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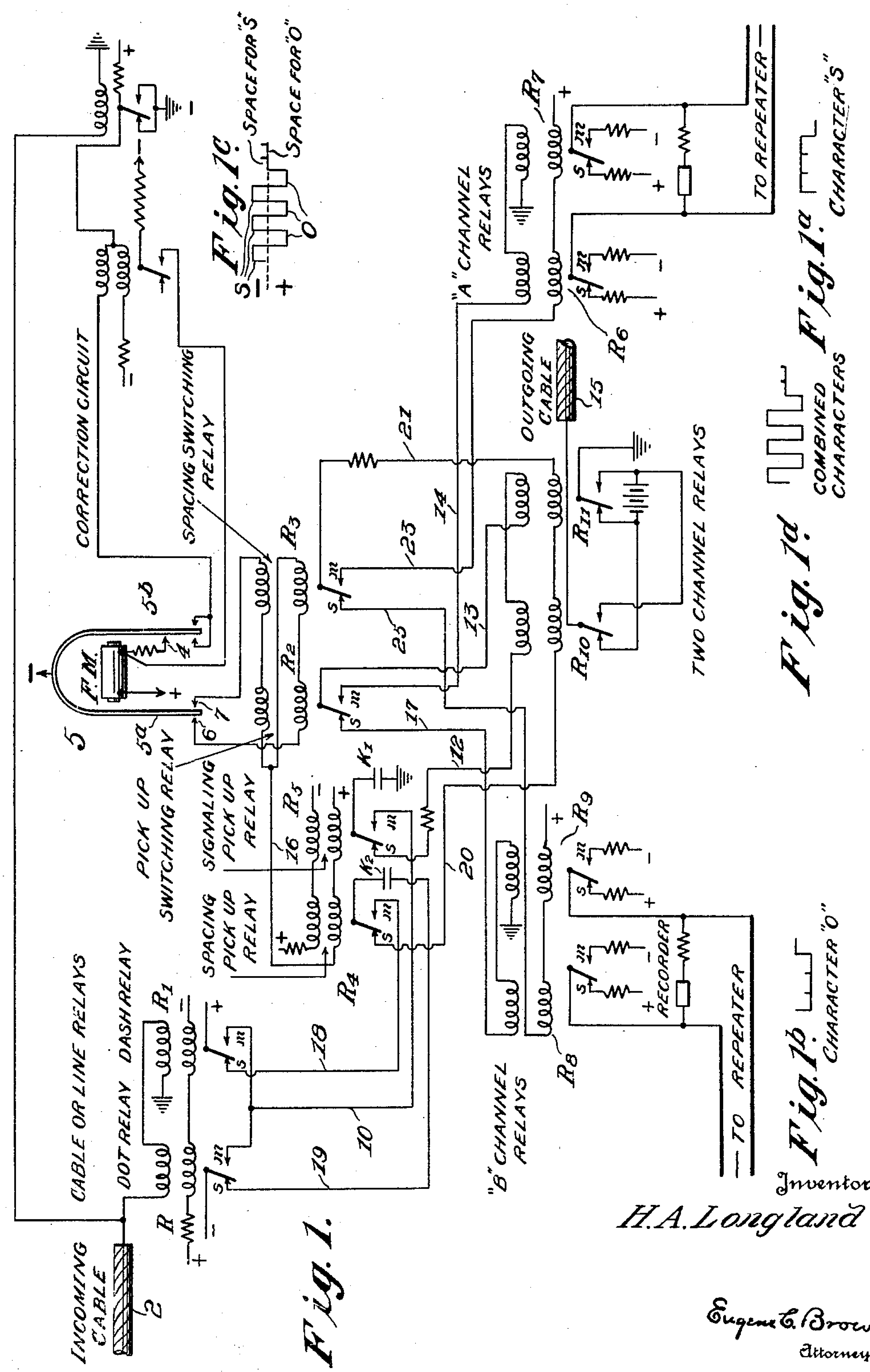

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TWO-CHANNEL FORK-CONTROLLED RECEIVING AND REPEATING APPARATUS FOR TELEGRAPH SYSTEMS

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This invention relates to telegraph systems which are adapted to high speed transmission and wherein the receiving and retransmitting apparatus are free from complicated mechanism such as rotary distributors which must be maintained in synchronism at the different stations and in which the regenerated signals are sharply defined and accurate.

One of the objects of my invention is to provide a receiver and transmitter for synchronous telegraph systems for separating interwoven impulses of two channels into separate channels and to reassemble the regenerated signals into their original interwoven arrangement and repeat them into a single cable or line.

