

Aug. 2, 1966

P. J. COHEN ET AL

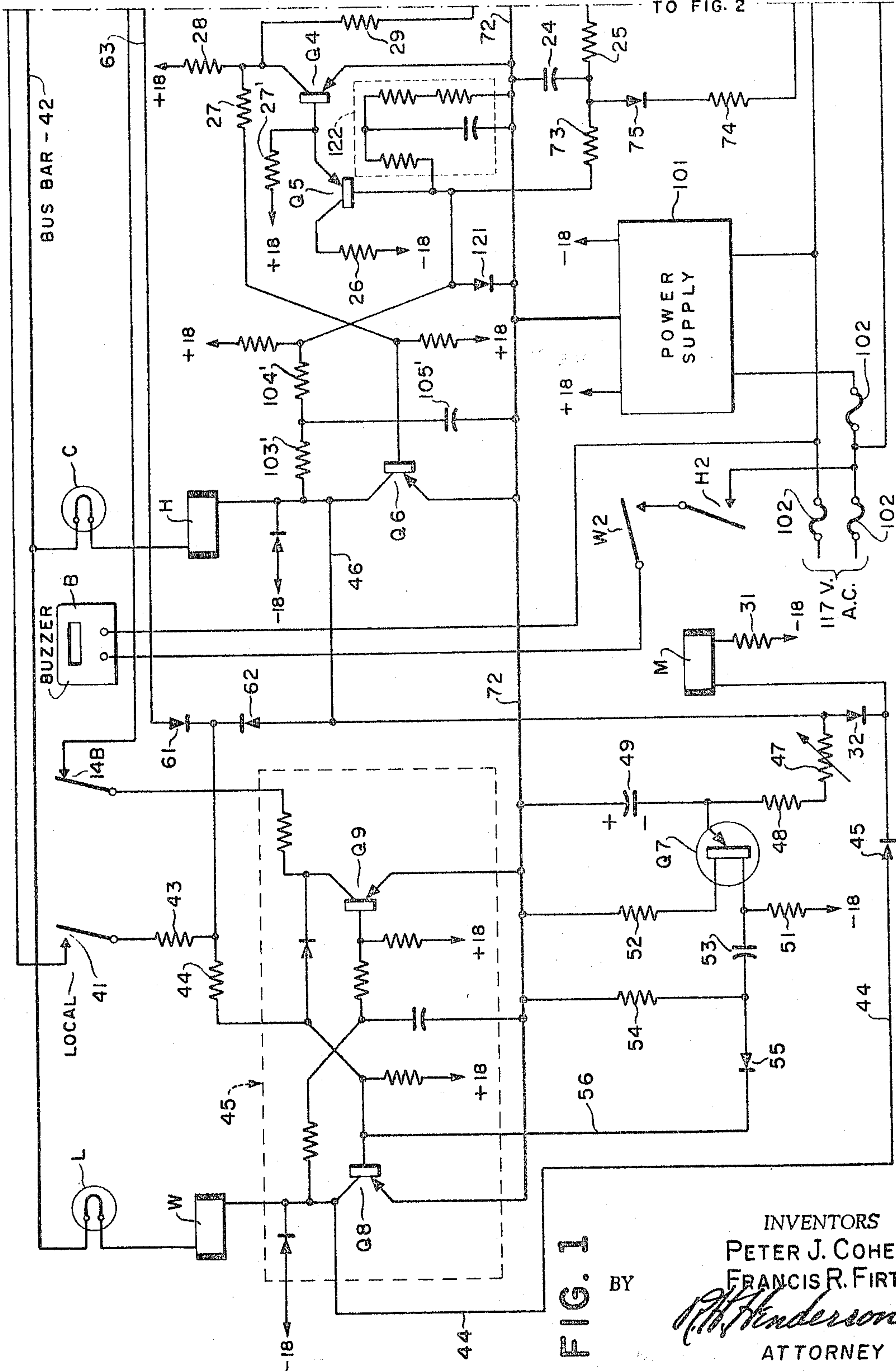
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TELEPRINTER CONTROL DEVICE

