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SIGNALING SYSTEM

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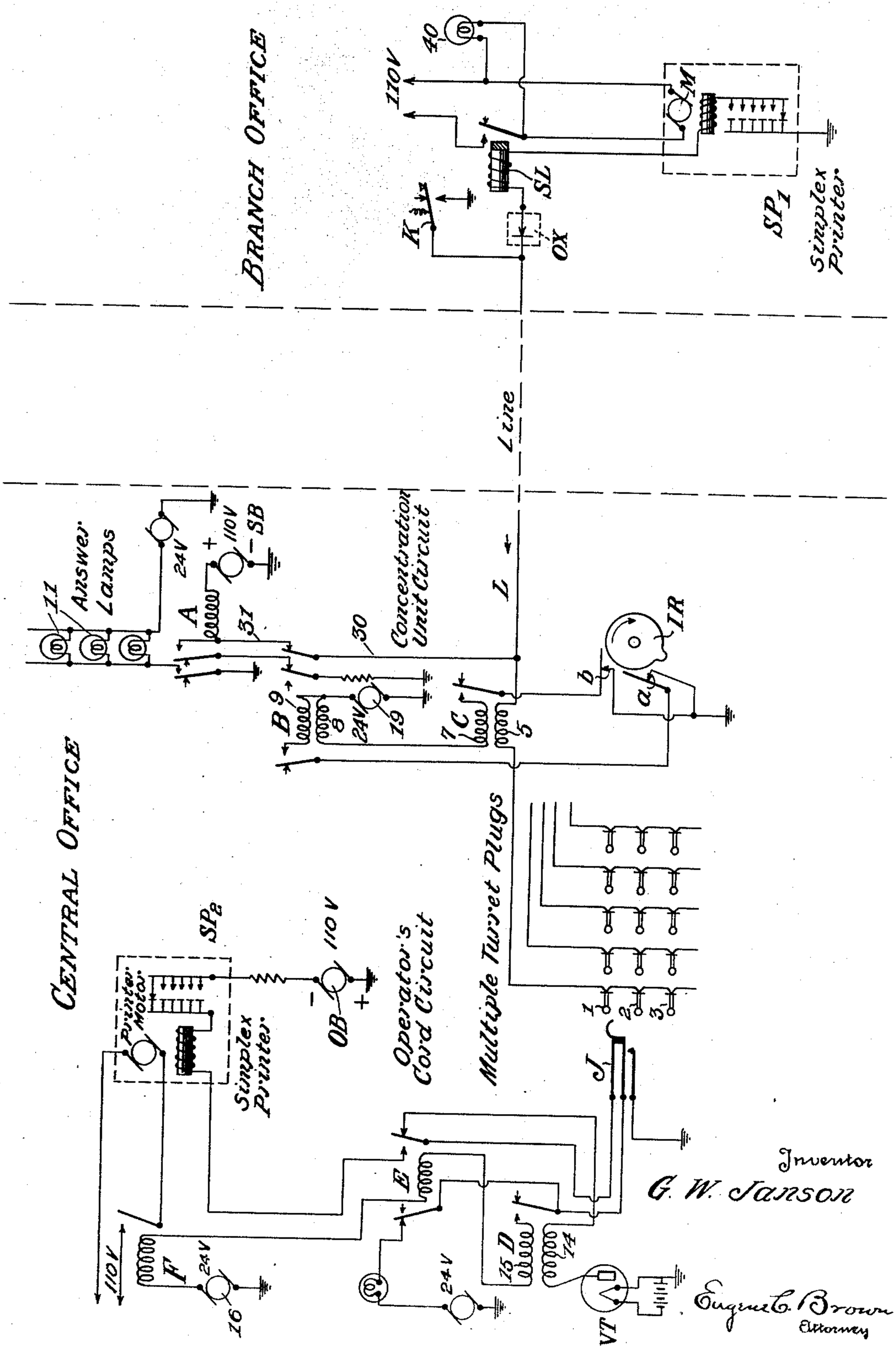

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SIGNALING SYSTEM

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This invention relates to signaling systems of the type wherein a plurality of lines terminate at a central office and while particularly intended for systems employing telegraph printers of the start and stop type, such as the well-known simplex printers, it is also applicable to other signaling systems.

Single current telegraph circuits in this country are normally closed, with line current flowing during idle time, in order to keep the line available for signals from either end. In some foreign countries, zero current during idle time is obtained, but at the expense of providing a line battery at each sending station.

The object of the present invention is to obtain, in a single current telegraph circuit, the advantage of zero line current during idle time without sacrificing the advantages of closed circuit operation. To this end I insert an asymmetric device, such as a rectifier element, in the line at the outer or branch office. This element is so poled that it permits the operating current to pass, but prevents the flow of current from a generator of opposite polarity applied during idle time. This system is, in effect, an open circuit line, but which may be closed for signaling by direct current from either end, viz: by short-circuiting the rectifier at the outer branch office or by reversing the polarity of the generator at the central office.

A change of polarity at the central office, either when initiating or when answering a call, places the outer office instruments under the direct control of the central office. The outer office can signal the central office at any time by short-circuiting the rectifier, thus providing a direct current path for the signaling generator. The line can be tested at any time by connecting the polarity of current which is passed by the rectifier.

In the following detailed description I shall refer to the accompanying drawing in which, for the sake of convenience, the circuit arrangement is illustrated for only one branch office and only one simplex printer is shown at the central office.

The operator's cord circuit and its associated equipment at the central office is substantially the same as that shown in U. S. Patent No. 1,804,327.

