June 4, 1940. W. J. ZENNER 2,203,289

TELEGRAPH SWITCHING SYSTEM

Filed Oct. 22, 1937 3 Sheets-Sheet 1

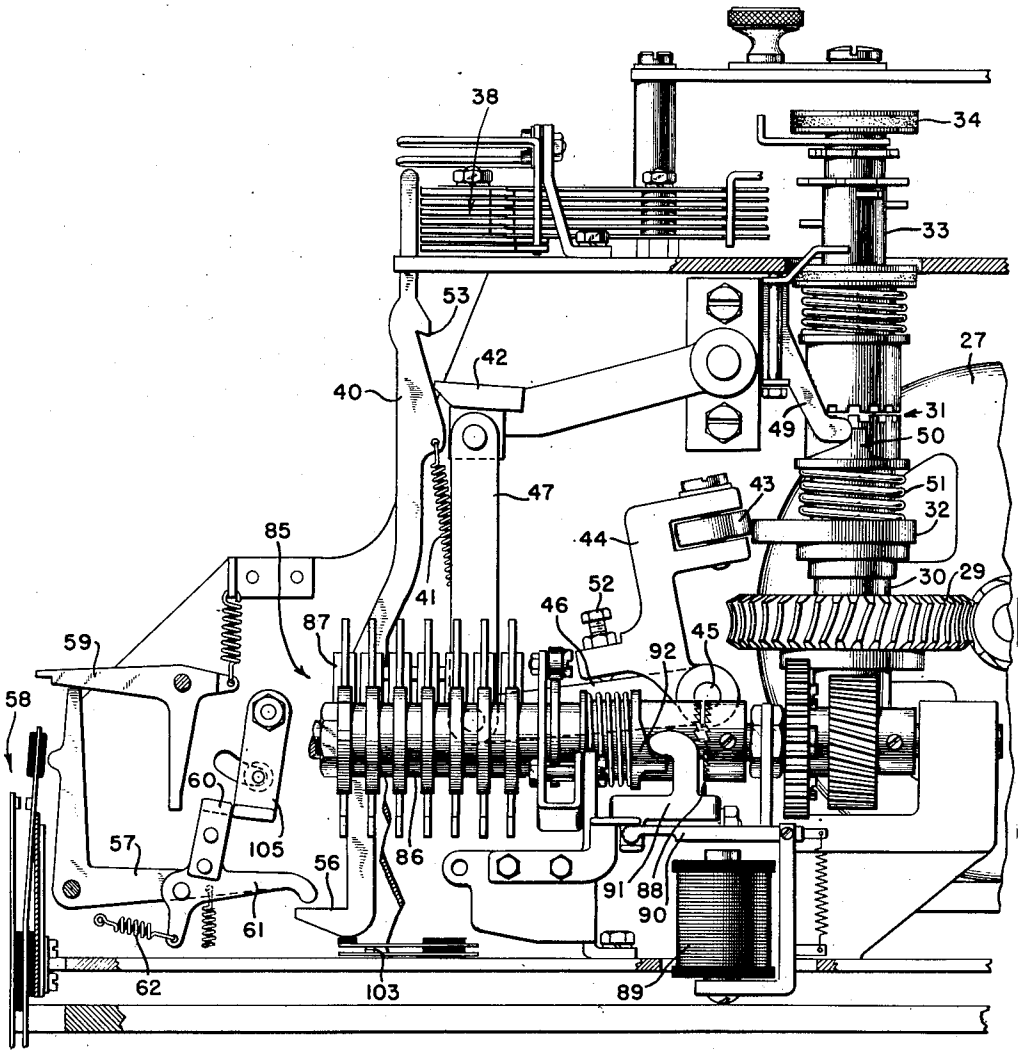


FIG. 1

