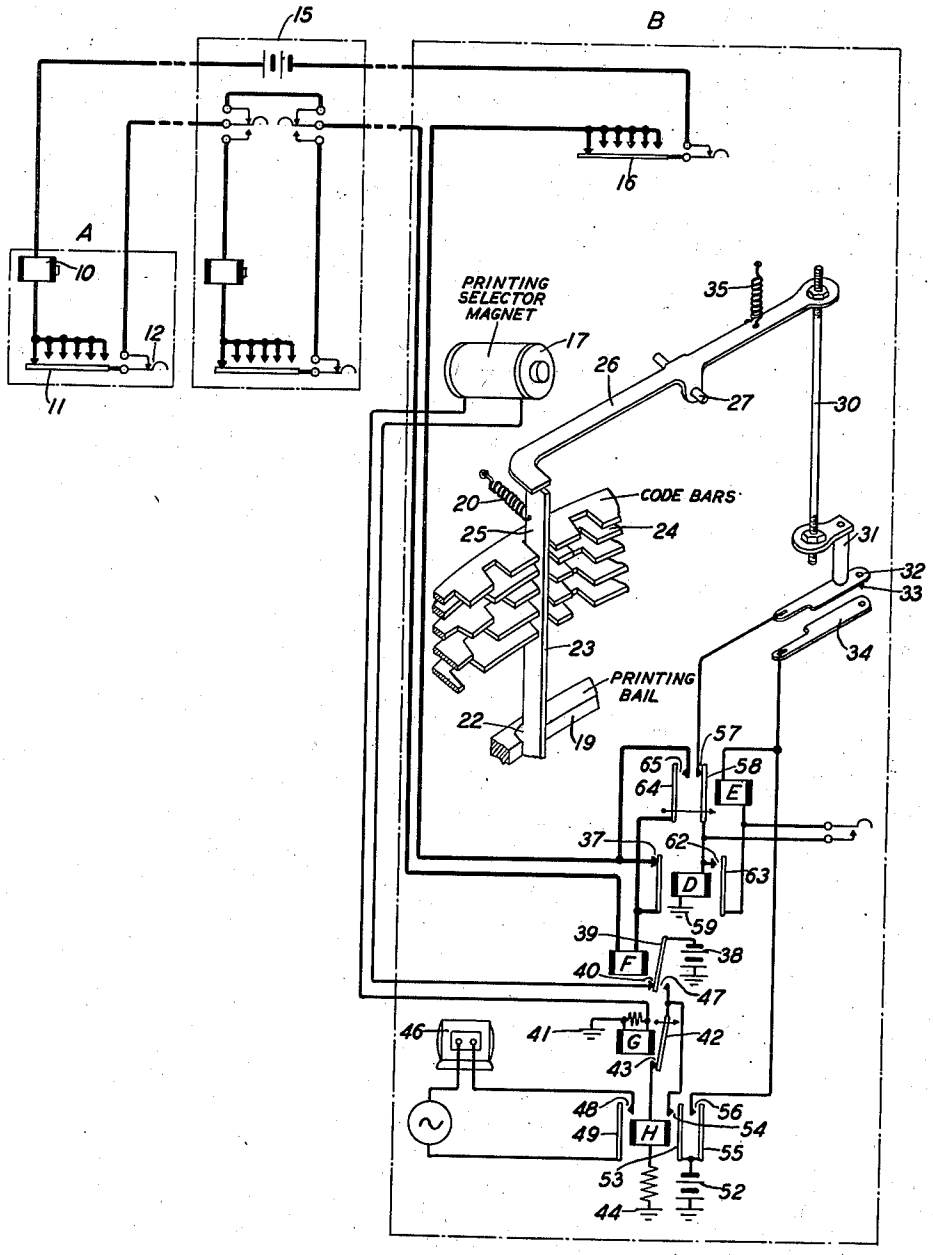
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PRINTING TELEGRAPH SYSTEM

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INVENTOR
E. F. WATSON

BY

ATTORNEY

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PRINTING TELEGRAPH SYSTEM

Edward Fisk Watson, Larchmont, N. Y., assignor to American Telephone and Telegraph Company, a corporation of New York

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This invention relates to teletypewriter systems and, more particularly, to arrangements for enabling the identity of a called teletypewriter station to be verified by a subscriber at a calling teletypewriter station or by a switchboard operator.

