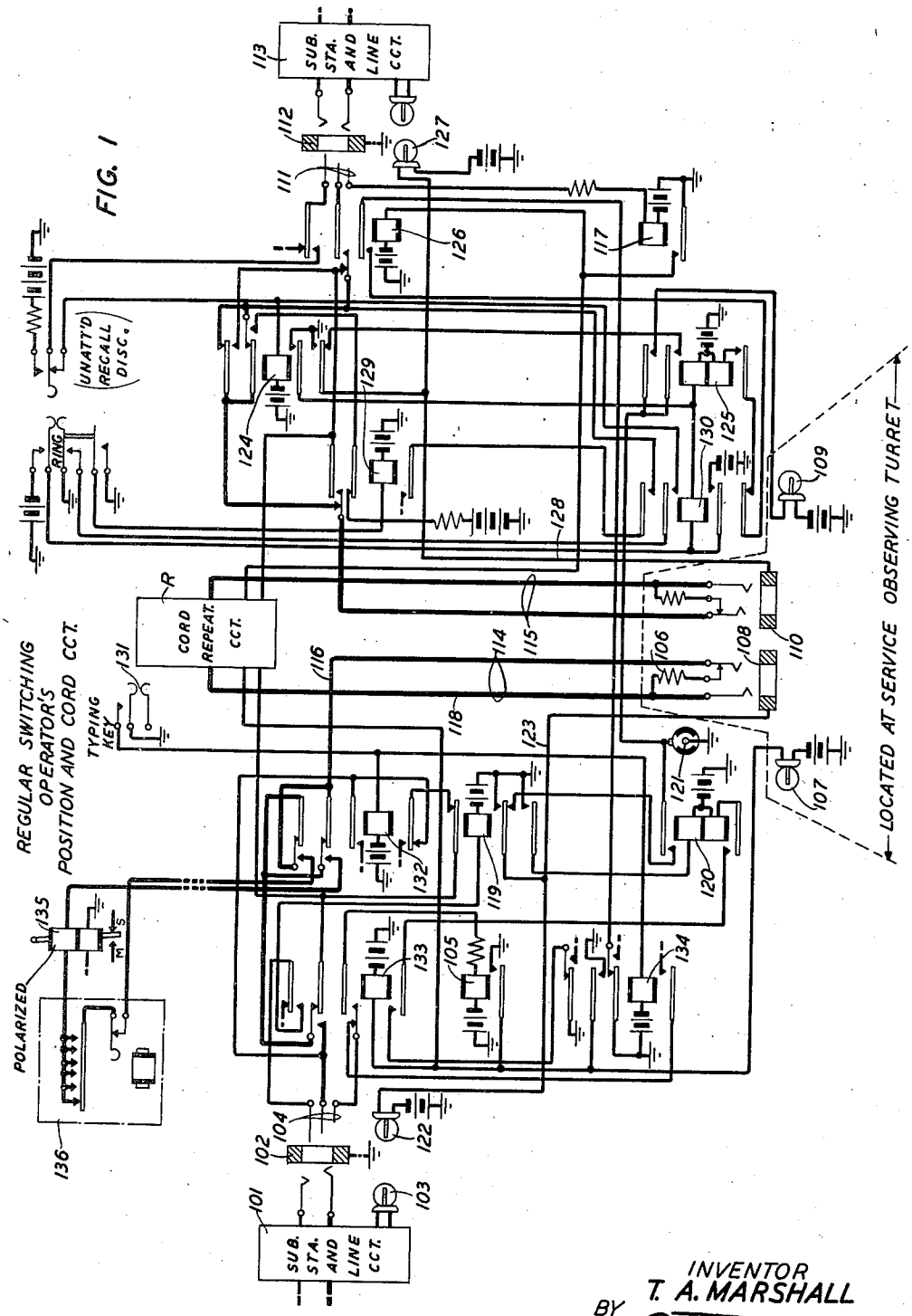
July 22, 1947. T. A. MARSHALL 2,424,244

CIRCUIT FOR LOCKING SERVICE-OBSERVING TELETYPEWRITER DURING SUPERVISORY SIGNAL RECEPTION

Filed Oct. 5, 1945 2 Sheets-Sheet 1

FIG. 1



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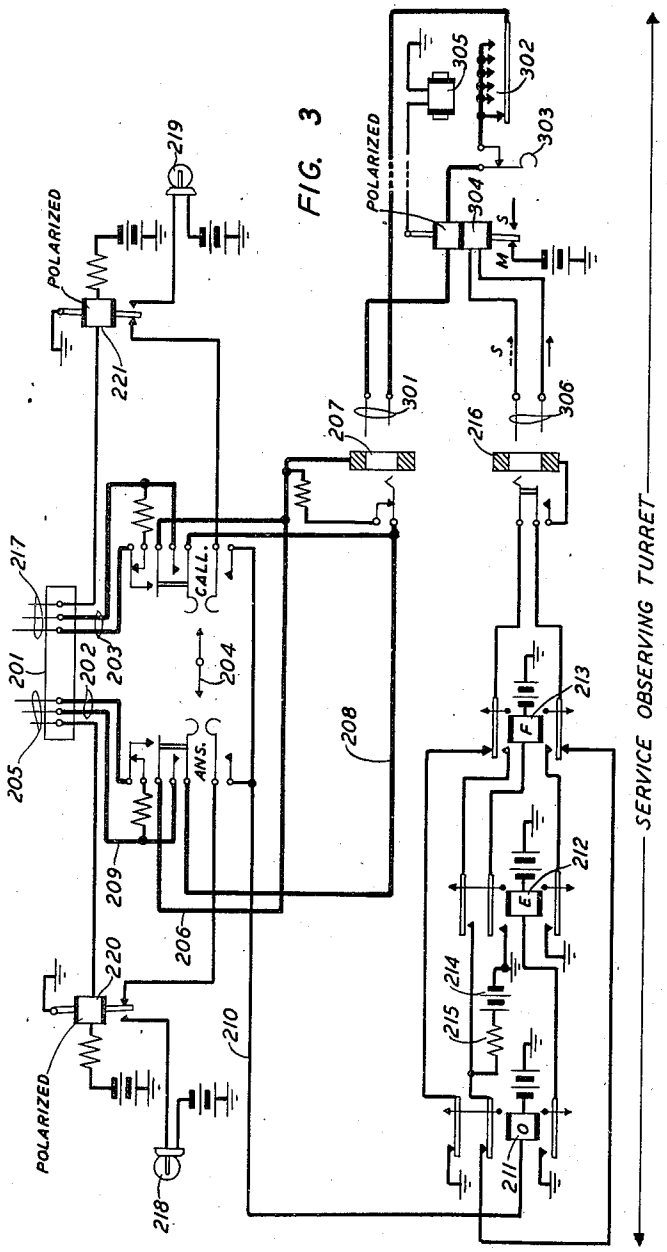


FIG. 3

FIG. 2

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Patented July 22, 1947

2,424,244

UNITED STATES PATENT OFFICE

2,424,244

CIRCUIT FOR LOCKING SERVICE OBSERVING TELETYPEWRITER DURING SUPERVISORY SIGNAL RECEPTION

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Application October 5, 1945, Serial No. 620,607

6 Claims. (Cl. 178—74)

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This invention relates to teletypewriter switching systems and particularly to service observing circuits used in connecton with cord circuits in switching operators' positions at manually operated teletypewriter switchboards.

It is old in the teletypewriter exchange systems art to provide means for flexibly inserting a teletypewriter for monitoring purposes in the communication lead of a subscriber line circuit or a repeater cord circuit at a regular switching operator's position. One such monitoring circuit is utilized for service observing, which is preferably performed in a separate room out of sight and hearing of the regular switch operators. The service observing circuit is equipped with means capable of recording the messages corresponding to the communication signals transmitted over a line or a trunk and for producing supervisory signals indicating the status of the call over the circuit connection established for communication purposes. The service observing circuit provides an indication of whether or not the cord circuit supervisory signals are functioning properly and furnishes also a check on the manner in which a call is handled by a regular switchboard operator. This is invaluable in the training of operators and in maintaining a high standard of service.

In a service observing room where there may be several teletypewriters operating simultaneously, considerable noise is created by the whirling of the transmitting, or selector, cam shafts of the several teletypewriters. A considerable amount of this whirling is what is known in the art as free whirling, or spinning, and should be prevented, thereby reducing the noise to a minimum. This free whirling of a cam shaft occurs when the observer's teletypewriter is operatively connected through a switching operator's cord circuit to a subscriber's line circuit during (1) the idle periods, that is, when the observer's teletypewriter is usable but not operating and neither message signals nor the normal rest signal are on the line or the cord circuit, (2) the transmission of a recall signal and (3) the transmission of a disconnect signal, which is a continuous space, or open condition, on the line circuit. At certain times, as, for example, when a subscriber who has a standing order to receive information regarding the duration and cost of all outgoing calls disconnects at the completion of any such call, the regular switching operator, who computes and supplies the information, generally has the typing or printer key of the cord circuit released but the cord circuit remains connected to the line during the calculation of the time and charge. The switching operator's teletypewriter may or may not continue to receive the continuous disconnect signal depending on whether or not the typing key of the cord circuit

