

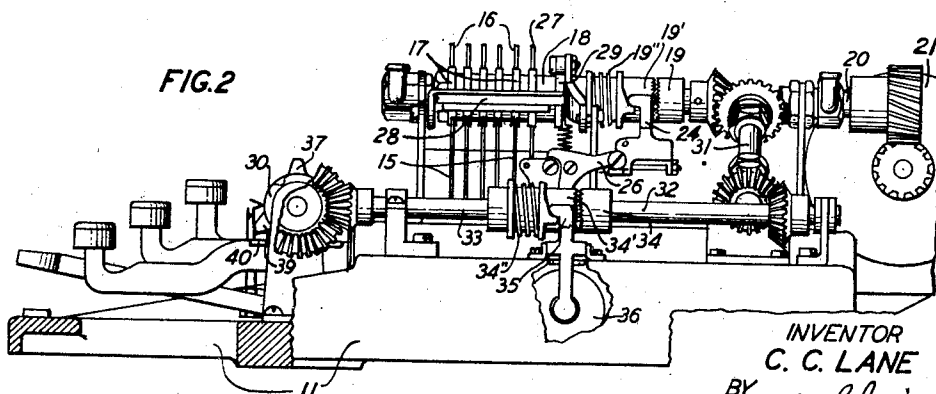
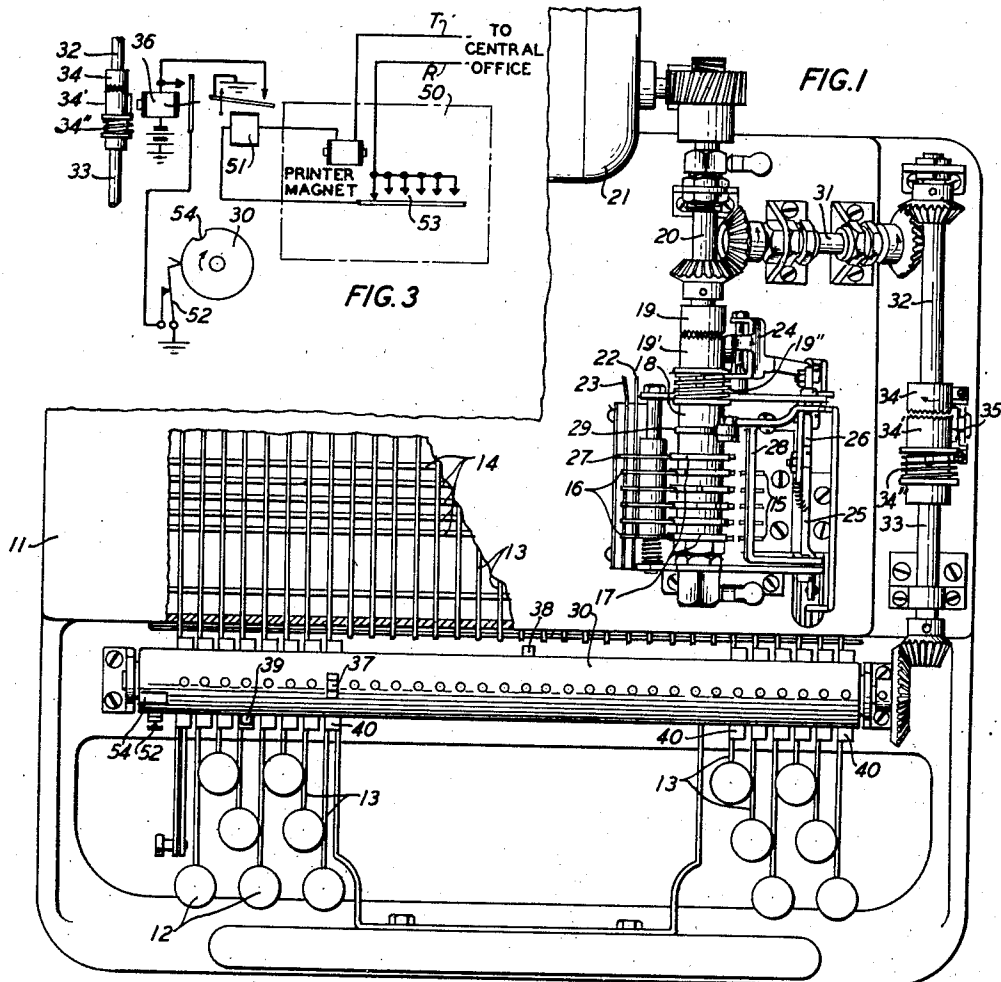
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C. C. LANE

