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INTERCOMMUNICATION SYSTEM

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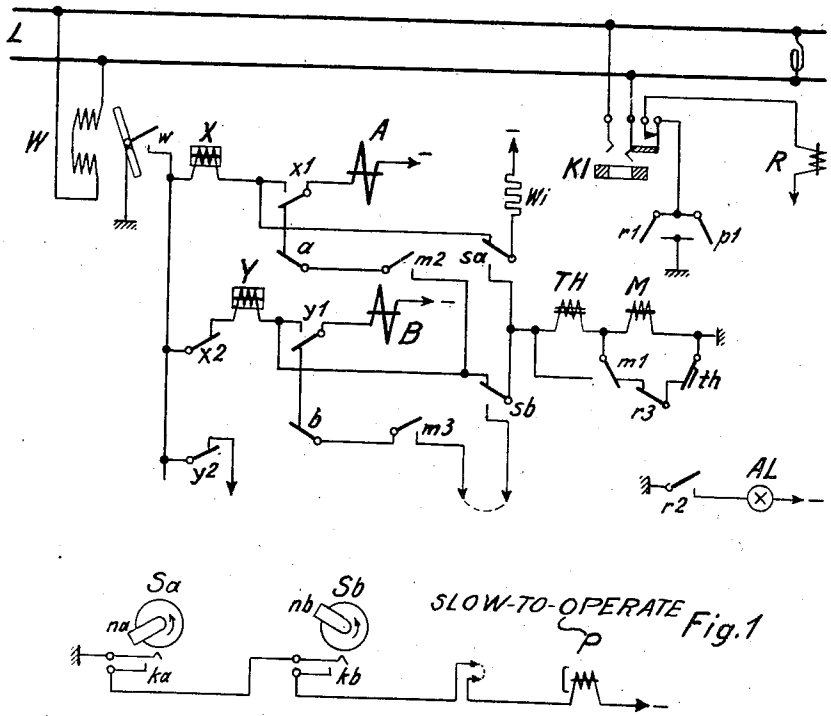
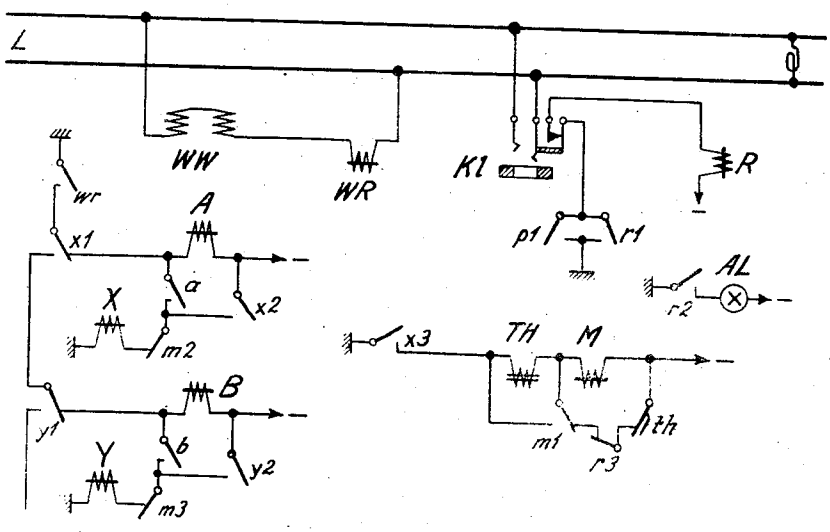


Fig.1



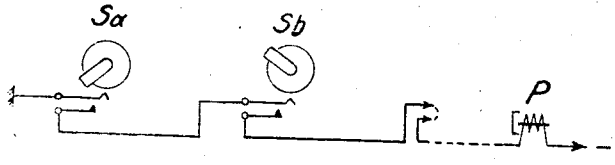


Fig.2

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INTERCOMMUNICATION SYSTEM

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6 Claims. (Cl. 179—85)

The invention relates to intercommunication systems, and more particularly to party-line systems for securing selective calls between the various branch stations thereof.