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is maintained in an operated position for the duration of the continuous disconnect signal. However, should the teletypewriter at the service observing position be in connection with the switching operator's cord circuit at the time a continuous disconnect signal is received and it is desired to retain the service observing teletypewriter in such connection until the cost information is furnished to the subscriber, the service observing teletypewriter would receive the continuous disconnect signal and its selector cam shaft would continue to spin for the duration of the disconnect signal, which in some cases might be for several minutes, the time required by the switching operator to compute the necessary charges for the subscriber. Then, again, in response to a recall signal received from the subscriber's line over the cord circuit, the line circuit may be held open for a considerable time, say as long as seven seconds in accordance with the usual practice employed on toll lines as described in Lane et al. Patent 1,979,273, dated November 6, 1934, and in this event the selector cam shaft of the service observing teletypewriter would spin until the typing key of the switching operator's cord circuit connected to the toll line, is operated to connect the switching operator's teletypewriter to the cord circuit and therefore to the line circuit for communication purposes.

An object of the present invention is to reduce operational noise in a service observing room by preventing, when open line signals of long duration such as employed for giving an indication for recalling the operator or disconnecting are on a subscriber's line, the free whirling of the selector cam shaft of a service observing teletypewriter which at the time is operatively connected through a switching operator's cord circuit to the subscriber's line.

This object more specifically stated is to electrically maintain, or lock, the printer selector magnet of a service observing teletypewriter in an operated position during the time that a long recall signal or a continuous disconnect signal is on the subscriber's line to which the teletypewriter is connected through a switching operator's cord circuit.

Another object is to control the locking means of the printer selector magnet of a service observing teletypewriter by supervisory signals received over a subscriber's line, thereby avoiding the use of message signals for such a purpose.

Heretofore in teletypewriter switching systems using manually operated switchboards only, the teletypewriter sets at the regular switching operators' positions and the supervisor's desk were equipped with anti-spin means for locking the teletypewriter against free whirling of the selector cam shafts. Some of these anti-spin means are arranged to lock mechanically as disclosed in

Burcky et al. Patent 1,947,694, dated February 20, 1934 and Reiber et al. Patent 2,021,383, dated November 19, 1935, whereas others are of the electrically locking type such as disclosed in Locke et al. Patent 2,237,154, dated April 1, 1941, and Large Patent 2,222,672, dated November 26, 1940. In the Locke et al. patent the supervisor's teletypewriter, as well as the switching operator's teletypewriter, is provided with anti-spin means, the operating circuits of the teletypewriters being shown, in schematic form, in Figs. 3 and 5, respectively. In the Locke et al. system the supervisor's teletypewriter, when connected to a switching operator's cord circuit, is connected in series with the switching operator's teletypewriter and both teletypewriters depend, for their operativeness, on whether or not the typing key (key 196 for the cord circuit shown in Fig. 2 of Locke et al. Patent 2,237,154, supra) of the particular cord circuit selected for connection to a subscriber's line, is operated. In other words, in order to operate a supervisor's teletypewriter through a switching operator's cord circuit the typing key of the selected switching operator's cord circuit must be in an operated position, and therefore, it can be said that the printer selector magnet of the supervisor's teletypewriter is controlled by means of the typing key of the switching operator's teletypewriter. However, the same should not be true of the printer selector magnet of the service observing teletypewriter, because the latter would be connected in the switching operator's cord circuit at a point which is independent of the position to which the cord circuit typing key is operated. The fact that the location of the service observing teletypewriter is independent of the location of the cord circuit typing key, is made necessary in order that the service observing teletypewriter may be operatively connected in the cord circuit at times when the cord circuit typing key is restored to normal, but the answering plug of the cord circuit is still connected to the subscriber's line as when the subscriber sends a disconnect signal and is awaiting information as to the amount of service charge assessed for a completed call. In both the Locke et al. and the Large systems the electrically locking anti-spin means are under the joint control of the message signals and a biasing current of a fixed value. The locking means in both systems employ a line relay having a line winding for receiving message signals and a biasing winding for receiving a current of fixed value from a local source, the current, when present, in the line winding being of sufficient value to dominate that in the biasing winding. In both systems the printer selector magnets of the teletypwriters when operatively connected to the line are locked in a operated position during (1) the idle periods, (2) the transmission of a recall signal and (3) the transmission of a disconnect signal, but this locking control is had solely by the message signal current in the line circuit.