My invention will be clearly understood and may readily be carried into effect from the following description in which I shall refer to the accompanying drawing wherein—

Figure 1 is a diagrammatic illustration of the apparatus and circuits embodying my invention;

Figures 1^a and 1^b represent respectively the segregated impulses of the A and B channels;

Figure 1^c represents the combined two-channel impulses received over the incoming cable; and

Figure 1^d represents the combined impulses of the two channels repeated into the outgoing line or cable.

The impulses of the code combinations of the two channels which are combined or interwoven at the transmitting station and sent over the cable 2 are arranged in alternation. I have shown for the purpose of illustration, in Fig. 1^c the letter "S" of the A channel combined or interwoven with the impulses of the letter "O" of the B channel.

The tuning fork 5 is preferably arranged to vibrate at the same frequency as the fundamental line frequency. However, it will be evident to engineers that the tuning fork may be arranged to vibrate at a multiple of the fundamental line frequency to accomplish the result disclosed in this invention. The vibrations of the fork are maintained by the pull exerted by the fork magnet FM each time the tine 5^b engages the contact 4. The fork is adjusted to vibrate at a rate slightly faster than the signaling frequency and a braking or retarding action is periodically applied through the magnet FM by the operation of the correction circuit shown on the right hand side of the tuning fork, as described in patent to Angel & Robinson No. 1,804,302.

Assuming that the fork is vibrating in synchronism with the distant transmitter or transmitters and that it is being properly corrected or maintained in synchronism by means of the correction circuit, the tine 5^a engages contact 6, thereby operating switching relays R^2 and R^3 and the pick-up relays R^4 and R^5 to their marking contacts through a circuit from minus battery, tine 5^a, contact 6, windings of relays R^2, R^3, R^4 and R^5 to plus battery.

With the relays in this position, the first dot impulse or element of the "SO" combination is received over the cable 2, causing the dot relay R to move its tongue to marking contact, the tongue of the dash relay R^1 remaining upon its spacing contact. Negative current, therefore flows from minus battery over the tongue and marking contact of relay R, conductor 10, marking contact and tongue of the signaling pick-up relay R^5 to condenser K^1 and ground, thereby placing a negative charge on the condenser. When the fork tine 5^a leaves contact 6, the tongues of the pick-up relays R^4 and R^5 are moved to their spacing contacts under the influence of current constantly flowing through their biasing windings. The negative charge in condenser K^1 then discharges through the tongue and spacing contact of relay R^5, through conductor 12, the upper windings of the two-channel relays R^{10} and R^{11}, conductor 13, tongue and marking contact of switching relay R^2, conductor 14 and upper windings of the A channel relays R^6 and R^7 to ground. As these relays are connected in opposite directions, only the dot relays R^6 and R^{10} will have their tongues moved to their marking contacts to thereby transmit the first dot element of the character "S" to the A channel repeater and recorder as indicated at Fig. 1^a, and into the outgoing cable 15 as indicated in Fig. 1^d.

As the fork tine 5^a swings over into engagement with its inner contact 7, a circuit is closed from minus battery through tine 5^a, contact 7, upper windings of switching relays R^2 and R^3, conductor 16 and operator winding windings of pick-up relays R^4 and R^5 to plus battery, thereby causing the tongues of relays R^2 and R^3 to move to their spacing contacts and the tongues of pick-up relays R^4 and R^5 to move to their marking contacts.

The second impulse or dash element of the two-channel combination shown in Fig. 1^c is now received over the cable 2, this being the first element of the character "O". This causes the tongue of the cable dash relay R^1 to operate its tongue over to the marking contact, the tongue of the dot relay R remaining against its spacing contact. A circuit is thus closed from positive battery through the tongue and marking contact of dash relay R^1 over conductor 10, marking contact and tongue of signaling pick-up relay R^5 through condenser K^1 to ground, thereby placing a positive charge on the condenser.

When the fork tine 5^a leaves contact 7 the tongue of pick-up relay R^5 moves to its spacing contact under the control of its upper biasing winding as previously described. The positive charge on the condenser K^1 discharges over a circuit through the tongue and spacing contact of relay R^5, conductor 12, upper windings of the channel relays R^{10} and R^{11}, conductor 13, tongue and spacing contact of switching relay R^2, conductor 17 and upper operating windings of the "B" channel relays R^8 and R^9 to return or ground. Since these relays are connected in opposite directions, only the dash relays R^9 and R^{11} are operated to their marking contacts and thereby transmit the first dash element of the character "O", as indicated in Figs. 1^b, 1^c and 1^d.

