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TELETYPEWRITER SELECTOR SYSTEM

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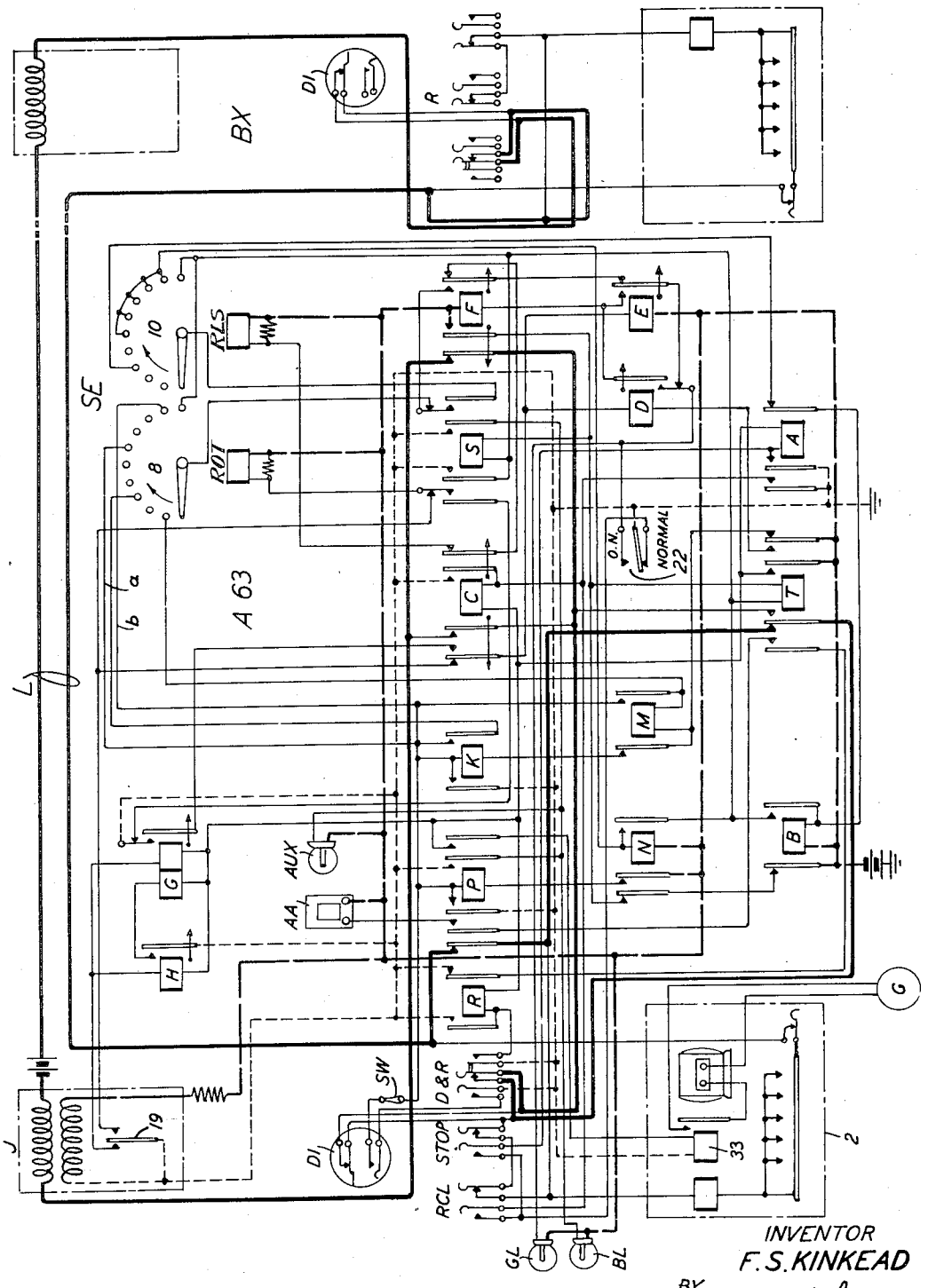

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TELETYPEWRITER SELECTOR SYSTEM

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11 Claims. (Cl. 178—4.1)

This invention relates to telegraphy and particularly to selective calling and control arrangements for printing telegraph systems.