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TELEGRAPH EXCHANGE SYSTEM

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INVENTOR
C. C. LANE
BY *J. W. Schmied*
ATTORNEY

UNITED STATES PATENT OFFICE

CUTHBERT C. LANE, OF LITTLE NECK, NEW YORK, ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

TELEGRAPH EXCHANGE SYSTEM

Application filed December 15, 1931. Serial No. 581,121.

This invention relates to the subscriber's station circuit for a printing telegraph exchange system and its object is to provide means for automatically repeating back to a calling subscriber the code number corresponding to the station to which the calling subscriber is connected.

A printing telegraph exchange system usually comprises a group of subscribers' printer stations and one or more switchboard or central offices for interconnecting the subscribers for communication purposes. Means may be provided at the switchboard for starting the motors at a called subscriber's station circuit for conditioning the printer set thereat to receive a message whenever the called station is unattended. The Locke-Kinkead copending application Serial No. 459,684, filed June 7, 1930 discloses a system of this type. It is often desirable in such systems to bring to the attention of the calling subscriber the code number of the unattended station to which he is connected before starting to transmit a message. Such an arrangement will prove a check on the central office operator and will acquaint the calling party with the fact that he is communicating with the correct party.

Broadly, this invention comprises means to transmit an answer-back signal to the calling subscriber. In accordance with this invention a shaft is connected to the keyboard of the subscriber's printer set, transverse of the key levers, for engaging a group of the key levers in a predetermined order upon rotation of the shaft in order to repeat back to a calling subscriber the code number corresponding to the called station circuit. The periphery of the shaft is drilled with numerous holes in such manner that studs may be inserted in the holes to engage any desired key lever at any desired position of the shaft as it revolves. This shaft is arranged to engage a driving member and to revolve one complete revolution upon the actuation of the unattended start relay in the subscriber's station circuit. Upon the completion of one revolution the driven member automatically disconnects itself.

A feature of the invention resides in the

small amount of equipment required to accomplish the desired result.

Other objects and features will appear in the following detailed description considered in conjunction with the accompanying drawing. A system which may be adapted to employ the present invention is disclosed in the Locke-Kinkead copending application, supra, but it may be employed in modified systems operating upon similar principles.

Referring to the drawing:

Fig. 1 illustrates a fragmentary plan view of a telegraph-typewriter set in which only the essential parts necessary for a clear understanding of the invention are shown;

Fig. 2 is an elevation view of the typewriter set taken at the right side of Fig. 1; and

Fig. 3 is a schematic circuit arrangement of the essential elements necessary to operate the telegraph-typewriter set of a called subscriber's station when it is desired to transmit the code number of such station to a calling subscriber's station.

Similar characters of reference designate similar parts throughout the several views.

As it is understood by those familiar with the art, keyboard-operated printing telegraph outfits are of at least two distinct kinds, one in which the character writing keys operate a mechanism for perforating a tape which is then fed through a transmitting device for sending over the line impulses of different combinations corresponding to the groups of letters or groups of figures, or both, which the operated keys represent, in which the operated keys actuate the transmitting device directly for transmitting the signal combinations over the line. Either kind may be adapted for use in illustrating the present invention. The kind employing direct keyboard transmission is described herein.

Referring to Figs. 1 and 2 of the drawing, the numerical designation 11 represents the main frame of the telegraph-typewriter which is operated principally by means of character writing keys 12, each being fixedly mounted on one end of individual key levers 13. The key levers extend rearwardly in juxtaposition to the five selector or comb bars

