

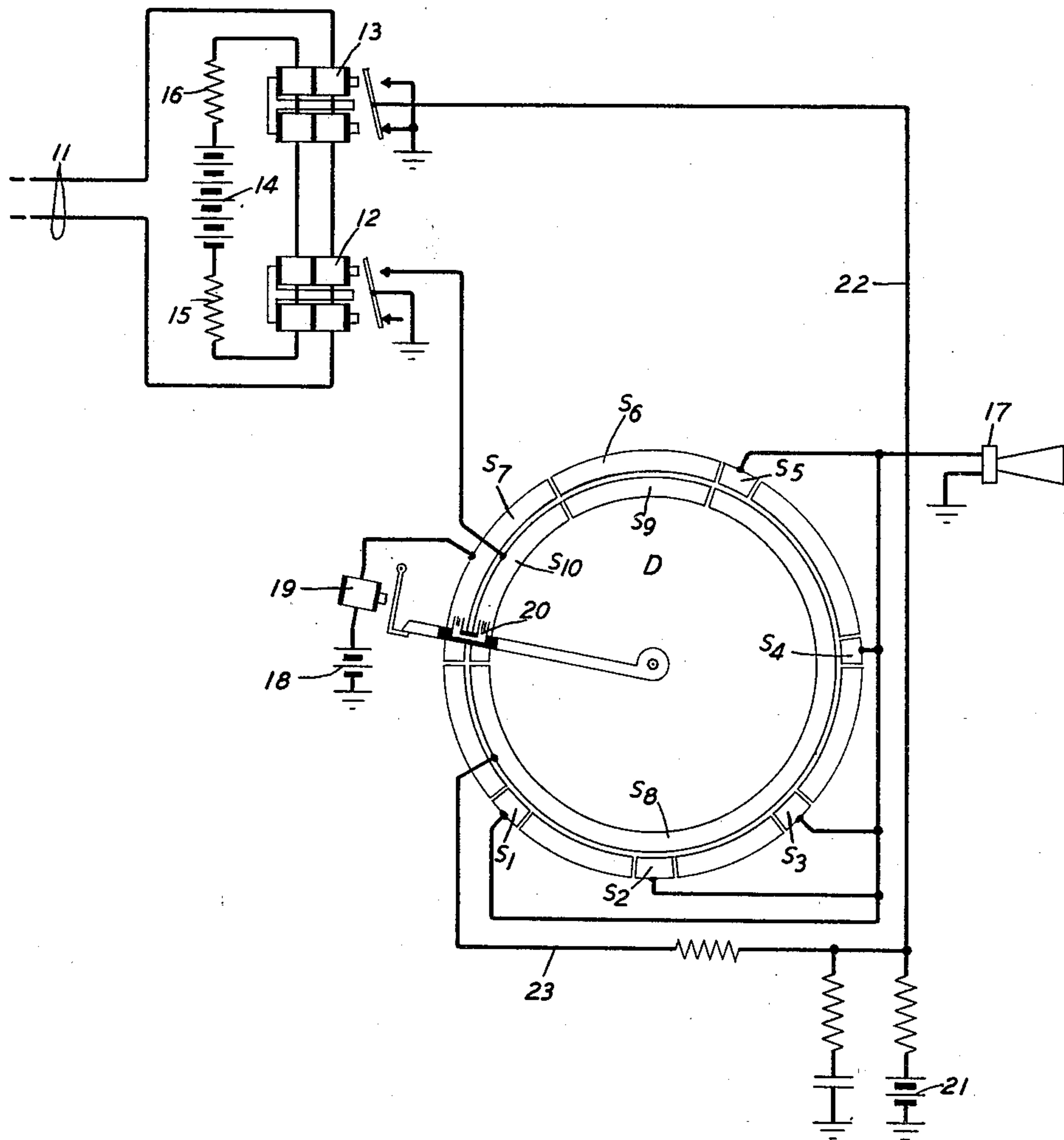
Aug. 16, 1932.