In a prior patent, Kinkead 1,795,652, granted March 10, 1931, there is disclosed a system in which a plurality of printing telegraph stations are each equipped with code selecting switches and impulse sending devices so arranged that the operator at any station may selectively call any other station by sending a proper code consisting of successive series of impulses, each series causing a temporary setting of the switches and the recording of the series at the called station only, whereupon the switches release in order to receive and record the next series of impulses of the code. In that prior system an operator at any one station may dial a single station only or several stations in succession, each of the several being simultaneously connected to the line for printing telegraph communications after the last dialing operation. Furthermore, by dialing a proper code combination it is possible to select all stations on the line for broadcast communication.

A general object of the present invention is to improve systems of the character described in the prior patent and to increase their efficiency.

A particular object of the present invention is to provide circuit arrangements and apparatus for releasing the calling station and the called stations by a single operation on the part of the operator.

Another particular object of the present invention is to simplify the procedure necessitated to select an additional station without releasing one or more stations already selected. In the previous system this was accomplished by the transmission of three so-called break signals. In the present system this function is accomplished as the result of a single operation on the part of the operator whereupon the apparatus transmits the break signals automatically.

A further object is to provide arrangements whereby the printer apparatus at any station may not be started except by dialing the full code call for that station.

A further object is to provide circuit arrangements whereby the teletypewriter at a station is prevented from being started into operation in the normal operation of the system in case the driving motor thereof is started by tampering with the teletypewriter itself.

A system in accordance with the invention is disclosed in the accompanying drawing in which a station A63 is shown on a line with one other station BX, it being understood that any number of stations within the limits hereinafter specified may be connected to the line. All the apparatus at the station A63 is diagrammatically indicated whereas only the principal essential elements at the station BX are shown. In the drawing the main line circuit in the normally idle condition is shown in continuous heavy lines; conductors normally at ground potential are shown in medium dotted lines; conductors normally at battery potential are shown in heavy broken lines; and the remaining conductive connections are shown in lighter continuous lines.

A system in accordance with this invention may be operated to perform the following functions:

1. One or more stations may be called by individual codes from any other station or all stations may be called by a single code.

2. Complete remote control of the teletypewriter motor circuit is provided.

3. Typewriter signals will not cause false selections of the station selecting apparatus.

4. A calling signal is operated at all called stations to indicate that the station is being called.

5. A lamp is lighted whenever the circuit is being employed to call stations to give a warning that calling operations are going on.

6. A busy signal is displayed at all stations when the telegraph circuit is in use for communication.

7. At any time during operation of the teletypewriters additional stations may be called in on the line without the necessity of redialing those originally called.

8. At the completion of any communication any operator may stop all stations and restore the apparatus thereat to normal by a single operation.

The principal apparatus at a station consists of the usual teletypewriter machine diagrammatically indicated within the rectangle 2, a calling dial DI, a main line relay J, a step-by-step selector switch SE, guard and busy lamps GL and BL, respectively, together with various relays, a local battery, and other equipment.

Considering the station A63, the main line circuit may be traced from the upper conductor L, the line winding of relay J, the left outer contact of relay F, contacts of key D & R, the back contact of the inner left armature of relay T, the back contact of the outer left armature of relay P back to line.

Normally all relays are released except the relay J.