14. The selector bars are respectively arranged in engageable relation with five locking latches 15 so that when a key is depressed to move one or more selector bars endwise in either direction, the locking latches respectively associated with the operated selector bars, will latch or unlatch, depending on the position of the selector bars at the time, one or more contact levers 16. Respectively arranged in engageable relation with the five contact levers are five contact cams 17. The contact cams are fixedly mounted on a rotatable shaft 18 which is driven through clutch members 19 and 19' by shaft 20 geared to the printer motor 21. The five contact levers 16 are respectively arranged to open and close five pairs of transmitting contacts in various combinations for transmitting over a line circuit extending to a distant station, a five-unit code of impulses representing each character of a message. One contact of each transmitting pair forms an integral part of bus-bar 22 and the other contact of each pair forms an integral part of bus-bar 23, both bus-bars being connected in series with the line circuit. The sending unit is of the type wherein the motor is driven to run at approximately a constant speed. When a character is sent, the motor, acting through gearing and the clutch, rotates the keyboard sending cams which successively engage the unlatched contact levers for operating the transmitting contacts to form the combination of the particular character. In the stopped position the clutch is disengaged by the clutch stop arm 24 and whenever a key is depressed, this arm is moved out of engagement with its associated notch in the clutch member 19', allowing the two clutch members 19 and 19' to engage under the tension of coil spring 19'' and rotate the cam shaft through one revolution.

Beneath the key levers are the five transverse selector bars and a universal bar, (the latter is not shown but its use is well known in the art) extending across the width of the keyboard. The selector bars are provided with saw-tooth shaped notches according to the requirements of the signaling code, and they rest on rollers so that they move endwise easily in response to a depression of a key. When a key is depressed, it strikes the slanting sides of the notches and moves, either to the right or to the left, one or more selector bars, depending on the key selected, to determine whether the impulses corresponding to the bars are to be opened or closed circuit impulses. The universal bar (not shown), which is connected to the clutch stop arm 24 controlling the starting and the stopping of the sending cams 17, is pivoted at its two ends in such a way that the depression of any key lever moves it downward to actuate the stop arm through the trip-off pawl 25 and intermediate pawl 26. This allows the

clutch teeth to engage, causing the sending cams 17 to make one revolution. Each selector bar engages a vertical lever or locking latch 15 at its right-hand extremity and positions it to correspond to the signal impulse to be transmitted. Each locking latch controls the motion of a contact lever 16 by either allowing the contact lever to close its associated contact, or restricting the motion of the contact lever to hold the contact open, when the cam revolves. Each cam is provided with an indent in its periphery and these cams are so positioned on shaft 22 that the indents come into engageable relation with their respectively associated contact levers in a successive order through the rotation of the cam shaft through one revolution. This arrangement of the indents provides for transmitting the five impulses of a signal in a successive order. A sixth contact lever 27 controls the starting and stopping impulses. At the end of revolution of the cam, the stop arm 24 controlled by the universal bar again enters its notch on the driven sleeve 19' of the clutch and prevents the cam from rotating further until another key is depressed.

A locking bail 28 which engages the upper ends of the locking latches 15 at the beginning of each revolution prevents any change in the selection set up, until the revolution has been completed and the impulse of a signal have been transmitted. The bail is raised by a cam 29 near the end of each revolution. This arrangement also makes it impossible to depress another key until the impulses for the previous signal or character have been sent out over the line.

The sending unit just described is well known in the art and requires no further explanation. The purpose of illustrating it here is merely to show how the device of the present invention may be applied. It is understood, however, that the present invention is not limited in scope to the arrangement shown herein.

The invention herein resides essentially in the use of a rotatable shaft 30 mounted directly over the key levers 13 and provided with parallel rows of tapped holes extending completely around its periphery, each row being in alignment with a key lever. The number of holes in a row depend on the number of signals to be transmitted in order to complete the code number of a called station. The shaft is so positioned above the key levers that should a stud be inserted in any hole and the shaft rotated, the top of the stud would, upon reaching the underside, depress a key lever to an operated position. One stud is provided for each signal of the code number of the station at which the keyboard is located and the studs are so positioned, with respect to each other, on shaft 30 that their angular distances apart are equal and their transverse distances apart vary in accord-

ance with the locations of the keys which they are designed to operate. In other words, the studs are positioned to form a somewhat spiral alignment around shaft 30 in which the sectorial angles of the spiral formed by the studs are equal. Therefore, as shaft 30 makes one complete revolution the studs engage their respectively associated key levers successively and thereby transmit to the lines in their proper order the signal combinations representing the characters of the office code.