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1,871,916

SIGNAL MONITORING DEVICE

Filed Aug. 29, 1930



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SIGNAL MONITORING DEVICE

Application filed August 29, 1930. Serial No. 478,745.

This invention relates to impulse transmission systems and more particularly to electrical measuring systems wherein means are employed for determining the existence of distortion of received telegraph signals.

In transmitting telegraph signals, each made up of a plurality of impulses and each impulse having a definite length, distortion of the impulses and, therefore, of the signals, may be produced by various causes inherent in the line or in the apparatus connected therewith or both. The distortion with which this invention is concerned manifests itself in lengthening or shortening the duration of the impulses which constitute the signal transmitted over the line. This lengthening or shortening of the duration of the impulses interferes with the proper recording of the signals at any station connected to the line and, consequently, impairs the efficiency of transmission.

An object of this invention is to determine in a simple, efficient and economical manner the existence and magnitude of this form of distortion in signals incoming at a repeater or receiving station. This object, more specifically stated, is to indicate by audible means any distortion of the incoming signals and to determine by means of a distributor arranged for orientation the degree of distortion of the signals.

Various systems for determining the existence and magnitude of this form of distortion have been devised and used but, due to either complexity of the apparatus required or to other causes, such use has not been very wide.

In connection with telegraph circuits, printers are employed for monitoring purposes in telegraph offices. These printers are employed for communicating with subscribers and repeater stations, measuring orientation margins either in connection with routine tests of working circuits or when lining up circuits and when locating reported troubles.

According to the present invention two line relays and the receiving part of a start-stop rotary distributor are used in combination with a loud speaker arrangement. When

this apparatus is connected in the loop circuit the operation of the loud speaker affords an indication whenever the orientation setting of the distributor receiving rings is such that the armatures of the line relays reverse their positions while the distributor brush is on any one of the five selecting segments of the distributor. The operation of the loud speaker is used in obtaining orientation limits in the usual way so that substantially the same result may be secured as if the attendant were measuring the orientation margin while observing the printed copy or tape with a printer set. One advantage of this arrangement is that it eliminates the necessity of using for monitoring purposes a printer which uses the same code arrangement as the subscribers' machine.

Other objects and features will appear in the following specification and appended claims when taken in conjunction with the drawing.

In an embodiment of the present invention shown in the single figure of the drawing, loop circuit 11 is connected in series with the line circuit (not shown) at a repeater or a receiving station in a telegraph system designed to transmit signal combinations of "current" and "no current" impulses. Included in the loop circuit are a pair of biased polarized relays 12 and 13 each of which is equipped with two windings. The right-hand windings of the two relays are connected in series with the loop circuit and are normally operated in the position shown because of the loop circuit being connected in a normally closed transmission line, and the left-hand windings are connected in series in a continuously closed circuit comprising biasing battery 14 and regulating resistances 15 and 16. The line current normally flowing through the right-hand windings of the relays flows in a direction opposite to that flowing through the left-hand windings and is of such strength as to predominate over the latter. The biasing current flowing through the left-hand windings is regulated by means of resistances 15 and 16 and is made of just sufficient

strength to operate the relays every time the line or loop circuit is opened.

Start-stop distributor D is of the general type used in receiving apparatus of start-stop printing telegraph systems. A brush 5 interconnecting concentric rings of segments is driven by a constant speed motor and through a friction clutch. The brush is normally restrained from moving by a latch under the control of a release magnet. The distributor D comprises two concentric seg- 10 mental rings. The outer ring comprises a plurality of segments of equal size and equally spaced, designated S_1 to S_5 inclusive, which are connected in parallel to a loud speaker 15 device 17. The outer ring also includes segments S_6 and S_7 . Segment S_6 is left "dead" and serves as the "stop" segment, and segment S_7 is connected to battery through the 20 windings of release magnet 19 which, when operated, effects the starting of the distributor brush 20 rotating around the distributor segments. Distributor D is of the start-stop type which stops after each revolution of 25 brush 20, unless latch 19 is released by a new start impulse before the brush stops.

