

Feb. 16, 1932.

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1,845,571

TRANSMISSION OF SELECTOR IMPULSES OR THE LIKE OVER DUPLEXED LINES

Filed Aug. 19, 1930

2 Sheets-Sheet 1

Fig. 1.

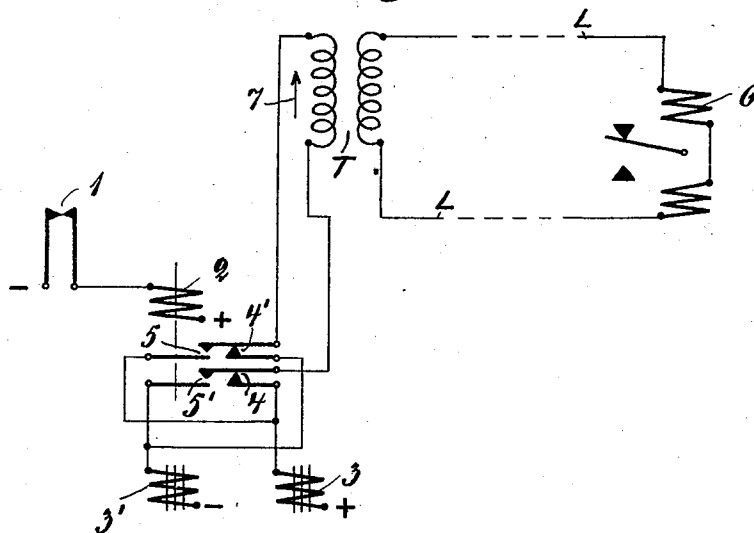
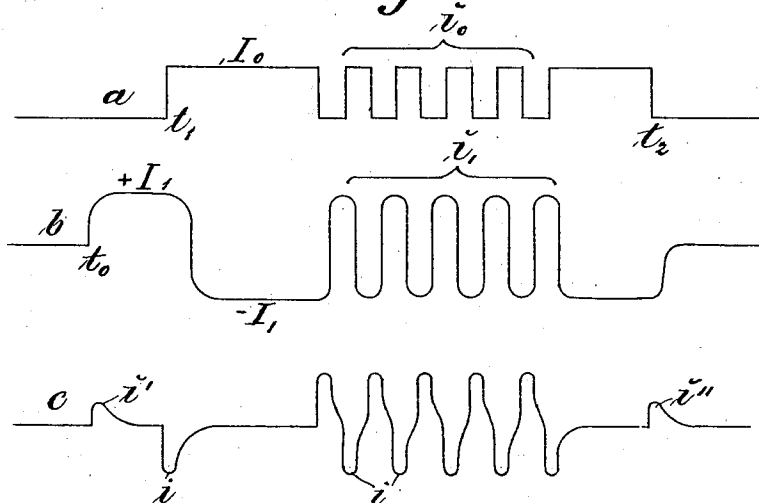


Fig. 2.



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Fig. 3.

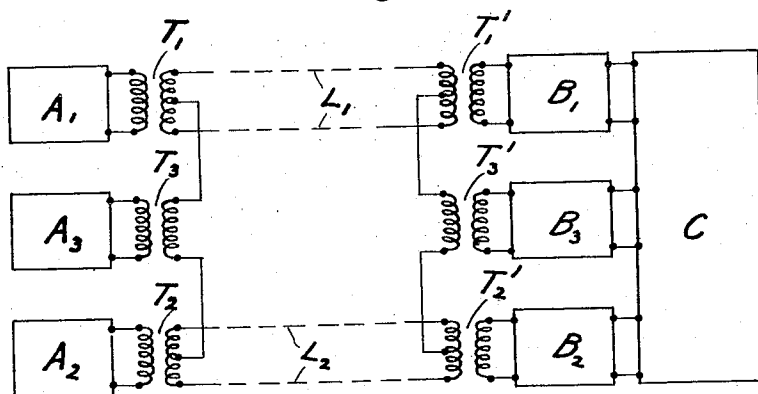
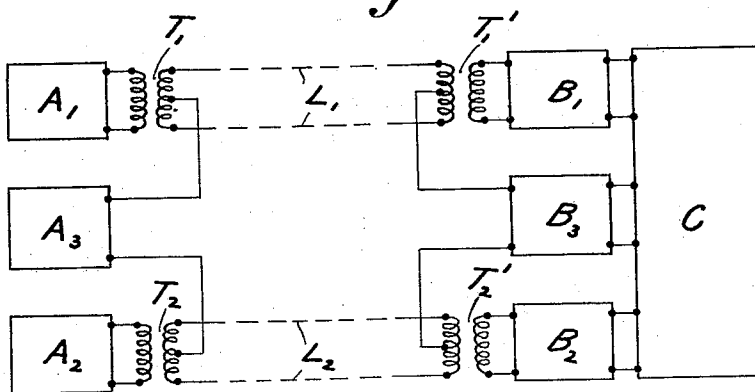


