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SIGNALING SYSTEM

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FIG. 1

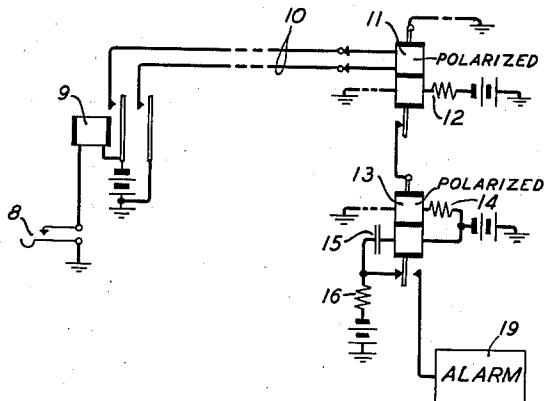
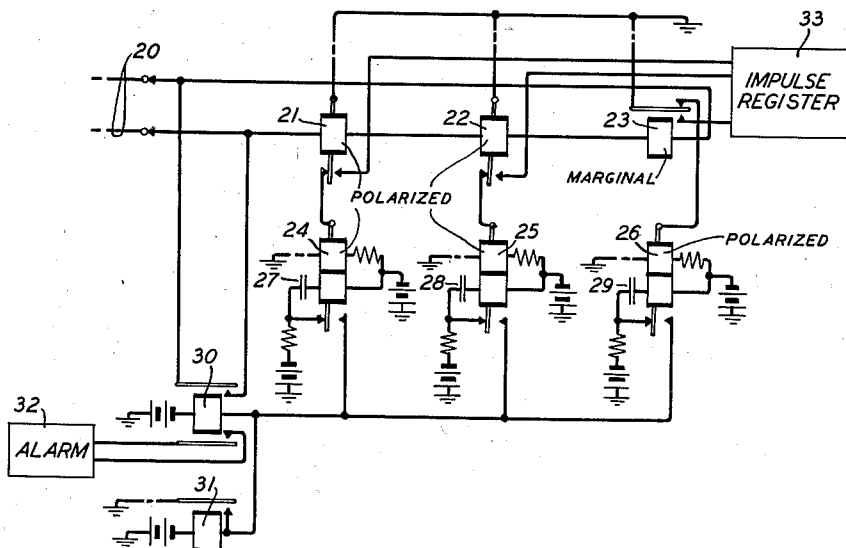


FIG. 2



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SIGNALING SYSTEM

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8 Claims. (Cl. 179—175.2)

This invention relates to signaling systems and particularly to systems in which signals are transmitted by impulses of current and it is the object of this invention to insure accurate and reliable signaling.

In systems employing current impulses for the transmission of signals, satisfactory operation of the signal receiving means requires that the impulses be of a certain minimum duration; and, to enable adjustment of the impulse device at the sending end of the signaling circuit, it is necessary that means be provided for measuring the length of the impulses. One such impulse measuring device, disclosed in Patent 1,976,503 granted to F. Kuchas, October 9, 1934, consists of an impulse receiving relay for responding to the impulse, a set of three auxiliary relays controlled by the impulse receiving relay, and a condenser-timed test relay controlled by the auxiliary relays. This invention is an improved impulse measuring device which consists of an impulse receiving relay for responding to impulses and a condenser-timed test relay controlled directly by the impulse receiving relay, no auxiliary relays or equivalent control apparatus being required.

The invention will be further described by considering specific embodiments shown schematically in the drawing which forms a part of this specification. The invention is, however, not limited to these particular arrangements, but is in general applicable to all impulse signaling systems. Referring to the drawing:

Fig. 1 represents a system in which all of the signal impulses are of like character; and

Fig. 2 represents a system in which the signaling impulses vary in direction and magnitude.