At the central office, the line L is connected through the line winding 5 of relay C to the multiple turret plugs 1, 2, 3, etc., rigidly located in front of the respective operators. A circuit is normally extended over each line from the central office to the branch offices, from the signal battery or generator SB through the winding of signal relay A, over conductor 31, outer right hand armature and back contact of relay B, conductor 30, line L, asymmetric element, such as a copper oxide rectifier OX, at the outer branch office, slow-to-release relay SL, printer magnet and normally closed printer contact to ground. No current flows over this circuit during idle periods as the rectifier element OX does not pass current from the positive pole of the generator SB which is normally connected to line.

The operator at the central office may signal the branch office by connecting her jack J to the plug associated with the branch office line, as described in the above mentioned patent. If this line is idle, relay D will be operated by virtue of the positive signaling battery SB being applied to the plate of vacuum tube VT. Operation of relay D closes a circuit through its locking winding to operate relays E and F. Operation of relay F starts the motor of printer SP_2. Operation of relay E transfers the tip connection of jack J from the plate of VT to the printer and thus applies negative operating battery OB to the line L. The plate current of VT was insufficient to operate relay C, but it is now operated by the increased current due to operating battery OB. Operation of relay C closes a circuit through its locking winding 7 to operate relay B. Operation of relay B removes positive signaling battery SB from the line.

Negative operating battery OB is passed by the rectifier OX, thus operating relay SL at the branch office. Operation of relay SL closes a circuit from local battery 110 v. to start the printer motor M of branch office printer SP_1 and to light the signal lamp 40. The circuit is now ready for handling messages, with the motor M under control of the central office operator.

The branch office operator may call the central office at any time by momentarily closing the switch K, thereby grounding the line ahead of the rectifier element OX. This causes current to flow through the line from positive signaling battery SB, thereby operating signal relay A and locking it, and lighting answer lamp 11 at the central office. In answering the call, the central office operator connects her jack J to the appropriate line plug, thereby connecting negative operating battery OB to the line and removing positive signaling battery, as was described in the preceding paragraphs. Relay A is unlocked by the operation of relay B, and in releasing extinguishes answer lamps 11. Negative operating battery, passed by the rectifier,

starts the branch office motor and lights the signal light as previously described, indicating to the branch office operator that she may proceed with transmission.

During the transmission of signals, slow-to-release relay SL maintains the circuit of the printer motor M closed during the intervals between marking signals, when no current is flowing in the line.

When transmission is concluded, the central office operator withdraws her jack J from the line plug, removing operating battery OB from the line and deenergizing winding 5 of relay C. Relay SL at the branch office releases soon after the operating battery is removed, and stops the branch office printer motor. Relay C does not release, however, until interrupter IR opens the contact *b*, deenergizing locking winding 7 of relay C and winding 8 of relay B. Relay B does not release until interrupter IR opens contact *a*, deenergizing winding 9 of relay B. In falling back, relay B reconnects positive signaling battery to the line and prepares the locking circuit of relay A for the next call.

While I have described my invention as applied to the concentrator circuit and operator's cord circuit shown in prior Patent 1,804,327, for purposes of illustration, it will be evident to engineers that other circuit arrangements may be employed. For instance, relay A could be made non-locking, a printer substituted for the busy lamps and a transmitter for the key K at the branch office. If a battery reversing switch, or other means of substituting one polarity for the other, is provided, the invention is applicable to single Morse circuits, or other systems which do not automatically reverse the battery. It may be used for selective signaling of telephone stations, and many other applications.

I claim:

1. In combination, a signaling conductor, a receiving apparatus at one end, a potential source, a signaling device, and a transmitting apparatus at the other end, one polarity of said potential source being normally connected to said conductor, an asymmetric element associated with said receiving apparatus and adapted to prevent the passage of current of the polarity normally impressed upon said conductor, means for shunting said asymmetric element to operate said signaling device, and means for reversing the polarity of said source to permit the transmission of signals to said receiving apparatus.

2. In combination, a signaling conductor, a signaling device and a potential source at one end and means for reversing the polarity of the source connected to the conductor, a signaling device and an asymmetric element at the other end, said asymmetric element being interposed between the signaling device and the conductor, and means for shunting the asymmetric element and the last mentioned signaling device, to operate said first mentioned signaling device.

3. In a telegraph system, a printer line, a potential source normally connected with one polarity to the line and means for reversing the polarity of the source connected to the line, a printing unit and a driving motor therefor, a circuit for said motor, a relay connected to said printing unit and controlling said motor circuit, and a rectifier element interposed between said relay and said line permitting said relay and said printing unit to operate only upon a reversal of the normal line polarity.

4. A printing telegraph system comprising a plurality of stations, a line connecting said stations, a printing telegraph apparatus including a motor therefor and a call signal at one of said stations, a source of potential normally connected with one polarity to line at the other station and means for reversing the polarity of the line connection, a relay at said first station operating to effect the operation of said signal and the starting of said motor, and an asymmetric element interposed between said relay and the line permitting the flow of current of only a polarity opposite to the normal polarity.

5. A telegraph system comprising a plurality of stations, a line connecting said stations, an electro-responsive device connected to the line at one station, a source of potential normally impressing one polarity on the line at another station, an asymmetric element interposed in the line between said electro-responsive device and said potential source to prevent the flow of current of said normal polarity and means for substituting a potential source of a polarity opposite to that normally impressed on the line to thereby actuate said electro-responsive device.

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