I have thus traced the reception of the first two elements of the combined or interwoven elements of the code characters "S" and "O" transmitted and received over the cable 2. The reception and translation of the third, fourth, fifth and sixth elements of the signal combination shown in Fig. 1^c are brought about in a manner similar to that just described, as will be clearly evident.

The reception and translation of the zero or spacing signals which follow the code characters will now be described. At the termination of the last element of the character "O", the fork tine 5^a is in engagement with contact 6, thereby causing the tongues of switching relays R^2 and R^3 and pick-up relays R^4 and R^5 to engage their marking contacts. At this instant the tongues of the cable relays R and R^1 engage their spacing contacts under the influence of their lower biasing windings. Inasmuch as no signal or zero signal comes over the line or cable, these cable relays remain inoperative. Hence the circuit over conductor 10 is open and no charge is transmitted to the condenser K^1. The spacing switching relay R^3 and the spacing pick-up relay R^4 now function to produce the two zero elements in the recorders of the "A" channel and "B" channel relays respectively and in the two-channel relays R^{10} and R^{11}.

With the cable relays R and R^1 on their spacing contacts, the spacing pick-up condenser K^2 is charged with positive current over a circuit from plus battery through the tongue and spacing contact of relay R^1, conductor 18, marking contact and tongue of spacing pick-up relay R^4, condenser K^2, conductor 19, spacing contact and tongue of relay R^1 to minus battery.

When the fork tine 5^a leaves contact 6, the tongue of spacing pick-up relay R^4 moves to its spacing contact under the influence of the current constantly flowing through its upper biasing winding. The positive charge on the condenser K^2 then discharges over the tongue and spacing contact of relay R^4, conductor 20, the lower windings of the two-channel relays R^{10} and R^{11}, conductor 21, tongue and marking contact of spacing switching relay R^3, conductor 23, lower or spacing windings of the "A" channel relays R^6 and R^7 to positive battery. These four relays move their tongues to their left hand spacing contacts, thereby transmitting the space element for the character "S" shown in Figs. 1^c, 1^a and 1^d.

The spacing element of the character "O" is produced in a similar manner after the fork tine 5^a engages its inner contact 7, thereby causing the tongues of the switching relays R^2 and R^3 to engage their spacing contacts. Hence the discharge from the condenser K^2 is diverted through the conductor 25 into the lower or spacing windings of the "B" channel relays R^8 and R^9. These relays and the two-channel relays R^{10} and R^{11} transmit the spacing element of the character "O" into the recorder and to the repeater of the "B" channel and into the two-channel outgoing cable 15, as indicated in Figs. 1^b and 1^d.

I have thus explained how the organization disclosed herein segregates the interwoven elements of the combined code characters and transmits the regenerated code characters into separate channels and simultaneously reassembles the regenerated elements of the code characters into the original interwoven two-channel combination which is repeated or retransmitted into the outgoing line or cable.

I claim:

1. In a telegraph system, receiving means responsive to combinations comprised of interwoven selecting impulses of code characters from a plurality of channels, separate

repeaters for the characters of the respective channels, means for segregating the impulses of the respective characters and transmitting them in regenerated form to said repeaters and a vibratory timing member controlling said segregation.

2. In a telegraph system as defined in claim 1, additional means under the control of said vibratory member for retransmitting into a line or cable regenerated combinations arranged in the same order as they were received by said receiving means.

3. In a telegraph system, receiving means responsive to combinations of selecting conditions, means for segregating said selecting conditions into groups representing character code combinations and transmitting corresponding regenerated code combinations of selecting conditions into separate channels and a vibratory timing member operating between contacts to control said segregation, said regenerated selecting conditions being transmitted while said vibratory member is in non-contacting position.

4. In a telegraph system, receiving means responsive to selecting impulses, a repeater comprising means for storing the impulses successively received by said receiving means, separate means for transmitting regenerated impulses corresponding to said stored impulses into separate channels, switching means for determining which channel shall receive the respective impulses, and a vibratory timing member for controlling the operation of said switching member.

5. In a telegraph system, receiving means responsive to intermingled selecting impulses from a two-channel source, means for segregating said impulses into groups representing code combinations of characters, means for transmitting said segregated groups into separate channels, switching means for determining the channel for the respective groups, and a vibratory timing member controlling the operation of said switching means.

In testimony whereof, I affix my signature.
HERBERT A. LONGLAND.