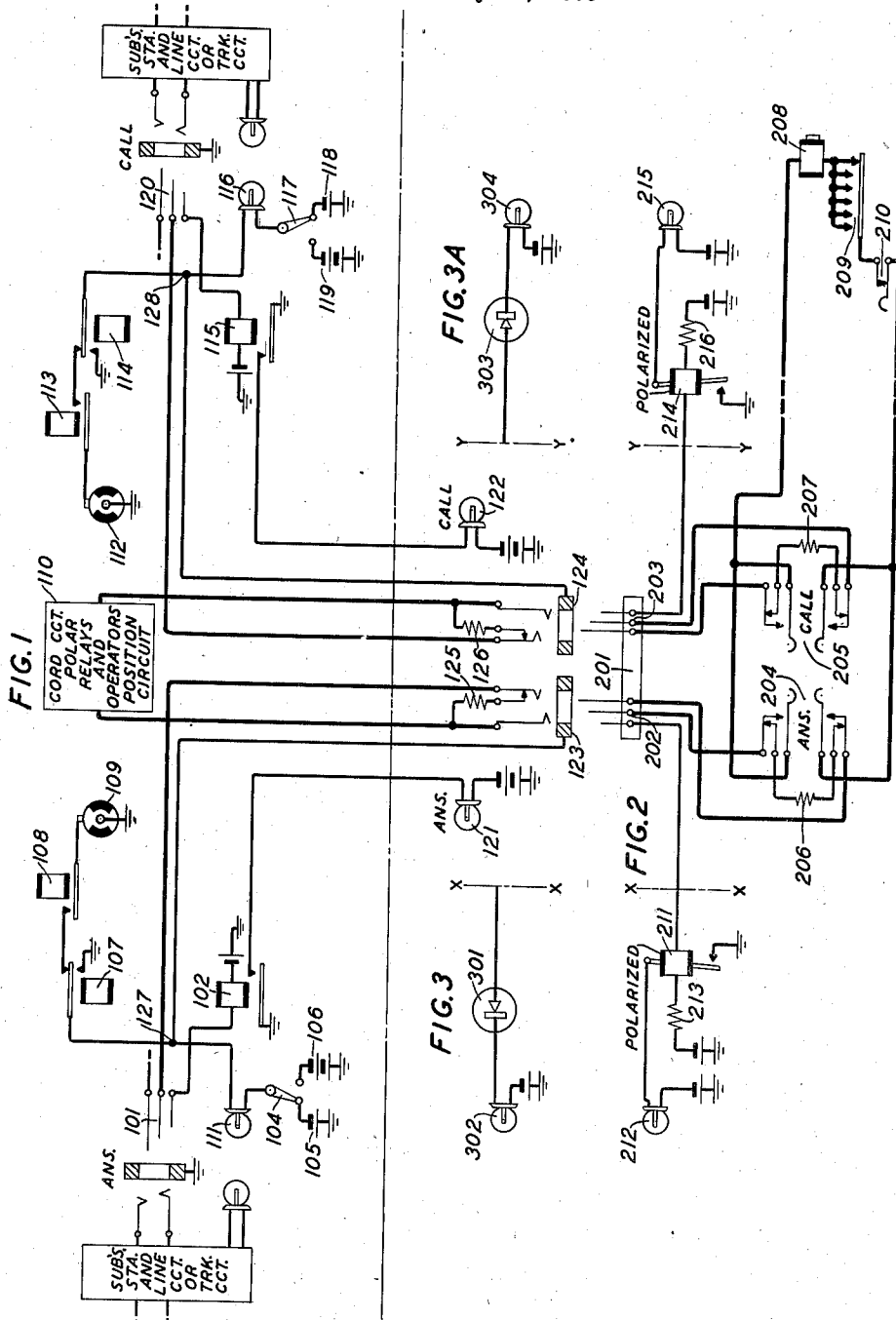


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TELETYPEWRITER SWITCHING SYSTEM

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TELETYPEWRITER SWITCHING SYSTEM

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This invention relates to teletypewriter switching systems and particularly to service observing circuits used in connection with cord circuits in manual teletypewriter switching systems.