Arrangements of the above identified type are known which employ code combinations built up by a plurality of individual signals of selectable duration so as to secure a large number of different call combinations, but the utilization of such call signals, which may be Morse signals, involves certain difficulties since, in cases that simple audible signal reproduction is employed, all other stations which are associated with the party-line common thereto will be influenced by a code combination intended to call one particular station only. Such arrangements introduce inadequate operation and it is therefore desirable to provide one or more or even all branch stations of a party-line with devices which are adapted to perform automatic utilization of incoming call signals, that is to say an automatic call discrimination.

The present invention has for its object to provide a simple and reliably operating arrangement for automatic call discrimination. This is achieved according to the invention in such manner that each signal element of a Morse code transmitted over a party-line is adapted to displace in response to the alternating current periodicity a particular setting member appropriate to the ordinal number of the signal element, so as to actuate that call indicating means, the entire setting members of which have been properly set when all signal elements have been received.

Call discriminators or eliminators of the above mentioned type may be employed either in all branch stations or in certain branch stations of the party-line, in an exchange located at the end thereof, for example. Such stations will be effectively called merely if the code combination allotted to this station has been accordingly received.

The invention will be more readily understood from the following description taken in conjunction with the accompanying drawing, in which:

Fig. 1 illustrates the wiring diagram of a call discriminator in which each code element is adapted to operate a particular setting member, while Fig. 2 shows a modification over the arrangement of Fig. 1 in which all setting members are operated by a drive arrangement common thereto.

Both embodiments hereinafter described and illustrated present the same feature that the rate of displacement of the various setting members substantially depends upon the number of impulses which arrive over the party-line, while, in appropriate limits being independent of the impulse duration, that is to say, of the impulse transmission speed. This is of particular importance in systems where the call signals are manually produced by the agency of a magneto generator in the calling position. It is therefore irrelevant whether the magneto generator is actuated rapidly or slowly in the systems above referred to, whereas the number of pulses, i. e., the number of magneto generator revolutions is decisive for the operation. For example, assuming a dash-dot Morse code, the dot may be produced by one, the dash by three revolutions of the magneto generator. Since one revolution generally corresponds to six cycles or impulses, six thereof are produced for a dot and eighteen for a dash.

Referring first to Fig. 1, there is shown a party-line L. The branch station illustrated in this figure comprises a call discriminator having an alternating current relay W and stepping mechanisms A, B, etc. The relay W responses to each alternating current cycle transmitted over the party-line L and may, for instance, be an alarm ringer, the armature of which is provided with a control contact *w*. The stepping mechanisms A, B, etc., are preferably designed as telephone relays, the armatures of which are equipped with a driving pawl adapted to engage a ratchet wheel. The stepping mechanism A is adapted to receive the first signal element arriving over the party-line, the second signal element being adapted to influence the stepping mechanism B and so forth. In cases that the party-line system employs Morse code signal comprising three signal elements as a maximum such as ——·, ·—·, · ·—, —·— etc., an entire number of three stepping mechanisms is required. Each stepping mechanism moves a cam disc S*a*, S*b*, etc. The contacts *ka*, *kb*, etc., actuated by the cam discs are interconnected in series relation so that the call indicating relay P will be operated in that branch station only, the code combination of which corresponds to the Morse code transmitted over the line. This call indicating device is a slow-to-operate relay which is allowed to attract merely in such cases that the last cam disc has ben arrested on the contact allotted thereto. However, this timing of the relay prevents its attraction if the contact has been transiently actuated, that is to say when the cam disc is moved beyond the position in which the contact is closed. It is thus possible by the provision of

a sufficient delay with respect to the operation of this relay to allot to the individual stations Morse signal combinations composed of a different number of signal elements. In other words, various stations may be called by three, and other stations by two individual signals, for example. If the codes ·— and ·— — are simultaneously utilized in the system, the relay P is not rendered effective immediately after the receipt of the code ·—, on the contrary a certain time interval elapses before the operation of this relay so as to permit the energizing circuit for the relay P of the station having the call combination ·— to be duly interrupted prior to the receipt of an eventually arriving third element which in the present case was assumed to be a dash.