General outline of operation

Let it be assumed that the apparatus is in normal position and it is desired to call another station. The operator at the calling station operates the key D & R and the code of the desired station is dialed on the calling dial DI. When the key D & R is operated the calling dial has its operating contacts included in the main line circuit. After the code of any desired station, the digit "1" is dialed except that in the case of the last station of several which are to be called in upon the line, the digit "0" is dialed. The guard lamp GL is lighted during the dialing of each code digit and extinguished during the intervals between dial operations. This occurs because whenever the selector switch SE is off-normal, its off-normal contact 22 closes the circuit of the guard lamp GL to ground. If the guard lamp remains lighted it indicates an open signal line circuit because an open line will cause every selector SE upon the line to remain advanced one step and consequently the off-normal contacts 22 of every selector will ground and light every lamp GL. After the "0" is dialed the busy lamp BL and the auxiliary busy lamp AUX will light at all stations indicating that the circuit is in use.

To call all stations upon the line the code number "90" is dialed.

After the dialing operation is completed for any desired number of stations by dialing "0", the typewriter motors of the called and calling stations will start and an audible signal will be given at all called stations. This audible signal may be stopped by operating the key D & R. Typewriter communication may now be carried on by any of the called stations or the calling station without any further effect on the selectors. Accidental operation of the dials at any of the stations will not interrupt the teletypewriter communication.

A recall key RCL is employed if it is desired to call additional stations without redialing those originally called. When operated, this key causes three break signals to be transmitted, all the typewriters stop and the busy lamps BL will be extinguished. Additional stations may then be dialed in the usual manner of dialing an additional station. When the dialing of the additional stations is completed, the dialing of "0" starts the motors at all stations just called as well as the previously called stations and the calling station. The audible signals AA at the called stations will operate and the busy lamps BL at all stations will light.

When the final message is completed the operator at any station may stop all stations by operating the stop key STOP which causes the circuit to transmit five break signals. This causes all the teletypewriters to stop, all lamps to be extinguished and all the apparatus to return to normal.

Operation at a called station

Considering the station A63 (which typifies a station whose call designation is 63) to be called, it will be noted first that all relays are in released position except the relay J. Relay J is a polar relay and is operated to the left by current flowing over the line. When another operator on the line dials the first digit "6", the relay J will follow the pulses and apply ground to the rotary magnet ROT of the selector and the winding of the relay E during each open period of the line. The wipers of the selector will be stepped up one contact for each pulse but the relay E is of slow-release type and remains operated during the train of impulses. When operated, the relay E applies ground to the relay F and operates it over a circuit extending from battery, winding of relay F, make contact of relay E, the normally closed contact of relay G and the off-normal contact 22 of the selector. After the last pulse, the relay E releases and applies ground through the front contact of the relay F and the right-hand make-before-break contacts of relay S to the first wiper of the selector. At the last pulse the wiper is on the 6th contact and therefore ground will be applied to the winding of the relay K. The relay K operates and locks through a locking circuit closed over its left front contact. The guard lamp GL is lighted over a ground connection through the off-normal contacts 22 while the selector is off normal.

The operation of restoring the selector to normal after the dialing of the first digit is as follows: The relay E upon releasing removes ground from the winding of the relay F which also is of the slow-release type. When the relay F releases, it breaks the ground circuit to the first wiper and applies ground to the release magnet RLS of the selector which operates and restores the selector to normal. The release magnet is deenergized when the off-normal contacts of the selector open.

When the second digit "3" is dialed, the selector will step up to the third position and ground will be applied to the winding on the relay P through the right-hand contact of the relay K. In operating, relay P locks itself up through a circuit extending from battery, inner left back contact of relay N, winding of relay P, inner left make contact of relay P to ground. The selector will be restored to normal in the same manner as in the case above described for dialing of the digit 6. The relay P energizes the busy lamp BL over a circuit from battery through lamp BL, right inner make contact of relay P to ground. The auxiliary lamp AUX also is energized. The relay P also closes one pair of contacts in the audible signal circuit which will be hereinafter further described, and one pair of contacts in series with the circuit controlling the power control relay 33, which circuit will also be hereinafter described.