Shaft 30 is driven primarily from the main driving shaft 20. Shaft 31 is geared to shaft 20 in a one to one ratio for driving shaft 32 which serves to drive shaft 33 by means of clutch members 34 and 34'. These clutch members are brought into engagement by the tension of coil spring 34". Geared to shaft 33 in a lesser ratio than one to one is shaft 30 which makes one revolution to as many revolutions of shaft 33 as there are signals constituting the number of the called station, bearing in mind that where it is desired to use both letters and numerical digits to complete a station number, a "shift" signal, and probably a "space" signal, may have to be transmitted between the letters and numerical digits. Shafts 31 and 32 are continuously rotating while motor 21 is operating. The driven clutch member 34', in a stopped position, is disengaged from the driving clutch member 34 by the clutch stop arm 35 which is controlled by magnet 36, the operation of which will be hereinafter described.

In the particular arrangement illustrated in the drawing, three studs 37, 38 and 39 are shown in Figs. 1 and 2, but as stated above, as many studs may be provided as there are signals required to transmit the complete station code number. In a case where there are four digits in the station code number, four studs are provided, one for operating each of the four keys and the four keys must be operated during a single revolution of shaft 30 in order that the station code number can be transmitted to the distant or calling station. Each of key levers 13 may be equipped with a flat detachable member for providing a bearing plate for engaging its associated stud.

It was stated above that shaft 33 makes as many revolutions during one revolution of shaft 30 as there are signals in the called station number. This provision is necessary inasmuch as shaft 33 which operates at the same speed as shaft 18, has to complete one revolution in order to transmit each combination of signal impulses and in the case where there are four digits or signals in the station code number and consequently there are to be transmitted four combinations of impulses, shaft 33 has to complete four revolutions in the interval in which it takes shaft 30 to complete one revolution. Therefore, by means of gear arrangements between shafts

33 and 30, shaft 30 is made to rotate at a speed having a ratio of one to four with that of shaft 33.

Fig. 3 shows in schematic form only so much of the circuit at a subscriber's station A as is necessary to give a clear understanding of the operation of the apparatus shown in Figs. 1 and 2. T and R represent a portion of the subscriber's loop circuit extending through the subscriber's printer set 50 at station A to a central office, (not shown). When a subscriber at a distant station desires a connection to the subscriber's station shown in Fig. 3, the connection is established in the manner described in the Locke-Kinhead pending application, supra. Should, however, the subscriber's printer set be unattended at the time the connection is requested and the distant subscriber still desires to have the connection established, the operator at the central office operates a key which momentarily opens the loop circuit to cause the release of a slow-release relay 51. The release of relay 51 closes an operating circuit for relay 36 which, in operating, withdraws the clutch stop arm 35 from engagement with the driven clutch member 34'. Relay 36 in operating closes a locking circuit for itself from grounded battery, through the relay winding, to the normally closed contact 52, to ground. This locking circuit is maintained closed for approximately a complete revolution of shaft 30 and consequently relay 36 is maintained in an operated position for the duration of the same interval.

The withdrawal of clutch stop arm 35 permits clutch member 34' to move, under the tension of coil spring 34", into engagement with the driving clutch member 34 and therefore shaft 33, which is fixedly attached to clutch member 34', begins to rotate at the speed of shafts 32, 31 and 20. The rotation of shaft 33 drives shaft 30 at a speed having a ratio of say, for the purpose of illustration, one to three with that of shaft 33, assuming that there are three digits in the code number of station A. Assuming that the shaft 30 is in a position wherein stud 39 is about to engage its associated key lever (not as shown in Fig. 2 because in that figure stud 39 is shown as having passed from engagement with its key lever), the start of rotation of shaft 30 will cause stud 39 to depress its key lever and to thereby send out over the line the signal combination representing the first digit of the called station code number. The continued rotation of shaft 30 causes the selector key levers respectively associated with studs 38 and 37 and corresponding to the other digits of the called subscriber's code number to be momentarily depressed to their operated positions, in turn, whereby the combinations of impulses controlled by said selected keys, are transmitted over the sending contacts 53 which are integral parts of bus-

bars 22 and 23, to the loop circuit T—R. In the time that the three signal combinations are being transmitted to the loop circuit, shafts 18, 20, 31, 32 and 33 are each completing one revolution to each signal combination transmitted.