Fig. 4.



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UNITED STATES PATENT OFFICE

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TRANSMISSION OF SELECTOR IMPULSES OR THE LIKE OVER DUPLEXED LINES

Application filed August 19, 1930, Serial No. 476,378, and in Sweden August 20, 1929.

The transmission of selector impulses over duplexed lines is connected with certain difficulties which, to a certain extent, are due to the fact that the duplexed natural lines and, in certain cases, also the duplex line formed may not be advantageously arranged in metallic connection with the appertaining impulse sending and impulse receiving devices whereby thus the transmission of direct current impulses over the lines is made impossible. Instead of sending rectified impulses separated by current interruptions over the line, an efficient and reliable impulse sending over such lines may, however, be brought about according to the invention by adapting the impulse sender, to bring about reversals of the current direction in a local impulse circuit which is inductively connected with the lines, by way of example, by means of an appertaining duplexing coil. The current in the local impulse circuit will evidently be subjected to variations equal to twice the amplitude of the current and, by the inductive connection of the impulse circuit to the line, induction current impulses will be sent over the line of corresponding double intensity which actuate a polarized impulse relay on the receiving side.

The invention will be more closely described with reference to the accompanying drawings on which Figure 1 diagrammatically illustrates the idea of the invention. Figure 2 shows some current diagrams and Figures 3 and 4 show two embodiments of the invention.

In Figure 1 the reference character 1 denotes the impulse contact in an impulse sender, by way of example a finger disc or a dial. The impulse contact 1 is series connected with the winding 2 of a contact relay, the contact set of which is arranged as a commutator or pole reversing device in a local intermediate circuit including the primary winding of a transformer T, the secondary winding of which is connected to the telephone line L. Said intermediate circuit is, in similarity with the impulse circuit proper, open when there is no conversation going on. When the intermediate circuit is closed, the plus pole of the appertaining impulse battery is con-

nected to the one terminal of the transformer T over a choke coil 3 and a normally closed contact 4 in the contact set of relay 2 whereas the minus pole is connected to the opposite terminal over a choke coil 3' and a normally closed contact 4' of the relay. The primary winding of the transformer is then passed by current in the direction of the arrow 7. When the relay 2 is energized the contacts 4, 4' are opened and the battery poles are instead connected to the transformer over normally open contacts 5, 5', the current direction in the primary winding of the transformer being then reversed.

To the far end of the line L there is connected a polarized impulse relay 6 for the reception of the induction current impulses transmitted over the line.

Before the beginning of the impulse sending, by way of example, when the subscriber lifts his microtelephone, the impulse intermediate circuit, including the primary winding of the transformer T, is closed. At the moment in question, which is designated t_0 at b in Figure 2, the current in the local circuit rises in positive direction and reaches after a certain short period of time its full value i_1 . The closing of the impulse circuit proper, including the relay winding 2, may, if desired, also be caused by the lifting of the subscriber's microtelephone but is somewhat delayed by a suitable mechanical or electromagnetical damping device and takes this place first at the moment t_1 at a in Figure 2, when the current in the primary circuit of the transformer already has reached its full value. In the current closing in the intermediate circuit, a current impulse i' at c in Figure 2, has been sent over the line which impulse may serve to set the polarized relay in its starting position in case the relay does not already take up said position.

