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TELEPHONE SYSTEM

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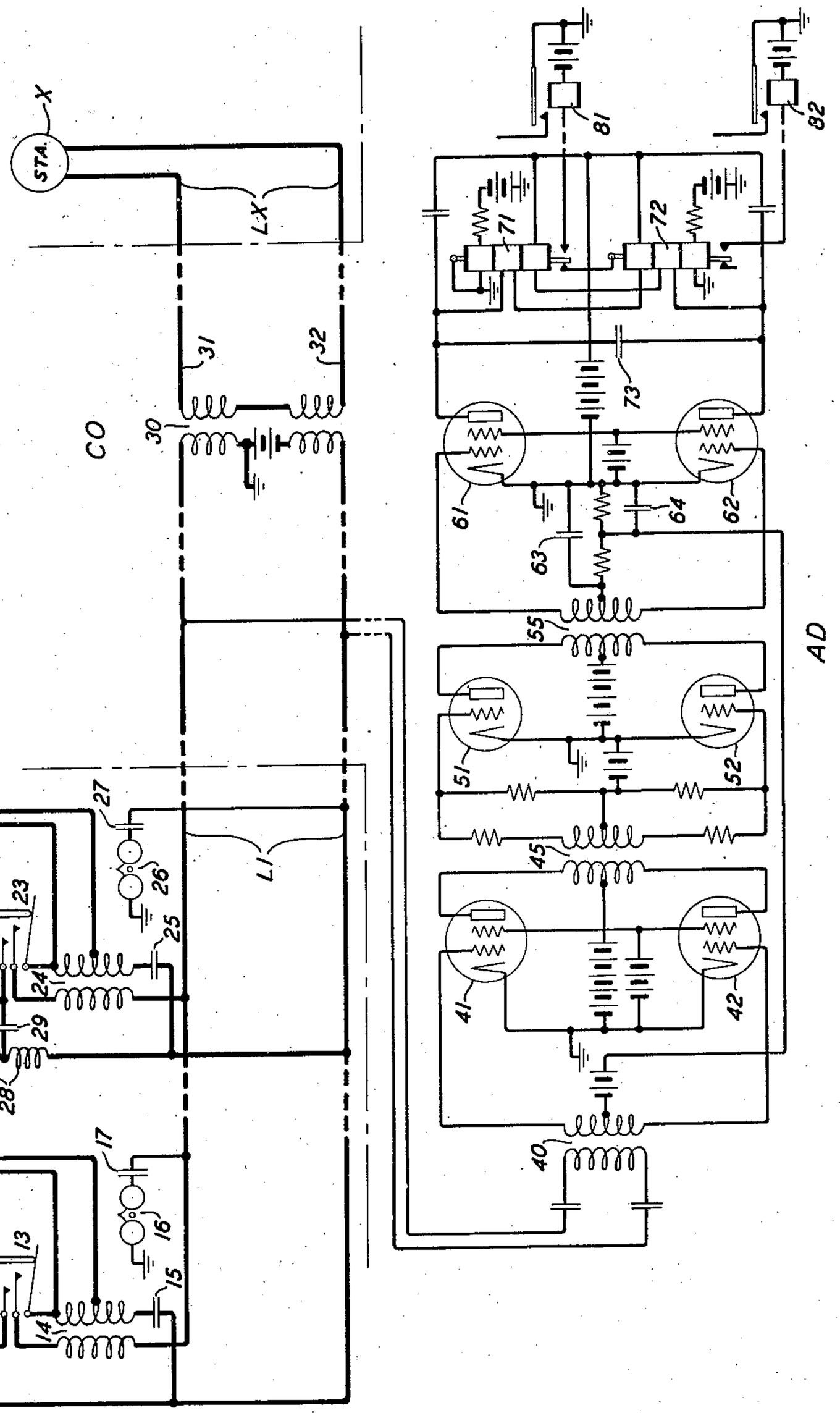

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TELEPHONE SYSTEM

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6 Claims. (Cl. 179—8.5)

This invention relates to telephone systems and particularly to systems comprising two-party lines.

It is the object of the invention to enable the automatic identification of the calling station on a two-party line without in any degree affecting the transmission of voice current or selective impulses over the subscriber's line.