It may be pointed out in this connection that dashes of particular lengths may be employed as call signals in addition to the normal dashes and dots. Such dashes of longer duration may, for example, be produced by ten revolutions of the magneto generator and utilized for collective or accident calls, in which case the cam discs in addition to the cam for individual calls must be provided with a second cam for the collective call, these additional cams being identically positioned in all stations. The angular displacement of the stepping mechanism concerned, e. g. the stepping mechanism A in the case under consideration, is thus particularly large in connection with the aforementioned type of calls.

Again referring to Fig. 1, it may be assumed that the station illustrated therein may be called by a code combination, the first signal of which is a dot and the second signal of which is a dash. The operation in this station is in this case as follows:

The calling station transmits by one single revolution of the magneto generator the first calling signal, i. e. the dot, which comprises six impulses which are received by the relay W in the station shown. The contact *w* thus oscillates to and fro six times. The first impulse energizes the relay X over the contact *sa* and the resistance W*i*, whereby the reverted contact *x*1 of the relay X transfers the received impulses to the stepping mechanism A over the contact *w*, the relay X and the contact *x*1. The contact *x*2 disconnects the relay Y from the contact of relay W. The stepping mechanism A now advances its pertaining cam disc step by step. As soon as the cam disc has been brought out from its normal position, a contact *sa* is reverted in any known manner (not shown) with the result that the original energizing circuit for the relay X is interrupted, while on the other hand battery current through the resistance W*i* is preparatorily applied to the relay Y. The stepping mechanism A advances its cam disc S*a* by a given angle of rotation under the influence of the received current impulses and this advancement corresponds to six steps, so that the cam *na* at the conclusion of the train of impulses closes the contact *ka*. Since the relay X is a slow-to-release element, this relay remains operated during the received impulse train over its contact *x*1. At the end of the impulse train referred to, the relay X releases whereby its contact *x*1 is restored to normal. On receipt of the second train of impulses which as above mentioned comprises $3\times6=18$ pulses, the relay Y is energized over the following circuit: ground, contact *w*, contact *x*2, relay Y, cam contact *sb*, cam contact *sa*, resistance W*i*, battery, ground. This relay tilts its *y*-contacts so as to apply the stepping mechanism B under the influence of contact *w*. The cam disc S*b* is thereby displaced by an angular rotation which corresponds to 18 steps, so that the contact *kb* is actuated after finished train of impulses as will be obvious from the illustration. In the same moment in which the cam disc S*b* has been moved out from its home position, the cam contact *sb* is tilted in a similar manner as heretofore described in connection with the cam contact *sa*, whereby a further stepping mechanism will be prepared for the reception of a third train of impulses. In cases that the total number of Morse or code signals correspond to the code combination allotted to the station under consideration, the relay P operates after the elapse of a given period of time over the serially connected cam contacts *ka*, *kb*, etc. On attraction the relay P tilts its contact *p*1 thus establishing a circuit for relay R which is caused to operate. The contact *r*1 of this relay establishes a holding circuit for this relay, while contact *r*2 causes the call indicating lamp AL to be lightened. The call is then answered to when the operator at this station inserts a plug (not shown) in the jack K*l*, whereby a conversation may be entered. The insertion of the plug in the jack K*l* interrupts the holding circuit for relay R with result that its contact *r*2 restores to normal whereby the call indicating lamp AL extinguishes.