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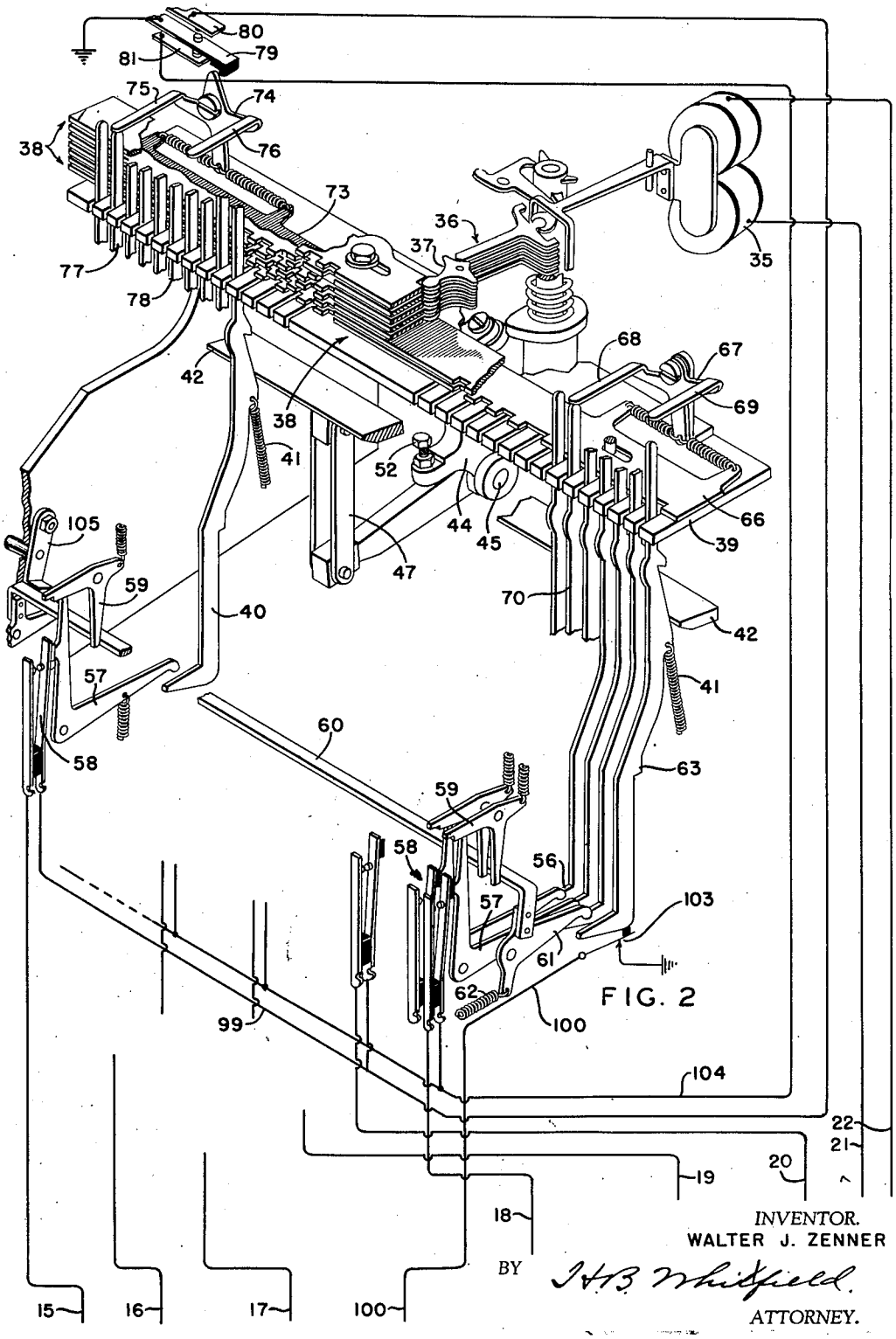


FIG. 2

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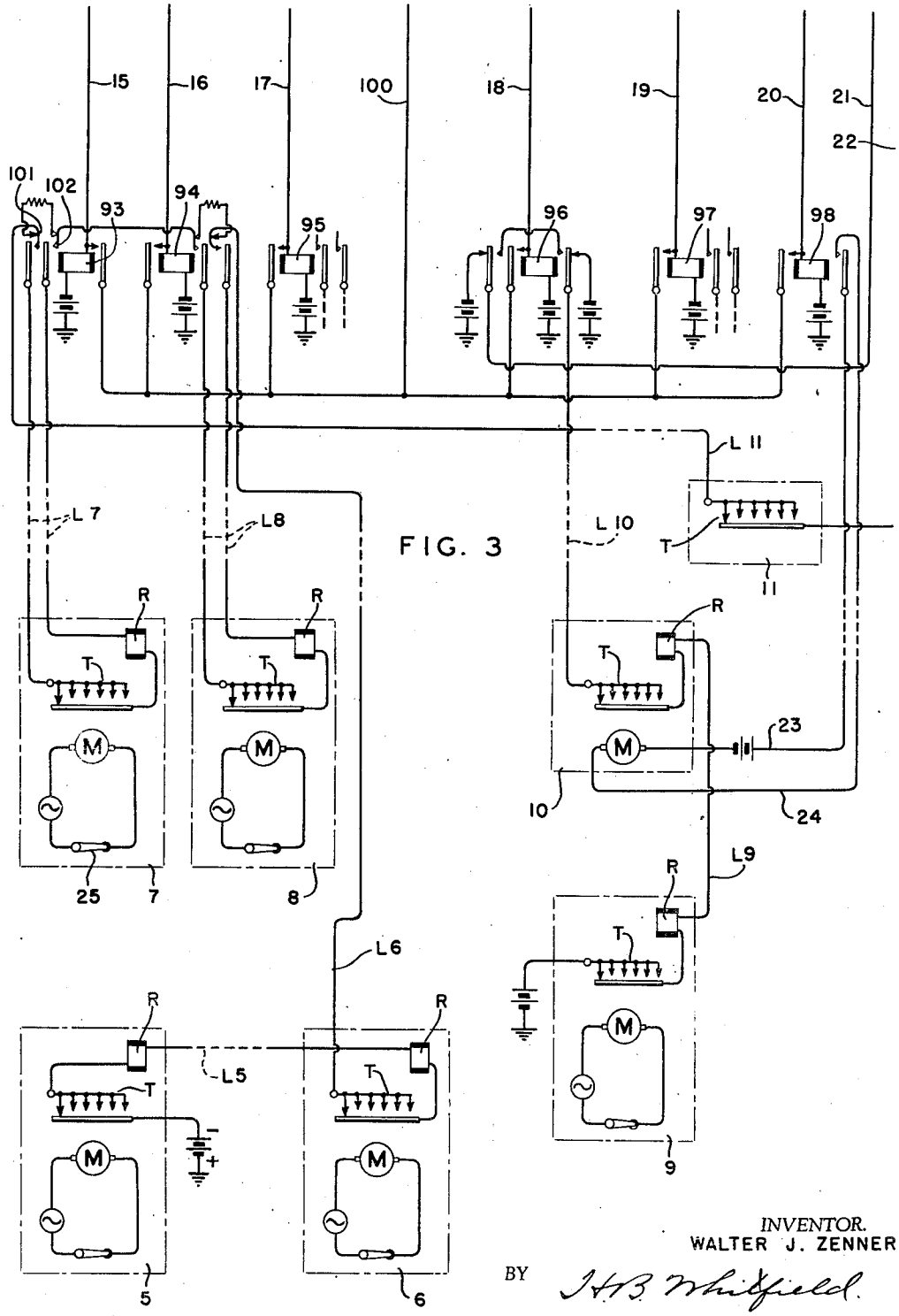