An object of this invention is to provide a service observing circuit for use in connection with a cord circuit in a manual teletypewriter switching system, in which the same supervisory signals as appear in the cord are reproduced in the service observing circuit.

A further object of this invention is to provide a service observing circuit which is interconnectable with different types of cord circuits at different times, said cord circuits having apparatus units with battery of different voltages connected in parallel with apparatus units in the service observing circuit.

A feature of this invention is a service observing circuit for use with a cord circuit in a manual teletypewriter switchboard, said observing circuit having a lamp signal corresponding to the cord supervisory answering lamp and another corresponding to the cord supervisory calling lamp, said service observing lamps being arranged to light steadily, flash or darken in unison with their corresponding cord lamps, reproducing the cord supervisory signals in the service observing circuit.

A further feature of this invention is a unidirectional current device used in a circuit connectable at different times to different types of circuits, wherein the voltages of the connecting circuits are not the same, to prevent the false operation of an apparatus unit on one of the different types of connection.

It is old in the teletypewriter art to provide means for flexibly inserting a teletypewriter for monitoring purposes in the transmission lead of a cord circuit, in series with the teletypewriter switchboard operator's teletypewriter circuit. Such an arrangement is disclosed in Patent 1,884,567 to J. J. Catogge, October 25, 1932. Service observing is preferably performed in a separate room out of sight and hearing of the operators.

As far as applicants are aware, however, no facilities are available to perform the functions of their circuit herein, namely, to provide a service observing circuit for cooperating with teletypewriter switching cord circuits, which, in addition to reproducing the teletypewriter communication signals transmitted through the cord, reproduce also the cord supervisory signals. The advantage of this will be apparent to anyone skilled in the art, as it not only provides an in-

dication that the cord circuit supervisory signals are functioning properly, but furnishes also a check on the manner in which the call is handled by the operator. This is invaluable in the training of operators and in maintaining a high standard of service.

In arranging the service observing circuit herein to connect to a cord circuit, instead of to the subscriber's line circuit, a number of advantages over other service observing arrangements are afforded. In observing circuits, in which connections are made to line circuits, it is necessary to provide either an entire reappearance of the subscriber's line lamps and jacks in the location where the service observing is performed, the expense of which is prohibitive, or to make temporary patches to a group of selected line circuits at various times. These temporary connections are objectionable for a number of reasons among which are the following: (1) Setting them up and changing them periodically involves expense. (2) The patching is generally performed at the distributing frame by means of a shoe and a long cord which is cumbersome and interferes with the normal work on the distributing frame. (3) Since a list of numbers of the lines which are to be observed must be made up by some operating official, such as the chief operator, turned over to the wire chief and then passed on to the maintenance men, and since anyone who has access to the distributing frame may readily observe the numbers of the lines which are under observation, it is difficult to keep the numbers of the observed lines secret. (4) When patch connections are made to selected line circuits, the observing operators are limited to observing only on calls involving the particular lines in the selected group. There may be long intervals during which the observing operator is idle awaiting calls in said selected group.

These difficulties are obviated when the service observing circuit is connected to the cord circuit instead of to the line. The service observing operator receives indications whenever the operator uses the cord circuit. The arrangement by comparison with the other is inexpensive, secret, does not involve cumbersome cross-connections, nor long intervals during which switchboard operators are busy making connections, but, because the particular lines on which they are working have not been selected for observation, there is no means of checking on the service.

The invention will be more readily understood

from the following description when read in connection with the associated drawing.

Fig. 1 is a portion of a cord and operator's position circuit used at a telegraph or teletypewriter switchboard in interconnecting telegraph or teletypewriter subscribers, or to extend a subscriber's line to a trunk or to interconnect two trunks. The circuit which is well known in the art, has been modified to flexibly interconnect with the service observing circuit of the invention herein;

Fig. 2 is a service observing circuit which interconnects with Fig. 1. The observing circuit is used in observing the service provided on connections established by means of the cord circuit per Fig. 1; and

Figs. 3 and 3A are alternative embodiments of a portion of Fig. 2.