It is an object of this invention to provide a simple automatic arrangement, having a short operating time, whereby the identity of either an attended or an unattended called teletypewriter station may be verified by the calling teletypewriter station connected therewith before the transmission of messages is commenced.

In printing telegraph systems, to avoid confusion and loss of time, it is advisable for a calling subscriber at a teletypewriter station to know for certain that he is connected to the particular teletypewriter station with which he desires to communicate. Heretofore, the identity of the called station has been made known to the calling subscriber by two different methods. With the first method, the called subscriber may manually transmit signals indicating the identity of his station. Two disadvantages of this method are that its consumes time and is not adaptable for use with unattended stations. The second method as exemplified in Patent No. 1,960,360, granted May 29, 1934, to E. F. Watson, employs a cam arrangement for opening and closing the communication line a preassigned number of times. This entails the expense of the extra equipment for operating the cam.

In one application of printing teletypewriter systems it is the practice to connect a plurality of teletypewriter subscribers' stations together through a central office for purposes of intercommunication. In such a system it is desirable that the calling subscriber's station be certain that it is connected with the desired called subscriber's station and that the station is in condition to receive before commencing the transmission of messages. For this purpose means are usually provided whereby, upon the completion of the central office connection, the calling subscriber can start the motor at the called subscriber's station to condition the printer set thereat to receive a message whenever the called subscriber's station is unattended. Patent No. 1,712,528, granted May 14, 1929, to B. S. Swezey, discloses a system of this type.

In accordance with the present invention each subscriber's station is assigned a particular code combination for identification purposes. To verify a central office connection the calling subscriber may first transmit the identification combination of impulses assigned to the subscriber's station with which a communicative connection is desired. The called subscriber's station is provided with an arrangement responsive only to that particular code combination to actuate a function lever arranged to close an electrical contact. The closing of the contact completes an energizing circuit for a relay which operates to open the normally closed line circuit connecting the stations thereby transmitting an open line pulse.

The first relay functions also to close an energizing circuit for a second relay which is retarded in operation and remains inoperative for a predetermined time interval corresponding to the no-current or spacing code units of the code combination of another character, such as V or M. The second relay operates after the elapse of the predetermined time interval to close the line circuit for a period of time corresponding to the marking units in this second character. As a result, this second character is transmitted to the calling station and is printed by the teletypewriter at that station. The registration of this character at the calling subscriber's station serves to verify the central office connection since no other called subscriber's station is arranged to cause the printing of that character at the calling subscriber's station in response to the particular identification code combination initially transmitted by the latter.

While the described device is adaptable to a printing teletypewriter system in which the motor of the called subscriber's station is started from the remote calling subscriber's station, it is equally applicable in teletypewriter systems wherein the called subscriber's station motor may be started from the central office—either by the operator, or by an automatic switching arrangement.

In the drawing, station A and station B are connected together through a central office 15. There is shown in the drawing only so much of the apparatus and circuits at station B as is required at a called station to respond to identification impulses and to give the desired answer-back or reply signal in accordance with the principles of the invention.

The subscriber's sending-receiving circuit at station A is of a well-known type and comprises a printer magnet 10 and a set of sending-receiving contacts 11 provided with a non-locking key 12.