The signaling system of Fig. 1 comprises impulse contacts 8, sending relay 9 and a line 10 which is or may be connected to electromagnetic signal receiving means, not shown; the minimum allowable length of each signal impulse is determined by the character of this signal receiving means. The testing means for measuring the length of impulses comprises a polarized impulse receiving relay 11 and a polarized test relay 13. Since the impulses over line 10 are all of like duration and polarity, a non-polarized impulse receiving relay could be used if sufficiently fast in operation. Relay 11 is biased by the energization of its lower winding in series with resistor 12, and relay 13 is biased by the energization of its upper winding in series with resistor 14; so that these relays hold their armatures in the positions shown when there is no current through their

operating windings. The operating (upper) winding of relay 11 is connected in series with line 10 for energization in response to each impulse created by the operation of the signal sending relay 9. The operating (lower) winding of relay 13 is connected in series with condenser 15, any current through this winding being due either to the charging or discharging of condenser 15. Normally condenser 15 is charged, the charging circuit being traced through the back contacts of relays 11 and 13. Upon operation of relay 11, by an impulse through its operating winding, this charging circuit is opened; and condenser 15 discharges through resistor 16, the current through the lower winding of relay 13 causing the operation of this relay for an interval of time which depends upon the capacity of condenser 15 and the value of resistor 16. By a proper choice of these elements, test relay 13 will remain operated for a desired interval of time, which interval is the length of time that impulse relay 11 is operated by an impulse of minimum allowable length. If the current impulse which energizes the operating winding of relay 11 is equal to or longer than the minimum allowable impulse, relay 13 will release at the same time or before relay 11 releases; but, if the current impulse which energizes the operating winding of relay 11 is less than the minimum allowable impulse, relay 11 releases while relay 13 is operated thereby closing a circuit through the back contact of relay 11 and front contact of relay 13 to operate an alarm 19.

In case the signal impulses consist of interruptions of the current over line 10, the armature of relay 13 will be connected to a front contact of relay 11; and, in this case, reoperation of relay 11 prior to the release of relay 13 will close the alarm circuit to indicate too short an impulse.

Application of the invention to an automatic or semi-automatic telephone system in which the current impulses vary in polarity and amplitude is illustrated in Fig. 2. Reference may be had to Patent 1,840,132 granted to T. H. Roberts, January 5, 1932, and to the aforementioned Kuchas patent for a complete description of a register sender arranged to transmit such current impulses. The impulses transmitted over line 20 are of three kinds, one is a negative impulse of a certain amplitude; another is a positive impulse of the same certain amplitude; and the third is a negative impulse of considerably larger amplitude. The impulse measuring apparatus consists of three impulse receiving relays 21, 22 and

23 connected in series to the signal line 20, the test relays 24, 25 and 26 and auxiliary relays 30 and 31. An impulse register of any suitable type for registering the impulses received by relays 21, 22 and 23 forms a part of the test mechanism. Relay 21 is operatively responsive to both the weaker and the stronger negative impulses, relay 22 is operatively responsive to the positive impulses, and relay 23 is operatively responsive only to the stronger negative impulses. Each of these impulses must be as long or longer than the minimum interval which is required for operation of the impulse register which is fully illustrated and described in Patent No. 1,464,084 granted to A. E. Lundell et al., August 7, 1923. Each of the test relays 24, 25 and 26 is similar to relay 13 of Fig. 1 and is operated for a definite interval of time, when the associated impulse receiving relay operates, by the discharge of the condenser which is in series with its operating winding. Thus, upon the operation of impulse relay 21, condenser 27 discharges through the lower winding of test relay 24 thereby operating and holding relay 24 for the interval of time that relay 21 is operated by a weaker negative impulse of minimum allowable duration. Upon operation of impulse relay 22, condenser 28 discharges through the lower winding of test relay 25, thereby operating and holding relay 25 for the interval of time that relay 22 is operated by a positive impulse of minimum allowable duration. And upon operation of impulse relay 23, condenser 29 discharges through the lower winding of test relay 26, thereby operating and holding relay 26 for the interval of time that relay 23 is operated by a stronger negative impulse of minimum allowable duration. If any one of the impulse relays 21, 22 and 23 releases before its associated test relay releases, a circuit is closed for operating relays 30 and 31. Relay 31 closes a circuit for holding relays 30 and 31 operated independent of the test relays. Relay 30 closes a circuit for operating the alarm 32 and at its upper front contact short circuits the windings of impulse relays 21, 22 and 23 thereby blocking further operation of these relays so as to retain in the impulse register 33 the record of the impulses already received.