It will be assumed that a call is incoming through the answering jack to the left of Fig. 1. In response to the operation of the lamp signal associated with the jack indicating that a call is incoming, plug 101 of Fig. 1 is inserted into the answering jack. A circuit is thereupon established from ground, through the sleeve of the answering jack, sleeve of plug 101 and winding of relay 102 to battery, operating relay 102. The ring conductor of the jack is extended through the ring of plug 101 and the ring conductor of the cord, through resistance 125 to the cord circuit polar relays indicated by 110. These relays and other portions of the cord and operator's position circuit which are not shown in detail in Fig. 1 are omitted as they are known in the art and function in a known manner. Such arrangements are disclosed in numerous patents, such as the patent to F. S. Kinkead et al. 2,024,581, December 17, 1935, to which reference is made. The Kinkead patent discloses one embodiment of a subscriber's line and station circuit, a cord and position circuit and a trunk circuit with which the service observing circuit of this invention will cooperate. It is not, however, limited to cooperation with the circuits of the Kinkead disclosure as the service observing circuit herein will function with a variety of such circuits.

When relay 102 is operated, a circuit may be traced from ground, through the armature and contact of relay 102 and the filament of lamp 121 to battery. Lamp 121 is associated individually with jack 123. Its lighting indicates that plug 101 associated with the answering end of the cord per Fig. 1 has been used in answering an incoming call.

It is to be understood that at any operator's position there are numerous cord circuits, any one of which may be chosen by an operator thereat in answering and extending a call. Jacks 123 and 124 and their associated lamps 121 and 122, respectively, are located at a service observing board which is ordinarily located in a room separate from that in which the switchboard containing the cord circuits and jacks per Fig. 1 are located. All or any part of the cords in the switchboard may be similarly extended to the observing position so that the observing operator may observe on any connection handled by the operators at the particular board being observed upon a particular cost so extended. In certain cases, such as in large cities where more than one switchboard may be required and where it is economically feasible, all of the cord circuits in all of the boards may be connected as indicated in Fig. 1 to a single centralized service

observing board which may be used to observe on all of the telegraph or teletypewriter switching at the various boards in a particular area.

In response to the lamp signal 121 which will light at a particular position in the service observing board, in front of an operator observing on the cord with which lamp 121 is associated, the operator at that particular service observing position will insert double ended plug 201 into jack 123 associated with lamp 121 and jack 124 associated with the calling end of Fig. 1 and paired with jack 123 in the service observing board.

When double ended plug 201 is inserted in jacks 123 and 124, the telegraph signal transmission conductors in the answering end of the cord per Fig. 1 are opened and the transmission conductors associated with plug 202 in the service observing circuit are connected in series therewith. Similarly, the telegraph signal transmission conductors in the calling end of the cord per Fig. 1 are opened and the transmission conductors associated with plug 203 in the service observing circuit are connected in series therewith. These circuits may be traced as follows: From the ring conductor of the answering jack incoming from the calling station, through the ring or middle conductor of plug 101, through the tip of jack 123, the shunting path through resistance 125, now being open due to the insertion of plug 202, through the tip or right-hand conductor of plug 202, the bottom break contacts of key 204, which contacts are in engagement when key 204 is in the normal or unoperated position, through resistance 206, the top break contacts of key 204, which contacts are also in engagement, the ring or middle conductor of plug 202, ring of jack 123 to the polar relays 110 of the cord circuit. For the calling end of the cord, the circuit extends from the ring or middle conductor of plug 120, through the tip or left-hand conductor of jack 124, the shunt path through resistance 126 being open due to the insertion of plug 203 in jack 124, through the tip of plug 203, top break contacts of key 205, resistance 207, bottom break contacts of key 207, through the ring or middle conductor of plug 203, ring of jack 124 to the polar relays 110 of the cord circuit per Fig. 1.