Although the switchboard operator's cord circuit at the teletypewriter central office is not

shown in detail, it is of a well-known type. A plurality of cord circuits may be provided for establishing connections between a calling subscriber's station and any one of a plurality of called subscriber stations in a manner well-known in manually operated telephone central offices. While the use of a teletypewriter central office is illustrated, the invention is not necessarily limited thereto, and may be readily applied to a private wire system wherein the teletypewriter central office is not employed.

The teletypewriter apparatus at station B is identical with that of station A and includes a set of sending-receiving contacts 16 connected in series with a line relay F which is responsive to line impulses for controlling a printing selector magnet 17. The selector magnet 17 is arranged to select various pull bars, of which one is shown at 23, for operation by a printing bail 19 adapted to engage a foot 22 on a pull bar 23 to cause the latter to be moved vertically after it has been moved horizontally by a spring 20 into a path set for it in code bars 24 which are operated in response to code impulses received from the line by magnet 17. This movement of the pull bar 23 effects the printing of a character. The structure and operation of this apparatus are identical with that found in teletypewriter equipment of any well-known type such, for example, as that disclosed in Patent No. 1,904,164 issued to Morton et al on April 18, 1933 and relating to an improved form of printing telegraph.

In the preferred form of this invention, one end of a function lever 26 is arranged to engage an upper portion 25 of the pull bar 23. Function lever 26 is pivoted at 27 and is connected at its opposite end to the upper end of a vertical rod 30. The lower end of rod 30 is provided with a suitable electrical insulating member 31 engaging an upper contact 32. The latter is provided on its under surface with a suitable electrical contact point 33 normally disengaged from a lower electrical contact 34 as a result of the function lever 26 being normally urged in a counter-clockwise direction by a retractile spring 35. An engagement between the point 33 and the contact 34 is effected by the function lever 26 in a manner to be described hereinafter. Also station B is provided with several additional relays whose function and operation will be explained hereinafter.

Operation of the system

The line circuit is shown in heavy lines. The calling subscriber's station A is connected through the central office 15 and its battery with the called subscriber's station B by means of the usual cord circuit. This involves a normally closed line circuit which may be traced through normally closed non-locking key 12, sending contacts 11 and printer magnet 10 of the circuit of the calling subscriber's station A, central office 15 and its battery, and the path at the station of the called subscriber B which extends through sending contacts 16, normally closed contact 37 of relay D, and the winding of line relay F. The normally operated line relay F connects battery 38 through armature 39, contact 40, winding of printer selector magnet 17, winding of slow release relay G, and then to ground 41 thereby causing the operation of relay G. The slow release armature 42 of relay G is normally connected through contact 43, winding of motor control relay H to ground 44.

In verifying the identity of the called subscriber's station with which he is connected in the above manner, the calling subscriber A from his remote station first starts motor 46 of the connected subscriber's station by opening the non-locking key 12 to interrupt momentarily the closed line circuit extending through line relay F. The key 12 is retained in the open position for a time interval somewhat longer than the open periods ordinarily effected in the transmission of messages. The opening of the line circuit causes a deenergization of normally operated line relay F to release armature 39 from engagement with contact 40 to connect battery 38 to contact 47 of relay F.

The disengagement of armature 39 from its contact 40 serves to interrupt the energizing circuit of relay G, but since relay G, which is normally operated, is slow to release in the direction indicated by the arrow and does not release armature 42 in response to the momentary interruption of the line circuit, battery 38 is now connected through armature 39, contact 47, slow release armature 42, contact 43, winding of relay H to ground 44 to provide an energization circuit for motor control relay H. The operation of relay H completes a circuit through contact 48 and its left armature 49 to start the motor 46 at the connected subscriber's station B. In addition, it provides a locking circuit for itself which may be traced from battery 52, right armature 53 of relay H, contact 54, slow release armature 42, contact 43, winding of relay H to ground 44.