When the digit "0" is dialed, ground will be applied to the windings of the relays S and T and they will be operated over a circuit from battery, left-hand contact of relay B, outer left-hand contact of relay N, through relays S and T in parallel, zero contact of the bank of contacts 8, make-before-break right-hand contact of relay S, right make contact of relay F (which is closed), right back contact of relay E, make-before-break contact of relay D and off-normal contact 22 to ground. Relays S and T will be held operated through the inner left make contact of relay S supplying ground. In operating, relay S short-circuits the inner right make contact of relay P which controls the busy lamp BL. The rotary magnet of the selector SE will be transferred from the right contact of relay J to the left outer make contact of relay S. The right make contact of relay F will be transferred from the first wiper to the second wiper of the selector SE through the right make contact of relay S. The operation of relay T will break the holding circuit of the relay K at the outer right back contact of the relay T and the relay T will also short-circuit the pulsing contacts of the dial DI over a circuit extending through the inner left make contact of relay T.

Relay T starts up the circuit

Relay T in operating also completes the circuit to the audible alarm AA through a circuit from battery, alarm AA, left middle make contact of relay P, left outer make contact of relay T, inner right back contact of relay R to ground. Relay T also operates the power control relay 33 over a circuit from battery, inner right make contact of relay T, inner right make contact of relay P, relay 33 to ground. The teletypewriter motor will operate and messages may be transmitted by operating the keys in the usual manner. The audible alarm AA may be stopped by operating the D & R key.

Stopping all stations—operation station sending stop signal

When it is desired to stop all stations and clear out all selections preparatory to making the next call, the key STOP must be operated until the guard lamp GL lights. When the key STOP is operated, the line circuit is open, thus releasing the J relay, the armature of which falls back to its right-hand position and closes a circuit to the relay A as follows: battery, inner right make contact of relay T, winding of relay A contact of key STOP to ground. The relay A locks up through its inner left make contact. When the relay J releases it deenergizes the relays H and G which release shortly thereafter; the relay G deenergizes the relays D and E by taking off their ground connection through the left outer make contact of the relay C. The relay G also closes the circuit on the rotating magnet ROT and causes the selector to step one segment. The relays D and E are slow-release and hold operated for a sufficient time to permit ground at the selector off-normal contacts 22 to operate the relay F. The same ground also lights the guard lamp GL over a circuit from battery through the lamp, off-normal contacts 22 to ground. The lighting of this lamp indicates that the key STOP may be released. When the relays D and E release the relay F, the relay F closes the line circuit at its outer left back contact which thereby operates the relay J to its left contact, again operating the relays H and G. The relay H operates the relays D and E which again in turn operate the relay F which again opens the line and operates the relay J to its right contact. The relay J releases the relays H and G and the relay G energizes the rotating magnet ROT and steps the selector to the second segment. This sequence of operations continues until the selector reaches the fifth segment to which the relay N is connected. When the wiper of the selector makes contact with the fifth segment, relays D and E release and apply ground through a contact on the relay F to the relay N which locks up through a contact on the relay S. The circuit for operating the relay N is from battery, winding of relay N, selector brushes of bank 10 on selector SE, outer right make contact of relay S, right make contact of relay F, armature of relay E, contact on relay D and off-normal contacts 22 to ground. When the relay N operates it releases the relay P which opens the circuit through the motor control relay 33 and stops the teletypewriter motor. The relay N also opens one side of a parallel holding circuit of relays S and T. When the slow-acting deenergized relay F releases it closes the signal line but opens the other side of the holding circuit which releases the relays S and T which in turn release the relays A, C and N. Relay F also prepares a circuit to the release magnet RLS of the selector which is completed when the outer right back contact for the relay C is closed, thus operating the release magnet, and returning the selector to normal. The release of the relay C short-circuits the contacts of the relay F which serve to interrupt the main signaling line. The release of the relay C also releases the relay A, and transfers the operating winding circuit of the relays D and E to the right-hand contact of the relay J. The entire selector circuit is now restored to normal and ready for the next call.