FIG. 3

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Patented June 4, 1940 2,203,289

UNITED STATES PATENT OFFICE

2,203,289

TELEGRAPH SWITCHING SYSTEM

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Application October 22, 1937, Serial No. 170,376

7 Claims. (Cl. 178—2)

This invention relates to telegraph systems and more particularly to systems and apparatus therefor capable of selectively interconnecting telegraph stations for communication.

An object of the invention is the provision of telegraph selector apparatus responsive to permutation code signals for interconnecting line conductors for telegraphic communication.

A further object of the invention is the provision of instrumentalities at a central station for enabling a subscriber at any one of a plurality of substations to connect the telegraph apparatus thereat with any other desired station of the system without the intervention of an operator.

The above and other objects of the invention are attained by the provision of a selector mechanism including instrumentalities responsive to permutation code signals for setting, in accordance with such signals, a plurality of permutation or code bars. These code bars serve, upon their permuted setting, to select selectable elements which, by means of bell crank levers controlled thereby upon the operation of a universal bail, close contacts individual thereto. These contacts are included in circuits extending to other stations equipped with printing telegraph apparatus, which is adapted to be connected through such contacts to other stations of the system. The contacts, through provision of a latch mechanism, are maintained closed until a predetermined selection is established, which operates mechanism whereby the several latch mechanisms are operated and all of the previously operated contacts are restored to their normal or open position. While the selector apparatus serves to interconnect, through its contacts, the line conductors of the printing telegraph stations, its selector mechanism responds to the impulses impressed on the interconnecting line conductors but is ineffective on the selector mechanism since instrumentalities responsive to a particular signal are provided for rendering all selectable elements unresponsive to the permuted setting of the permutation bars, except for one selectable element which responds to a particular signal for restoring the selector to a selective condition. Through the recited contacts, the line conductors may be connected either directly or through the contacts of relays controlled from the contacts on the selector apparatus.

The above and other objects and features of the invention will now be described in detail with reference to the accompanying drawings in which,

Fig. 1 illustrates, in end elevation, a selector apparatus embodying instrumentalities for selectively interconnecting the line conductors singly or in groups;

Fig. 2 shows diagrammatically the selector apparatus shown in Fig. 1 as it may be arranged at a central or switching station; and

Fig. 3 shows diagrammatically the arrangement of several substations and the lines interconnecting such substations with the central station embodying apparatus as exemplified in Fig. 2.

With Figs. 2 and 3 positioned with Fig. 3 below Fig. 2, a substantially complete system is disclosed.

The selector apparatus disclosed in Figs. 1 and 2 is similar to and embodies many of the features disclosed in Patent No. 1,745,633 granted February 4, 1930, to S. Morton et al. Consequently, the disclosure of the Morton et al. patent is incorporated herein by reference as a part of the present specification, and for details of the selecting apparatus not specifically disclosed herein, reference should be had to the cited Morton et al. patent. It is, however, to be understood that the invention is not limited to the particular type or form of selector apparatus disclosed in the cited Morton et al. patent, for it is manifest that other forms and types of selecting apparatus might be used with equal satisfaction to the particular selector apparatus chosen for illustration of the present invention.

As disclosed in Fig. 2, the selector apparatus is located at a central station. It is, however, manifest that such apparatus may be located at any one of a plurality of stations, which may not necessarily be designated as a central station. As disclosed in Fig. 3, particularly when arranged immediately below Fig. 2, a plurality of subscriber's stations 5, 6, 7, 8, 9, 10, and 11 are connected through line conductors L5, L6, L7, L8, L9, L10, and L11 to the selector relays. At each of the indicated stations, except station 11, a receiving printer R and a transmitter T are located. At station 11 only a transmitter T is disclosed. It is, of course, understood that a receiving printer might also be located at station 11 if it is desired that such station should act also as a station for receiving communications from other stations. Also, at each of the stations, there is a driving motor M, which supplies power for driving the elements of the receiving printer R and the transmitter T. The motor at each of the stations may be driven from a

local source of alternating current applied through either a manually controlled switch, such as 25, or the contacts of a remotely controlled relay as disclosed for station 10. In the case of station 10, the circuit for its driving motor will be normally open at the contacts of its control relay, whereas the operating circuit for the driving motor at the other stations will be controlled by the local attendant, and at such stations the driving motor will run continuously if there is any likelihood that a message is to be destined for such station.

