

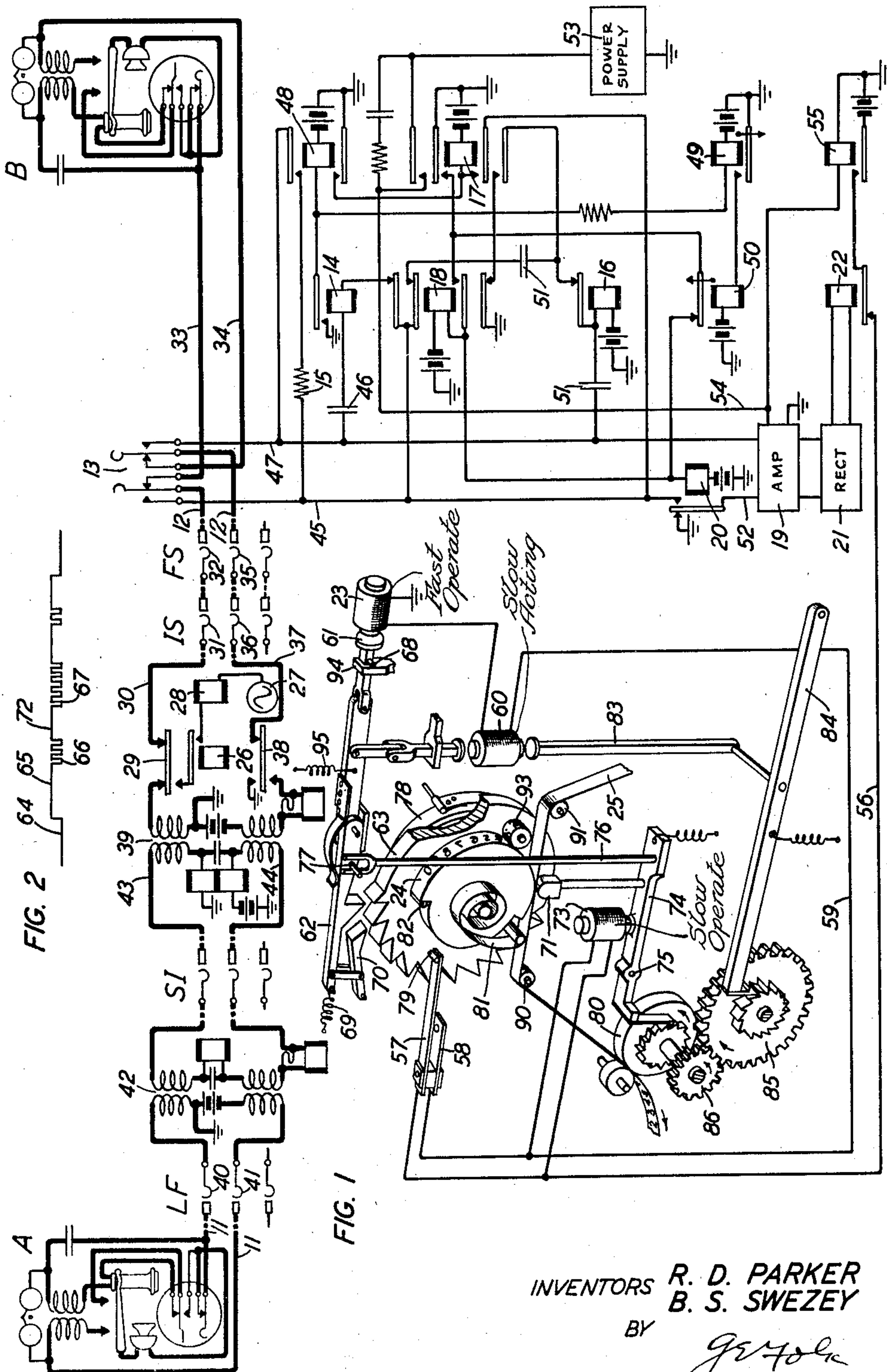
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R. D. PARKER ET AL

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CALL RECORDING SYSTEM

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INVENTORS R. D. PARKER
B. S. SWEZEY

BY

g. r. y. k.

ATTORNEY

UNITED STATES PATENT OFFICE

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CALL RECORDING SYSTEM

Ralzemond D. Parker, Brooklyn, and Burdette S. Swezey, Bayside, N. Y., assignors to American Telephone and Telegraph Company, a corporation of New York

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This invention relates to telephone systems and more particularly to call recorders for use at subscribers' stations.