The inner ring comprises a long segment S_8 which is connected to grounded battery 21, and two comparatively short segments S_9 30 and S_{10} which are of angular lengths respectively equal to those of segments S_6 and S_7 . Segment S_9 is left "dead" and segment S_{10} is connected to a contact of relay 12.

The parallel circuits including battery 21, 35 segments S_1 to S_5 and loud speaker 17 are normally short-circuited by a circuit extending from battery 21, conductor 22, armature of relay 13 to ground at either of the relay contacts. This short circuit is removed only 40 when the armature of relay 13 is traveling from one of its associated contacts to the other. Therefore, if relay 13 operates while the brush 20 is passing over one of the short segments S_1 , S_2 , etc., a short pulse of cur- 45 rent will flow into the loud speaker 17 which, in response to the opening of this short circuit, will operate; but if the relay operates at any time other than when the brush is passing over one of the short segments S_1 , S_2 , etc., S_5 , 50 the operating circuit of the loud speaker is open and nothing happens other than the momentary opening of the short circuit which remains closed during the time that the brush subsequently passes over one of the short seg- 55 ments S_1 , S_2 , S_3 , etc.

Having in mind the foregoing description of the circuit in which the invention is embodied, the nature of the invention will be clear from the following description of the 60 mode of operation of the circuit.

In the well known start-stop printing telegraph system, for each character transmitted there is an "open" or start impulse followed by five selecting impulses which may be 65 either "open" or "closed", and a "closed" or

stop impulse. By the term "open" impulse is meant an impulse of such character as to deenergize the right hand windings of relays 12 and 13 whereby the relay armatures move to their alternate contacts under the influ- 70 ence of the current in the left hand windings, and similarly by the term "closed" impulse is meant an impulse of such type as to energize these windings and to cause the relay armatures to be attracted to their contacts as shown. The existence and magnitude of the distortion of incoming signals is deter- 75 mined by investigating the phase relation between the distributor brush 20 and the changes in polarity of the incoming signals which manifest themselves by operating the relays. 80

In order to disclose clearly the operation of the apparatus of this invention, it is desirable to describe how the circuit operates when undistorted signals are received in the right- 85 hand windings of relays 12 and 13. In response to the first impulse received which is an "open" or "no current" impulse, the right-hand windings of the relays are deenergized and the current continuously flowing through the left-hand windings causes both relay armatures to move to their respec- 90 tively associated alternate contacts. The armature of relay 12 connects ground to the operating circuit for release magnet 19 which operates and allows brush 20 to start rotating. When the second, or first selecting, impulse is received, brush 20 has reached the middle 95 of the spacing segment between segments S_7 and S_1 and the duration of this impulse is equal to the interval it takes brush 20 to reach the middle of the spacing segment between segments S_1 and S_2 . Therefore, the middle 100 portion of the first selecting impulse is being received during the time that brush 20 is passing over segment S_1 . Likewise, for each of the other four selecting impulses, brush 20 is passing over one of the segments S_2 , S_3 , etc., 105 when the middle portion of an impulse is being received. 110

For the purpose of this invention it matters not whether these selecting impulses are "open" (no current) or "closed" (current) 115 impulses because ground is connected to the armature of relay 13 in response to either impulse and the circuit short circuiting the distributor, is established at the time brush 20 passes over short segments S_1 , S_2 , etc. 120 However, when the stop impulse, which is a "closed" or current impulse, is received, the armatures of relays 12 and 13 are moved to the position shown and ground is disconnected from the operating circuit for release 125 magnet 19 which cannot operate until the next impulse, which is the start or "open" impulse of the next signal, is received. The stop impulse, which is the longest of those comprising the signal combination, is re- 130

ceived at the time brush 20 is passing over the middle of segment S_6 and continues up until the time the brush 20 is stopped by the latch of the release magnet.