It will readily be observed from the illustration that a thermo-relay TH is heated from that very moment in which the stepping mechanism A was moved out from its home position. The energizing circuit for this thermo-relay is traced as follows: ground, battery, resistance W*i* cam contact *sa*, thermo-relay TH, contact *m*1, contact *r*3, thermo-relay contact *th*, ground. The relay M is unable to attract since being short-circuited over the contacts *m*1, *r*3 and *th*. However, the energization of relay R causes this short-circuit to be removed at contact *r*3 so that the relay M is energized whereby its contact *m*1 establishes a short-circuit across the relay TH and at the same time an own holding circuit. The contacts *m*2, *m*3, etc. of the relay M are simultaneously closed so as to cause the stepping mechanisms A, B, etc., to be released one after another in a succession which is opposite to that of their energizations. The homing circuit for the stepping mechanism B is thus traced as follows: ground, battery, stepping mechanism B, contact *y*1, self-interrupter contact *b*, contact *m*3, dotted connection, cam contact *sb*, contact *m*1, relay M, ground. The cam contact *sb* is restored to normal as soon as the stepping mechanism B has been homed, so that also the stepping mechanism A will be released over: ground, battery, stepping mechanism A, contact *x*1, self-interrupter contact *a*, contact *m*2, cam contact *sb*, contact *m*1, relay M, ground. When the last stepping mechanism has been restored to normal, the cam contact *sa* is reverted so that the relay M becomes de-energized, whereupon all switching means of the called branch station are restored.

The relay R of all other stations for which the transmitted code combination was not intended does not operate, so that the thermo-relay TH of these stations attracts after the elapse of a given period so as to permit the relay M to be energized by removing, at contact *th*, the short-circuit across this relay. The stepping mechanisms of the aforementioned branch stations are then again released in the same

manner as heretofore described in connection with the actually called station.

The arrangement shown in Fig. 2 differs from that according to Fig. 1, since all setting members, that is to say the cam discs *sa, sb,* etc., are moved in response to an electric drive WW common thereto. This electric drive system is an ordinary alternating current stepping mechanism as usually employed in connection with party-line systems. The cam discs are loosely provided on the shaft of this mechanism and must be clutched to the shaft by the agency of specific clutching relays A, B, etc. These clutching relays are controlled by means of a relay WR which in the arrangement according to Fig. 2 is connected in series with the electric drive WW to the party-line L. It is obvious that these two means may be connected in parallel with one another. The relay WR is adapted to response to complete alternating current trains of impulses only and not to release under the influence of the individual alternating current cycles. It is thus possible to employ a phase relay in the position of the element WR.

On receipt of the first individual signal, a dot, for instance, the relay WR responses and its contact *wr* causes the clutching relay A to be energized so as to engage the first cam disc S*a* with the shaft of the electric drive system. Under the influence of the individual elements of the first signal transmitted, the cam disc S*a* is advanced into the angular position which corresponds to the length of the alternating current transmission. The contact *a* is thereby closed but the relay X is not energized prior to the end of the alternating train of impulses since previously short-circuited by the contact *wr*. When operated, the relay X establishes an own holding circuit at contact *x*2, whereby the relay A simultaneously releases by virtue of the short-circuit established thereacross. The cam disc S*a* is then disengaged from the shaft of the drive mechanism and arrested in the position thus reached. The relay X preparatorily at contact *x*1 connects the contact chain through to the second clutching relay B.

Consequently, on receipt of the second train of impulses, that is to say, the second train of alternating cycles, also the relay B is energized over contact *wr* with the result that the cam disc S*b* is clutched to the shaft of the driving mechanism under the influence of the electric drive system WW and thus advanced into the desired position. At the end of the second train of impulses also relay B releases since being short-circuited at contact *y*2 of relay Y which is now attracted. The contact *y*1 connects the contact chain through to further devices if such have been provided.