An object of this invention is to provide efficient and reliable mechanism and simplified controlling circuits for use in recording unanswered incoming telephone calls at a subscriber's station.

A prior patent application to E. L. Getz et al., Serial No. 595,390, filed February 26, 1932 discloses a telephone call recorder at a subscriber station in an automatic or semi-automatic telephone system in which a pen-register is made responsive to the impulses inductively transmitted over the talking circuit from the calling subscriber's impulse sending device without the necessity of modifying the selector switch circuits at the central office.

The present invention is an improvement thereover and comprises in its preferred embodiment a single typewheel arranged to be responsive to current impulses produced by the calling subscriber's dial or other impulse sending device to provide at the called subscriber's station a printed record of the calling number. In response to ringing current incoming over the line, an impulse relay is connected across the line conductors to receive dial impulses and an operating circuit is closed through the winding of a stepping magnet. Upon receipt of each train of dial impulses, the impulse relay interrupts the operating circuit of the stepping magnet to cause the advance of a ratchet wheel and the typewheel and thus present the corresponding digit or character adjacent the printer tape. At the end of each train of impulses, a printing magnet is energized and the typewheel is thereupon restored to its normal position and made ready to receive the next series of dial pulses and so on until all the digits of the calling subscriber's telephone number have been successively recorded. A special feature of the invention is an improved arrangement for preventing the advance of the typewheel in response to the initial operation of the stepping magnet prior to the receipt of the first series of dial pulses. Another feature of the invention resides in the arrangement whereby the ratchet wheel is restored in advance of the typewheel to insure that the ratchet wheel be in normal position before the first impulse of the next digit is received.

Referring to the drawing, Figure 1 shows a calling subscriber's station A and line 11 connected by line finder switch LF, a district selector switch SI, an incoming selector switch IS and a final selector switch FS to a called subscriber's station

B comprising a call recording equipment in accordance with this invention.

Fig. 2 discloses the character of the current to which the recording equipment at station B responds.

The equipment at the subscribers' stations A and B is of the usual type employed in automatic telephone systems including a dial for use in establishing any desired connection. The called station B is also provided with recording equipment to which the line 12 may be transferred by operation of the key 13. The recording equipment comprises a relay 14 for responding to ringing current; a resistance 15 for connection across the line conductors to trip the ringing; a buzzer 16 for transmitting an audible signal over the line conductors to a calling subscriber; control relays 17 and 18 for controlling the tripping bridge and buzzer; an amplifier 19 for amplifying incoming pulses transmitted by the operation of the calling subscriber's dial; a control relay 20 for extending the line conductors to the amplifier; a rectifier 21 for transforming the amplified impulses into direct current impulses; and an impulse relay 22 for responding to the rectified impulses to control the recording of the dialed number on a recording tape 25. The typewheel 24 which carries the characters to be printed on the recording tape is actuated by a ratchet wheel 63 stepped around by a pawl 62 which is actuated by a magnet 23 under the control of the current impulses from rectifier 21.

The line finder switch LF and selector switches SI, IS and FS and their associated equipment are represented schematically, only those portions being shown which are necessary for a full, complete explanation of this invention. These switches may be of the panel type and similar to the construction of the switches disclosed in the United States patent to Craft et al. 1,123,696, issued January 5, 1915. The operation of the selector switches is controlled by a register sender in accordance with dial impulses from the calling station but the register sender is not shown in the drawing since it is not directly related to this invention; reference may be had to United States patent to Stearn et al. 1,395,977 issued November 1, 1921 for a complete description of the operation of such a register sender and the switches controlled thereby.

