

May 19, 1942.

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2,283,395

TELEPHONE SYSTEM

Filed Oct. 31, 1940

8 Sheets-Sheet 1

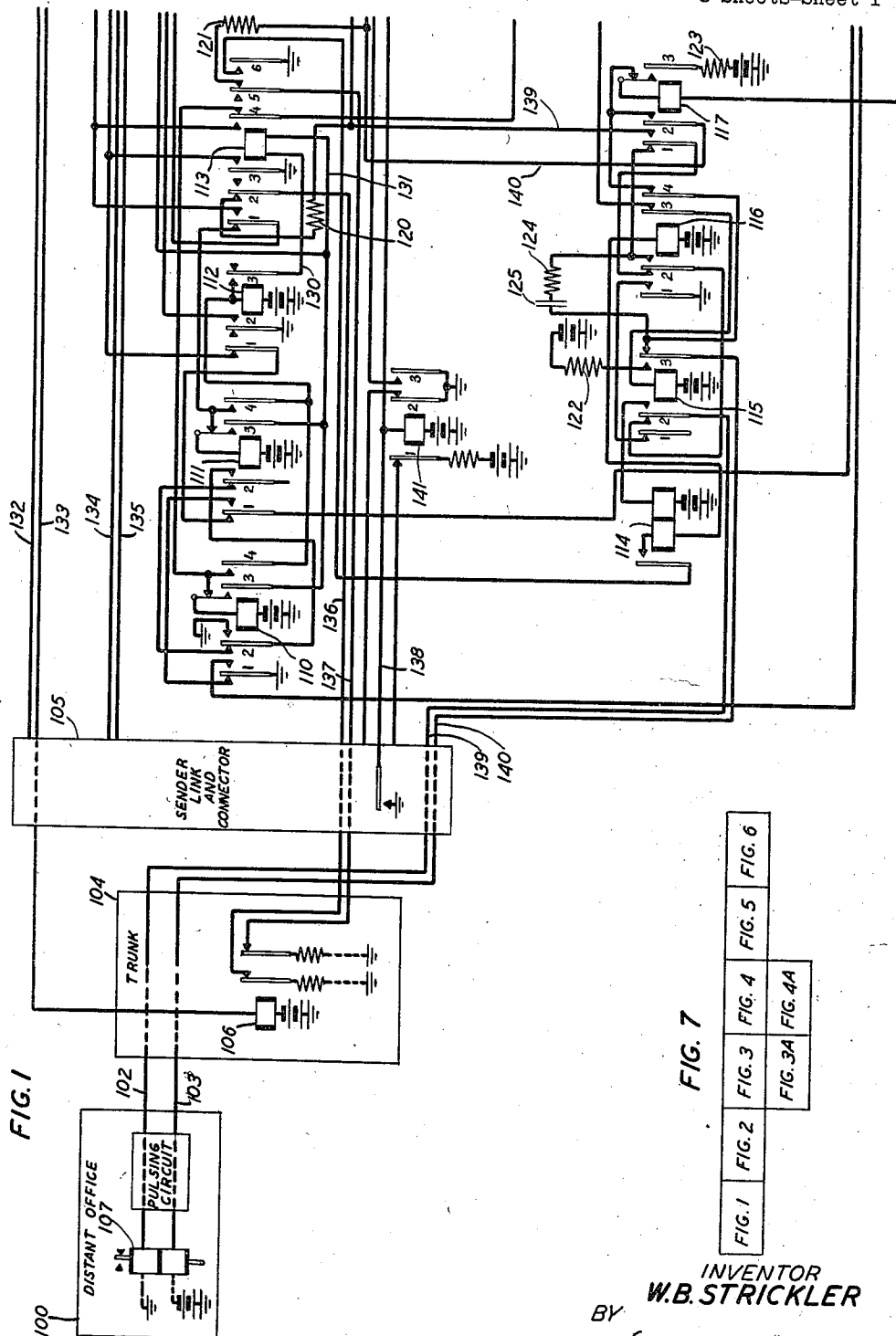


FIG. 1

FIG. 7