According to the present invention electrically locking anti-spin means are provided for a service observing teletypewriter in a teletypewriter exchange system wherein the service observing teletypewriter is connected in a switching operator's cord circuit, in series, with the switching operator's teletypewriter, but independent of the location of the typing key provided to connect the cord circuit to the switching operator's teletypewriter. The printer selector magnet of the service observing teletypewriter, like that of a switching operator's or a supervisor's teletypewriter, is controlled by a line relay having a line winding for receiving the message signals and a biasing winding, the current in the latter winding being of such value as to control the relay only at such times when no current is present in the line winding. However, the biasing current in the line relay controlling the printer selector magnet of the service observer's teletypewriter is not of a fixed value and is controlled by a local source of supervisory signals. The anti-spin means of the present invention comprise a chain of three slow-release relays which is arranged to utilize such source of supervisory signals. This source of supervisory signals which is located in the switching operator's cord circuit, is applied under five different conditions, namely, (1) when the chain relays are in normal positions, that is, released, as prior to operating the typing key of the service observing operator's cord circuit to either an answering or calling position, and no current is present in the line winding of the line relay; the chain relays closing a circuit extending through the biasing winding to permit a biasing current to flow in such a direction as to operate the line relay to its "marking" position thereby operating the printer selector magnet of the teletypewriter, (the release of the printer selector magnet would cause the teletypewriter cam shaft to spin); (2) when the typing key of the service observing operator's cord circuit is operated to its answering or calling position the chain relays operate to close a biasing circuit wherein the biasing current flow reverses as to tend to operate the line relay to its "spacing" position, but the current in the line holds operated the printer selector magnet; (3) when a recall signal is received over a short line circuit extending from a subscriber station known in the art as a local subscriber station, by momentarily opening the line circuit at the subscriber station, one or two, but not three, of the chain relays release, but by this time the line circuit is again closed after the momentary opening, to hold the printer selector magnet operated for the duration of the recall signal which at the switching operator's switchboard causes to be connected to the cord circuit a source of alternating current for effecting a flashing of the supervisory lamp in the cord circuit at the switching operator's position and the supervisory lamp in the cord circuit at the service observing operator's turret, (4) when the recall signal is received over a long repeatered line circuit extending from a subscriber station known in the art as a toll line subscriber station, by opening the line circuit at the subscriber station through operating a key which is automatically held open for a period of seven seconds, the three relays operate in sequence whereby the flow of line relay biasing current is reversed in its direction to hold the printer selector magnet operated before the supervisory lamps begin to flash, at which time the line circuit is automatically closed, and (5) when a disconnect is received over the line circuit by restoring to normal the subscriber station loop circuit a steady ground is maintained connected to the line circuit to cause a steady light in the supervisory lamp of the switching operator's cord circuit and the supervisory lamp in the service observing operator's turret, and the three relays release to close the line relay biasing circuit wherein the direction of current is such as to operate the line relay to its "marking" position and therefore the printer selector magnet is main-

tained operated until the switching operator removes the cord circuit from the line circuit.

A feature of the invention is the provision in the service observing operator's cord circuit, of three relays of the slow-to-release type arranged under the control of supervisory signals for electrically locking the printer selector magnet of a teletypewriter in a mark, or operated, position.

Another feature is the provision of a line relay having windings in the communication and the biasing circuits, respectively, for controlling the printer selector magnet of a service observer's teletypewriter, the current flowing in the communication, or line, winding being of a value sufficiently high to dominate that flowing in the biasing winding. The current in the biasing winding is subject to reversals in direction depending upon the various stages through which a call over the transmission line or trunk proceeds. This biasing current is arranged (1) under normal conditions, that is when the service observing teletypewriter is not connected to the answering or the calling end of any cord circuit at a regular switching operator's position, to flow in a marking direction, whereby the armature of the relay is held in the marking position and the printer magnet of the service observing teletypewriter is accordingly held operated to prevent free whirling of the printer selector cam shaft; (2) during the receipt of message signals for monitoring purposes, to flow in a spacing direction, whereby the relay is operated to its spacing position in response to spacing pulses in the incoming message signals; (3) upon the receipt of a recall signal from a short subscriber line as registered in the switching operator's cord circuit, to flow in a spacing direction, thereby tending to operate the relay to its spacing position, but the sudden reclosure of the line holds the relay in its marking position, although the registration has caused an interrupter circuit to be applied to the sleeve conductor of the service observing operator's cord until the typing key of the switching operator's cord circuit is operated; (4) upon the receipt of a recall signal from a subscriber toll line, which holds the line circuit open for seven seconds, to flow in a marking direction for the duration of the opening, but when the line recloses the line current resumes flowing, although the flashing of the supervisory lamps continues until the typing key of the switching operator's cord circuit is operated; and (5) upon the receipt of a disconnect signal to flow in a marking direction whereby the relay operates to its marking position and is maintained in such position until the particular cord at the regular switching operator's position is removed from the line, at which time the biasing current will continue to flow in its marking direction to hold the relay in its marking position as hereinbefore stated.

Another feature is the provision of means controlled by three relays of the slow-to-release type for effecting the reversals in the direction of the biasing current in the relay of the service observing operator's teletypewriter.

