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CONNECTION FOR TELEGRAPH PLANTS

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Fig. 1

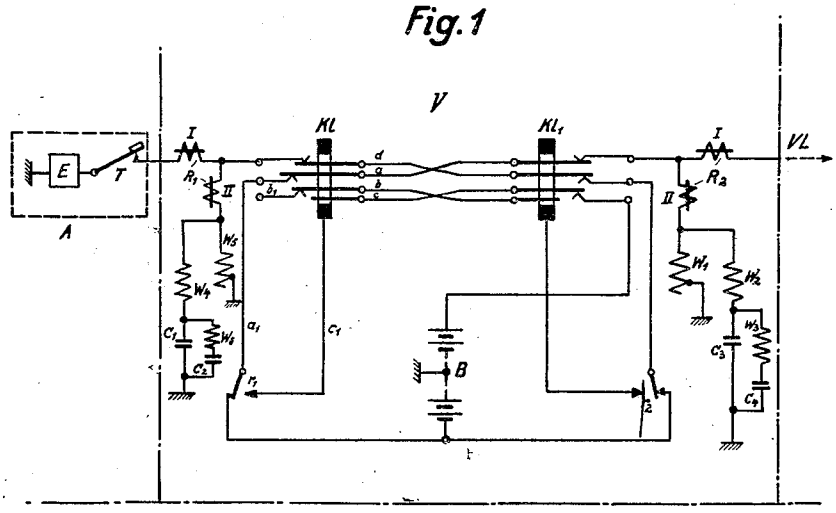
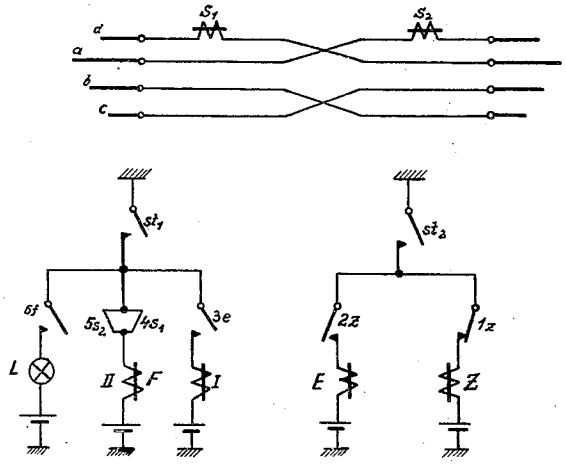


Fig. 2



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CONNECTION FOR TELEGRAPH PLANTS

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In telegraphic plants the news or signals are transmitted from one place to the other by way of long cables or overhead lines. One operator connects the transmitting station with the outgoing end of such a cable or line of connection, while another operator will connect the incoming end of said cable or line with the receiving station. There may still be provided an additional intermediate connection station, in which the incoming end of the line referred to is connected with the outgoing end of a second line of connection.

Connection lines, both in cables and overhead lines are open to trouble, caused by the influence of inductivity and capacity through the line proper or through neighbouring lines. In order to avoid such disturbing effects a different potential will be placed alternatively on the telegraph lines over which the signals are transmitted, while on the subscribers' connection lines of the transmitting and receiving stations only a determined potential must be placed, when impulses of current are sent from a transmitting station to a receiving station for the purpose of transmission of news.

Suppose a sending station wishes to transmit a signal or news over a long cable or overhead line to another telegraph station, the following manipulations must be carried out:

The operator at the intermediate station being connected to the transmitting station will connect the calling station with the outgoing line of connection, while the operator of the station to which the receiving station is connected will connect the incoming overhead or cable line with the connection line of the desired receiving station. The following case may happen, that an intermediate station is provided whose operator will connect two overhead or cable lines, if the exchange of the sending station is not in direct connection with the exchange of the receiving station. In that instance the operator of the intermediate station will connect the incoming end of the first overhead or cable line with the outgoing end of the second overhead or cable line. When carrying through such connections care must be taken by the operators, that on the subscribers' connection lines of the various telegraph stations only a determined potential must be placed, while on the connection main lines alternatively a different potential may be placed, when signals or news are sent by way of such lines.

The present invention relates to an arrangement, in which one and the same wire or wires may be used for all purposes, both for connecting the subscriber's line of the sending station to the connection main line and also the connecting line to the connecting line and the connecting line to the subscriber's line of the receiving station.

In the drawings one mode of execution according to the invention is shown by way of example.

Figure 1 is a diagrammatic view of the arrangement, and

Figure 2 shows a detail.