The selector at the central station, which serves to connect, through the contacts controlled thereby, the line conductors of the several recited stations, embodies a driving motor 27 which drives, through gears 28 and 29, a shaft 30 which, through positive clutch 31, drives a cam sleeve including an operating cam 32. Power from shaft 30 is also communicated to cam barrel or sleeve 33 through a friction clutch 34. As is fully described in the cited Morton et al. patent, the cam barrel or sleeve 30 is normally held against rotation, but rotates in response to the deenergization of the electromagnet 35 when it responds to the start impulse for setting, through the T-levers 36 and the transfer elements 37, the code bars 38 in accordance with the signals impressed on the electromagnet 35, which, in turn, causes the corresponding operation of the selector mechanism of the apparatus as is fully disclosed in the cited Morton et al. patent.

In the particular selector apparatus disclosed as a part of the present invention, there are seven code or permutation bars 38. Five of these bars are positioned directly in response to the operation of the selector unit of the apparatus, whereas the other two bars respond to particular groups of code signals. For example, one of the two code bars responds to a code signal to render the other code bars ineffective for selective purposes, except for one particular signal combination, which is utilized for restoring the selector to its normal position. The other code or permutation bar responds to shift and unshift signal combinations; that is, it is moved in one direction in response to a shift signal and in the other direction in response to an unshift signal for the purpose of expanding the selective possibilities of the selector apparatus.

As illustrated in Fig. 2, the permutation bars 38 are slidably mounted on a plate 39, which has its forward edge, as viewed in Fig. 2, notched to provide a guide comb for a plurality of selectable or pull bars 40 arranged with their upper ends to cooperate with the permutation bars 38 and to be selected in response to the various permuted settings of such bars. Individual to each of the pull bars 40 is a spring 41, which tends to move its pull bar downwardly and rearwardly and hold it in normal position, as shown in full lines in Fig. 2, with the forward restraining edge of a common operating or striker bar 42 against an edge of each of the pull bars 40.

As shown in Fig. 1, cam 32 cooperates with a roller 43 carried by arm 44 rotatable on pivot shaft 45 to which is also mounted lever 46 connected through link 47 to the lower part of common operating or striker bar 42. Operation of lever 46 in response to the rotation of cam 32 will occur cyclically with the operation of cam drum 33 due to the action of a cam thereon (not shown) with pivoted release lever 49, which has its free end moved out of the path of a stop lug 50, which permits spring 51 to move the driven portion of clutch 31 into operative relation with the driving portion thereof. Power is thus communicated by cam 32 and through lever 44 and set screw 52 secured thereto and engaging lever 46. The latter lever will be rotated about pivot shaft 45, and through link 47, the common operation or striking bar 42 will be operated. However, operation of striking bar 42 occurs in timed relation to the setting of permutation bars 38 to allow for the selection of pull bars 40.

Normally, cam 32 is held against movement and holds, through levers 44 and 46 and link 47, striker bar 42 in its lowermost position with springs 41 under tension. In this position, the upper end of each of the pull bars 40 is held in front of but spaced slightly from the notched forward edges of the permutation or code bars 38. When the latter are set in accordance with any received signal, cam 32 is rotated, and, through levers 44 and 46 and link 47, striker bar 42 is raised and lowered. If the latter moves upwardly, the springs 41 move the bars 40 rearwardly against the notched edges of the permutation bars 38, and one of the bars corresponding to the setting of the permutation bars drops into the notches of the latter far enough to bring a rearwardly projecting lug 53 thereon into the path of movement of striker bar 42. Upon the continued upward movement of bar 42, its forward edge engages the lug 53 of the selected bar 40 and moves it upwardly, thereby moving the lower edge of such bar correspondingly. When a bar 40 is engaged with the notches of the permutation bars 38, the latter are locked against adjustment, but as the striker bar 42 returns to its normal position, it engages a cam surface formed on the rear edge of each of the bars 40 and moves all of such bars clear of the permutation bars 38. The latter are then ready to receive a new setting as previously described.

The lower end of each of the bars 40 is formed with a hook 56, which engages one arm of a bell crank lever 57, the other arm of which serves to operate a pair of normally open contacts 58, the purpose of which will be described later. Cooperating with the arm of the bell crank lever 57, through which the contacts 58 are closed, is a spring operated latch 59 arranged in such manner that upon the operation of any of the bell crank levers 57 in a counterclockwise direction, as viewed in Fig. 2, the contacts will, through latch 59, be held in their operated position.