Calling in additional stations after communication has commenced

If after one or more stations have been called in upon the line and communication has commenced it is desired to call additional stations, use is made of the recall key RCL. The recall key RCL functions differently from the stop key STOP in that the recall key does not operate the relay A and thus when the selector wiper of the bank 10 reaches the third contact, a circuit is closed through the relay B which causes that relay to operate. The circuit is from battery through the winding of relay B, right back contact of relay A, third segment of the selector, outer right make contact of relay S to ground over the right make contact of relay F, contacts on relays D and E and the off-normal contacts 22. The relay B in operating opens the holding circuit of the relays S and T. When the relay T releases it causes the relay C to release which prepares a circuit to a release magnet RLS of the selector through contacts on the relays D, E and F. When the relays D, E and F release, the release magnet RLS operates and the selector returns to normal. When the relay S releases as just described it transfers the stepping magnet ROT of the selector from a contact on the slow-release relay C to the right-hand contact of the relay J. This makes the circuit responsive to dialing impulses so that additional stations may now be called in upon the circuit in the manner previously described for calling. If the required stations are dialed, the numeral 0 is dialed and the teletypewriter motors at the initial stations as well as at those originally called will be started and messages may be transmitted. The audible signal AA will also be operated.

Operation at stations being stopped

When the signal line circuit at any station is opened by operation of the key STOP the operation at all other stations connected to the circuit will be as follows: The duration of the open pulse is determined by the release times of the relays J, H, G, E, and F at the station originating the opening of the line and the duration of the closed pulse by the operating time of the relays J, G, D and F. At the stations receiving the open pulse the relay J releases, which opens the circuit of the relays H and G and closes the circuit of the relays D and E. When the relay G releases to close a circuit to the rotating magnet ROT it steps the selector to the first position. The circuit is from battery, winding of the rotating magnet ROT, outer left armature of relay S, make-before-break contact of relay G to ground. This closes the off-normal contacts 22 of the selector which operates the relay F over a circuit extending through the make-before-break contact of relay D which has already operated. When the signal line is again closed, the relay J operates which closes the cir-

cuit of the relays H and G and opens the contact of the relays D and E. Relay D is of the slow-release type and holds operated during the short closed period of the line. After this short closure, the line is again open at the station sending the stop signal and the above sequence of operations is reproduced. After the last open pulse, the line remains closed, thus allowing the relays D and E to release, thereby opening the circuit of the relay F. Since relay F is of the slow-release type, it remains operated a short period of time after the relay D opened its circuit and thus provides a temporary path from ground at the selector off-normal contacts through the front contact of the relay D and the back contact of the relay E, front contact of the relay F and the front contact of the relay S to the wiper of bank 10 which has ben stepped to the 5th position. This operates the relay N. The relay N opens the circuit of and releases the relay P and locks through a contact on the relay S (which is operated). Relay N opens the locking circuit of the relay S at its outer left back contact (and also the relay T) and consequently the relay N holds operated only until the relay F drops its armature which releases the relay S and opens the locking circuit of the relays S, T and N. The relay P upon release opens the circuit of the busy lamp BL and also the circuit of the relay R and the motor control relay 33 which thus stops the teletype motor and restores the selective calling circuit to normal ready for the next call.

Operation at other stations in recalling

When the recall key RCL is operated at any station, the operation at other stations of the relays J, H, G, D, E and F will be the same as when the stop key STOP is operated. Since the recall signal consists of only three pulses, the selector wiper will be in the third position to which the relay B is connected at the time the relays D and E fall back and release the relay F. When the relay F releases it will supply ground through relay S and the selector wiper operates the relay B which unlocks and releases the relays S and T, thus rearranging the circuit to make it responsive to regular dial pulses so that additional stations may be dialed in upon the line. However, the stations already dialed remain connected.

