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PATENT



SPECIFICATION

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PROVISIONAL SPECIFICATION.

Improvements in or relating to Telegraph Systems.

We, JOSEPH ARTHUR LOVEL DEARLOVE, of 4, Great Winchester Street, in the City and County of London, ALEXANDER DAVIDSON, of Lima, Peru, and NELSON JOSEPH PERRYMAN, of Lima, Peru, Electrical Engineers, do hereby declare the nature of this invention to be as follows:—

5 This invention relates to telegraph systems.

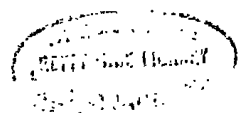
The chief object of the invention is to provide means for dividing up a signal consisting of a number of dots or dashes received as a single or block signal or semi-blocked signal at one end of a submarine cable or other telegraph line into its constituent dots or dashes as transmitted from the sending end of the line, such a method being referred to as interpolation. In accomplishing this interpolation according to the present invention the receiving relay at the end of the cable serves to control the circuit of an auxiliary relay which when operated periodically opens the circuit closed by the operation of the receiving relay. In this way the signals received if in block form are broken up into their constituent dots and dashes.

10 There may be provided two local transmitting relays controlled by the receiving relay, one for transmitting dots and the other for transmitting dashes. Associated with each of these transmitting relays is an auxiliary relay as hereinbefore referred to. One terminal of each of the transmitting relays is connected to the tongue of the receiving relay through a local battery, each of the other two terminals being connected respectively to the two fixed contacts of the receiving relay through the armature and back contact of the associated auxiliary relay. Resistance coils to prevent sparking are connected between the tongue of the receiving relay and the last mentioned terminals of the transmitting relays. The operating winding of each auxiliary relay is connected to the tongue and back contact of the local transmitting relay, the said back contact being connected to positive battery and the front contact to negative battery. Each auxiliary relay has a condenser connected across the terminals of its operating winding. The end of the operating winding of the auxiliary relay which is joined as hereinbefore mentioned to the tongue of the transmitting relay is preferably connected thereto through two resistances, the condenser being connected at the junction of these resistances. The line or apparatus to which the signals are to be transmitted is connected to the tongue of one of the transmitting relays, the tongue of the other transmitting relay being connected to earth.

15 The operation of the arrangement described is as follows:—

If a number of consecutive dots is received the tongue of the receiving relay

[Price 6d.]



may be held on the dot contact. The dot transmitting relay is therefore energised thereby applying battery to the dot auxiliary relay and the condenser connected across its winding. Owing to the presence of the condenser the operation of the auxiliary relay is delayed but when it does operate it opens the circuit of the dot transmitting relay causing the tongue of the latter to fall back. The tongue of the auxiliary relay is pulled back by a spring or other means of control after the condenser has discharged through the winding and when the contacts of this relay are closed the operations just described are repeated. The transmitting relay consequently transmits the number of dots contained in the signal as originally sent. The dash relay operates in a similar manner.

A given speed of signalling being fixed on, the condensers are adjusted so that individual dots or dashes are sent to line at that speed when the receiving relay tongue is held to the dot or dash contact.

If the signals are transmitted to reperforating apparatus it is necessary to distinguish between letter and word spacing and for this purpose a third auxiliary relay may be provided which is intermittently energised during the time that no dots or dashes are being received.

The resistances connected between the tongues of the local transmitting relays and the condensers can be varied in value without materially affecting the speed of operation of the auxiliary relays but they form a useful means of adjustment for varying the "percentage of definition" of the signals going to line. The resistances connected between the operating windings of the auxiliary relays and the condensers form a means of strengthening the first dot or dash or a series and therefore of strengthening up cross letters.

Instead of the cable receiving relay directly controlling relays which act as local transmitters as hereinbefore described, the cable receiving relay may control relays of the post office or other type which operate local transmitters or sounders for sending on into a second cable. Further the auxiliary relays may be caused to vibrate in other ways than that hereinbefore described for example mechanically as by constructing them similarly to electric trembler bells.

Dated this 17th day of April, 1917.

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### COMPLETE SPECIFICATION:

#### Improvements in or relating to Telegraph Systems.

We, JOSEPH ARTHUR LOVEL DEARLOVE, of 4, Great Winchester Street, in the City and County of London, ALEXANDER DAVIDSON, of Lima, Peru, and NELSON JOSEPH PERRYMAN, of Lima, Peru, Electrical Engineers, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:

This invention relates to telegraph systems and more particularly to signal receiving or retransmitting apparatus.