Filed May 4, 1962

2 Sheets-Sheet 1

TO FIG. 2



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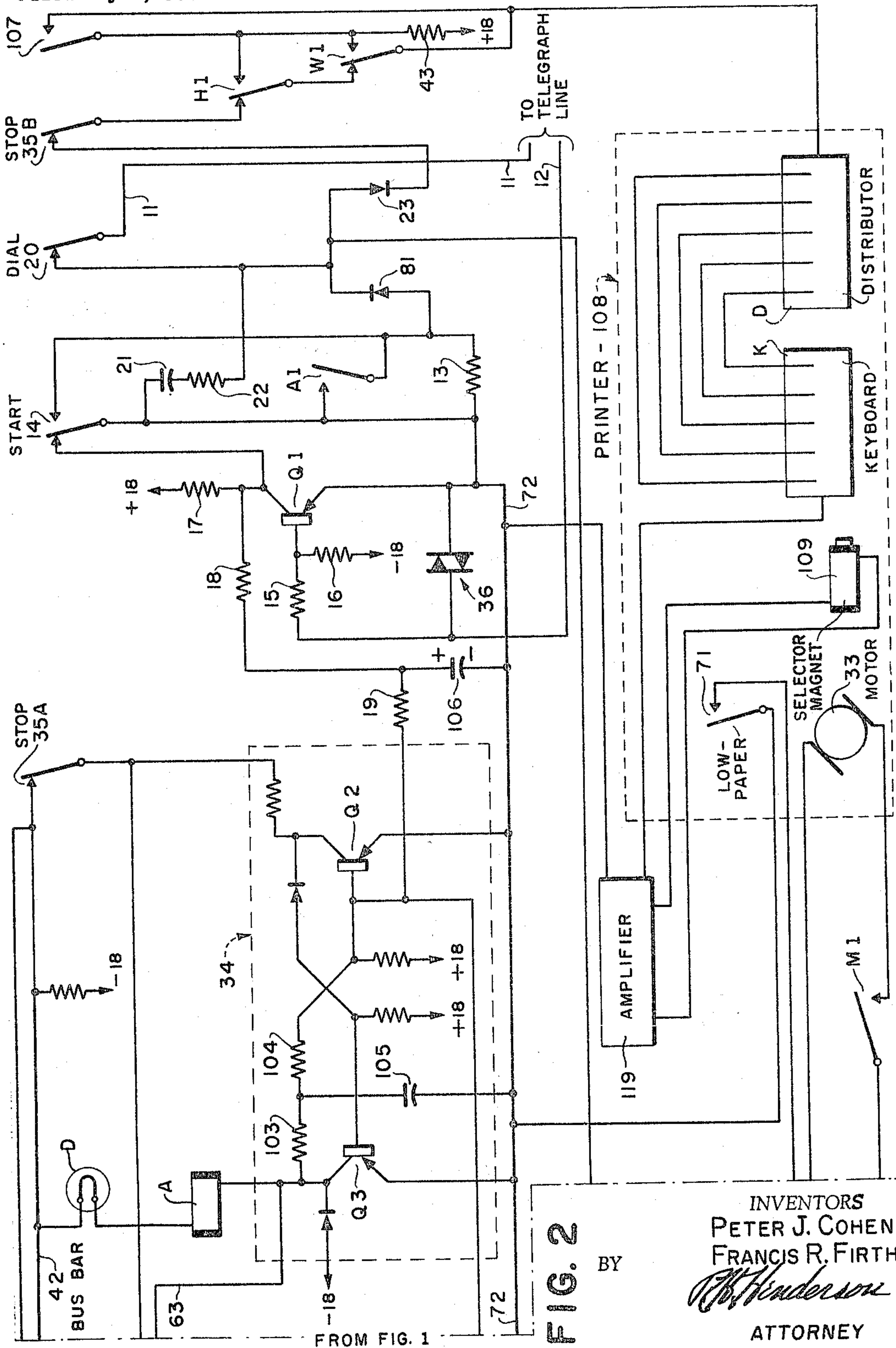
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2 Sheets-Sheet 2



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TELEPRINTER CONTROL DEVICE

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This invention relates to the printing telegraph, and more particularly to a novel unit for the remote control of a telegraph printer.

In telegraph systems where line switching rather than message switching is employed, as in the case, for example, where business establishments originating a relatively heavy volume of traffic are provided with a message printer and facilities for the direct dialing of all other subscribers in the system, it becomes desirable to provide means for the remote operation of the printers.

Thus, it is necessary for the receiving station to recognize an incoming call, to turn on the locally-energized motor of the printer, to provide assurance that it is in receptive condition, and to provide a number of functions, later to be described, without assistance from an operator.

This has formerly been accomplished by means of a variety of control systems employing numerous relays, and especially polarized relays of relatively complex and expensive construction which, however, were never called upon to perform the usual office of a telegraphic polar relay in actual message transmission, and, in fact, were utilized to only a minute fraction of their capabilities.