Another feature is the provision of switching means for connecting the service observing teletypewriter to either the answering or the calling end of any one of the cord circuits at a switching operator's position whereby the reversals in the direction of the biasing current in the line relay in the teletypewriter circuit may be effected when monitoring either end of a cord circuit.

The invention will be more readily understood

from the following description when read in connection with the accompanying drawing of which:

Fig. 1 shows a cord circuit of a switching operator's position at a subscriber switchboard, the cord circuit being provided with a termination at a service observing operator's position at a monitor board in another room from that of the switching operators;

Fig. 2 shows a cord circuit at the service observing operator's position at the monitor board with provision for inserting a teletypewriter set circuit; and

Fig. 3 shows the service observing teletypewriter set circuit arranged for connection to the service observing operator's cord circuit.

In arranging the service observing circuit herein to connect to a cord circuit instead of to the subscriber line circuit, a number of advantages are afforded and these advantages are set forth in Large et al. Patent 2,233,056, dated February 25, 1941.

In Fig. 1, the cord circuit is shown in skeletonized form and for a detail showing, reference may be had to Figs. 3 and 4 of Large Patent 2,222,672, dated November 26, 1940. The cord circuit is arranged at either end for connection to a subscriber line circuit such as shown in Fig. 1 of Kinkead et al. Patent 2,024,581, dated December 17, 1935. The cord circuit has in addition to its terminations at the answering and the calling plug, service observing jacks whereby a service observing operator's cord circuit may be connected thereto.

In Fig. 2 the cord circuit at the service observing operator's position is shown in schematic form and includes supervisory lamps, a three-way switch whereby service observations may be made as desired on communications incoming at either end of the switching operator's cord circuit to which it is connected at the time, and three slow-to-release relays arranged to be controlled by the three-way switch.

In Fig. 3 the service observing operator's teletypewriter circuit is shown in schematic form and includes a differentially wound line relay for controlling the operation of the printer selector magnet, and a double plug arrangement, the two plugs serving to energize the primary, or line, and the secondary, or biasing, windings, respectively, of the relay. Among other elements included in the teletypewriter circuit, there are provided, but not shown, local operating circuits for the driving motor which is assumed herein to be continuously operated.

For the purpose of illustration it will be assumed that answering jack 102 and calling jack 112, respectively, terminate subscriber line circuits 101 and 113 at a regular switching operator's position at a subscriber's switchboard. The cord circuit shown in Fig. 1 is arranged to answer a call incoming over jack 102 and to complete the call over jack 112, although a call may be established in the opposite direction. Connected intermediate answering plug 104 and the repeater relays represented diagrammatically by block R are the service observing operator's position circuit jack 108 and its associated supervisory lamp 107, and intermediate calling plug 111 and the repeater relays are service observing operator's position circuit jack 110 and its associated supervisory lamp 109. When answering plug 104 and calling plug 111 are connected to their respectively associated jacks 102 and 112, the cord circuit is arranged to repeat message signals be-

tween the interconnected subscriber lines. A service observing teletypewriter may at any time during the intercommunication, be connected to the established connection to monitor the signals incoming from either of the subscriber lines as shown and described in the Large et al. Patent 2,233,056, supra, the line selected depending on the direction in which the three-way switch 204 is operated. When switch 204 is operated to its answering, or left-hand, side the service observing teletypewriter set is connected for making observations on the line terminating in jack 102 and when the switch is operated to its calling, or right-hand, side, observations may be made on the line connected to jack 112. Supervisory lamps 107 and 109 remain lighted during the time that plugs 104 and 111 are respectively inserted in jacks 102 and 112 for establishing a connection and are extinguished only when the plugs are removed. When plugs 205 and 217 are connected to jacks 108 and 110, respectively, supervisory lamps 218 and 219, associated with the service observing operator's cord circuit, are extinguished during transmission of message signals but register all supervisory signals such as flashing when a recall signal is received over either of their respectively associated plugs 215 and 217, and remaining energized, or lighted, when a disconnect signal is received. In response to a disconnect signal received over plug 205 or 217, lamp 218 or 219 depending on the end of cord circuit receiving the disconnect signal, is lighted steadily until the established connection is broken.