Operation at uncalled station

If any code other than "63" is dialed by another station, the relay P at the station A63 will not be operated which thus prevents operation of the audible signal and the teletypewriter motor when the "0" is dialed.

The digit "1" must be dialed between individual station codes to clear out partial selections. After "1" is dialed, the relay M will operate and in turn release the relay K at all stations, if it happens to be operated.

After dialing "0" the relays S and T will be operated at all stations. At all uncalled stations these relays will be released when a series of three or five pulses are transmitted as the result of the operation of the keys STOP or RCL as hereinbefore described.

Operation at a calling station

When the calling operator moves the dial DI off normal, ground will be supplied to the relay P which operates and locks. When "0" is dialed the relays S and T operate and the relay T closes a circuit to the motor control relay 33 which starts the teletypewriter motor. When the key D & R is operated, the circuit will be closed for the relay P from battery through the off-normal contacts of the dial DI and the key D & R to ground. The relay R will also have ground applied to it by the key D & R and it will operate when relay T is energized. When operated, the relay R opens the audible signal circuit. This prevents the audible signal circuit from sounding at the calling station.

Arrangement for preventing uncalled stations being started except by dialing

If the relay P is controlled only by the relay K and not by the operator's keys, it will be necessary to dial both digits of the calling station code to start the printer. This arrangement is conventionally illustrated by the switch SW which signifies an open in the path between the relay P and the off-normal contacts of the dial DI. In practice the conductive lead containing the switch SW and the switch itself could be omitted. With this arrangement, the key D & R has no effect upon the relay P and consequently a station not dialed will not under normal conditions be able to start its printer motor. Furthermore, the main line circuit through the teletypewriter is bridged by a pair of contacts on the relay P. When the relay P is released these contacts are closed and the teletypewriter cannot under normal conditions transmit or receive even if this motor is started by manual operation of the relay 33 or other manner of tampering with the teletypewriter mechanism.

Broadcasting

When "90" is dialed, the relays P at all stations will operate because their windings are connected to the 9th contacts of the first bank of selectors. Thus all stations may be dialed in for broadcasting by dialing one single code call.

Any number from 2 to 8 inclusive may be used for the first digit of station codes.

Any number from 2 to 8 inclusive may be used for the second digit of the station codes except the one which has been used for the first digit. The code to which the selector circuit of a station will respond is determined by segments to which the leads *a* and *b* are connected.

It will be noted that a very convenient party line teletype circuit is provided by the system in which only desired stations are called in upon the line. Disconnection is accomplished by a single operation on the part of the operator and likewise a single operation suffices to prepare the circuit for calling in additional stations without redialing those originally called.

What is claimed is:

1. In a signaling system, a line, a plurality of stations operatively related thereto, a selector switch at each station, means responsive to dialing impulses for calling in said stations for communication over said line, a circuit changing device (key STOP), mechanism operated by the change of said device from one position to another to advance said selector switches a predetermined number of steps, and elements effective upon and controlled by the making of the last step of the selector switch to restore all said selector switches to normal and to release all said stations from the line.

2. In a signaling system, a line, a plurality of teletypewriter stations each having a teletype-

writer mechanism operatively related thereto, an impulse sender at one or more of said stations, a selector at each station controlled by the dialing of a suitable code combination to call in said station and to connect in said teletypewriter mechanism in said line, a circuit changing device (key RCL), a mechanism in each station controlled by a single operation thereof to disconnect said printer mechanism and to condition said circuit for the dialing of additional stations without releasing any station whose teletypewriter mechanism is already connected to said line.

3. A teletypewriter system comprising a plurality of stations each provided with a dialing mechanism for calling other stations and a selector mechanism, each station being provided with devices for being dialed by the sending of a proper code from each other station, a teletypewriter mechanism at each station and circuit arrangements connected to said teletypewriter mechanism for preventing it from being operatively related to the line over the normal circuit connections except when the proper code number thereof has been dialed.