All cam discs S*a,* S*b,* etc., are thus set one after the other in all stations, while being set as heretofore described in connection with the arrangement of Fig. 1 on that station to which the transmitted code combination is allotted. The relay P is then energized over the series connected contacts of the cam discs S*a,* S*b,* etc. On operation, its contact *p*1 causes the energization of the relay R, the contact *r*2 of which establishes the circuit for the call indicating lamp AL which is lightened similarly as described in conjunction with the first embodiment. The call is thus answered to exactly in the same manner as described in connection with Fig. 1. The embodiment illustrated in Fig. 2 also employs a thermo-relay TH which is heated over contact *x*3 immediately after the commencement of the alternating current transmission. After the operation of this thermo-relay, or, if the actually called station is concerned, after the operation of relay R, also relay M is energized so as to release relay X at contact *m*2 and relay Y at contact *m*3 and to effect homing of the cam discs over a further contact (not shown). This may, for instance, be effected by the agency of a retracting spring which is relieved by the relay M. It is also possible to connect the electric system WW in a self-interrupting circuit, for instance, so that the shaft common thereto is again started. The cam discs may thus be restored to normal by clutching them several times to the shaft common thereto.

It is also possible to substitute the electric drive WW by a machine drive arrangement responsive to the current flowing over the line. Moreover, the cam discs may be replaced by contact arms or the like. Finally, the release or homing of the circuit elements thus set may be effected according to other principles than shown in the Figs. 1 and 2. For instance, a particular release key may be employed, while the release of the called station may be effected by any type of switching means instead of relay R operated in response to an incoming call, such switching means being actuated on answering to the call, that is to say, when the operator inserts the plug into the answering jack, for example.

What is claimed is:

1. A party-line system having several branch stations, a party-line common thereto, and means for generating alternating current Morse code signal consisting of a plurality of signal elements each of which being composed of any desired number of alternating current cycles, each branch station comprising means responsive to alternating current cycles, means responsive to said signal elements and controlled by said alternating current cycle responsive means, a plurality of members individually allotted to the corresponding signal element of appropriate ordinal number and adapted to be moved into any of a plurality of positions by said signal element responsive means under the influence of the number of alternating current cycles transmitted, means for successively distributing each of said signal elements to its appertaining member, call indicating means operable in dependency on the position of said members after the receipt of all signal elements of a Morse code signal, a timing device adapted to restore all means to normal after the elapse of a given interval, and means for automatically releasing the called station on answering to a call.

2. A party-line system as defined in claim 1, in which said alternating current cycle responsive means is a line relay common to all signal element responsive means.

3. A party-line system as defined in claim 1, in which said alternating current cycle responsive means is a polarized alternating current alarm mechanism the armature of which is adapted to operate control contacts.

4. A party-line system as defined in claim 1, in which said distributing means are relays adapted to be successively energized during the persistance of a code signal.

5. A party-line system having several branch stations, a party-line common thereto, and means for generating alternating current Morse code signals consisting of a plurality of signal elements each of which being composed of any desired number of alternating current cycles, each branch

station comprising stepping mechanisms individually allotted to the corresponding signal element of appropriate ordinal number, a plurality of members individually allotted to the corresponding stepping mechanism and adapted to be moved thereby into any of a plurality of positions under the influence of the number of alternating current cycles transmitted, means for successively distributing each of said signal elements to its appertaining stepping mechanism, call indicating means operable in dependency on the position of said members after the receipt of all signal elements of a Morse code signal, a timing device adapted to restore all means to normal after the elapse of a given interval, and means for automatically releasing the called station on answering to a call.

6. A party-line system having several branch stations, a party-line common thereto, and means for generating alternating current Morse code signals consisting of a plurality of signal elements each being composed of any desired number of alternating current cycles, each branch station comprising means responsive to said signal elements, an electric drive energized by alternating current cycles transmitted over said party-line, a plurality of members individually allotted to the corresponding signal element of appropriate ordinal number, clutching means responsive to said signal elements and adapted to successively clutch said members to said drive so as to move said members into any of a plurality of positions under the influence of the signal elements received, means for successively distributing the signal elements to the appertaining clutching means, call indicating means operable in dependency on the position of said members after the receipt of all signal elements of a Morse code signal, a timing device adapted to restore all means to normal after the elapse of a given interval, and means for automatically releasing the called station on answering to a call.

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