Assume first, that key 13 is normal when a connection from calling line 11 is established with called line 12. When the ringing control relay 26 of the incoming selector circuit operates as described in the above mentioned patent to

Stearn et al., it connects the source of ringing current 27 through the winding of tripping relay 28, the upper front contact of relay 26, the springs of sequence switch cam 29, conductor 30 and brush 31 of selector IS, brush 32 of the final selector FS, the upper conductor of line 12, the left-hand back contact of key 13 over conductor 33 through the ringer of station B back over conductor 34 through the right-hand back contact of key 13, the lower conductor of line 12, brush 35 of selector FS, brush 36 and conductor 37 of selector IS through the springs of sequence switch cam 38 to ground. When the receiver is removed at station B the tripping relay 28 operates to advance the sequence switch of the incoming selector to a position in which battery and ground are connected through the right-hand windings of repeating coil 39, the springs of cams 29 and 38, conductors 30 and 37, brushes 31 and 36 of selector IS, brushes 32, 35 of selector FS over line 12 to the called station B; the ringing circuit is opened when the sequence switch advances. The calling station A is now connected over line 11 through brushes 40, 41 of line finder LF and the left-hand windings of repeating coil 42 to battery and ground in the district selector circuit. The talking current is transmitted between the calling and called stations through repeating coils 39 and 42, the connections between the right-hand windings of coil 42 and the left-hand windings of coil 39 being traced through brushes of selector SI and conductors 43, 44 of the incoming selector circuit. When the receivers are returned to the receiver hooks at stations A and B the connection is released in the manner described in the above mentioned patent to Stearn et al.

Assume next that the key 13 is operated when the connection is extended from station A to station B so that line 12 is connected to the recording equipment instead of to the telephone instrument. In this case the ringing circuit extends from the upper conductor of line 12 through the left front contact of key 13 over conductor 45 through the uppermost back contact of relay 18, the winding of relay 14 through condenser 46 and back, over conductor 47, through the right front contact of key 13, to the lower conductor of line 12. Relay 14 is operated by the ringing current, thereby closing obvious circuits for causing the operation of relays 48 and 49. Relay 48 closes an obvious circuit for operating relay 17 and also bridges the resistance 15 across conductors 45 and 47, thereby causing the operation of the tripping relay 28 of the incoming selector. Relay 49 in operating energizes relay 50 to prevent the operation of relay 20 at this time due to the closing of the inner upper contact of relay 17. The operation of tripping relay 28 causes the advance of the sequence switch at the incoming selector, the normal talking connection between lines 11 and 12 being completed through cams 29, 38 as hereinbefore described. The ringing circuit is opened by the advance of the sequence switch so that relay 14 releases.

With relay 17 operated a circuit is closed from battery through the winding and upper contact of buzzer magnet 16 through the lowermost contact of relay 17 to ground at the lower back contact of relay 18. The alternate operation and release of buzzer 16 causes a distinctive tone to be transmitted through condensers 51 and the inner upper back contact of relay 18 over conductors 45, 47 and line 12 and through repeating coils 39, 42 to the calling subscriber at sta-

tion A. This tone indicates to the subscriber at station A that the called station B is equipped with number recording apparatus. Upon the release of relay 14 in consequence of the opening of the ringing circuit at the incoming selector, relays 48 and 49 release but relay 17 is held operated through its inner lower front contact and over conductor 45 to ground at the repeating coil 39 of the incoming selector. The release of relay 48 opens the bridge through resistance 15 and the release of relay 49 causes the release of relay 50. Both relays 49 and 50 are of the slow release type and as soon as relay 50 has released a circuit is closed from battery through windings of relays 18 and 20 in parallel through back contact relay 50 to ground at the inner upper front contact of relay 17. The operation of relays 18 and 20 prepares for the receipt of dial impulses from the calling station A by opening the circuit for operating the buzzer 16, by disconnecting conductor 45 from the winding of relay 14 and from condenser 51 and by transferring conductor 52 from ground at the back contact of relay 20 to the conductor 45. Relays 18 and 20 are locked up through contacts of relay 17. The amplifier 19 is now ready to receive impulses, the source 53 for energizing the amplifier being connected through the uppermost front contact of relay 17 to conductor 54 leading to the amplifier.

When the calling subscriber no longer hears the buzzer tone he may dial his own telephone number for registration at the called station, the impulses thus created being eventually transmitted over the talking circuit to line 12 and thence to amplifier 19. The impulses are amplified and transformed into direct current impulses by the rectifier 21 for causing the alternate operation and release of the impulse relay 22 connected in the output of the rectifier.