The motor commences operating at the instant its power supply circuit is closed by the operation of relay H, and is maintained in this condition by means of the locking circuit for relay H which is unaffected by any subsequent line interruptions resulting from the transmission of messages—due to the slow release feature of relay G. The closing of the key 12 at the calling subscriber's station A closes the line circuit again through line relay F to complete energization circuits through the printing selector magnet 17 and the slow release relay G thereby conditioning the printing selector magnet 17 for the reception of messages.

At the completion of the transmission of a message, the motor at called subscriber's station B may be stopped by opening the key 12 for a time interval sufficient to cause the release of the armature 42 of slow release relay G to interrupt the holding circuit for relay H. For a more detailed explanation of the motor starting circuit reference may be had to the Swezey patent, supra.

While the invention is illustrated in combination with the remote motor control system disclosed in the Swezey patent, supra, it will be understood that the invention is not necessarily limited to use therewith and is readily adaptable for application with any suitable motor control system such, for example, as that shown in Patent No. 1,655,448 issued to E. F. Watson on January 10, 1928 and Morton et al. Patent No. 1,904,164 supra.

The subscriber at the calling station A is now ready to ascertain whether his station is connected with the station of the desired called subscriber and with this objective in view transmits a combination of code impulses, such as for "A" which is preassigned to only that particular called subscriber's station for the purpose of identification each subscriber's station is assigned an individual combination of code impulses. When the called subscriber's station re-

ceives this series of identification impulses, the pull bar **23** (which corresponds to the letter assigned to that station) is moved into the space caused by the alignment of the code bars **24**. Elevation of the pull bar **23** by printing bail **19** actuates the lever **26** about its pivot **27** in a clockwise direction to cause an engagement between the contacts **33** and **34**. This completes a circuit from battery **52**, the outer right armature **55** of relay H, contact **56**, contacts **34** and **33**, contact **57** and armature **58** of relay E, winding of relay D to ground **59**. It is to be understood, of course, that since another station has some other code combination assigned to it, some pull bar other than that corresponding to pull bar **23** will be selected in the teletypewriter at that station. Consequently, the lever at that station, which corresponds to lever **26**, will be located immediately above the proper pull bar in the teletypewriter at that station.

Relay D operates to open the normally closed contact **37** to interrupt the normally closed line circuit thereby registering an open line condition in the teletypewriter at the calling subscriber's station A as a part of the identifying answer-back signal. The opening of the line has the same effect as the usual open start impulse of a code combination; that is, it causes the release of magnet **10** at station A thereby starting the receiving selecting mechanism at station A into operation as though magnet **10** had released in response to a regular start impulse. The operation of relay D also provides a holding circuit for itself which may be traced from ground **59**, winding of relay D, contact **62**, armature **63**, winding of slow operating relay E, contact **56**, armature **55** to battery **52**.

When relay D operates its armatures, slow operating relay E is short-circuited by contacts **33**, **34** and **57**, **58** and does not operate. After the opening of contacts **33**, **34** by the falling back of pull bar **23** and lever **27**, this short-circuit is removed. However, relay E is designed to be slow in operating so as to keep the line circuit open for a predetermined period of time the duration of which corresponds to the duration of a normal impulse. Therefore, the line remains open and the receiving selecting mechanism at station A responds to this open condition of the line in the same manner in which it would respond to a spacing code impulse transmitted from station B.

When relay E operates after its time delay has expired, it brings armature **64** into engagement with contact **65** thereby closing the line which remains closed until one of the subscribers or the central office operator opens it. The receiving selecting mechanism at station A responds to this prolonged closure of the line in the same manner that it would respond to a series of marking impulses transmitted from station B. Thus, station B has in effect transmitted two spacing impulses and a series of marking impulses to station A. This corresponds to the code combination for the letter "V" whcih is consequently printed by the teletypewriter at station A. If relay E were designed to be a little slower in operation, such as for the length of two spacing impulses in addition to the start impulse effected by the first operation of relay D, then the teletypewriter at station A would receive, in effect, three spacing impulses followed by a series of marking impulses. Since this corresponds to the code combination assigned to the letter "M", the teletypewriter at station A would accordingly print the letter "M". The apparatus may be designed to print other letters in a similar manner by designing relay E to operate still more slowly. Whichever arrangement is used is purely a matter of choice depending on the requirements of a particular system. Since the duration of the open circuit condition will be less than the time required for one complete revolution of the distributor brush arm, the line circuit will be in a closed, or marking, condition by the time the receiving distributor brush arm completes its revolution. As this corresponds to a stop impulse, the rotating brush arm will be stopped in the usual manner.