Since relays, in general, comprise a source of considerable initial and maintenance expense, it is desirable to minimize their utilization in customer equipment provided that their function can be retained, or, as in the instant equipment, enlarged. Inherent limitations in size, weight, sensitivity, mounting position and environmental conditions, such as vibration, also can be circumvented thereby.

In part by the application of a floating ground or power supply center-tap potential which has no fixed relationship to the potential of the earth ground, and in part by the unique circuitry of the instant device which is constructed to take practical advantage of the foregoing concept, the instant invention is enabled to effectuate such advantage.

It is an object of the present invention to provide a remote control unit for the printing telegraph which accomplishes automatic on-line reception of messages without prejudice to other functions of the receiving equipment.

It is a further object of the invention to provide such a unit which facilitates off-line operation of a telegraph printer without danger of losing on-line messages.

It is another object of the invention to provide such a unit having improved compactness and reliability by reason of a great reduction in the number of mechanical operating parts.

Still another object of the invention is to provide such a unit having the capacity to recognize polar switching signals without the use of a polar relay.

It is an additional object of the invention to provide such a unit wherein a full repertoire of functions is provided at a lesser cost than in prior devices.

It is a still further object of the invention to provide such a unit wherein requirements for routine maintenance and adjustment are minimized.

Another object of the invention is to provide such a unit adaptable to unitary integration into a compact dial, control and page-printer package.

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General operation

It is the function of the instant device to provide for the automatic operation of a local telegraph printer, together with certain necessary manual operations involved in its use, in the following manner.

During idle periods of the telegraph line the Central Office provides a potential of 240 volts to the local loop telegraph pair connecting to this equipment, of a polarity arbitrarily termed positive. During such inactivity the equipment is required to present an impedance such that 5 milliamperes are drawn in the loop.

For local origination of a transmission, it is necessary to cause loop current to increase to 60 milliamperes, constituting a request-to-dial signal. Upon central facilities becoming available, this request is answered by an interruption of line current at Central Office for 25 milliseconds, and reduction of line current by the Central Office, comprising a proceed-to-dial signal. Recognition, display, and utilization of this signal is a function of the instant equipment. It is desirable that recognition capabilities be limited to the brief period associated with the request in order to avoid the possibility of any spurious response to noise, and this is accomplished by the arrangement to be described.

Display of the proceed-to-dial signal must be followed by the transmission of coded destination-dialing interruptions from the local unit.

Such interruptions may be answered by a busy signal from the Central Office, comprising a reversal to negative loop polarity for 200 milliseconds, followed by the restoration of positive idle polarity.

If, however, a connection is attained by the Central Office, the polarity reversal imposed on the loop by the Central Office persists, and the local unit must display this fact, start the printer motor, and reduce the circuit impedance for establishment of a 60-milliamper working current by connection of the printer selector magnets (or a selector magnet driver amplifier) to the loop, after which transmission from the local station may begin.

Termination of transmission from the local station, as effected by momentary operation of a stop switch in the instant device, must cause continued interruption of loop current. This being answered by reversal to positive loop polarity by the Exchange, the device must then reduce the loop current to 5-milliamperes idle current for maintenance of a guard circuit in the stand-by condition.

Receipt of a message by the local unit is essentially similar to the operation above described, the Exchange applying reversed polarity to the local loop in the same manner as upon making a successful connection to a called line during calling out from a local station, and the instant equipment, in consequence, being caused to start the printer motor for the receipt of message information.

Off-line operation

Certain functions of the equipment, such as the preparation of perforated message tapes for rapid transmission, require operation of the local printer without connection to the local telegraph loop. It is a function of the instant device to disconnect the printer from the line for this purpose and to guard the line for signalling the advent of incoming messages during that time, by causing a buzzer to sound upon receipt from the Exchange of the polarity reversal signalling an intention to transmit to the local station. Instantaneous depression of a "connect" push button in the instant device may then cause the printer to be connected to the local loop, and to assume the receptive impedance for incoming telegraph messages, as before described. If such button is not so depressed, then after the lapse of a predetermined interval of time,

during which the tape perforating device may be disconnected from the printer, such connection is established automatically by the instant device.

The manner of attaining the foregoing objects, as well as several advantages which later will become apparent, will be better understood by a consideration of the following detailed description of a specific illustrative example of the best known means of practicing the invention, taken together with the drawings, wherein:

FIG. 1 is a portion of a schematic wiring diagram of the instant invention.