When the relay 2 at the time t_1 is energized, the current in the impulse intermediate circuit is reversed by means of the contact set in above described manner and is thus subjected to a variation equal to $2I_1$. On account of the current reversal in the primary winding of the transformer, a second impulse i of twice the amplitude of the first impulse

is sent over the line. Said impulse may serve to initiate the selecting operation, by way of example, by that the polarized relay, upon its shifting, actuates a pre-selector or a finder.

5 When the subscriber thereupon actuates his impulse sender and thereby brings about repeated current interruptions and closings i_0 of short durations at a contact 1, a series of corresponding current reversals, designated
10 i_1 at b in Figure 2, are thereby caused in the intermediate circuit and a corresponding series of alternately positive and negative current impulses i at c in Figure 2, are sent over the line which impulses shift the arma-
15 ture of the polarized relay 6 between its two positions. The polarized impulse relay sends then in turn corresponding selector impulses.

When the subscriber at the end of the conversation hooks up his microtelephone both
20 the impulse circuit proper and the impulse intermediate circuit are interrupted simultaneously at the time t_2 , a final impulse i'' being then sent over the line, by means of which impulse the polarized relay, if required, is
25 restored to its starting position.

In the embodiment according to Figure 3 the two telephone lines L_1, L_2 are duplexed in ordinary manner by means of duplexing
30 transformers T_1, T_2, T'_1, T'_2 so as to form a duplex line. Each one of the three lines is on the sending side provided with an impulse sending device A_1, A_2 and A_3 respectively of the kind described above and comprising a
35 current reversing relay 2. In the two natural lines L_1, L_2 the two appertaining duplexing coils T_1, T_2 are used also for the connection of the impulse intermediate circuit to the line and serve thus, in addition to their ordinary
40 purpose, to replace the transformer T in Figure 1. The impulse sending device A_3 for the duplex line is connected to the line over a transformer T_3 .

On the receiving side an impulse receiving device B_1, B_2 or B_3 respectively is connected
45 to each one of the lines. Said device comprises a polarized relay 6. The connection between the two natural lines L_1, L_2 and the appertaining impulse receivers B_1, B_2 respectively is mediated by the corresponding du-
50 plexing transformers T'_1, T'_2 whereas the impulse receiver B_3 for the duplex line is connected over a special transformer T'_3 . The three impulse receivers B_1, B_2, B_3 are on their opposite side connected to a common
55 selector device C in the exchange.

The embodiment according to Figure 4 is differentiated from that in Figure 3 only thereby that the impulse sender A_3 and the
60 impulse receiver B_3 of the duplex line are directly associated with the line.

I claim:—

1. A switching arrangement for the trans-
mission of current impulses over phantom-
65 lines, comprising an impulse circuit, an im-
pulse sender controlling said circuit, a relay

connected to said circuit, a direct current source, a transformer connecting said direct current source with the line, and means under the control of said relay for reversing the cur-
rent supplied to the transformer, a polarizing
70 relay being provided for the reception of the induction current impulses of alternating di-
rection sent through the transformer upon
actuation of the impulse sender.

2. A switching arrangement as claimed in
claim 1, in which said direct current source
is connected through inductances or resist-
ances to its circuit including a contact set of
said relay adapted to operate as a pole revers-
ing device and a primary winding of the
80 transformer.

3. A switching arrangement as claimed in
claim 1, in which is provided a pole reversing
device, the duplexing coils on the sending side
being adapted to transfer inductively to a
85 main line the current impulses reversed by
the pole reversing device.

4. A switching arrangement as claimed in
claim 1, in which the duplexing coils on the
receiving side are adapted to transfer the im-
90 pulses to the appertaining polarized receiving
relays.

In testimony whereof I affix my signature.
ROMAN TRECHCINSKI.

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