FIG. 1	FIG. 2	FIG. 3	FIG. 4	FIG. 5	FIG. 6
		FIG. 3A	FIG. 4A		

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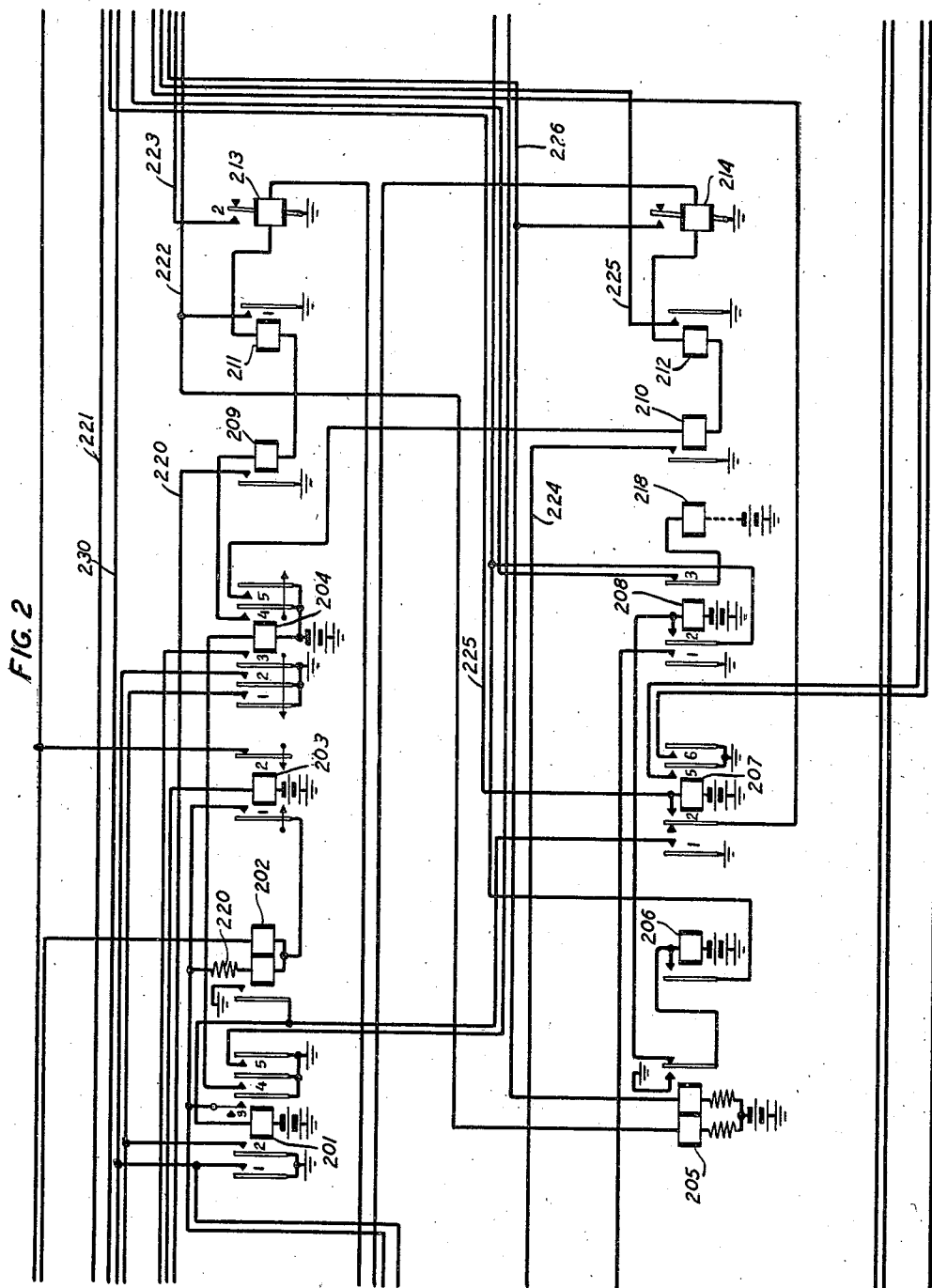
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8 Sheets-Sheet 2