A in Figure 1 denotes a telegraph station which is equipped both with a receiving apparatus E and with a transmitting device T. In the exchange station V are arranged the necessary connecting means for effecting telegraphic connections. Each telegraph line entering the exchange station has associated with it a differential relay R_1 or R_2 which operates to relay the incoming message from the transmitting station to the receiving station connected thereto by a connecting cord at the exchange station.

Suppose the telegraph station A is to transmit some news to a receiving station not illustrated in Figure 1. The telegraph station A will call in known manner the operator at the exchange V. The arrangement for such call is not shown in Figure 1, since this is quite immaterial for the subject matter of invention. If the attention of the operator at the exchange station V is attracted by said call, he will connect to the transmitting station A and will accept the instructions of the transmitting station. He then will connect the transmitting station A with the desired receiving station either directly or by way of a line of connection.

Be it assumed that the transmitting station

A is connected by the operator at the exchange V by way of a line of connection with the desired receiving station. This is effected by the operator by means of a connecting cord. He introduces one end of the said cord into the jack KL and the other end thereof into the jack KL_1 whereby the transmitting station A is connected with the trunk line. Both ends of the connecting cord are equal per se and consist of four leads *a*, *b*, *c* and *d*. A second operator at another exchange will then connect by means of the same cord the incoming end of the trunk line VL with the subscriber's connection line of the desired receiving station, or the case may occur that an intermediate station is provided, whose operator will connect the incoming end of the first trunk line VL leading from the exchange V with a second trunk line going out from said exchange. All kinds of connection will be carried out according to the invention by one and the same connecting cord.

If the transmitting station A is connected by the operator at the exchange V with the end going out from V of the trunk line VL, the said transmitting station A may emit the impulses. The following circuits are closed: ground, receiving apparatus E of the transmitting station A, transmitter T of the transmitting station A, winding I of the relay R_1, jack KL, wire *d* of the connecting cord, back contact r_2, battery B and ground.

In the same way there exists for the winding II of the relay R_1 a circuit which is as follows: ground, variable resistance W_5, winding II of the relay R_1, jack KL, wire *d* of the connecting cord, back contact r_2, battery and ground. In these circuits the relay R_1 can be operated. It constitutes the impulse relay and transfers the impulses sent by the transmitting station A to the trunk line connected to it in the following manner:

By opening and closing the transmitting apparatus T at the transmitting station the impulses corresponding to the news to be transmitted will be emitted. The said impulses are transferred by the contact r_1 to the trunk line VL connected with the transmitting station A.

As the transmitting station A is connected to the trunk line VL it is necessary to place on the said trunk line during transmission alternatively a different potential. This is effected in the following manner:

The battery B at the exchange V is connected in an opposite sense and by means of the contact r_1 the positive and negative poles are alternatively connected to the trunk line during telegraphing. If the relay R_1 is operated the positive pole of the battery B is connected with the trunk line by way of the following circuit: ground, positive pole of the battery, jack KL_1, wire *c*, lead c_1, reversed contact r_1, lead a_1, jack KL, lead *a*, winding I of the relay R_2 and trunk line VL.

If now during the emission of the impulses by the transmitting station A the relay will drop for the first time, the negative pole of the battery B will be connected to the trunk line VL by way of ground, negative pole of the battery B, back contact r_1, lead s_1, jack KL, wire *a*, jack KL_1, winding I of the relay R_2 and trunk line VL. The relay R_2 allotted to the trunk line VL, will not be operated. The relay R_2 is constructed as differential relay and through the two windings I and II thereof the current will flow in opposite directions. At the other end of the trunk line VL terminating at the connecting point of a second exchange, there is connected the same battery as the battery B of the exchange V. The impulses emitted by the transmitting station A will then be transferred to a relay, which is provided at the incoming end of the trunk line VL. This relay can operate, since both windings of the differential relay pass the current in the same direction. It will transfer the impulses to the desired receiving station, which is connected by means of the same cord as that represented in Figure 1 to the incoming end of the trunk line VL. The resistances W_4, W_5 and W_6 and the condensers C_1, C_2 in the subscriber's connection of the transmitting station A are provided as compensating devices, which are known per se. This will also apply to the resistances W_1, W_2 and W_3 and the condensers C_3 and C_4 provided at the outgoing end of the trunk line VL.

The resistances W_1 and W_5 are variable in order to easily adapt the sensitivity of the relays R_1 and R_2 to the leads, for which they are provided.

When impulses are transmitted from the transmitting station A to the exchange V only a definite potential is constantly connected to the connecting lead of the transmitting station A, as already explained. But the impulses emitted at the transmitting station A are transferred to the trunk line VL in that alternately a different potential is connected to the trunk line VL.