Common to all of the latches 59 is a bail 60, which extends transversely of the selector apparatus as disclosed in Fig. 2. Bail 60 is pivoted at its opposite ends in the side frame of the selector apparatus and has secured at its right-hand end a lever 61 normally under the tension of a spring 62 to move its free end into the path of the hook portion of a particular pull bar 63, which responds to a predetermined setting of the code bars 38. When such predetermined setting of the code bar 38 is established and the striker bar 42 operates, as previously described, pull bar 63 likewise operates and, through lever 61, operates bail 60 to operate all of the latches 59 to the position shown in Fig. 2 free of latching engagement with the bell crank levers 57, so that each of such levers will be restored to their normal unactuated position by the tension of one of the springs of the pair of contacts 58.

It is highly desirable, following operation of one or more of the bell crank levers 57, to establish a condition whereby the selector apparatus will not respond to the code combination of impulses im-

pressed on its electromagnet 35, except for a particular code combination which may be allocated to the function of restoring the selector to its normal position. To accomplish such a result, blocking bar 66 is provided. This blocking bar is operated by a spring tensioned lever device 67 arranged with horizontally extending arms 68 and 69 the forward ends of which lie in the path of certain ones of the pull bars 40. Specifically, arm 68 lies in the path of pull bar 70 and arm 69 lies in the path of pull bar 63. Consequently, when these pull bars 63 and 70 are operated, and provided lever device 67 is in a position to receive movement from either of the bars, the blocking bar 66 will be moved to a position dependent upon which of the arms 68 and 69 are engaged by the respective pull bars 63 and 70. As disclosed in Fig. 2, lever device 67 has its arm 68 positioned to be engaged by pull bar 70. When such pull bar is operated, its upper end engages arm 68 and rotates latch device 67 about its pivot and allows the spring attached thereto to move bar 66 to the left as viewed in Fig. 2. When in such position, bar 66 blocks all of the pull bars 40 but allows the operation of pull bar 63 in response to a particular code combination of impulses. Under such conditions, arm 69 is now in the path of the upper end of pull bar 63 and will be engaged thereby upon the operation of such pull bar. Lever device 67 remains in its set position due to its frictional engagement with its pivot screw.

Also, grouped with the permutation bars 38 is a code bar 73 arranged to be shifted right or left through a lever device 74 similar in construction to lever device 67 and provided with horizontal forwardly extending arms 75 and 76, which lie in the path of pull bars 77 and 78 identified with shift and unshift signal code combinations, respectively. That is, when the code bars 38 are positioned in accordance with a shift signal, pull bar 77 will be selected, and upon its operation will move code bar 73 to the left, as viewed in Fig. 2, through the lever device 74 which remains in its set position due to its frictional engagement with its pivot screw. Likewise, upon the operation of pull bar 78, lever device 74 will be operated and code bar 73 will be restored to the position shown in Fig. 2. With the code bar 73 in its respective left and right-hand positions, the permuted arrangement of the code bars 38 will be altered to accommodate a larger number of pull bars 40 with a five unit code. In other words, such an arrangement expands or doubles the selective possibilities of the basic five unit code.

Also operated by lever device 74 is a contact spring 79, which may engage either contact spring 80 or contact spring 81 depending upon the position of code bar 73.

As shown in Fig. 1, there is also mounted, on the base plate supporting the motor 27 and the other parts of the selector mechanism, a transmitting unit 85 including a transmitting cam shaft 86 and a plurality of contacts 87 arranged to be operated in sequence in response to the rotation of the cam shaft 86 and conditions established for their operation. Power for driving cam shaft 86 is supplied from motor 27 and suitable shafts and gears through a positive clutch 88, which is arranged to have its driven and driving portions in engagement in response to the energization of an electromagnet 89 provided with an armature 90 cooperating with a stop latch 91, which, upon the energization of electromagnet 89, is moved out of the path of stop lug 92 and allows the engagement of the driven portion of clutch 88 with the driving portion thereof, and thus the communication of power to cam shaft or sleeve 86. The transmitting unit 85 may be used for the purpose of transmitting signals indicating the proper interconnection of desired line conductors.

Referring now to Figs. 2 and 3 arranged as previously indicated with Fig. 3 below Fig. 2, it is seen that the conductors 15, 16, 17, 18, 19, and 20 extend to contacts 58 of the selector apparatus located at the central station. Included in each of these conductors and preferably located at the central station or the station at which the selector apparatus is located is a relay 93, 94, 95, 96, 97, and 98, respectively, which are arranged to have their energizing circuits established in response to the operation of the contacts 58 individual thereto. That is, there is a set of contacts 58 individual to each of the conductors 15 to 20, inclusive.

As disclosed in Fig. 2, the contacts 58 are grouped and may be referred to as shift and unshift contact groups. That is, depending upon the position of code bars 73 and contact spring 79, ground will be applied to the respective groups of contacts. With the code bar 73 in the position shown in Fig. 2 where contact spring 79 is in engagement with contact spring 81, ground is applied to the left-hand or unshift group of contacts 58. With code bar 73 in its other position, contact spring 79 will be in engagement with contact spring 80 and ground will then be applied to the other or shift group of contacts. In that way, the circuits for the relays 93 to 98, inclusive, are controlled.