5 Assuming that there is considerable distortion present in the incoming signals, which manifests itself in lengthening or shortening the duration of the impulses received, and that, for example, the fifth selecting impulse is shortened and is received at the time brush 20 has reached the beginning of segment S_5 , the armature of relay 13 will be moving to its alternate contact while brush 20 is passing over segment S_5 . The disconnection of ground from conductor 22 while the armature of relay 13 is traveling from one contact to another, opens the short circuit around the distributor and current flows in the circuit extending from grounded battery 21, conductor 23, segment S_8 , brush 20, segment S_5 , loud speaker 17 to ground. The loud speaker operates and gives forth an impulsive sound to indicate that distortion is present. This indication may be given over any or all the short segments of the outer ring of the distributor. If the amount of distortion is small and it is desired to determine the degree of distortion present in the signals, the rings may be oriented with respect to the body of the distributor face and the degree of orientation compared with that of normal signals, that is, the orientation which may be made before the loud speaker is operated as described above.

35 It is understood that the present invention is not limited to the use of a loud speaker but that other indicating circuits may be employed, such as a quick-acting relay for operating a lamp, or recording device or neon tube, the relay winding being connected in place of the speaker and an additional circuit controlled by the relay armature and including the lamp, device or neon tube being provided. Then again, the distributor may be arranged differently so that the short segments of the outer ring might be somewhat longer than shown whereby any objectionable distortion would operate the indicating device without having to change the orientation. With the latter arrangement the indicating device could be left connected in the loop circuit and arranged to operate an alarm whenever the distortion exceeded a predetermined amount. For monitoring a large number of circuits, there could be employed a number of distributors having their respective rotatable brushes mounted on one shaft which would be driven by a single motor. In this case, lamp signals would probably be desirable to indicate the circuit on which the distortion was occurring, with a common alarm to attract the attention of the attendant.

What is claimed is:

65 1. In an impulse transmission system, a

device for indicating and measuring received signals for distortion which manifests itself in lengthening or shortening the duration of impulses, comprising means responsive to the beginning or ending of a current impulse in the received signals for operating normally ineffective circuits, rotary means, and indicating means intermittently connected to said rotary means and normally maintained ineffective to operate, said indicating means being effective to operate only when a received current impulse begins or ends at such times when said rotary means is connected to said indicating means.

2. In a signaling system, a receiving station, a transmission circuit terminating at said station, means for transmitting signal current impulses over said circuit at predetermined intervals, a pair of relay devices connected in series in said circuit and arranged to be controlled by said transmitted current impulses, a local source of potential for controlling said devices when no current is in said circuit, means cooperatively associated with one of said devices for indicating and measuring a change in the intervals of transmitted current impulses received in said pair of devices, and other means cooperatively associated with the other of said devices for preventing the operation of said indicating and measuring means when the intervals of transmitted current impulses are of the desired duration.

3. In a signaling system in accordance with claim 2 wherein the relay devices maintain a short circuit around said indicating means when current is flowing in the transmission circuit at predetermined intervals and for opening said short circuit to effect the operation of said indicating means when said intervals vary.

4. In a system for indicating the length of signal impulses comprising connection terminals for a line in which the impulses exist, a distributor including a rotary brush, means to control the distributor to operate in synchronism with the impulses to be indicated, dead segments in said distributor coinciding in time with the normal effective beginning and ending of an impulse, active segments in said distributor corresponding to the normal central portion of an impulse, an indicator connected to at least one of said active segments, and means controlling the operative connection of said active segments to said indicator whereby said indicator is operated solely when said brush is upon one of said connected active segments simultaneously with the effective beginning or ending of a signal impulse.

5. In a start-stop telegraph system, a device for measuring the distortion of telegraph signals which manifests itself in the lengthening or shortening of the signal impulses comprising means responsive to said signal

impulses, a rotary start-stop distributor controlled by said means, means to orient said distributor to measure the distortion, and an audible indicator electrically connected to said distributor and cooperatively actuated
5 by said distributor and said responsive means to indicate the distortion of the signals.

In testimony whereof I have signed my name to this specification this 28th day of
10 August, 1930.

RALPH E. PIERCE.