FIG. 2 is the remainder of the schematic wiring diagram of FIG. 1.

Turning now to the drawings, the several functions of the instant invention will be described with reference to FIG. 1 and FIG. 2. For convenience and clarity of representation, the four relays employed in the invention have their relay coils designated A, H, W, and M, and their several contact pairs A1, H1 and H2, W1 and W2, and M1 respectively, which contact pairs are located on the drawings in proximity to their associated circuitry. Such contacts are represented in the open position, which obtains when their respective coils are deenergized. Transistors are shown to be energized through appropriate current limiting resistors and/or blocking diodes from the symbols +18 or -18, the same referring to positive or negative voltages respectively supplied at the output of power supply 101, energized from mains current as shown, through fuses such as 102.

Outgoing calls

Nominally-positive idle current of 5 milliamperes drawn between line terminals 12 (nominal plus) and 11 (nominal minus) through the limiting resistor 13 is increased to 60 milliamperes by depression of start key 14 short-circuiting resistor 13. A portion of such 60-milliamperes current, as limited by resistor 15, biases transistor Q1 to the "on" or conductive condition.

This constitutes a "request-for-dial" signal, and is answered at the Exchange by a 25-millisecond circuit interruption and current reduction, which interruption in the current comprises a negative current pulse. This pulse causes transistor Q1 to become non-conductive, this condition being assured by the application of reverse bias current limited by the resistor 16. Transistor Q1 passes the pulse to its collector (energized through resistor 17) and through the resistors 18 and 19 to base of transistor Q2. Since transistors Q2 and Q3 are connected in well-known "flip-flop" configuration 34, this causes transistor Q3 to energize relay A and "dial" lamp D.

Resistors 103 and 104 connected between the collector of transistor Q3 and the base of Q2 comprise a cross-coupling resistor divided into two parts and having a capacitor 105 to the common ground connected therebetween. The foregoing assembly comprises a means of slowing the switching speed of the transistor Q2 and Q3 in order to overcome the instability which would otherwise occur upon any introduction of an inductance such as that of the coil of relay A into the collector circuit of transistor Q3. Such instability would be caused by the presentation of an augmented impedance into the shunt path of such transients and thereby magnifying their amplitude in the cross-coupling circuit, if the instant circuitry were not employed.

A similar circuit comprising resistors 103', 104' and capacitor 105' operates in the circuit of transistors Q6 and Q5, later described, for similar protection of the coil of relay H.

Relay A thereby holds closed with its contacts A1 the circuit initiated by switch 14, any tendency toward excessive sparking of either being absorbed by the condenser 21 and resistor 22.

Back contacts of start switch 14 are closed at all times when it is not actually being depressed, thus short-circuiting transistor Q1 and preventing it from passing spurious noise impulses to the Q2-Q3 flip-flop. A capacitor 106

connected between resistor 19 and ground serves to slow the response of the Q2-Q3 flip-flop in order to cause it to reject spurious line signals.

Dialing interruptions of the loop current take place at dial 20 and, upon their completion, loop polarity reversal to negative polarity is effected by the Exchange. At the same time, the reversal of polarity charges condenser 24 through delay resistor 25 and renders base of transistor Q5 positive. Such charging is possible because rectifier 81 blocks the flow of current under this condition, enabling a charging voltage to build up. This reduces Q5 current through resistors 26 and 27' to place a positive potential on the base of transistor Q4, cutting it off. Collector potential at transistor Q4 thus becomes negative and is applied through resistor 27 to the base of transistor Q6, lowering its resistance and energizing "connect" lamp C and relay coil H, whose contact H1 thereupon energizes printer 108 including the selector magnets such as 109 therein by an amplifier 119, through rectifier 23, conductive for this polarity, by connecting them across the telegraph loop. Simultaneously with pull-in of relay H, transistor Q4 becomes non-conductive, and negative current is supplied from the collector thereof through resistor 29 to the base of transistor Q2, causing flip-flop Q2-Q3 to reverse and deenergize the "proceed-to-dial" lamp D and the relay A. A diode 121 connecting the base of transistor Q5 to ground serves to limit to a safe value the reverse voltage applied to transistor Q5 and Q4 under "connect" conditions. Switch contacts 107 in the dialing mechanism close during the dialing process, so that if dialing should occur during the connect period due to a mistake, a shunt path to maintain the operation of the selector magnets of printer 108 is provided.

Busy signal

In the event that the called line is in other use, the Exchange returns a "busy" signal comprising a 200-millisecond polarity reversal, followed by restoration of normal positive polarity. This, of course, causes the instant equipment to resume its idle aspect.