The chief object of the invention is to provide improved means for dividing up a signal consisting of a number of dots or dashes received as a single or

block signal or semi-blocked signal at one end of a submarine cable or other telegraph line into its constituent dots or dashes as transmitted from the sending end of the line, such a method being known as interpolation.

According to this invention in a telegraph system having signal receiving or retransmitting apparatus comprising a receiving relay adapted to close the circuit of another relay and to cause battery to be applied to an interrupting relay which serves to open at its contacts the circuit so closed for the purpose of interpolation, there is employed a resistance in series and a condenser in shunt or an inductance in series with the winding of the interrupting relay for the purpose hereinafter described. The apparatus may comprise two such vibrating relays one for the interpolation of dots and the other for the interpolation of dashes and if necessary as when transmitting the signals to a repeating apparatus a third interrupting relay may be employed to transmit spacing impulses.

In order that the invention may be clearly understood and readily carried into effect the same will now be more fully described with reference to the accompanying drawings, in which:—

Figures 1 and 2 are diagrams of apparatus and circuits arranged at the receiving end of a cable and adapted for interpolation according to this invention.

Referring to Figure 1, the signals are received on any suitable cable relay represented at A by a tongue 1 with stops or contacts 2 and 2<sup>1</sup>. Two local transmitting relays 3 and 3<sup>1</sup> are provided, the relay 3 serving when energised to connect negative terminal of battery B to line to transmit dots and the relay 3<sup>1</sup> serving when energised to connect positive battery to line to transmit dashes, the tongue 4 being connected to line L and the tongue 4<sup>1</sup> to earth E. The tongues 4 and 4<sup>1</sup> of the relays 3 and 3<sup>1</sup> normally rest on the lower contacts of these relays. The contacts 2 and 2<sup>1</sup> of the relay A are connected, through contacts 6 and 6<sup>1</sup> and armatures 7 and 7<sup>1</sup> of auxiliary interrupting relays 8 and 8<sup>1</sup>, to the windings of the transmitting relays 3 and 3<sup>1</sup>, the other ends of the windings of these latter relays being connected through battery B<sup>1</sup> to the tongue 1 of the relay A as shown. The armatures 7 and 7<sup>1</sup> of the relays 8 and 8<sup>1</sup> are normally kept in contact with contacts 6 and 6<sup>1</sup> by springs 9 and 9<sup>1</sup> or other suitable means. Connected across the terminals of the relays 8 and 8<sup>1</sup> through resistances R and R<sup>1</sup> are condensers K and K<sup>1</sup>. The relays 8 and 8<sup>1</sup> are connected as shown to the battery B and through resistances R<sub>2</sub> and R<sub>2</sub><sup>1</sup> to armatures 4 and 4<sup>1</sup> of relays 3 and 3<sup>1</sup>.

The operation of the arrangement will now be described.

If a dot or a number of dots is received by the relay A, the tongue or armature 1 of this relay is moved on to the contact 2 thereby allowing battery B<sup>1</sup> to energise relay 3. The relay 3 therefore connects negative battery to line over contact 10 and armature 4 of relay 3 and also connects battery B across the terminals of relay 8 with resistances R and R<sup>2</sup> in series and the condenser K in parallel therewith. Owing to the presence of the resistances and condenser, the operative energisation of the relay 8 is delayed but when it attracts its armature 6 the circuit through the relay 3 is broken and the condenser is discharged. This operation of the relay is repeated so long as the tongue 1 of the relay remains on the contact 2. Consequently a blocked signal causes a number of separate dots to be transmitted to the line L or to say a direct writer connected to the points L and E. If a dash or series of dashes is received on the relay A the tongue 1 is moved on to the contact 2<sup>1</sup> and the relays 3<sup>1</sup> and 8<sup>1</sup> operate similarly to the relays 3 and 8 to connect positive battery to line that is to say to transmit dashes.

A given speed of signalling being fixed on, the condensers K and K<sup>1</sup> and resistances R, R<sub>2</sub>, R<sup>1</sup> and R<sub>2</sub><sup>1</sup> are adjusted so that individual dots or dashes are sent to line at that speed when the tongue 1 of the receiving relay A is held on the dot or dash contacts.

The resistances  $R_2$  and  $R_2^1$  serve to make the resistances of the charging circuits of the condensers sufficiently high to give the necessary period of delay in the operation of the interrupting relays. The adjustments of the resistances  $R$ ,  $R^1$ ,  $R^2$ ,  $R_2^1$  form a useful means of varying the proportion of "battery" and "earth" in each interpolated and retransmitted signal. 5

Instead of employing separate interrupting relays for the dots and dashes one interrupting relay may be employed which controls the circuits of two relays one being a dot and the other a dash relay.

