal, that is to say, it was undistorted in any way, as might have been the case if it had been received over the circuit 1, the arm of the distributor should have reached the dividing line zero at the instant of termination of the dot impulse, that is to say, at the instant the armature 4 moved back to its spacing contact. To complete the calibration of the set preparatory to measuring the signals received over the line 1, the face of the distributor 8 is oriented so that the brush of the arm 7 will reach the zero dividing line at the termination of the dot impulse. This condition can be determined by watching the operation of the message registers connected with the segments plus 1 and minus 1 during the receipts of a number of signals from the source 19.

With the set thus adjusted, the apparatus is ready to measure distortions received over the line circuit 1. The calibrating source 19 would be disconnected by opening the switch 20. The signal to be measured is then transmitted over the line 1 in the usual manner and operates the relay 3, causing the armature 4 to move between its marking and spacing contacts. At the beginning of each marking or spacing impulse the brush arm 7 is released. At the end of each impulse a record is made on the message register corresponding to the particular dot length. In this way the length of each impulse is recorded automatically and the value and the number of distortions occurring on the telegraph circuit in a certain length of time may be obtained from the readings of the various message registers. It should be understood that the arm 7 does not rotate continuously but is held by the pawl 21 after it reaches this point after each revolution until a releasing impulse is applied to the magnet 12 through the condenser 9.

In the arrangement shown in the drawing, ten small segments are indicated on each side of the zero dividing line. Each of these groups of segments constitutes a quadrant of the distributor face or one-half a dot length and each segment constitutes five per cent of a dot length. Consequently, segment minus 1 and its associated circuit registers all distortions from zero to minus five per cent, and segment minus 2 from minus five percent to minus ten per cent and so on up to minus 50 per cent. These negative segments could be continued through another quadrant so as to measure negative distortions of 50 to 100 per cent and in similar manner positive segments could be added to measure distortions from plus 50 per cent to plus 100 per cent.

It will be seen, therefore, that by means of the invention embodied in the drawing and described hereinbefore the magnitude of distortion of one signal or succession of signaling impulses may be registered and the condition of the line may be readily determined.

While this invention has been disclosed as embodied in a particular form it is to be understood that it is capable of embodiment in other forms without departing from the spirit and scope of the appended claims.

What is claimed is:—

1. In a telegraph distorting measuring machine, the combination with a source of marking and spacing impulses of a relay responsive to the said impulses having an armature and sources of potential of opposite polarity connected with its contacts, a segmental rotary distributor adjusted so that the arm thereof will pass over a fixed number of segments while the armature of the said relay rests upon a certain contact, a condenser connected between said distributor arm and the armature of the said relay, and registering devices, each connected with a segment of the said distributor to effectively record the magnitude of distortion of the signal impulse actuating the said relay.

2. In a telegraph distortion measuring machine, the combination with a source of marking and spacing impulses of a relay controlled thereby having an armature and sources of potential of opposite polarity connected with the contacts thereof, a rotary distributor having an arm and a plurality of segments and adjusted so that the arm thereof will pass over a predetermined number of segments when the impulse operating the said relay is undistorted, a condenser connected between said arm and said armature adapted to be charged in opposite senses by the source of marking and spacing

impulses, and a plurality of measuring means individual to and connected with the various segments to register the degree of distortion of the impulses actuating the said relay.

3. In a telegraph distortion measuring machine, the combination with a relay having a winding connected therewith as a source of current impulses and having an armature adapted to move between contacts connected with sources of potential of opposite polarity, a rotary distributor having an arm and a plurality of segments, the said arm being connected with the armature of the said relay, the connection including a condenser, a starting relay connected with one of the said segments having means to release the said arm, a plurality of registering means connected with the said other segments, each registering means comprising a relay adapted to be energized by one of the sources connected with the said first relay, and a message register controlled by the relay connected with the said segments whenever the brush of the said arm rests thereon.

4. In a telegraph distortion measuring machine, the combination with a source of telegraph signals, the length of whose marking and spacing elements is to be measured, of a rotary distributor having a brush arm and a plurality of segments, the said distributor being adjusted so that the arm will travel over a predetermined number of segments during the continuance of an undistorted signal element, a plurality of electro-responsive devices, each individual to and connected with one of said segments, and a capacity coupling between said source of signals and said brush arm.

5. In a telegraph distortion measuring machine, the combination with a source of telegraph signals, the length of whose marking or spacing impulses is to be measured, of a line relay having an armature and contacts, a source of marking and of spacing potential connected with said contacts, a rotary distributor having a brush arm and a plurality of segments, a condenser connected with said armature and said distributor arm, a releasing magnet connected with one of said segments operable whenever the condenser is charged by its effective connection with one of the contacts of said relay, thereby releasing said arm, and a plurality of registering devices each connected with one of said segments, each registering device being operable if the condenser is connected with the other of said contacts at the instant when the said brush arm is effectively connected with the segment to which said registering device is attached.

In testimony whereof, I have signed my name to this specification this 19th day of May 1924.

JOSEPH HERMAN.