Upon establishing connection, however, because of the aforementioned positive potential on the base of transistor Q4, its high resistance state imposes negative collector voltage limited by resistor 28 and applied through resistor 29 to base of transistor Q2, rendering it conductive and thereby extinguishing transistor Q3 to drop out relay A, extinguish "proceed-to-dial" lamp D, and restore impedance to the idle value by opening relay contacts A1.

Relay M is energized through resistor 31 and rectifier 32 by the conductivity of transistor Q6 under this condition, and its contact M1 connects motor 33 to the local power line.

Knock down

Upon completion of message transmission, depression of stop switch 35AB interrupts current through distributor D and keyboard K through its contact 35B, which change of impedance is detected by the Exchange and answered by line reversal to negative idle polarity, transmitted through terminal 11 as a negative potential through diode 23 and resistor 25 to base of transistor Q5, increasing its current to turn on transistor Q4 and extinguish transistor Q6, thus extinguishing "connect" lamp C and dropping out relay H to open its contact H1 and deenergize keyboard K and distributor D, as well as motor 33, by opening contact M1 of relay M, which is controlled also (through rectifier 32) by collector of transistor Q6.

Off-line operation

For such purposes as preparation of tapes for transmission, use of the printer for practice purposes, and telegraphy over local circuits, provision is made for off-line operation of the printer. Depression of "local" push-button 41 applies negative potential from buss bar 42 to the base of transistor Q8 through the resistors 43 and 44, thereby causing the flip-flop 45, comprising transistors Q8

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and Q9, to become conductive through the transistor Q8, thereby energizing relay coil W and "local" lamp L. Coil W, by closing its contacts W1, energizes distributor D and keyboard K through resistor 43, while coil M is energized simultaneously with coil W over the line 44 through rectifier 45 to close its contacts M1 to start the printer motor 33.

Break in

If, during the above-described type of operation, an incoming message signal occurs on the terminals 11, 12, relay H pulls in as before described but, since contacts W1 of relay W are in the energized position and the back contact therefore open, the energization of relay H connected thereto is therefore ineffective in this case to increase line current to the 60 milliamperes required to initiate reception. Energization of relay H does, however, apply a positive potential to line 46, imposing it, after a time delay of about 2 seconds introduced by resistors 47 and 48 and capacitor 49, on the base of unijunction transistor Q7. This causes Q7 to break down through resistors 51, 52 and pass a positive charge shaped by capacitor 53 and resistor 54 through rectifier 55 to the line 56 for actuating flip-flop 45 to release relay W. Relays H and W having been pulled in throughout this 2-second interval, their respective contacts H2 and W2 are closed in series to actuate buzzer B from the local power line as a warning to the operator that an incoming message is pending. This 2-second interval provides an opportunity for the operator to disconnect the tape perforator from the local printer in preparation for receiving the incoming message.

Interlocks

Protection is provided against inconsistent modes of operation by the following interlock arrangements.

Prohibition of the local or off-line state during "connect" or "proceed to dial" is accomplished by means of rectifiers 61 and 62. If either relay H or relay A is energized, as occurs in these states respectively, the lines 46 or 63 apply local power supply ground through rectifier 62 or 61 to the junction of resistors 43 and 44 through a low impedance path, retaining transistor Q8 of flip-flop 45 in the off state and relay W consequently deenergized.

Local switch 41 is thus rendered ineffective to alter this condition, even though closed during the period when connection or dialing persist.

To a similar effect, any local request for a proceed-to-dial signal, as effected by a depression of start switch 14A, causes opening of a second set of contacts 14B thereon, removing the negative energization on the collector of transistor Q9 of flip-flop 45, whereby the base bias holding Q8 on (and thereby relay W energized) is removed, and relay W is deenergized to disengage local off-line operation.

Since start contacts 14B are connected to negative buss 42 only through stop contacts 35A, opening of the latter has the same effect of disengaging local operation as does depression of the start switch 14A.

Actuation of stop switch 35A acts in a similar manner to remove "on" bias from the collector of transistor Q3 in flip-flop 34 to deenergize relay A and disengage the proceed-to-dial connection.

A "low paper" switch 71 is arranged to close when the record paper supply is near exhaustion. By thus connecting the base of transistor Q5 to positive buss 72 through resistors 73 and 74, and the rectifier 75, it prevents the application of any positive pulses to Q5 such as would cause it to initiate the energization of relay H (in the manner already described) to establish a connection for the transmission of outgoing messages or the receipt of incoming ones. Closure of switch 71 during operation of the printer on either incoming or outgoing messages, however, is ineffective to disrupt operation until after completion of the message because of the fact that transistor Q5 is functional only during switching of a connection, and passive at other times.