If, on the contrary, the transmitting station A is to receive news from another transmitting station, namely by way of the trunk line VL no different potential will be alternately connected to the subscriber's connection at the transmitting station A during telegraphing, but the current flowing in a definite direction through the receiving apparatus E at the transmitting station A is only interrupted impulse-wise. This is done in the following manner:

The relay R_2 constitutes the transferring relay, which will transfer the emitted impulses of current to the receiving station A over the contact r_2. The circuit is as follows: ground, negative pole of the battery B, back contact r_2, jack KL_1, lead *d*, jack KL, winding I of the relay R_1, transmitting apparatus T, receiving apparatus E and ground.

During the relay R_2 being actuated said circuit will be interrupted by opening of the contact r_2 and the reeciving apparatus E at the transmitting station A is adjusted by closing and opening of the circuit above referred to in accordance with the impulses emitted. The receiving apparatus E in Figure 1 is represented only diagrammatically. The mode of action of said apparatus is not explained, since this is immaterial for the subject matter of the invention. During telegraphing only a definite potential will remain connected to the subscriber's line of the transmitting station A and the receiving apparatus is adjusted by opening and closing of said circuit. On reversing the contact r_2 no other potential will be connected to the subscriber's line at the telegraph station A, since no potential is connected to the wire b_1 of the connecting lead of the telegraph station A.

As follows from the above the same cord, consisting of the wires *a*, *b*, *c* and *d* may be used for all kinds of connections and it is immaterial whether or not a definite potential is connected during the telegraphing. If the connecting cord *a*, *b*, *c*, *d* at the exchange V is to be used for the connection of two trunk lines, either a ground or a cable line, a different potential is connected to said lines during telegraphing either at the outgoing or incoming side of the trunk line.

Both the relays S_1 and S_2 for the end signal may be connected to the connecting cord, as this is shown in Figure 2. To each connecting cord two relays for the end signal are allotted. The action of the end signal is as follows:

If the connecting cord is introduced, for instance into the jacks KL and KL_1 the two contacts st_1 and st_2 are closed and besides the relays S_1 and S_2 for the end signal are actuated. Each of these relays S_1 and S_2 will follow during telegraphing the impulses emitted and is excited and deenergized alternately. By the closing of the contact st_2 the following circuit will be closed: ground, working contact st_2, back contact $1z$, winding of the relay Z, battery and ground. On becoming energized the relay Z will actuate its contacts $1z$ and $2z$. By opening of the contact $1z$ the relay Z proper will interrupt its circuit and drop off, causing the back contact $1z$ to return to its position of rest. At that instant the relay will again become energized. The relay Z will thus operate as interrupting relay. By closing the contact $2z$ a circuit for the relay F is formed by way of: ground, closed contact st_2, working contact $2z$, winding of the relay F, battery and ground. The relay F will follow synchronously the automatic interrupting relay Z and it is energized and disenergized in succession. By closing and opening of the contact $3e$ the relay F is likewise energized and disenergized in synchronism with the automatic interrupting relay Z. The circuit is as follows: ground, working contact st_1, working contact $3e$, winding I of the relay F, battery and ground. The relay F is provided with a winding II actuating a rising wheel-mechanism not shown in Figure 2. By energizing the winding I impulse-wise the rising wheel is advanced by one tooth each time, and if said escapement or rising wheel is advanced by a definite turn, the contact $6f$ will be closed, and in consequence the lamp L will be lit up. But the winding II of the relay F is provided for the purpose of always returning again the adjusted escapement wheel to its position of rest as often as the relay F is energized. This will take place if during the telegraphing one of the two relays S_1 and S_2 for the end signal is energized impulse-wise. While the relay, either the relay S_1 or S_2, drops off a circuit for the winding II of the relay F will be formed each time by way of the contact $4s_1$ or the contact $5s_1$. The said circuit is as follows: ground, working contact st_1, back contact $4s_1$ or back contact $5s_2$, winding II of the relay F, battery and ground. Thus the escapement wheel is always returned to its position of rest during the telegraphing operation.

If now the telegraphing operation is finished, the two relays S_1 and S_2 for the end signal will no longer drop off impulse-wise, and they will remain energized as long as the connecting cord is introduced in the jacks. The escapement wheel is adjusted through the winding I of the relay F without the same being returned to its position of rest by the winding II of the relay F. After a certain period, when the escapement wheel has been adjusted by a definite angle of turning, the contact $6f$ is then closed, so that the following circuit for the end signal lamp is effected: ground, working contact st_1, working contact $6f$, end signal lamp L, battery and ground. The end signal lamp L will be lit and indicates to the operator at the exchange that the telegraphing operation is finished and that he may interrupt the connection.