Immediately after the last stud 37 has operated its associated key lever an indent 54 in the left-hand end of shaft 30 receives the movable spring of contacts 52 to open the locking circuit for relay 36. Relay 36 releases and thereby causes the clutch stop arm 35 to drop back from the driven brush member 34' so that when shaft 33 returns to its normal position immediately after the transmission of the last signal combination, the shaft is stopped thereby stopping the rotation of shaft 30.

What is claimed is:

- 20 1. A printing telegraph circuit of the type used in a printing telegraph exchange system for communication between subscriber's station printer sets, characterized in this, that there are provided therein keyboard operating means in engageable relation with the driving mechanism of the printer set at a called subscriber's station for selecting and actuating certain contacts in response to a signal received from the central office to transmit back to the printer set at the calling station certain signal combinations in a definite sequence corresponding to the characters constituting the called subscriber's station number and other means included in said keyboard operating means for automatically effecting the disconnection of said first mentioned means immediately after the desired number of signal combinations have been transmitted.
- 40 2. A circuit of the type used in a printing telegraph exchange system for communication between printer sets, over a line, said printer sets each having a keyboard characterized in this, that means are associated with the keyboard of the printer for engaging a group of key levers in a predetermined order for transmitting a code signal upon the application to the line at a distant point of a special non-signaling potential, said means automatically disconnecting itself from the keyboard after transmitting the code combination once.
- 55 3. An answer-back arrangement for a subscriber's printer set comprising a motor, a relay responsive to currents of one polarity for starting said motor, a shaft associated with said motor and adapted to be rotated upon the actuation of said motor, a driven member adapted to be driven by said shaft but normally disengaged therefrom, a magnet responsive to the operation of said relay for causing the engagement of said shaft with said driven member for one complete revolution of said member, a keyboard, key levers for said keyboard and means for depressing

a group of said key levers in a predetermined order upon rotation of said driven member.

4. A telegraph exchange system, a central office, a subscriber's station, a printer set at each of said stations, means at said central office for establishing connections between printer sets at any two subscribers' stations, driving mechanism for each of said sets, a driven mechanism in engageable relation with one of said driving mechanisms, a camming element controlled by said driven mechanism, a device responsive to a signal from said central office for effecting an engagement between said driven mechanism and said one driving mechanism whereby the actuation of said driven mechanism causes to be transmitted from one subscriber's station to another subscriber's station, a series of impulse combinations corresponding to the digits of the code number of one subscriber's station, and means included in said driven mechanism for automatically effecting the release of said driven mechanism and said device immediately after the last impulse combination of the subscriber's station number is transmitted.

5. A telegraph exchange system according to claim 4, wherein the driven mechanism comprises two rotatable members arranged to operate at different speeds.

6. A telegraph exchange system according to claim 4, wherein the camming element is a rotatable shaft in engageable relation with the keyboard of one of said subscriber's printer sets, and arranged to cause to be transmitted from said keyboard one or more signal combinations during one revolution of said shaft.

7. A telegraph exchange system according to claim 4, wherein the device for engaging said driving and said driven mechanisms is an electromagnetic relay arranged to operate in response to the signal received from the central office and to remain operated until the termination of the interval in which the signal combinations corresponding to the digits of the subscriber's station code are being transmitted.

8. A telegraph exchange system according to claim 4, wherein the means effecting the release of said driven mechanism comprises a rotatable member having an indented surface in engageable relation with said device whereby the engagement between said surface and said device causes a disengagement between said driving and said driven mechanism.

9. In a telegraph system comprising a keyboard operated sender, a line, and devices for impressing upon the line code combinations characteristic of the station wherein the sender is located, said devices comprising mechanisms for operating the keyboard sender, said devices being actuatable to operate the key-

board in conformity to the definite code combination in response to the application to the line of a special non-code potential.

5 10. A system according to claim 9 provided with means at a distant point for imposing the special non-code potential upon the line.

11. A system according to claim 9 in which the line extends through a central office to a connected subscriber and having a circuit
10 changing device at the central office to connect a source of special non-code potential upon the line.

In witness whereof, I hereunto subscribe my name this 11th day of December, 1931.

15 CUTHBERT C. LANE.

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