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Switching for disconnection also is unaffected by switch 71 because the initiating polarity reversal then applied to the base of transistor Q5 is in such direction as not to be transmitted by the rectifier 75 to switch 71.

It is found that practice of the invention as above described results in the production of an equipment which displays distinct advantages both in respect of small size and of unusual lightness of weight which not only reduces the costs of transportation and storage, but also makes practical the integration of the equipment into a unitary assembly with the printer having a convenient over-all size.

It is further found that because of its unique electrical characteristics, use of the invention results in the presentation to the telegraph line by the control unit during the "connect" period of an impedance which is substantially below that available with devices of the prior art. As a result of this lower impedance, it is apparent that substantially longer transmission distances can be spanned by the local telegraph loop without having recourse to the expense and inconvenience of repeaters, thus enlarging the radius of practical operation of the local exchange. This radius being already large, it is obvious that any substantial increase thereof, such as above described, can result in providing a significant increase in the primary service area of local telegraph exchanges without burden to the public for the cost of additional repeater equipment.

Although the instant invention has been described in terms of a specific illustrative example of the best mode known of practising the invention, it will be understood by those skilled in the art that certain modifications and alterations may be made therein without, however, departing from the essential spirit of the invention, and it is therefore intended that the invention be limited only by the appended claims.

What is claimed is:

1. In a telegraph system which comprises a central exchange, a telegraph line pair and a telegraph instrument adapted for line switching destination selection, control means for the instrument comprising:

- (1) resistor means and first diode means in circuit with said line for limiting current flow in one direction to a predetermined idle value;
 - (2) momentary start switch means and a first relay having a pair of contacts, said start switch means and said contacts being connected across said resistor for calling current initiation and retention respectively;
 - (3) varistor means comprising a pair of oppositely conducting semiconductor diodes connected in parallel, and in circuit with said line for establishing a stabilized voltage drop thereacross upon line current flow therethrough;
 - (4) first bistable transistor means having an "on" state and an "off" state, saturable transistor means connected thereto and to said varistor means for the switching of said first bistable transistor means to said "on" state only upon transistor desaturation induced by varistor means voltage drop extinction, back contacts on said momentary start switch means connected across the said saturable transistor means output to obviate saturable transistor means desaturation effect during start switch means inaction, said first relay being connected to said first bistable transistor means and responsive to the "on" state thereof to close its said contacts across said resistor means, for maintaining line calling current after transistor desaturation;
 - (5) dial means in the line for destination code signalling; and
 - (6) second diode means connected to said line and to the telegraph instrument and oppositely directed to said first diode means for flowing line current into the telegraph instrument upon line polarity reversal.
2. In a printing telegraph line remote control unit:
- (1) first rectifier means and resistor means in a line

current path for conduction under one direction of line polarity;

(2) transistor means comprising a varistor in the line, for initiating a stable "on" state of electrical potential upon an interruption of line current in said one direction, including depressably closable start switch contact means across said resistor means as well as depressably openable start switch contact means in circuit with said transistor means for enabling initiation of said "on" state only during start switch depression;

(3) relay means having contacts connected across said resistor means and responsive to said stable "on" state of electrical potential to close said contacts; and

(4) telegraph instrument means, and second rectifier means in circuit with said line responsive to another condition of line polarity to actuate the instrument means.

3. In a printing telegraph remote control unit on a telegraph line having an idle polarity and an active polarity:

(1) current limiting means in the line polarized for idle line polarity current;

(2) means to establish a call current comprising call-current initiating means connected to the said line-current limiting means for deactivation thereof, and call-current maintaining means comprising call-current interruption detecting means in the line, bistable transistor means having an "on" state, connected and responsive thereto for establishing an "on" state upon detection of a call-current interruption, relay means connected and responsive to said bistable transistor means and connected to said line-current limiting means for deactivation thereof during an "on" state;

(3) said call current initiating means having further means connected to said detecting means to provide detection only during limiting means deactivation;

(4) dialing means in the line; and

(5) telegraph instrument means on the line polarized for activation by active line polarity current.