It is known in telephone systems which include two party lines to provide a ground connection at one of two stations on a subscriber's line to enable identification of the calling station at the central office. While such a ground connection includes sufficient impedance to prevent any substantial adverse effect on the transmission of voice currents or selective impulses, any arrangement for identifying the calling station which does not require a ground connection is, in this respect, a more desirable arrangement. It is further known that voice currents, that is currents generated in telephone transmitter circuits and transmitted through a connected telephone line, are not symmetrical in wave form, the amplitude of the negative half cycles of current being greater than that of the positive half cycles of current or vice versa, depending upon the particular circuit arrangement at a subscriber's station.

This invention is a means for identifying the calling station on a two-party line which utilizes the asymmetric character of the voice currents transmitted over the line from the calling station to identify the calling station, the substation circuit arrangements at the two stations being such that the negative half cycles of the voice currents transmitted over the line from one of the stations are of larger amplitude than the positive half cycles and that the positive half cycles of the voice currents transmitted over the line from the other station are of larger amplitude than the negative half cycles.

According to a feature of the invention the two stations of a two-party line are arranged so that the voice currents transmitted over the line from one of the stations differs in character from the voice currents transmitted from the other of the stations in that the amplitude of the positive half cycles are of the greater amplitude in the one case and the negative half cycles are of the greater amplitude in the other case.

According to a further feature of the invention means is provided in the central office for determining whether the positive half cycles of voice currents transmitted over a calling party line are larger or smaller than the negative half cycles, thereby identifying the particular one of two stations on the line which is engaged in conversation over the line.

A clear and complete understanding of the invention will be facilitated by considering a telephone system embodying the features of the invention, one such system being represented schematically in the drawing which forms a part of this specification.

The drawing, which consists of a single figure, shows a system comprising two telephone subscriber's stations A and B connected to a line L1, a subscriber's station X connected to a line Lx and a central office CO comprising a repeating coil 30 and an asymmetry detector AD.

The stations A and B are of the central battery type. Station A comprises a transmitter 11, receiver 12, switch 13 actuated by removal of the transmitter and receiver from their normal support, induction coil 14, condenser 15, ringer 16 and ringing condenser 17. Station B comprises like elements and, in addition, a network consisting of induction coil 28 and condenser 29. By providing such a network at station B and not providing such a network at station A, the amplitude of the positive half cycles of the current in line L1 will be larger than the amplitude of the negative half cycles when this current is generated by one of transmitters 11 and 21; and the amplitude of the negative half cycles of the current in line L1 will be larger than the amplitude of the positive half cycles when this current is generated by the other of transmitters 11 and 21.

The repeating coil 30 and detector AD may be individual to the line L1 but are preferably common to a plurality of lines, and may constitute a part of a trunk or selector circuit through which a desired connection is established between the calling line L1 and any called line Lx and subscriber's station X in the system. In a manual telephone system the detector AD may be a part of an operator's position equipment; and in a dial telephone system the detector AD may be individual to a trunk or selector circuit or common to a group of such circuits. The detector AD may be associated with a calling line L1 only while the calling station is being identified.

The asymmetry detector AD comprises an input transformer 40 the primary winding of which is connected to a calling line L1, variable mu amplifier tubes 41 and 42, transformer 45, linear amplifier tubes 51 and 52, transformer 55, amplifier detector tubes 61 and 62 and relays 71 and 72. The

speech voltages transmitted over line L1 and applied through transformer 40 to the grids of amplifier tubes 41 and 42, are further amplified by tubes 51 and 52 and then applied through transformer 55 to the grids of self-biasing detector tubes 61 and 62. The voltages applied through transformer 55 cause rectified currents in the grid-cathode circuits of tubes 61 and 62, thereby effecting the charging of condensers 63 and 64; so that the bias of both of these tubes is increased until the effective grid voltage is almost equal to the peak voltage of the applied signal. With voice current of asymmetric wave form in line L1, the final, small current which maintains the charge in condensers 63 and 64, results from the highest positive peak voltage; and the grid of that one of tubes 61 and 62, to which this peak voltage is applied, is less negative than the grid of the other of these tubes. Therefore, the current in the anode-cathode circuit of the detector tube to which the highest positive voltage is applied will be larger than the current in the anode-cathode circuit of the other of these detector tubes. A portion of the self-biasing voltage developed by detector tubes 61 and 62 is included in the bias of the variable mu amplifier tubes 41 and 42 to supply an automatic sensitivity control so that the linear amplifier tubes will not be overloaded by loud speech or tones. The current in the output circuit of tube 61 energizes the middle winding of relay 71 and upper winding of relay 72 in series; and the current in the output circuit of tube 62 energizes the middle winding of relay 72 and lower winding of relay 71 in series. Relays 71 and 72 are polarized relays, each of which has a biasing winding for normally holding the contact springs in the position shown. If the negative and positive half cycles of current in line L1 were of like amplitude, the middle and lower windings of relay 71 would be substantially equally and differentially energized and the middle and upper windings of relay 72 would be substantially equally and differentially energized, so that neither relay 71 nor relay 72 would be operated. Condenser 73 bypasses the alternating current components of the detected signal and permits only the direct current components to pass through the differential windings of relays 71 and 72. If, however, the current transmitted through line L1 and transformer 40 to detector AD results from speech at the one or the other of stations A and B, the asymmetric character of this current will effect the operation of relay 71 in the one case and relay 72 in the other case. If relay 71 operates, it closes a circuit for operating relay 81 to indicate that station A is the calling station; and if relay 72 operates, it closes a circuit for operating relay 82 to indicate that station B is the calling station. Relays 81 and 82 may control the operation of the message registers which are individual to the stations A or B, if these stations are message rate stations; or control whatever other operations are desired.