When the teletypewriter circuit shown in Fig. 3 is connected to the service observing operator's cord circuit and the motor start switch (not shown) is operated, the lower winding of line relay 304 becomes energized in a direction that will hold the relay in its marking, or left-hand, position, the circuit being traceable from grounded positive battery 214, resistance 215, inner upper armature and contact of relay 211, back contact and lower armature of relay 213, contact spring and sleeve conductor of jack 216, sleeve conductor of plug 306, through the biasing, or lower winding of relay 304, tip conductor of plug 306 and jack 216, upper armature and back contact of relay 213, outer upper armature and contact of relay 211, to ground, and the relay 304 in its marking position maintains printer selector magnet 305 operated so that the teletypewriter selecter cam shaft is prevented from whirling, or spinning, when the teletypewriter is idle. When answering plug 104 is connected to answering jack 102 and calling plug 111 is connected to calling jack 112 and the plugs 205 and 217 are respectively connected to jacks 108 and 119, the circuit just traced remains unchanged. However, should switch 204 be operated to either its answering or its calling side, a circuit is closed at one of its lowermost normally open contacts for operating relay 211 to effect, in sequence, the operation of relays 212 and 213. Relays 211, 212 and 213, upon operating, close a circuit traceable from grounded positive battery 214, resistance 215, contact and outer upper armature of relay 212, front contact and upper armature of relay 213, tip spring of jack 216 and plug 306, through the lower winding of relay 304, through the conductor of plug 306, sleeve conductor and spring contact of jack 216, lower armature and front contact of relay 213 to ground at the lower armature and contact of relay 212, and the current flowing in the lower winding of relay 304 is thereby reversed tending to operate relay 304 to its spacing, or right-hand, position. Relay 304, however, remains at this time in its marking, or left-hand, position due to a dominating current flowing in its line, or upper, winding over a circuit traceable from grounded negative battery (not shown) in the subscriber line circuit to a grounded positive battery (not shown) in the repeater of the switching operator's cord circuit. The line circuit is traceable over a path determined by the direction in which switch 204 is operated, for example, should it be assumed that switch 204 is in its answering, or left-hand, position, then the line circuit would be traceable from grounded negative battery shown in Fig. 1 of the Krecek Patent 2,024,581, supra, through the subscriber's station to the ring conductors of jack 102 and plug 104, conductor 116, tip conductors of jack 108 and plug 205, the uppermost normally open contacts at the left side of switch 204, conductor 206, sleeve conductors of jack 207 and plug 301, through the upper, or line, winding of relay 304, break key 303, transmitting contacts 302, tip conductors of plug 301 and jack 207, conductor 208, middle normally open contacts at the left side of switch 204, conductor 209, ring conductors of plug 205 and jack 108, conductor 118, through the upper winding of repeater relay 311 (not shown), to grounded positive battery at the marking contact and armature of repeater relay 312 (not shown). The repeater relays 311 and 312 are shown in Fig. 3 of Large Patent 2,222,672, supra. During the transmission of message signals, relay 304 responds to such signals to effect the operation of printer magnet 305 whereby a record is made at the service observing operator's teletypewriter of the messages, incoming or outgoing, depending upon the position to which switch 204 is operated.

Recall signals

To describe the circuits involved in sending recall signals reference is made to Large Patent 2,222,672, supra, page 6, line 70, second column. When a recall signal is transmitted from either of two interconnected subscriber stations, such as when the subscriber operates a local non-locking flash, or recall, key, ground at the subscriber station is momentarily connected to the tip conductor of answering plug 104 or calling plug 111 depending upon which one of the interconnected subscriber stations is involved in sending the recall signal. Typing key 131 is shown in its normal position.

Should it be assumed that a recall signal is received from the line connected to jack 102, ground is connected to the tip conductor of answering plug 104, and relay 119 would operate. Relay 119, upon operating, operates relay 120. Relay 120 locks in its operated position and prepares a circuit which closes when relay 119 releases at the time the recall key at the subscriber's station restores itself to normal, the circuit being traceable from ground, through sixty impulse per minute interrupter 121, the upper armature and contact of relay 120, back contact and inner lower armature of relay 119, then over parallel paths, one through the filament of supervisory lamp 122, to grounded battery and the other over conductor 123, sleeve conductor of jack 108 and plug 205, through the winding of relay 220, to grounded battery. Relay 220 is normally biased in the position shown but in response to the current in the interrupting circuit including interrupter 121