In the operation of the system disclosed and the apparatus thereof, let it first be assumed that the subscriber at station 5 desires to be connected to subscriber at station 7, the line L6 of which extends to the right-hand front contact of relay 94, and further that the selector apparatus is in its shifted position or the position wherein contact spring 79 engages contact 80. The motor switch at station 5 is normally closed during business hours so that the motor M of such station is energized by the power source provided for that purpose. It is also to be assumed that motor 27 of the selector unit located at the central office is also running, and that the selector unit is in a condition for the selection and operation of its various pull bars. Accordingly, a subscriber at station 5 transmits by means of transmitter T a combination of significant current impulses over line conductors L5 and L6 to the central office over line conductor L11 and conductors 21 and 22. At the central office, the preassigned combination of significant current variations is received by receiving magnet 35 of the selector unit, which operates the selecting unit for selecting a particular pull bar 40. Pull bar 40 is operated, as previously described, by bail 42 in a manner to operate bell crank lever 57 associated therewith, which, when operated, will be latched by latch 59 against the tension of its retractile spring to hold contacts 58 closed pending the receipt of a significant code combination of impulses to effect the operation of restoring bail 60 and restoration of all of the operated bell cranks 57 to normal or the position shown in Fig. 2.

In the description immediately above relative to the closure of contacts 58 through the operation of the selector unit, it was assumed that

the selector unit was in a condition to permit the operation of any of the pull bars 40, and further, that the code bar 73 was in a position with contact spring 79 in engagement with contact 80. However, to insure that the selector unit was in a condition to selectively operate the contacts 58, the code signal combination significant for connecting line 7 in an operative circuit with station 5 should be preceded by signal combinations, which effect the operation of a blocking bar 66 to a position where the pull bars 40 are free to be selected by the alignment of the notches in the code bars 38. As previously described, blocking bar 66 is operated through the operation of pull bar 63 and lever device 67. With blocking bar 66 in the position shown in Fig. 2, any of the pull bars 40 may be selected.

Upon the closure of contacts 58, a circuit is completed for the energization of relay 93 extending from grounded battery, winding of relay 93, conductor 15, closed contacts 58, conductor 99, contact 80, and contact spring 79 to ground. Relay 93 is energized and as a result of its energization operates its several armatures. Through its left-hand armatures the line conductors of station 7 are connected serially with conductor L11 in circuit with which station 5, through conductors L5 and L6, is connected. Through the right-hand armature of relay 93, a locking circuit therefor is established extending from grounded battery, winding of relay 93, right-hand front contact and armature thereof, conductor 100 and normally closed contacts 103 to ground. Relay 93 thus is maintained energized independently of contacts 58. It is, however, assumed that a locking circuit for such relay might not be required since latch 59 maintains, through bell crank lever 57, contacts 58 closed pending the receipt of a code combination of impulses to effect the operation of restoring bail 60.

With the operation of relay 93 as described, the operating circuit for station 5 extends from grounded battery at station 5, normally closed contact of transmitter T, the selector magnet of printer R, line conductor L5, selector magnet R and the closed contact of transmitter T at station 6, line conductor L6, normally closed right-hand contacts of relay 94, contact 102 and armature of relay 93, right-hand conductor of the line conductor L7, selector magnet of the printer R, closed contact of the transmitter T at station 7, the left-hand line conductor L7, armature and contact 101 of relay 93, line conductor L11, normally closed contact of transmitter T at station 11, conductor 22, winding of selector magnet 35 of the selector unit at the central station, conductor 21 and the extreme left-hand armature and back contact of relay 96 to the opposite terminal of battery.

Since the subscriber at station 7 normally has switch 25 closed during business hours, the motor M at such station will be energized at this time by current from the local source of power. Accordingly, the system is now in condition for communication to take place between the subscribers at stations 5 and 7 with the printing telegraph apparatus at station 6 responding to impulses impressed through the operation of the transmitter at either station 5 or 7 provided the motor at station 6 is operating.

As described, the electromagnet 35 of the selector unit at the central office is included in the circuit connecting stations 5, 6, and 7. Consequently, the selector magnet 35 will follow the significant impulses or code combinations of impulses generated through the operation of the transmitter T at either station 5 or 7. It is, of course, manifest that the selector unit should not respond to the operation of the transmitter at the respective stations following the establishment of a connection unless it is desired to connect additional stations to the intercommunication circuit. To prevent the operation of the pull bars 40 following the establishment of a connection or connections with desired stations and notwithstanding the fact that the selector magnet 35 and its component elements will follow the signals impressed upon the circuit traced for stations 5 and 7, blocking bar 66 is provided. This blocking bar, as previously described, responds to the operation of pull bar 70 in response to a combination of impulses transmitted from station 5 following the selection of station 7, whereby it is moved to the left, as viewed in Fig. 1, to a position where all of the pull bars of the selector unit, except pull bar 63, are prevented from dropping into the notches of the permutation bar 38 notwithstanding the fact that such permutation bars are operated, and in operating the notches therein are aligned for the selection of pull bars 40. With such a construction, the permutation bars 38 respond to the signals impressed upon the electromagnet 35, but no selection of a pull bar 40 is effected since the blocking bar 66 prevents their selection.