What is claimed is:

1. An impulse testing device comprising an impulse receiving relay, a test relay, a condenser, a circuit including a contact of said impulse relay for charging said condenser, and a circuit rendered effective upon the opening of said contact for discharging said condenser through a winding of the test relay, the discharge current being effective to operate and hold the test relay operated for a desired length of time.

2. An impulse testing device comprising an impulse receiving relay, a test relay, a condenser, a circuit including a contact of said impulse relay for charging said condenser, and a circuit rendered effective upon the opening of said contact for discharging said condenser through a winding of the test relay, the discharge current being effective to operate and hold the test relay operated for a desired length of time, and an alarm circuit closed by said contact of the impulse relay and a contact of said test relay.

3. An impulse testing device comprising an impulse receiving relay, a test relay, a condenser, a circuit including contacts of both of said relays for charging said condenser, and a circuit rendered effective upon the opening of said contact of the impulse relay for discharging said condenser through the operating winding of said

test relay, the discharge current being effective to operate and hold the test relay operated for a desired length of time.

4. An impulse testing device comprising an impulse receiving relay, a test relay, a condenser, a circuit including contacts of both of said relays for charging said condenser, and a circuit rendered effective upon the opening of said contact of the impulse relay for discharging said condenser through the operating winding of said test relay, the discharge current being effective to operate and hold the test relay operated for a desired length of time, and an alarm circuit including said contact of the impulse relay and another contact of said test relay.

5. In a signaling system, a line, a signal sender for sending signal impulses over said line, and an impulse testing device comprising an impulse relay for responding to impulses transmitted over said line, a test relay, a condenser connected in series with the operating winding of said test relay, a circuit for charging said condenser, and a circuit rendered effective by the response of said impulse relay to an impulse in said signal circuit for discharging said condenser, said condenser having the capacity required for operating and holding said test relay operated for a definite interval of time.

6. In a signaling system, a line, a signal sender for sending signal impulses over said line, and an impulse testing device comprising an impulse relay for responding to impulses transmitted over said line, a polarized test relay having a biasing winding and an operating winding, a condenser connected in series with the operating winding of said test relay, a circuit for charging said condenser, energization of the operating winding of the test relay by the charging current being effective to aid the biasing winding, and a circuit rendered effective by the response of said impulse relay to an impulse in said signal circuit for discharging said condenser, said condenser having the capacity required for operating and holding said test relay operated for a definite interval of time, which interval is the length of time that said impulse relay is operatively affected by an impulse of minimum allowable duration in said signal circuit.

7. In a signaling system, a line, impulse receiving relays connected to said line, a first one of said relays being operatively responsive to current impulses of one polarity and a second one of said relays being operatively responsive to current impulses of opposite polarity, test relays, one for each of said impulse relays, condensers, a circuit including a contact of said first impulse relay for charging a first one of said condensers, a circuit including a contact of said second impulse relay for charging a second one of said condensers, a circuit rendered effective by the operation of said first impulse relay for discharging said first condenser through a winding of the associated test relay to operate said test relay, a circuit rendered effective by the operation of said second impulse relay for discharging said condenser through a winding of the associated test relay to operate said test relay, an auxiliary relay, and circuits for operating said auxiliary relay, a first one of said last-mentioned circuits being closed by the release of said first impulse relay while the associated test relay is operated and a second one of said last-mentioned circuits being closed by the release of said second impulse relay while the associated test relay is operated.

8. In a signaling system, a line, impulse receiving relays connected to said line, a first one of said relays being operatively responsive to current impulses of not less than a certain magnitude, a second one of said relays being operatively non-responsive to current impulses of said certain magnitude and operatively responsive only to impulses of a higher magnitude, test relays, one for each of said impulse relays, condensers, a circuit including a contact of said first impulse relay for charging a first one of said condensers, a circuit including a contact of said second impulse relay for charging a second one of said condensers, a circuit rendered effective by the operation of said first impulse relay for discharging said first condenser through a winding of the associated test relay to operate said test relay, a circuit rendered effective by the operation of said second impulse relay for discharging said condenser through a winding of the associated test relay to operate said test relay, an auxiliary relay, and circuits for operating said auxiliary relay, a first one of said last-mentioned circuits being closed by the release of said first impulse relay while the associated test relay is operated and a second one of said last-mentioned circuits being closed by the release of said second impulse relay while the associated test relay is operated.

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