operates to flash supervisory lamp 218. The service observing operator responds by operating switch 204 to its left-hand position, if the switch is not already in this position when lamp 218 flashes. Lamp 122 likewise flashes simultaneously so that both the switching operator and the service observing operator are informed that a recall signal is being transmitted from the subscriber station associated with answering jack 102. The regular switching operator also responds by operating typing key 131 to connect a teletypewriter 136 to the regular switching cord circuit. Relays 119 and 120 respectively, corresponding to relays 306 and 307 shown in Fig. 3 of Large Patent 2,222,672, supra, wherein their respective operating circuits are shown and described in detail. Typing key 308 also shown in Fig. 3 of Large Patent 2,222,672 is representative of the typing key 131 used, in the present specification. Relay 220, upon operating, to its left-hand contact for each interval of current flowing through interrupter 121, remains operated for each interval of current which is of a sufficient duration to probably effect the release of slow-release relay 211, and possibly slow-release relay 212, but not slow-release relay 213. Therefore the biasing current in the circuit hereinbefore traced continues to flow in such a direction as to tend to operate relay 304 to its spacing position. However, the tip conductor of answer plug 104, by the release of the subscriber's recall key, has been restored to close the communication, or line, circuit, and relay 304 is now in its marking, or left-hand position under the domination of line current in its upper winding. Thus the selector cam shaft of the service observing teletypewriter is prevented from spinning in response to a recall signal. Relay 304 during the recurrent operations of relay 220 is in a condition to follow message signals in the line circuit whereby the service observing operator is permitted to observe what is taking place between the subscriber and the regular switching operator. Relays 105, 132, 133, 134 and 135 respectively, correspond to relays 304, 306, 303, 305 and 419 of Large Patent 2,222,672, supra.

Should it be assumed that ground is connected to the tip conductor of calling plug 111, relays 124 and 125, respectively, would operate, in sequence, in a manner similar to that of relays 317 and 318 shown in Fig. 3 of Large Patent 2,222,672, supra. Interrupted current through interrupter 121 would be effective to cause lamps 127 and 219 to flash in response to the recall signal received over the subscriber line terminated in jack 112. The service observing operator operates switch 204 to its right-hand position if it is not already in this position when lamp 219 flashes. Relay 221, upon operating to its right-hand contact for each interval of current flowing through interrupter 121, remains operated for each interval of current which is of a sufficient duration to probably effect the release of slow-release relay 211, and possibly slow-release relay 212, but not slow-release relay 213, assuming, of course, that switch 204 was operated to its right-hand position. The biasing current in the circuit established by relays 212 and 213 in their operated positions providing that relay 212 did not release in response to the recall signal, tends to operate relay 304 to its spacing position. However, inasmuch as the tip conductor of plug 111 has been restored to close the communication, or line, circuit by the release of recall key at the subscriber's station connected to jack 112, this biasing current is at this time without effect, because relay 304 during the recurrent operations of relay 221 remains in its marking, or left-hand, position as hereinbefore described when the recurrent operations of relay 220 were taking place, and the selector cam shaft of the service observing teletypewriter cannot spin in response to a recall signal received over plug 111. Relays 117, 126, 129 and 130, respectively, correspond to relays 320, 319, 315 and 316 of Large Patent 2,222,672, supra.

Should the recall signal be received over a subscriber toll line circuit wherein a repeater is employed, the line would be automatically held open for seven seconds as described in Lane et al. Patent 1,979,273, supra, and during this comparatively long interim slow-release relays 211, 212 and 213 would release to close the normal circuit for biasing line relay 304. The current in the normal biasing circuit flows in such a direction as to operate relay 304 to its marking position whereby printer selector magnet 305 is locked in its operated position. At the termination of the seven seconds interval the source of alternating current at the switching operator's switchboard is connected to the cord circuit for flashing the supervisory lamps in both the switching operator's cord circuit and the service observing operator's cord circuit, and the line circuit automatically closes. From this point on the operational procedure of the cord circuits is the same as that hereinbefore described in connection with a recall signal received over a short subscriber line circuit.

Disconnect signals

To describe the circuits involved in sending disconnect signals, reference is again made to Large Patent 2,222,672, supra.

When a disconnect signal is transmitted from either of the interconnected stations, a permanent, instead of a momentary, ground is connected to the tip conductor of the jack terminating the line over which the disconnect signal is received.

Assume that the permanent ground is received over the tip conductor of answering jack 102, relay 119 operates and remains operated to close a circuit from ground at the armature and contact of relay 119, then over parallel paths, one extending through the filament of supervisory lamp 122, to grounded battery and the other extending over conductor 123, sleeve conductors of jack 108 and plug 205, through the winding of relay 220, to grounded battery. Lamp 122 remains lighted as long as answering plug 104 remains connected to answering jack 102. Relay 220 operates to its left-hand position to light supervisory lamp 218. Switch 204 is operated to its left-hand position, if it is not already in this position at the time lamp 218 becomes lighted. Relay 220, upon operating to and remaining in its left-hand position, permits all the slow-to-release relays 211, 212 and 213 to release thereby closing a circuit hereinbefore traced, to reverse the current in the biasing, or lower, winding of relay 304. Inasmuch as the line circuit is now open no current flows in the line, or upper, winding of relay 304, and ordinarily the relay would operate to its spacing, or right position, but the biasing current in the lower winding of the relay has now been reversed by the release of relays 211, 212 and 213 and relay 304 therefore remains in its marking, or left-hand, position. Thus, the printer magnet 305 is locked in its operated position for the duration of the disconnect signal or as long as the plug 104

remains in connection with answering jack 102, and the service observing teletypewriter is not free to whirl or spin.