When the intercommunication between subscribers 5 and 7 has been completed, the subscriber at either station may send a group of code combinations of impulses for operating the selector unit at the central station to effect disconnection of the interconnected lines of the respective stations. Such disconnection results from the deenergization of relay 93 and/or the opening of the contacts 58 associated with such relay. To achieve such results, a significant signal is transmitted to the selector unit for effecting its operation to cause the selection and operation of pull bar 63, which, when operated by striker bail 42 from cam 32, rotates lever 61 about its pivot to cause the corresponding rotation of bail 60 through which all of the latches 59 are rotated in a clockwise direction against the action of their retractile spring. Thus, latches 59, which may be holding bell crank levers 57 to maintain the closure of their associated contacts 58, are operated sufficiently to allow bell crank levers 57 to be restored to their normal position by the action of the retractile spring individual thereto. Simultaneously, with the operation of pull bar 63 upwardly, normally closed contacts 103 are opened removing the ground connection from the locking circuit of relay 93. Relay 93 thus is deenergized and restores the circuit connections to the condition shown in Fig. 3.

The operation of pull bar 63, also through lever device 67, specifically, its engagement with arm 69, causes the blocking bail 66 to be moved to the right as viewed in Fig. 2 or to the position shown in such figure to allow subsequent selection and operation of pull bars 40.

Let it now be assumed that station 5 desires to be connected to station 10. As shown in Fig. 3, the operating circuit of motor M at station 10 is controlled through the right-hand contacts of relay 98, and further that the line circuit L10 of station 10 is controlled by relay 96. In order to effect the connection of station 10 in circuit

with station 5, it is necessary for station 5, assuming that the motor of such station is normally running, to transmit a group of impulses identified with the pull bar 40 of the selector unit allocated to the control of relay 96 followed by a group of impulses identified with the pull bar 40 allocated to relay 98. Upon the transmission, through the operation of transmitter T at station 5 of a group of impulses identified with the pull bar individual to the contacts associated with relay 96, a circuit is established for the energization of relay 96 extending from grounded battery, through the winding of relay 96, conductor 18, contacts 58 now closed, conductor 104, contact 81, and contact spring 79 to ground. Of course, in such explanation, it is understood that the selector unit is in its unshifted position or a position where contact 81 is engaged by contact spring 79. Relay 93 is thus energized and a locking circuit therefore is established through its middle front contact and armature to ground at contacts 103. Upon the energization of relay 96, the printing telegraph apparatus at station 10 is included in circuit with the printing telegraph apparatus at stations 5, 6, and 9. However, as to stations 6 and 9, it may be assumed that the motor switch at each of such stations is normally open, which removes power from the operating motor at each station and renders the printing telegraph apparatus thereat non-responsive to signal impulses, which may be impressed on the interconnecting line conductors. Of course, if the motor switch at each such station is closed, the operating motor thereof will be running and the receiving printer thereat will respond to the impulses impressed upon the interconnecting line conductors.

The operating circuit of the motor M for station 10 is remotely controlled, as distinguished from locally controlled, as exemplified by stations 5, 6, and 9 Consequently, it is necessary to follow the group of impulses, which effected the operation of the pull bar allocated to relay 96 with a group of impulses for operating the pull bar 40 allocated to relay 98. When such operation occurs, which is similar to that described for the operation of pull bar, which effected the energization of relay 96, relay 98 is energized and locks up over circuit 100 through contacts 103. Through the right-hand armature and front contact of relay 98, a circuit including conductors 23 and 24 and motor M of station 10 is completed. Motor M thus is started and makes possible the operation of the printing telegraph at such station.

Before intercommunication is commenced between the stations 5 and 10, assuming that stations 6 and 9 are not operating due to the fact that the motor thereat is not running, station 5 transmits a group of impulses to cause the movement of blocking bar 66 to a position to block the operation of pull bars 40, while the blocking bar is in its left-hand position as viewed in Fig. 2. Following the completion of the intercommunication between stations 5 and 10, a predetermined code combination of impulses is transmitted for operating the selector unit at the central station to cause the movement of pull bar 63, through which bail 60 is operated, whereby the operated latches 59 are actuated to release the operated bell crank levers 57 and contact 103 is opened momentarily. The circuit and the apparatus is now restored to its normal position.

Should a subscribed at station 6 desire to be connected to station 8 for the purpose of communication with that station, transmitter T is operated for transmitting a predetermined group of code combinations of impulses which operate the selector unit to select and operate the pull bar 40 allocated to the set of contacts individual to relays 94, which, through its right-hand contacts, controls the connection of line conductor 8 in circuit with the line conductor extending to station 6. However, in order to operate relay 94 through contacts 58 controlled by the operated bell crank lever 57, it is necessary that the selector unit be in its upper case position in which contact spring 79 is in engagement with contact 80. Upon the energization of relay 94 in a manner similar to that described for relay 93, intercommunication may be commenced between stations 6 and 8. It is, of course, assumed that prior to communication between such stations, a group of impulses was transmitted preferably by station 6 to cause the operation of blocking bar 66 to prevent the further operation of pull bars 40 until a signal is transmitted for restoring the blocking bar 66 to the position shown in Fig. 2. Of course, if station 6 desires to communicate with stations other than station 8, prearranged code combinations of impulses may be transmitted to the selector unit prior to the transmission of the group of signals identified with the blocking bar for operating the pull bars identified with such additional stations. The additional stations will be connected in circuit with station 5 in a manner identical to that described for the other referred to stations. It is thus apparent that station 6 may communicate either with station 8 to the exclusion of other stations or with any number of the other stations by the transmission of the prearranged code combination of impulses identified with such other stations.