It is obvious, of course, that while at this time the operating circuit of relay D is opened by the operation of armature **58** of relay E, relay D remains in the operated condition due to its holding circuit. Also, it is evident that the closing of the contacts **33**, **34** is effective only on the first occasion to cause the sending out of an acknowledging signal since thereafter relays D and E remain in the operated condition which precludes these relays from changing the condition of the communicative line. In addition, the continued operation of relays D and E renders it possible for the pull bar **23** to actuate the transverse lever **26** as many times as desired during the normal transmission of messages without resulting in any interference therewith since the telegraph line, which was initially opened when relay D operated, is now closed by operated relay E which restores the normal line condition required for communicative purposes.

In this manner, therefore, the calling subscriber can cause the called subscriber's station to send out a prearranged character, such as letter V or M, for registration in the calling subscriber's office in response to the identification code impulses initially sent out by the calling subscriber to check the identity of the called or answering subscriber. The registration of the character, assigned to the called station, at the calling subscriber's station serves to inform the operator at this station that the desired subscriber's station is answering, since no other station is arranged to respond to the particular code combination assigned to that called station. It will be understood, also, that the switchboard operator can perform the verification operation in precisely the identical manner employed by the calling station operator.

It will be also understood that the several stations may have assigned thereto for identification purposes any one of the sixty-four (64) code combinations comprising thirty-two (32) upper case and thirty-two (32) lower case characters. However, the use of the "Figures" and "Letters" code combinations appears undesirable since the "Figures" and "Letters" keys are employed to shift the platen roll from its upper to its lower position, or vice versa, and the assignment of these code combinations for identification purposes might result in confusion and error. In addition, when the present invention is employed with the remote motor control system disclosed in the Swezey patent, supra, the stopping of the motor at the called station occasioned by the termination of the previous communicative connection and the starting of the same motor for the next communicative connection may result by a remote possibility in the printer at the called station being conditioned to receive messages with

a path in the code bars equivalent to any one of the following combinations:

Code unit 1 2 3 4 5	Lower case character	Upper case character
× × × × ×	Letters	Letters
– × × × ×	V	;
– – × × ×	M	.
– – – × ×	O	I
– – – – ×	T	5
– – – – –	Blank	Blank

× indicates current pulse; – indicates no-current pulse.

If any one of the above code combinations had been assigned for identification purposes, it will be evident that the conditioning of the printer at the called station would operate the relays D and E. Bearing in mind that the relays D and E operate only once to transmit an acknowledging signal as previously explained, the sending out of a code combination corresponding to that previously set up on the called printer would be ineffective to cause the called station to acknowledge or respond to its identification combination. This would occasion error and confusion. To obviate these several possibilities, therefore, there are preferably assigned only fifty (50) identification characters, twenty-five (25) of the upper case and twenty-five (25) of the lower case. There is avoided the use of "Figures" and "Letters" combinations, the combinations of V, M, O, T and "blank" of the "Letters" position and the combinations corresponding thereto in the "Figures" position.

It will be understood, however, that when the invention is employed with the motor control systems disclosed in the Watson or Morton et al patents, supra, the printer at the called station cannot be conditioned as indicated in the table, hence there is no likelihood of confusion arising from the use for identification purposes of the character combinations mentioned therein. In such a case, there can be assigned sixty (60) identification characters, thirty (30) of the upper case and thirty (30) of the lower case, avoiding, as before, the use of the "Figures" and "Letters" combinations.