If it is required to work a reperforator it is necessary to distinguish between letter and word spacing. An arrangement of apparatus and circuits by which 10 this result may be obtained is shown in Figure 2. As in the arrangement shown in Figure 1 the signals are received on a relay A and auxiliary relays 20 and 20<sup>1</sup> are provided which serve to interpolate dots and dashes respectively. The relays 20 and 20<sup>1</sup> are controlled by a double relay T. In addition there is provided a spacing interrupting relay 21 controlled by a spacing relay 22. 15 The dots, dashes and spacing impulses are transmitted respectively to three relays 23, 24 and 25. The double transmitting relay T comprises two operating windings 26 and 26<sup>1</sup> which control respectively armatures 27 and 27<sup>1</sup>. Additional contacts 28 and 28<sup>1</sup> carried on but insulated from the armatures 27 and 27<sup>1</sup> are connected respectively to contact 29 of relay 21 and to the operating winding 30 20 of the spacing relay 22. The contacts 28 and 28<sup>1</sup> normally rest on the stops 31 and 31<sup>1</sup> and short circuit a resistance coil 32. Normally current flows through the operating coils 30 of the spacing relay 22, the circuit being from battery B<sup>2</sup> through winding 30 of relay 22, short circuit of resistance 32 back to battery B<sup>2</sup>.

The general operation of the arrangement will now be described. 25

Whilst no signals are being received the contacts 28 and 28<sup>1</sup> on the armature 27 and 27<sup>1</sup> of relay T are in contact with stops 31 and 31<sup>1</sup> so that the resistance 32 is short circuited. The relay 22 is therefore energised and pulls up its armature 34. A circuit is therefore closed from battery B<sup>2</sup>, contact 35, armature 34, winding of relay 21 back to battery B<sup>2</sup>. The energisation of the 30 relay 21 is delayed owing to the presence of the condenser K<sup>2</sup> and associated resistances but on the armature breaking contact with contact 29 the short-circuit across the resistance 32 is removed, thereby causing the armature of relay 22 to fall back. The relay 21 is therefore caused to vibrate as in the arrangement shown in Figure 1 and spacing impulses are transmitted by the 35 relay 25 which is intermittently connected across the terminals of the battery B<sup>2</sup> by relay 22.

If a dot or dash is received either winding 26 or 26<sup>1</sup> is energised and the armature 27 or 27<sup>1</sup> is raised thus removing the short circuit from the coil 32 to prevent the operation of the spacing relay 22. If a dot or a series of dots is 40 received the tongue 1 of the relay A is moved on to the contact 2 thereby causing the armature 27 to be pulled up. This connects battery B<sup>2</sup> to relay 20 which vibrates as in the arrangement shown in Figure 1 and the relay 23 is also intermittently energised. If a dash or series of dashes is received the relay 24 is intermittently energised in a similar way. 45

The relays 23, 24 and 25 serve to operate a reperforator of any suitable type.

In the systems according to this invention instead of employing resistances in series and condensers in shunt with the operating windings of the interrupting relays to delay their energisation, inductances may be employed. For 50 example, the inductances may be connected in series with the windings of the relays and resistances be connected in shunt to both the relay windings and the inductances.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:— 55

1. In a telegraph system having signal receiving or retransmitting apparatus

comprising a receiving relay adapted to close the circuit of another relay and to cause battery to be applied to an interrupting relay which serves to open at its contacts the circuit so closed for the purpose of interpolation, the employment of a resistance in series and a condenser in shunt, or an inductance in series, with the winding of the interrupting relay for the purpose specified.

2. In a telegraph system, signal receiving or retransmitting apparatus comprising a receiving relay adapted to close the circuits of one or other of two transmitting relays, these relays applying battery to two interrupting relays which serve to open the circuits so closed and the energisation of the interrupting relays being delayed by connecting resistances in series and condensers in shunt, or inductances in series, with their windings, for the purposes specified.

3. In a telegraph system, signal receiving or retransmitting apparatus comprising a receiving relay adapted to close the circuits of one or other of two local relays these relays serving to close the circuits of two interrupting relays which intermittently open the local circuits so closed, and the contacts of the local relays being so arranged and connected that when neither of these relays is being operated the circuit of a third interrupting relay is closed, the energisation of the interrupting relays being delayed by connecting resistances in series and condensers in shunt or inductances in series, with their windings, for the purposes specified.

4. A telegraph system comprising receiving or retransmitting apparatus arranged and operating substantially as described or as illustrated in the accompanying drawings.

Dated this 26th day of October, 1917.

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[This Drawing is a reproduction of the Original on a reduced scale.]