Thus according to the arrangement illustrated in Figure 2 the end signal lamp L will not be lit immediately after the emission of the impulses terminates, but only after a certain period. If thus a telegraph station wishes to repeat once more the telegraphing, this can be done without difficulty, since the end signal lamp L will be lit only after a certain period, after the expiry of which the operator will sever the connection. While pulling out both ends of the connecting cord from the jacks KL and KL_1 the contacts st_1 and st_2 are again opened, the relays Z, E and F drop off and the lamp L of the end signal becomes extinguished. The connecting cord

consisting of the wires *a*, *b*, *c* and *d* can be used for effecting a fresh connection.

I claim:

1. In a telegraph system and in combination, a central station, a plurality of telegraph lines variously equipped for more than one type of operation and terminating at said central station, a connecting cord, means at said central station whereby signals may be automatically exchanged between any pair of said lines with the aid of said connecting cord.

2. In a telegraph system and in combination, a central station, a plurality of telegraph lines variously equipped for more than one type of operation and terminating at said central station, a connecting cord, means associated with said terminals of said lines whereby suitable signals may be automatically exchanged between any pair of said lines with the aid of said connecting cord.

3. In a telegraph system and in combination, a central station, a plurality of telegraph lines equipped for make and break operation and terminating at said central station, a plurality of telegraph lines equipped for polar signal operation and terminating in said central station, means associated with said terminals of said telegraph lines whereby signals may be exchanged between any pair of said telegraph lines with the aid of a single connecting cord.

4. In a telegraph system and in combination, a central station, a plurality of local telegraph lines equipped for make and break signal operation and terminating at said central station, a plurality of telegraph trunk lines equipped for polar signal operation and terminating at said central station, a plurality of connecting cords for connecting a local line with a trunk line, means associated with said terminal of each local line for automatically retransmitting make and break signals received over said local line to one of said trunk lines as polar signals when connected to said trunk line by one of said cords, means associated with said terminal of each trunk line for automatically retransmitting polar signals received over said trunk line to one of said local lines as make and break signals when connected to said local line by one of said cords.

5. In a telegraph system and in combination, a central station, a plurality of local telegraph lines equipped for make and break signal operation and terminating at said central station, a plurality of telegraph trunk lines equipped for polar signal operation and terminating at said central station, a plurality of four strand connecting cords for connecting one of said lines with another of said lines, means associated with said terminal of each local line for automatically retransmitting make and break signals received over said local line to one of said trunk lines as polar signals when connected to said trunk line by one of said cords, means associated with said terminal of each trunk line for automatically retransmitting polar signals received over said trunk line to one of said local lines as make and break signals when connected to said local line by one of said cords, means associated with said terminal of each local line for automatically retransmitting make and break signals over a second one of said local lines when connected to said second local line by one of said cords, means associated with said terminal of each trunk line for automatically retransmitting polar signals over a second of said trunk lines when connected to said second trunk line by one of said cords.

6. In a telegraph system and in combination, a central station, a plurality of local telegraph lines equipped for make and break signal operation and terminating at said central station, a plurality of telegraph trunk lines equipped for polar signal operation and terminating at said central station, a differential relay associated with each of said local lines, compensating means, associated with each of said relays, a jack associated with each of said local lines and having four contacts: the first connected to the terminal of said local line; the second connected to the armature of said differential relay; the third unconnected; and the fourth connected to a first contact of the armature of said relay, a first source of current connected to the second contact of the armature of said relay, a differential relay associated with each of said trunk lines, compensating means associated with each of said relays, a jack associated with each of said trunk lines and having four contacts: the first connected to the terminal of said trunk line; the second connected to the armature of said differential relay; the third connected to a second source of current; the fouth connected to a first contact of the armature of said differential relay, a second contact of the armature of said relay connected to the source of current first mentioned, a four strand connecting cord for connecting the contacts of any two of said jacks.

7. In a telegraph system and in combination, a central station, a plurality of telegraph lines variously equipped for more than one type of operation and terminating at said central station, a four strand connecting cord, means at said central station whereby signals may be automatically exchanged between any pair of said lines with the aid of said connecting cord, a plurality of relays inserted in said cord, means associated with said relays for automatically operating an auxiliary signalling device.

8. In a telegraph system and in combination, a central station, a plurality of telegraph lines variously equipped for more than one type of operation and terminating at said

central station, a connecting cord, means at said central station whereby signals may be automatically exchanged between any pair of said lines with the aid of said connecting cord, a plurality of relays inserted in said cord, means associated with said relays for operating an auxiliary signalling device at a predetermined time after the termination of a message.

In testimony whereof I have affixed my signature.

WILHELM KRUSE.