From the previous description of the structure and its operation, it is evident that the line conductors of the various stations may be interconnected directly through contacts 58, in which case relays 93, 94, 95, 96, and 97 would not be required. In addition, the locking circuits for the noted relays may be eliminated with the provision of the mechanical latches 59. Of course, with the relays 93 to 97 inclusive arranged with locking circuits under the control of contact 103 operated by lever 61, the mechanical latches 59 may be rotated about their pivot and held in a non-engaging position with respect to bell crank levers 57. This may be achieved by the provision of an arm 105 pivoted to the side frame of the selector apparatus and arranged with instrumentalities for holding it in its set position. With the apparatus so arranged, the bell crank levers 57 would be operated and the contacts 58 would be momentarily closed for effecting the energization of the control relay individual thereto, which would be locked up through contacts 103 and maintained in that position pending the receipt of a signal combination effective to operate pull bar 63 and open normally closed contacts 103.

The invention has been disclosed and described in connection with a particular form of apparatus. It is, however, manifest that other forms of apparatus might be used with equally good results without departing from the spirit and scope of the present invention, which is intended to be limited only as set forth in the appended claims.

What is claimed is:

1. In a selector unit, a plurality of sets of contacts, means individual to each set of contacts for causing their operation, a plurality of permu-

tation bars, means responsive to code signal impulses for setting said bars in varying permutations, a selectable element selected through the setting of said bars and operated upon its selection for operating said contact operating means, means for holding each contact operating means in its actuated position, and means associated with said permutation bars and responsive to a particular setting thereof for preventing, pending the establishment of predetermined signal conditions, the further operation of said contact operating means.

2. In a selector unit, a plurality of sets of contacts, means individual to each set of contacts for causing their operation, a plurality of permutation bars, means responsive to code signal impulses for setting said bars in varying permutations, a selectable element selected through the setting of said bars and operated upon its selection for operating said contact operating means, a latch for each contact operating means for holding it in its actuated position, and a blocking bar arranged with said permutation bars and operated in response to a particular setting of said bars for preventing, until the selection of a particular selectable element, the operation of said other selectable elements.

3. In a selector unit, a plurality of sets of contacts, means individual to each set of contacts for causing their operation, a plurality of permutation bars, means responsive to code signal impulses for setting said bars in varying permutations, a selectable element selected through the setting of said bars and operated upon its selection for operating said contact operating means, and a bar arranged with said permutation bars and operated to one position by a particular selectable element to prevent the operation of certain of said selectable elements, and operated to another position by a selectable element to permit the selection and operation of all of said selectable elements.

4. In a selector unit, a plurality of sets of contacts, means individual to each set of contacts for causing their operation, a circuit controller effective to control the effectiveness of said contacts, a plurality of permutation bars, means responsive to code signal impulses for setting said bars in varying permutations, a selectable element selected through the setting of said bars and operated upon its selection for operating said contact operating means, and means operated by certain of said selectable elements for controlling the position of said circuit controller and thus the effectiveness of said contacts.

5. In a selector unit, a plurality of sets of contacts, means individual to each set of contacts for causing their operation, a circuit controller having its contacts arranged to be connected in circuit with said plurality of contacts, a plurality of permutation bars, means responsive to code signal impulses for setting said bars in varying permutations, a selectable element selected through the setting of said bars and operated upon its selection for operating said contact operating means, a further permutation bar, and means responsive to particular code signal impulses for operating said further permutation bar to operate said circuit controller.

6. In a selector unit, a plurality of sets of contacts, means individual to each set of contacts for causing their operation, a plurality of permutation bars, means responsive to code signal impulses for setting said bars in varying permutations, a selectable element selected through the setting of said bars and operated upon its selection for operating said contact operating means, a motor for supplying power effective to operate the selected selectable elements, a transmitting cam shaft, transmitting contacts controlled by said cam shaft, a clutch through which power is communicated to said transmitting cam shaft, and an electromagnet effective when energized to render said clutch effective whereby power is communicated from said motor to said transmitting cam shaft.

7. In a selector system, a plurality of sets of contacts, means individual to each set of contacts for causing their operation, a plurality of permutation bars, means responsive to code signal impulses for setting said bars in varying permutations, a selectable element selected through the setting of said bars and operated upon its selection for operating said contact operating means, a latch for each contact operating means for holding it in its actuated position, a relay individual to each set of contacts energized upon the closure of its contacts, a holding circuit for each relay established upon its energization, and means responsive to a particular setting of said bars for operating said latch to restore the contact operating means to normal and for opening said locking circuit to restore the energized relay to normal.

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