4. In a motorized printing telegraph instrument remote control unit on a telegraph line having an idle polarity and an active polarity:

(1) current limiting diode means in the line polarized for idle line polarity;

(2) means to establish a call-current comprising call-current initiating means connected to the said line current limiting means for deactivation thereof and call-current maintaining means comprising call-current interruption detecting means in the line, first bistable transistor means having an "on" state, connected and responsive thereto for establishing an "on" state upon detection of a call-current interruption, first relay means connected and responsive to said bistable transistor means and connected to said limiting means for deactivation thereof during an "on" state;

(3) said call current initiating means having further means connected to said detecting means to provide detection only during limiting means deactivation;

(4) connect means comprising second relay means, transistor means connected to the telegraph line for energizing said second relay means in response to line active polarity, maintaining means therein for holding said second relay means energized after initial energization, said second relay means having front contacts for energizing said instrument, third relay means having contacts connected for energizing said motor;

(5) a connection extending between said second relay means and said third relay means to start said motor upon connect means energization;

(6) a connection extending between said connect means and said first bistable transistor means to deenergize said first relay upon connect means energization;

(7) dial means in the line for destination code signaling; and

(8) second diode means connected to said line and oppositely directed to said first diode means for flowing line current into the telegraph instrument upon line polarity reversal.

5. In a telegraph system which comprises a central exchange, a telegraph line pair and a telegraph instrument adapted for line-switching destination selection, control means for the instrument comprising:

(1) call means comprising current setting first relay means in the line having unilateral conductivity and first bistable transistor means including start switch means responsive to line-current interruption to set a calling current in the line;

(2) connect means comprising second relay means, transistor means connected to the telegraph line for energizing said second relay means in response to a change in line polarity, maintaining means therein for holding said second relay means energized after initial energization;

(3) connection between said connect means and said first bistable transistor means to deenergize said first relay means upon connect means energization;

(4) second bistable transistor means having an "on" state and an "off" state, and having third relay means therein responsive to said "on" state and connected to said telegraph instrument for energizing it thereby only during such "on" state therein;

(5) contact means on said start switch means connected to said second bistable means for establishing an "off" state therein upon start switch means depression;

(6) avalanche transistor means connected to said second bistable transistor means for establishing an "off" state therein upon avalanche breakdown and having a connection to said connect means and responsive thereto to provide breakdown after connect means energization;

(7) delay means associated with and active in conjunction with the last said connection to introduce a predetermined delay time before said breakdown after energization of said connect means;

(8) local switch means connected to said second bistable transistor means for establishing an "on" state therein upon local switch means depression;

(9) indicator means in circuit with contacts of said third relay means and of said second relay means energizable thereby to indicate the occurrence of any "on" state in said second bistable transistor means occurring during energization of said connect means.

6. In a telegraph system which comprises a central exchange, a telegraph line pair and a telegraph instrument adapted for line switching destination selection, control means for the instrument comprising:

(1) first bistable transistor means connected to the line and active to establish a calling current in one direction therein;

(2) dial means in the line to transmit a calling signal;

(3) connect means comprising a transistor connected to the line and responsive to current in another direction therein to connect said telegraph instrument to the line;

(4) second bistable transistor means connected to the line and responsive to the polarity thereof, having an "on" state and an "off" state, and having relay means therein responsive to said "on" state and connected to said telegraph instrument for energizing it thereby only during such "on" state therein;

(5) avalanche transistor means connected to said second bistable transistor means for establishing an "off" state therein upon avalanche breakdown, and having a connection to said connect means and responsive thereto to provide breakdown after connect means energization; and

(6) delay means associated with and active in con-

junction with the last said connection to introduce a predetermined delay time before said breakdown after energization of said connect means.

7. In a remote control unit for operating a printing telegraph instrument in conjunction with a telegraph line which includes first transistor means for establishing a calling current upon remote command when line current is in one direction, and second transistor means in the line energizable for connecting the instrument to the line when line current is in the other direction, means for off-line operation of the telegraph instrument which comprises:

- (1) bistable transistor means having an "on" state and an "off" state, and having relay means therein responsive to said "on" state and connected to said telegraph instrument for energizing it thereby only during such "on" state therein;
- (2) avalanche transistor means connected to said bistable transistor means for establishing an "off" state therein upon avalanche breakdown, and having a connection to said second transistor means and responsive thereto to provide breakdown after energization thereof;
- (3) delay means associated with and active in conjunction with the last said connection to introduce a predetermined delay time before said breakdown;
- (4) local switch means connected to said bistable transistor means for establishing an "on" state therein upon local switch means depression; and
- (5) indicator means in circuit with contacts of said relay means and connected to said second transistor means, energizable thereby to indicate the occurrence of any "on" state in said bistable transistor means occurring during energization of said second transistor means.