The telegraph signal transmission path of each end of the cord circuit per Fig. 1 is thus extended into the service observing circuit per Fig. 2. By operating key 204 associated with the answering end of the cord, the service observing operator may interconnect her position circuit in series with the answering end of the cord. Similarly, by operating key 205 associated with the calling end of the cord, the service observing operator may interconnect her position circuit in series with the calling end of the cord. When key 204 is operated, the path heretofore traced through resistance 206 is disconnected at the top and bottom break contacts of key 204 and the path through the service observing circuit is substituted therefor. This path may be traced through the top make contacts of key 204, winding of receiving magnet 208, sending contacts 209, break key 210 to the bottom make contacts of key 204. Similarly, when key 205 is operated, the path through resistance 207 is broken at the top and bottom break contacts of key 205, and the service observing position is substituted for the resistance through the top and bottom make contacts of key 205.

If it is desired to insure secrecy, sending con-

tacts 209 and break key 210 in the service observing position circuit may be omitted. If it is desired to permit the observing operator to communicate over the circuit as, for instance, in the training of operators or for some other reasons, these facilities may be included.

Lamps 111 and 116 associated with the answering and calling ends of the cord circuit per Fig. 1, respectively, are supervisory lamps. They are used to transmit disconnect signals from the calling and called subscriber to the operator, as well as recall signals from the calling or called subscriber to the operator or recall signals from operator to operator in the case of a tandem connection involving a plurality of switchboards.

They are also used in certain systems of operation, such as straightforward systems, in addition to providing disconnect and recall signals, to indicate successive steps in the establishment of a call through a plurality of switchboards to the called subscriber. These lamps may be lighted or darkened to convey these signals to the operator. The invention herein provides means for reproducing these signals at the service observing board, so that the service provided in handling calls may be observed. Essentially, this is performed by providing a lamp in the service observing board connected in parallel with the supervisory lamp associated with each end of the cord circuit. The lamps in the observing board operate in unison with their corresponding lamps in the telegraph or teletypewriter switching board.

The circuit for the supervisory lamp associated with the answering cord may be traced from battery 105 through switch 104, the filament of lamp 103 to the armature of relay 107. For a steady lamp signal, which may serve as a disconnect signal, relay 107 is operated, responsive to control means, not shown, to connect a steady ground to lamp 111, lighting the lamp. For a flashing lamp signal, relay 107 remains in its released condition, as indicated, and relay 108 is operated, responsive to control means, not shown, to extend the lamp circuit through the armature and back contact of relay 107 and the front contact and armature of relay 108, through alternate open and grounded segments of interrupter 109, flashing lamp 111.

The connections which control relays 107 and 108 may be arranged in a large variety of ways, well known in the art, to provide the steady and flashing lamp signals and, since they form no part of the invention herein, are not shown in detail. Notwithstanding the manner in which these signal conditions may be effected in the cord, however, the supervisory lamp conductors at each end of the cord are multiplexed into the service observing circuit to reproduce the signal conditions in a corresponding lamp associated with each side of the service observing circuit.

The manner in which this is performed is as follows: When steady or interrupted ground is connected to the normally open end of the lamp circuit of lamp 111, a parallel circuit is established extending from junction point 127 through the sleeve of jack 123, sleeve of plug 202, winding of polar relay 211 and resistance 213 to battery. Relay 211 operates in parallel with the circuit through lamp 111. This connects ground to the armature of a circuit extending through the filament of lamp 212. Lamp 212 is therefore lighted. If a steady ground is connected from relay 107, relay 211 remains operated to maintain lamp 212 steadily lighted corresponding to

the condition of lamp 111 in the cord. If an interrupted ground is connected from interrupter 109 both lamps 111 and 211 will flash simultaneously.