Since, in a dial system, the calling subscriber does not talk until the called subscriber answers and speech currents from the called station would interfere with the calling party test, it is necessary to further provide means for applying to the asymmetry detector speech currents from the calling station but not from the called station. To this end directionally selective coils similar to those disclosed in the patent to Meszar No. 1,835,802, granted December 8, 1931, may be inserted between the calling line and the repeating coil 39 to prevent speech currents from the called line from affecting the party line test which is made by the asymmetry detector.

What is claimed is:

1. In a telephone system, subscribers' lines, a calling line, two stations connected to said line, means including a link circuit for completing talking connections between calling and called lines, means connecting said calling line to said link, means at one of said stations polarizing in one direction the speech currents transmitted therefrom, means at the other of said stations polarizing in the other direction the speech currents transmitted therefrom, and means comprising an asymmetry detector associated with said link for determining the polarity of asymmetry existing in the speech currents transmitted from the calling station, thereby to identify the calling station.

2. In a telephone system, subscribers' lines and stations, each of said stations including a transmitter, one of said lines being a party line serving two of said stations, the transmitter circuit at said two stations being arranged so that the speech currents transmitted over the line are asymmetrical in wave form, the amplitude of the positive half cycles of the speech currents transmitted from one of said stations being larger than the amplitude of the negative half cycles and the amplitude of the negative half cycles of the speech currents transmitted from the other of said stations being larger than the amplitude of the positive half cycles, means including a link for completing talking connections between calling and called lines, means associated with said party line when a call is made from either of said two stations for identifying the calling station by determining whether the speech currents therefrom are polarized in the one direction or in the other direction.

3. In a telephone system, subscribers' lines, a party line, two stations connected to said line, means including a link circuit for establishing talking connections between calling and called lines, means responsive to the initiation of a call at either one of said stations for connecting said line to said link, the speech currents transmitted over said line from each of said stations being asymmetric in wave form, means at one of said stations for polarizing the speech currents transmitted therefrom in the opposite direction to that in which the speech currents transmitted from the other of said stations are polarized, and means associated with said link circuit for determining the direction in which the speech currents transmitted from the calling station are polarized, thereby to identify the calling station.

4. In a telephone system, subscribers' lines including a party line, two stations connected to said line, means including a link circuit for completing connections between calling and called lines, means responsive to the initiation of a call at either one of said stations for connecting said party line to said link, a transmitter circuit arrangement at one of said stations effective to polarize the speech currents transmitted therefrom in one direction, and a transmitter circuit arrangement at the other of said stations effective to polarize the speech currents transmitted therefrom in the other direction.

5. In a telephone system, subscribers' lines, a calling line, two stations connected to said line, means including a link for completing connections between calling and called lines, means connecting said calling line to said link, means at one of said stations polarizing the speech currents transmitted therefrom in one direction,

means at the other of said stations polarizing the speech currents transmitted therefrom in the other direction, means comprising an asymmetry detector associated with said link for determining the polarity of asymmetry existing in the speech currents transmitted from the calling station, and means controlled by said asymmetry detector for indicating which of said stations is the calling station.

6. In a telephone system, subscribers' lines including a party line, two stations connected to said line, means including a link circuit for completing connections between calling and called lines, means responsive to the initiation of a call at either one of said stations for connecting said party line to said link, a transmitter circuit arrangement at one of said stations effective to polarize in one direction the speech currents transmitted from said one station, and a transmitter circuit arrangement at the other of said stations comprising a network consisting of an induction coil and a condenser effective to polarize in the other direction the speech currents transmitted from said other station.

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