8. In a telegraph system which comprises a central exchange, a telegraph line pair and a motorized telegraph instrument adapted for line switching destination selection, control means for the instrument comprising:

- (1) first bistable transistor means connected to the line and active to establish a calling current in one direction therein;
- (2) dial means in the line to transmit a calling signal;
- (3) connect means comprising a transistor connected to the line and responsive to current in another direction therein to connect said telegraph instrument to the line.
- (4) second bistable transistor means connected to the line and responsive to the polarity thereof, having an "on" state and an "off" state, and having first relay means therein responsive to said "on" state and connected to said telegraph instrument for energizing it thereby only during such "on" state therein;
- (5) avalanche transistor means connected to said second bistable transistor means for establishing an "off" state therein upon avalanche breakdown, and having a connection to said connect means and responsive thereto to provide breakdown after connect means energization; and
- (6) motor-starting second relay means connected to said second bistable transistor means and responsive to an "on" state therein, and also connected to said connect means and responsive to an energized state thereof to start said motor in either case.

9. In a telegraph system which comprises a central exchange, a telegraph line pair and a telegraph instrument adapted for line switching destination selection, control means for the instrument comprising:

- (1) transistor means in the line for providing a calling signal under one condition of line polarity;
- (2) transistor means connected to the line for providing a connect circuit under another condition of line polarity, said means comprising relay means to

initiate a connection of the instrument to the line upon receipt of a connect signal from the line;

- (3) a paper supply for the instrument; and
- (4) switch means on the paper supply responsive to incipient paper exhaustion and connected to said means connected to the line for preventing only the initiation of instrument connection to the line.

10. In a remote control unit for a printing telegraph instrument having a calling period and which comprises bistable and line polarity sensitive transistorized calling means on a telegraph line, transistor actuated telegraph instrument line connect means which is polarity sensitive, and bistable transistorized means for initiating off-line operation of the telegraph instrument, a power supply for the transistors comprising power transformer means having a secondary winding with a center tap thereon, rectification means attached to said winding and in circuit with the transistors, said center tap being in conductive connection with the telegraph line during said calling period.

11. A device as described in claim 10 wherein said center tap is in conductive connection with the telegraph line during said calling period and at all other times.

12. In a remote control unit for a printing telegraph instrument which comprises bistable and line polarity sensitive transistorized calling means on a telegraph line, transistor actuated line polarity sensitive means to connect said instrument to a telegraph line, and bistable transistor means for effecting operation of the telegraph instrument out of connection with the telegraph line, positive and negative feeding power supply means for the transistors comprising varistor means across the telegraph line consisting of a pair of semiconductor diodes connected in parallel and oppositely poled, and a center tap in said power supply means having a polarity always substantially midway between said positive and negative feeds which is always in conductive connection with said varistor.

13. Means to provide augmented idle line current in a telegraph line for calling purposes which comprises a current limiting impedance in the line, varistor means to produce a relatively constant small voltage drop in the line which is effectively independent of line current, transistor means having an input connected across said varistor means, bistable transistor means having an "on" state and an "off" state in a current path and having an input connected to said transistor means for initiation of said "on" state by diminished conductance of said transistor means and relay means in said current path having contacts connected to said current limiting impedance whereby a discontinuity of line current causes discontinuance of the voltage drop across the varistor means to produce diminished conductance in transistor means for triggering the bistable transistor means to an "on" state for closing the relay contacts across the line impedance.

14. Means according to claim 7 for signalling the advent of telegraph messages on the line pair during off-line operation of the instrument which comprises means in said connect means operative for establishing a portion of a power circuit and means in said second bistable transistor means operative for establishing the remainder of said circuit, and signal means in said power circuit responsive to both aforesaid means to sound an alarm upon occurrence of the "on" state of said second bistable transistor means during response of said connect means.

15. The device of claim 6 wherein said first bistable transistor means and said connect means and said second bistable transistor means each comprise a relay coil and a signal lamp having an incandescent filament energizable therein, each said signal lamp being connected for operation in series with a said relay coil, whereby signal lamp life is extended.

16. A remote control unit for a printing telegraph instrument which comprises means to dial destination signals, means to connect a telegraph printer to the line, and means to provide off-line operation of the instrument,

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each of said means comprising a relay having an inductive relay coil, and an incandescent signal lamp connected in series with each said relay coil, whereby starting current surges in the lamps are eliminated and the life of the lamps prolonged.

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