The reason why relay 211 is provided instead of connecting the filament of lamp 212 directly to the sleeve lead of plug 202 to light and extinguish the two lamps directly in parallel will now be explained.

There are at present in service in the existing teletypewriter switching systems cord circuits having supervisory lamps operating on batteries of different voltages. For example, some of the supervisory lamps operate on 24 volts and others on 48 volts. The polar relay controlled lamp in the observing cord makes it possible to provide observing circuits, having battery voltage of one value only controlling its lamps, to function universally with the existing cords having supervisory lamps operating on different voltages. The polar relay is arranged to actuate its armature to engage its grounded contact in response to current flowing in one direction only. Relay 211 is arranged to respond to a current flowing from the positive terminal of the battery, or ground, to the negative terminal of the battery. It will operate in parallel with lamp 111, when ground is connected to a common point intermediate lamp 111 and relay 211. The observing circuit may be connected to switching cords having negative 48 volt battery connected to their supervisory lamps. This may be simulated by operating switch 104 to its alternate contact, to connect 48 volt negative battery 106 in series with the filament of lamp 111. For this condition, even though both relays 107 and 108 are unoperated, so that the conductor normally energizing the lamp circuit is open, if lamp 212 which lights on 24 volts were connected directly to the lamp lead, it would remain lighted at all times while the plugs 202 were connected to jack 123. This is so because the 48 volt battery would preponderate over the 24 volt battery and sufficient voltage would be impressed on lamp 212 to maintain it lighted at all times. This would, of course, be objectionable. The use of a polar relay, such as 211, prevents this from happening, because it will not respond to current flowing from the negative terminal of battery 106. It will respond, however, when ground is connected through the operation of relay 107 or 108 to junction point 127. Thus, it should be apparent that the service observing circuit per Fig. 2 will function universally with cords per Fig. 1 having batteries of different voltages connected to its supervisory lamps.

The supervisory circuit associated with the calling end of the cord, namely, batteries 118 and 119, switch 117, lamps 116 and 122, relays 113, 114 and 115 and interrupter 112, together with their associated wiring including junction 128, function in the identical manner with that described for their corresponding elements in the answering end of the cord. Similarly, polar relay 214, resistance 216, lamp 215 and their connecting wiring, associated with the calling end of the cord per Fig. 1, function as do their corresponding elements in the service observing circuit associated with the answering end of the cord per Fig. 1. It is not considered necessary, therefore, to an understanding of the operation of these elements to repeat this description as it may be readily understood from the foregoing by those skilled in the art.

Fig. 3 is an alternative embodiment for the

portion of Fig. 2 shown to the left of dotted line XX in Fig. 2. In this embodiment a copper-oxide rectifying element 301 replaces polar relay 211 to perform substantially the same function as the relay. As is known, such copper-oxide element, when connected in series in a circuit, presents a low resistance to current of one polarity and a high resistance to current of the opposite polarity. It is so connected as to present a low resistance to current flowing from the positive terminal or ground in Fig. 1 through element 301 and the filament of lamp 302 to negative battery. Thus when steady or interrupted ground is connected to junction point 127, lamp 302 will light steadily or flash in parallel with lamp 111 whether the filament of lamp 111 be connected to battery 105 or 106. The lamp 302 can not light when ground is disconnected from junction point 127, even though high voltage battery 106 be connected in circuit as the copper-oxide element 301 presents a high resistance to battery of negative polarity connected to its right-hand terminal.

Fig. 3A corresponds to Fig. 3 and is connectable to the portion of the service observing circuit cooperating with the calling end of the cord circuit per Fig. 1 to the right of line YY in Fig. 2. It is thought unnecessary to repeat its description as it functions in a manner identical with Fig. 2A.

What is claimed is:

1. In a teletypewriter switching system, a teletypewriter cord circuit, a teletypewriter service observing circuit, means in said circuits for interconnecting said circuits directly, a supervisory signal in said cord circuit, a signal in said observing circuit corresponding to said supervisory signal, and means in said circuits for operating said signals substantially in unison.