Prior to the transmission of the impulses dialed by the subscriber at station A the connection of power supply 53 to energize amplifier 19 also serves to connect the said source of power through winding of relay 55 to ground. Relay 55 in operating closes a circuit from battery, front contact relay 55, lower back contact relay 22, conductor 56, normally closed spring contacts 57, 58, conductor 59, winding of slow acting magnet 60 and winding of quick operating magnet 23 to ground. Magnet 23 being designed to operate faster than magnet 60 will now pull its armature 61 to the right before magnet 60 has pulled its upper armature down to cause the pawl 62 to engage the ratchet wheel 63. This initial operation of magnet 23 due to the closing of its control circuit by relay 55, therefore, does not cause any rotation of the ratchet wheel 63 since magnet 60 will not cause the pawl 62 to engage the ratchet wheel 63 until after magnet 23 has been energized long enough to pull up its armature. The recording apparatus is now ready to receive the impulses to be recorded.

As previously noted, the recording apparatus is designed to respond to open impulses similar to those transmitted over the line by the subscriber's dial. This is illustrated by the curve of Fig. 2 where the amplitude of current through windings of magnets 23 and 60 is plotted against time. Portion 64 indicates zero current; portion 65 indicates the initial closing of the control circuit by relay 55; and portion 66 is followed by three closely spaced current interruptions at the point 66 caused by the opening of the control circuit by relay 22 in response to the receipt of three impulses initiated by the dial

at station A representing the first figure of the number to be recorded. After a certain time interval this curve shows five current interruptions at the point 67 corresponding to the second figure dialed from station A. It will thus be seen that the stepping of the recording mechanism is secured by interruptions in the current supplied to magnet 23 from battery obtained over the contacts of relay 55.

As previously described the initial supply of current to magnets 23 and 60 as represented by portion 65 of Fig. 2 sets the recording mechanism in position to record the dialed figures by first pulling arm 62 to the right and then downwardly to bring it in contact with the ratchet wheel 63. The first current interruption by relay 22 will release armature 61, and pawl 62 will be moved to the left due to action of spring 69 until pin 68 contacts with the armature guide 94. Pawl 62 will then engage the first tooth in ratchet wheel 63. The impulse of current following this first interruption will pull pawl 62 to the right, moving ratchet wheel 63 one step clockwise where it will be held by the holding pawl 70. If, as in Fig. 2, we assume that the first figure dialed is 3, meaning three current interruptions for magnet 23, it follows that the ratchet wheel 63 and typewheel 24 will be stepped around three steps to place the numeral 3 on the type wheel opposite the tape 25 and the printing hammer 71. It may be noted that the typewheel 24 is not rigidly connected with the ratchet wheel but is moved clockwise in unison with the ratchet wheel because of a pin 82 on the ratchet wheel which engages a detent in the periphery of typewheel 24 to move the typewheel against the action of a spring 81.

The relatively long interval of current at point 72 of Fig. 2 representing the time elapsing between the dialing of two consecutive figures at station A is of sufficient duration to energize the slow operating relay 73 and the consequent attraction of its armature 74 will cause hammer 71 to strike the tape 25 and cause the numeral 3 to be printed thereon. The normal short circuit for relay winding 73 by means of spring contacts 57 and 58 was opened with the first advance of the ratchet wheel but the short current impulses due to the dialing of the numeral 3 were not of sufficient duration to cause relay 73 to operate. Armature 74 is pivoted at the point 75 so that when it is pulled up as just described the forked standard 76 connected thereto will contact with a pin 77 to raise pawls 62 and 70 and allow the ratchet wheel to be restored to normal due to action of spring 78 or its equivalent. This counter-clockwise movement of the ratchet wheel will cause pin 79 on the ratchet wheel to bring spring contacts 57 and 58 into engagement again to short-circuit relay 73. The resulting attraction of armature 74 by the pawl and ratchet arrangement shown will cause the drum 80 to advance the tape 25 over rollers 90, 91 to make ready for the printing of the next character dialed. Suitably spaced inking rollers such as roller 93 may be provided to provide ink for the characters on the typewheel.

It should be noted that ratchet wheel 63 is released to return to zero position before the printing operation has been completed. The attraction of armature 74 releases the ratchet wheel at the same time the printing hammer is advanced, so that at the time the printing is being done the ratchet wheel is being prepared for the receipt of the next series of dialed impulses. As soon as the printing hammer has been retracted

the typewheel 24 will be restored to normal due to the action of coiled spring 81 which has one end fastened to the typewheel and the other end fastened to a pin on the ratchet wheel. This spring will, therefore, rotate the typewheel counter-clockwise until it engages the stop 82 on the ratchet wheel.