A disconnect signal received over the line terminating in calling jack 122 causes a permanent instead of a momentary ground to be connected to the tip conductor of jack 112 whereby relay 124 becomes operated and remains operated to connect ground at its upper armature and front contact to a circuit having parallel paths, one extending through the supervisory lamp 127, to grounded battery and the other extending over conductor 128, sleeve conductor of jack 110 and plug 217, through the winding of relay 221, to grounded battery. Lamp 127 remains lighted as long as plug 111 is connected to calling jack 112. Relay 221 operates to its right-hand position to light lamp 219 and the relay remains operated to maintain the lamp lighted. The operation of relay 221 to its right-hand position permits the release of slow-release relays 211, 212 and 213 as hereinbefore described, providing switch 204 is operated to its right-hand position at the time. Thus the printer magnet 305 is maintained in its operated position to prevent free whirling, or spinning of the selector cam shaft of the service observing teletypewriter.

What is claimed is:

1. A printing telegraph system comprising a signal transmitting and receiving means at the termini thereof, a plurality of channels, a cord circuit including a typing key for interconnecting said channels, a transmitting and receiving means connected to said cord circuit by means of said typing key for communication with one or more of said means at the termini, a second cord circuit arranged for connection with the first-mentioned cord circuit at a point independent of the control effected by said typing key and including a transmitting and receiving device, and current reversing means responsive to a prolonged signal received from any one of said channels for electrically locking said device in a non-operative condition during the time that said signal is being received from said one interconnected channel.

2. In a printing telegraph system, a plurality of channels, a link circuit for interconnecting said channels, telegraphic communication means, switching means for connecting said communication means to said link circuit for communication between said interconnected channels, a printing device, a cord circuit for connecting said printing device to said link circuit, a source of supervisory signals with means for connecting said source to said link circuit and said cord circuit in response to a prolonged signal received from either of said interconnected channels, slow-acting means responsive to supervisory signals from said source for electrically locking said device in a non-operative condition when said link circuit and said cord circuit are in connection with any one of said interconnected channels over which said prolonged signal is received.

3. In a teletypewriter switching system, a plurality of telegraph circuits, a cord circuit for interconnecting said circuits, teletypewriting means, switching means for connecting said teletypewriting means to said cord circuit for communication over said interconnected circuits, a teletypewriter and an operating relay therefor, a second cord circuit with means for connecting said teletypewriter to the first-mentioned cord circuit, a source of supervisory signals with means for automatically connecting said source to both of said cord circuits in response to a prolonged signal received from either of said interconnected circuits, and slow-acting means responsive to supervisory signals from said source for reversing the current in the winding of said relay to electrically lock said teletypewriter in a non-operative condition.

4. In a teletypewriter switching system, a plurality of line circuits, a cord circuit with means for interconnecting said circuits, said cord circuit including a teletypewriter and a two-position switch for connecting said teletypewriter for communication purposes over said interconnected circuits, a source of supervisory signals with means for connecting said source to said cord circuit in response to a prolonged signal received over any one of said interconnected circuits, a second teletypewriter with means for connecting said second teletypewriter to said cord circuit independent of the control effected by said two-position switch, a relay for controlling the operation of said second teletypewriter, and current reversing means for controlling said relay in response to supervisory signals from said source for electrically maintaining said second teletypewriter in a non-operative condition for the duration of the prolonged signal.

5. In a teletypewriter switching system, a plurality of line circuits, a teletypewriter cord circuit for interconnecting said line circuits, a source of supervisory signals with means for connecting said source to said cord circuit in response to a prolonged signal received over any one of said interconnected line circuits, a service observing cord circuit, a teletypewriter included in said service observing cord circuit, a relay comprising a line winding and a biasing winding for controlling the operation of said teletypewriter, and current reversing means connected to the biasing winding of said relay comprising a plurality of slow-acting relays adapted to respond to the supervisory signals from said source for electrically holding said relay and the printer magnet of said teletypewriter in an operated, or marking, position for the duration of the prolonged signal.

6. In a teletypewriter switching system, a plurality of communication channels, a teletypewriter link circuit for interconnecting said channels, a source of supervisory signals with means for connecting said source to said link circuit in response to a prolonged signal received over any one of said interconnected channels, a teletypewriter service observing circuit including a teletypewriter and a control relay means for connecting said service observing circuit to said link circuit for communication over said channels, and electrically operated locking means responsive to the supervisory signals from said source for making said teletypewriter non-operative, said locking means comprising a source of biasing current for said relay and a slow-acting device for reversing the current from said source of biasing current while said prolonged signal is being received.

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