2. In a manual teletypewriter switching system, a teletypewriter service observing circuit connecting with a teletypewriter cord circuit, a first signal in said observing circuit, means in said circuits for operating said signal in unison with a first supervisory signal in said cord circuit, a second signal in said observing circuit, and means also in said circuits for operating said second signal in unison with a second supervisory signal in said cord circuit.

3. In a manual teletypewriter switching system, a teletypewriter cord circuit, a teletypewriter service observing circuit, means in said circuits for interconnecting said circuits directly and a visual supervisory signal in said observing circuit responsive to control means in a telegraph line circuit connected to said cord.

4. In a manual teletypewriter switching system, a teletypewriter service observing circuit, a visual signal therein and means connected to said observing circuit for operating said signal in response to a teletypewriter subscriber disconnect signal.

5. In a manual teletypewriter switching system, a teletypewriter service observing circuit, a visual signal therein and means connected to said observing circuit for operating said signal in response to a teletypewriter subscriber recall signal.

6. In a manual teletypewriter switching system, a teletypewriter service observing circuit, a visual supervisory signal therein and means connected to said observing circuit for operating said signal steadily to indicate a first condition and intermittently to indicate a second condition.

7. In a manual teletypewriter switching system,

a first cord circuit, a first electric apparatus element in said circuit, a first battery of a first polarity and of a first magnitude in electromotive force connected to said element, a second cord circuit, a second electric apparatus element in said second cord, a second battery of the same polarity as said first battery and of a second magnitude in electromotive force, substantially different from said first magnitude, connected to said second element, a monitoring circuit arranged to cooperate independently and interchangeably with said first and second cords, a third electric apparatus element in said monitoring circuit, a third battery of the same polarity, and same magnitude in electromotive force as said first battery connected to said element, means in said circuits for connecting said first element in parallel with said third element at a first time, means also in said circuits for connecting said second element in parallel with said third element at a second time and a unidirectional current device in series with said third element to prevent the energization of said third element due to said difference in magnitude.

8. In a teletypewriter switching system, a first lamp filament, a battery of a first polarity and of a first magnitude electromotive force connected between ground and a first end of said filament, a second lamp filament, a battery of said first polarity and of a second magnitude electromotive force, substantially greater than said first magnitude, connected between ground and a first end of said second filament, a conductor connecting the second ends of said filaments and a unidirectional current device connected in series in said conductor to prevent the heating of said filaments due to said difference in magnitude.

9. A circuit having a lamp filament connected in parallel with the winding of a polar relay, opposed batteries of substantially different voltages connected individually to said filament and said relay, means in said circuit for maintaining said lamp filament darkened and said relay winding energized in a first manner for a first condition and means connected to said circuit for maintaining said filament lighted and said winding energized in a second manner for a second condition.

10. In a teletypewriter switching system, a manual teletypewriter cord circuit, means in said circuit for connecting said cord to a calling teletypewriter circuit, a signal in said cord at a teletypewriter service observing position operating in response to said connection to indicate that said connection has been established, a teletypewriter service observing circuit, flexible switching means in said cord and observing circuits for manually interconnecting said cord and observing circuits in response to said signal, a supervisory signal also in said cord operating in response to control means in said calling circuit, a signal in said observing circuit corresponding to said supervisory signal and means in said circuit for operating said corresponding signal substantially simultaneously with said supervisory signal.

11. In a teletypewriter switching system, a manual teletypewriter cord circuit, means in said circuit for connecting said cord to a called teletypewriter circuit, a signal in said cord at a teletypewriter service observing position operating in response to said connection to indicate that said connection has been established, a teletypewriter service observing circuit, flexible switching means in said cord and observing circuits for manually

interconnecting said cord and observing circuits in response to said signal, a supervisory signal also in said cord operating in response to control means in said called circuit, a signal in said observing circuit corresponding to said supervisory signal and means in said circuits for operating said corresponding signal substantially simultaneously with said supervisory signal.

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