The subsequent receipt of the dialed impulses 67 of Fig. 2 will again cause the ratchet wheel and typewheel to be stepped around the desired number of steps after which the selected character will be printed as above described and the process will continue until the complete dialed number has been registered.

When the telephone receiver has been replaced at the calling station A the connection is released and the automatic switches are restored to normal as described in the aforementioned patent to Stearn et al. Relay 17 releases when its holding circuit is opened by the advance of the sequence switch in the incoming selector circuit. The release of relay 17 causes the release of relays 18 and 20 and disconnects the source of power from the amplifier 19 and control relay 55. This opens the energizing circuits of magnets 23 and 60 so that pawl 62 will be withdrawn upwardly by spring 95 to free the ratchet wheel. At the same time the release of magnet 60 will allow its lower armature 83 to fall back. The resulting lowering of arm 84 attached to armature 83 by a suitable pawl and ratchet arrangement will actuate gears 85, 86 to rotate the drum 80 an amount substantially greater than that produced by the ratchet and pawl associated with armature 74 to provide a substantial separation between the characters of the last calling subscriber's telephone number and the first character of the next calling subscriber's telephone number. The recording apparatus is now ready for further operation on the next incoming call.

What is claimed is:

1. In a telephone system, a subscriber's line, a subscriber's substation, mechanism at said substation for recording a telephone number transmitted over said line in the form of current impulses, said mechanism comprising a printing wheel, a step-by-step mechanism including a ratchet wheel responsive to said current impulses for stepping said printing wheel from its normal position to present a character on said wheel opposite the printing point, means for causing a record to be made of said character so selected, and means for restoring said ratchet wheel to its normal position in advance of the return of said printing wheel to its normal position.

2. In a telephone system, a subscriber's line, a subscriber's substation for connection thereto, mechanism at said substation for recording a telephone number transmitted over said line in the form of current impulses, said mechanism comprising a single typewheel, a step-by-step mechanism including a ratchet wheel responsive to a first series of said current impulses representing the first significant character of said telephone number for stepping said typewheel from its normal position to present a character on said wheel opposite the printing point, means for causing a record to be made of said character so selected, means for restoring said ratchet wheel to its normal position prior to the return of said typewheel to its normal position, said step-by-step mechanism being responsive to a second series of said current impulses representing the second significant character of said telephone number for stepping said typewheel from its normal position

to present the desired character on said typewheel opposite the printing point.

3. In a telephone system, a subscriber's substation, a line for connection thereto, means for transmitting over said line current impulses corresponding to the successive designations of a calling subscriber, said substation comprising a ratchet wheel, a pawl for actuating said wheel, a typewheel, means for causing said typewheel to be stepped around by said ratchet wheel, a tape for recording designations imprinted thereon from said typewheel, a magnet for actuating said pawl and a second magnet for simultaneously pressing said tape against said typewheel and for releasing said pawl.

4. In a telephone system, a subscriber's line and station, means for transmitting signal impulses over said line to said station, and means at said station for recording the characters corresponding to said signal impulses, said recording means comprising a typewheel, a ratchet wheel, a stepping magnet for advancing said ratchet wheel in accordance with each series of signal impulses received over said line, means for advancing said typewheel in step with said ratchet wheel, means operative at the end of each series of signal impulses for immediately restoring said ratchet wheel to normal position in readiness for operation by the next series of impulses, and means rendered operative by the restoration of said ratchet wheel for restoring said typewheel to normal position.

5. In a telephone system, a subscriber's line and station, means for transmitting signal impulses over said line to said station, and means at said station for recording the characters corresponding to said signal impulses, said recording means comprising a typewheel, a ratchet wheel, a stepping magnet for advancing said ratchet wheel in accordance with each series of signal impulses received over said line, means for advancing said typewheel in step with said ratchet wheel, means operative at the end of said series of signal impulses for making a record of the number of signal impulses received and for simultaneously releasing said ratchet wheel from its advanced position, means for restoring said ratchet wheel to normal position in readiness for operation in response to the next series of impulses incoming over said line, and means rendered operative by the restoration of said ratchet wheel for restoring said typewheel to normal position after the making of said record.