In a preferred application of the invention, each station of a group of twenty-five (25) is assigned one of the lower case combination of impulses, excepting the six undesirable combinations. Each station is arranged to respond in the above described manner only when the assigned combination of impulses of the lower case is received by it. Accordingly, the identification combination of impulses is sent when the platen roll of the calling station is in its lowermost, or "Letters", position and the platen roll of the called, or answering, station is brought to the same position. This enables the called station to respond with the "Letters" character, such as V or M, depending on the length of time the slow operating relay E is predeterminedly held inoperative.

In another preferred application of the invention, each station of a group of twenty-five (25) is assigned one of the upper case combination of impulses, excepting those combinations previously indicated as unsatisfactory. With this arrangement, each called station is adapted to close the contacts **33** and **34** and operate the several relays as previously described only when that combination of impulses of the upper case is received by it. Accordingly, the identification combination of impulses is sent out when the platen roll of the calling station is in its uppermost, or "Figures", position and the platen roll of the called, or answering, station is brought to the identical position. This enables the called station to respond with a "Figures" character code combination corresponding to the code combinations of either V or M of the "Letters" position depending on the length of time the slow operating relay E is predeterminedly held inoperative.

It is seen, therefore, that by this invention either a calling subscriber or a switchboard operator is enabled to verify the identity of a connected called subscriber's station irrespective of whether the called subscriber's station is attended or unattended by an operator.

What is claimed is:

1. In a teletypewriter system, a calling teletypewriter station, a called teletypewriter station, a normally closed telegraph line connecting the stations, an automatic device at the called station for sending out a reply signal to the calling station to indicate that the desired called station is connected therewith, a control instrumentality, selecting and operating means for selectively operating the control instrumentality only in response to a preassigned code combination of signal impulses initially sent out by the calling station, electromagnetic means operable in response to the operation of the control instrumentality for opening the normally closed line circuit to effect the sending out of a portion of the reply signal, and other electromagnetic means operable by the first-mentioned electromagnetic means for closing the line circuit to effect the sending out of the remaining portion of the reply signal.

2. In a teletypewriter system, a calling teletypewriter station, a called teletypewriter station, a central office, a normally closed telegraph line connecting the stations through the central office, an automatic device at the called station to transmit a reply signal to the calling station to verify the central office connection, said automatic device comprising a control instrumentality, actuating means for actuating said control instrumentality only upon receipt of a combination of impulses individually assigned thereto and initially sent out by the calling station, normally opened electrical contacts arranged to be closed by the control instrumentality when actuated, electromagnetic means operated by the closing of the contacts to open the line circuit to effect the sending out of a portion of the reply signal, and electromagnetic means responsive to the operation of the first-mentioned electromagnetic means to close the line circuit to effect the sending out of the remaining portion of the reply signal.

3. In a teletypewriter system, a calling subscriber's station, a called subscriber's station, teletypewriter transmitting and receiving mechanisms including a motor and power source therefor at the stations, a normally closed telegraph line connecting the stations, automatic means at the called station for effecting the sending out of a predetermined combination of impulses to actuate the receiving mechanism at the calling station for recording thereat that the desired called station is connected therewith, said automatic means including a control member actuating means for actuating the control member upon receipt of a particular combination of impulses individually assigned thereto and sent out

by the calling station, normally opened electrical contacts arranged to be closed by the control member when actuated, electromagnetic means operated by the closing of the contacts to open the line circuit to effect the sending out of an impulse, and other electromagnetic means responsive to the operation of the last-mentioned electromagnetic means to close the line circuit to effect the sending out of another impulse.