4. A teletypewriter system comprising a plurality of stations capable of being operatively related to a line, a teletypewriter mechanism at each station, a circuit connection normally preventing intertransmission of signaling impulses between said line and one of said teletypewriter mechanisms and a device controllable under normal conditions solely by dialing impulses corresponding to the code of said station for interrupting the circuit connection.

5. A teletypewriter station comprising a teletypewriter transmitting and receiving mechanism and a driving motor therefor, a line incoming to said station, means for preventing the transmission of signal impulses between said teletypewriter mechanism and said line or vice versa even when said motor is started, and elements operative under the control of a selector device for rendering said means ineffective.

6. A system comprising a plurality of stations capable of being selected for operative relation to the signaling line for teletypewriter communication thereover, each of a plurality of said stations comprising, first, a selecting impulse sending device, second, a selector controllable by selecting impulses, third, a line relay, fourth, a teletypewriter instrument, said line normally extending through said first, second and third devices but said fourth device not being normally operatively related thereto, and instrumentalities whereby said fourth device at any particular station may be operatively related to said line only by the sending of an impulse code combination from one of said first devices corresponding to the code for selecting said particular station.

7. In a party-line teletypewriter system, a plurality of stations capable of being remotely selected for operative teletypewriter communication over a common line between any two or more of said stations, a driving motor for a teletypewriter apparatus at one of said stations and connections whereby said motor may be started locally only when the code for selecting said station is dialed.

8. A party-line telegraph system comprising a plurality of stations each provided with telegraph transmitting contacts and a receiving instrument, a dialing device at each station, a line common to said stations, a selector at each station operative under the control of any one of said dialing devices to associate said transmitting contacts and said receiving instrument with said line, said transmitting contacts and said receiving instrument in the normal idle condition at their particular stations being disconnected from operative relation to said line.

9. A system for teletypewriter intercommunication comprising at one station an incoming line, a selector, a dialing device, and a teletypewriter mechanism, one or more other stations upon said line each provided with a dialing device, a short circuit around the contacts of said teletypewriter mechanism, and a sole means for removing said short circuit under the control of the sending of appropriate impulses to any one of said dialing devices.

10. A system for teletypewriter communication comprising at one station an incoming line, a stepping selector switch, a dialing device and teletypewriter provided with a motor and a circuit including motor starting contacts, one or more other stations upon said line each provided with a dialing device, said motor starting contacts being normally in non-motor operating condition and a sole means for placing said contacts in motor operating condition consisting of devices controlled by the selector switch local to said station through appropriate operation of one of said dialing devices.

11. In a system for interchangeable teletypewriter communication between selected stations all related to a common line, a dialing device at each station, a selector device at each station, a signal indicating device at each station controlled to signal indicating condition by movement of its selector device from normal position and another signaling device at each station controlled to signal indicating condition by the operation of the selector device at that station to a condition appropriate for selecting it.

FULLERTON S. KINKEAD.

DISCLAIMER

1,946,216.—*Fullerton S. Kinkead*, New York, N. Y. TELETYPEWRITER SELECTOR SYSTEM. Patent dated February 6, 1934. Disclaimer filed October 25, 1934, by the assignee, *Bell Telephone Laboratories, Incorporated.*

Therefore enters this disclaimer to the said claims of said Letters Patent as follows:

The combination defined by claim 7 is disclaimed except when the dialing device at each station is a numerical dial and the selection of a station is accomplished by apparatus including a selector switch of the type which operates in response to each group of impulses sent from the dial and registers each numerical group of impulses.

And the combination of claim 10 is disclaimed except when each station includes a recording magnet which records the first setting of the selector switch which thereafter returns to normal and steps forward in response to a subsequent group of impulses for controlling apparatus to make the desired selection.

[*Official Gazette November 20, 1934.*]