6. In a telephone system, a subscriber's line and station, means for transmitting signal impulses over said line to said station, and means at said station for recording the characters corresponding to said signal impulses, said recording means comprising a typewheel, a ratchet wheel, a stepping magnet for advancing said ratchet wheel in accordance with each series of signal impulses received over said line, means for preventing the advance of the ratchet wheel prior to the receipt of signal impulses, means for advancing said typewheel in step with said ratchet wheel, means operative at the end of each series of signal impulses for immediately restoring said ratchet wheel to normal position in readiness for operation by the next series of impulses, and means rendered operative by the restoration of said ratchet wheel for restoring said typewheel to normal position.

7. In a telephone system, a subscriber's line and station, means for transmitting signal impulses over said line to said station, and means

at said station for recording the characters corresponding to said signal impulses, said recording means comprising a typewheel, a ratchet wheel, a stepping magnet for advancing said ratchet wheel in accordance with each series of signal impulses received over said line, a printing magnet, means for advancing said typewheel in step with said ratchet wheel to present the desired character at the printing point, means actuated by said printing magnet for releasing said ratchet wheel from its advanced position, means for restoring said ratchet wheel to normal position in readiness for operation in response to the next series of signal impulses incoming over said line, and means rendered operative by the restoration of said ratchet wheel for restoring said typewheel to normal position.

8. In a telephone system, a subscriber's line and station, means for transmitting ringing current over said line to said station, means for transmitting signal impulses over said line to said station, and recording mechanism at said station comprising a relay for response to the signal impulses, means responsive to ringing current for operatively connecting said impulse relay to said line, a typewheel, a ratchet wheel, a stepping magnet controlled by said impulse relay, a pawl normally disengaged from said ratchet wheel for actuation by said stepping magnet, means for engaging said pawl and ratchet wheel subsequent to the initial operation of said stepping magnet to render said magnet effective to advance said ratchet wheel one step for each signal impulse received by said impulse relay, means for advancing said typewheel in step with said ratchet wheel to present the desired character opposite a printing point, a printing magnet operative at the end of each series of impulses received for making a record of the character presented at the printing point, means actuated by the operation of said printing magnet for releasing the ratchet wheel from advanced position, means for restoring said ratchet wheel to normal position in readiness for operation in accordance with the next series of impulses, and means rendered operative by the restoration of said ratchet wheel for restoring said typewheel to normal position.

9. In a telephone system, a subscriber's line and station, means for extending a call to said line, means for transmitting signal impulses over said line to said station, and recording mechanism at said station comprising a typewheel, a ratchet wheel, a stepping magnet, a pawl for actuation by said stepping magnet, said pawl being normally disengaged from said ratchet wheel, an auxiliary magnet, the operation of said auxiliary magnet effecting the engagement of said pawl and ratchet wheel, a printing magnet, a circuit including the windings of said stepping, auxiliary and printing magnets, means for closing said circuit in response to the extension of a call to said line, the stepping magnet being the first to operate in said circuit, contacts closed by said ratchet wheel in its normal position for short circuiting the winding of said printing magnet, means for interrupting said circuit in response to each incoming signal impulse to advance the ratchet wheel, means for advancing the typewheel in step with said ratchet wheel to present the desired character at the printing point, the interruptions of said circuit during the receipt of signal impulses being effective to prevent the operation of said printing magnet until the last impulse of a series has been received, and means actuated by the operation of said printing magnet

at the end of each series of impulses for making a record of said character.

10. In a telephone system, a subscriber's line and station, means for transmitting ringing current over said line to said station, means for transmitting signal impulses over said line to said station, and recording mechanism at said station comprising an impulse receiving relay, means responsive to ringing current for operatively connecting said impulse relay to said line, a typewheel, a ratchet wheel, a fast operating stepping magnet, a pawl actuated by the operation of said stepping magnet, said pawl being normally disengaged from said ratchet wheel, a slow-acting auxiliary magnet, a printing mag-

net, a circuit closed in response to ringing current incoming over said line, said circuit including the windings of said stepping, printing and auxiliary magnets, normally closed contacts controlled by said ratchet wheel for short-circuiting the winding of said printing magnet, contacts of said impulse relay for interrupting said circuit in response to the incoming signal impulses, means actuated by the operation of said auxiliary magnet for placing said pawl in engagement with said ratchet wheel, and means actuated by the operation of said printing magnet for disengaging said pawl and ratchet wheel.

RALZEMOND D. PARKER.

BURDETTE S. SWEZEY.

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