4. A teletypewriter system having in combination a first teletypewriter station, a second teletypewriter station, a telegraph line connecting the two stations, a motor at the second station for operating the teletypewriter thereat, said motor having a normally open energizing circuit, signaling means at the second station for transmitting a check signal to the first station in response to a preassigned signal transmitted from the first station, said signaling means having an energizing circuit normally open in more than one part, first control means for closing a part of the energizing circuit of the signaling means, supervisory means for operating the first control means and for closing the energizing circuit of the motor, and second control means for closing another part of the energizing circuit for the signaling means.

5. A teletypewriter system having in combination a first teletypewriter station, a second station having a teletypewriter with a plurality of pull bars, a telegraph line connecting the two stations, a motor at the second station for operating the teletypewriter thereat, said motor having a normally open energizing circuit, signaling means at the second station for transmitting a check signal to the first station in response to a preassigned signal transmitted from the first station, said signaling means having an energizing circuit normally open in more than one part, first control means for closing a part of the energizing circuit of the signaling means, supervisory means for operating the first control means and for closing the energizing circuit of the motor, and second control means for closing another part of the energizing circuit for the signaling means, said second control means including one of the pull bars.

6. A teletypewriter system having in combination a first teletypewriter station, a second teletypewriter station, a telegraph line connecting the two stations, a motor at the second station for operating the teletypewriter thereat, said motor having a normally open energizing circuit, signaling means at the second station for transmitting a check signal to the first station in response to a preassigned signal transmitted from the first station, said signaling means having a normally open energizing circuit, a relay for closing a portion of the energizing circuit of the signaling means, said relay having a normally open energizing circuit, and supervisory means for simultaneously closing both the energizing circuit for the motor and the energizing circuit for the relay and also for simultaneously opening both of said circuits.

7. A teletypewriter system having in combination a first teletypewriter station, a second teletypewriter station, a telegraph line connecting the two stations, a motor at the second station for operating the teletypewriter thereat, said motor having a normally open energizing circuit, supervisory means for closing and opening the energizing circuit of the motor, signaling means at the second station for transmitting a check signal to the first station in response to a preassigned signal transmitted from the first station, said signaling means having a normally open energizing circuit, a relay for closing a portion of the energizing circuit of the signaling means, operating means for operating said relay only once each time after the energizing circuit of the teletypewriter motor has been closed, said operating means including an energizing circuit for the relay, and control means for closing and opening a portion of the relay energizing circuit whenever the energizing circuit for the motor is closed and opened.

8. In a teletypewriter system, a calling subscriber's station, a called subscriber's station, teletypewriter transmitting and receiving mechanisms at each of the stations, connecting means for connecting the stations for communicative purposes, control means at the called station for effecting the sending out of a predetermined combination of impulses for registration in the calling station to verify the connection, said control means comprising an instrumentality for effecting the sending out to the calling station of a portion of the predetermined combination of impulses, selecting and operating means for selectively operating said instrumentality only in response to a preassigned permutation code combination of impulses initially sent out by the calling station, and electromagnetic means for effecting the sending out of another portion of the predetermined combination of impulses, said electromagnetic means being responsive to the operation of the instrumentality.

9. In a teletypewriter system, a calling subscriber's station, a called subscriber's station, teletypewriter transmitting and receiving mechanisms at each of the stations, a normally closed telegraph line connecting the stations, control means at the called subscriber's station for effecting the sending out of a predetermined combination of impulses to actuate the receiving mechanism at the calling subscriber's station for recording thereat that the desired called subscriber's station is connected therewith, a control instrumentality, operating means for operating the control instrumentality upon the receipt of a particular combination of impulses individually assigned thereto and initially sent out by the calling station, normally opened electrical contacts arranged to be closed by the control instrumentality when operated, electromagnetic means operated by the closing of the contacts for opening the line circuit to effect the sending out of a portion of the impulses, and other electromagnetic means responsive to the operation of the first-mentioned electromagnetic means for closing the line circuit to effect the sending out of another portion of the impulses.

EDWARD FISK WATSON.