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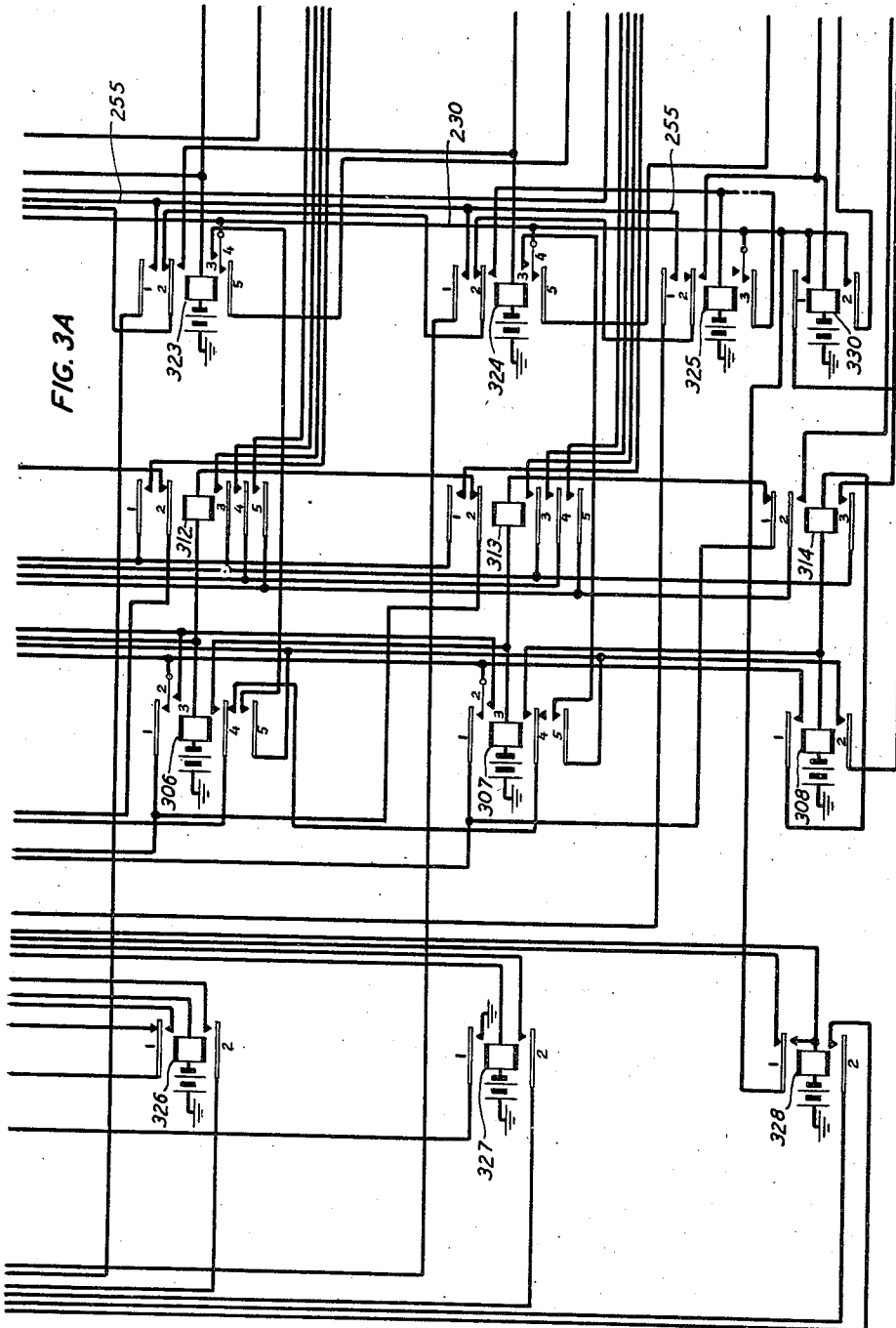
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TELEPHONE SYSTEM

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8 Sheets-Sheet 4



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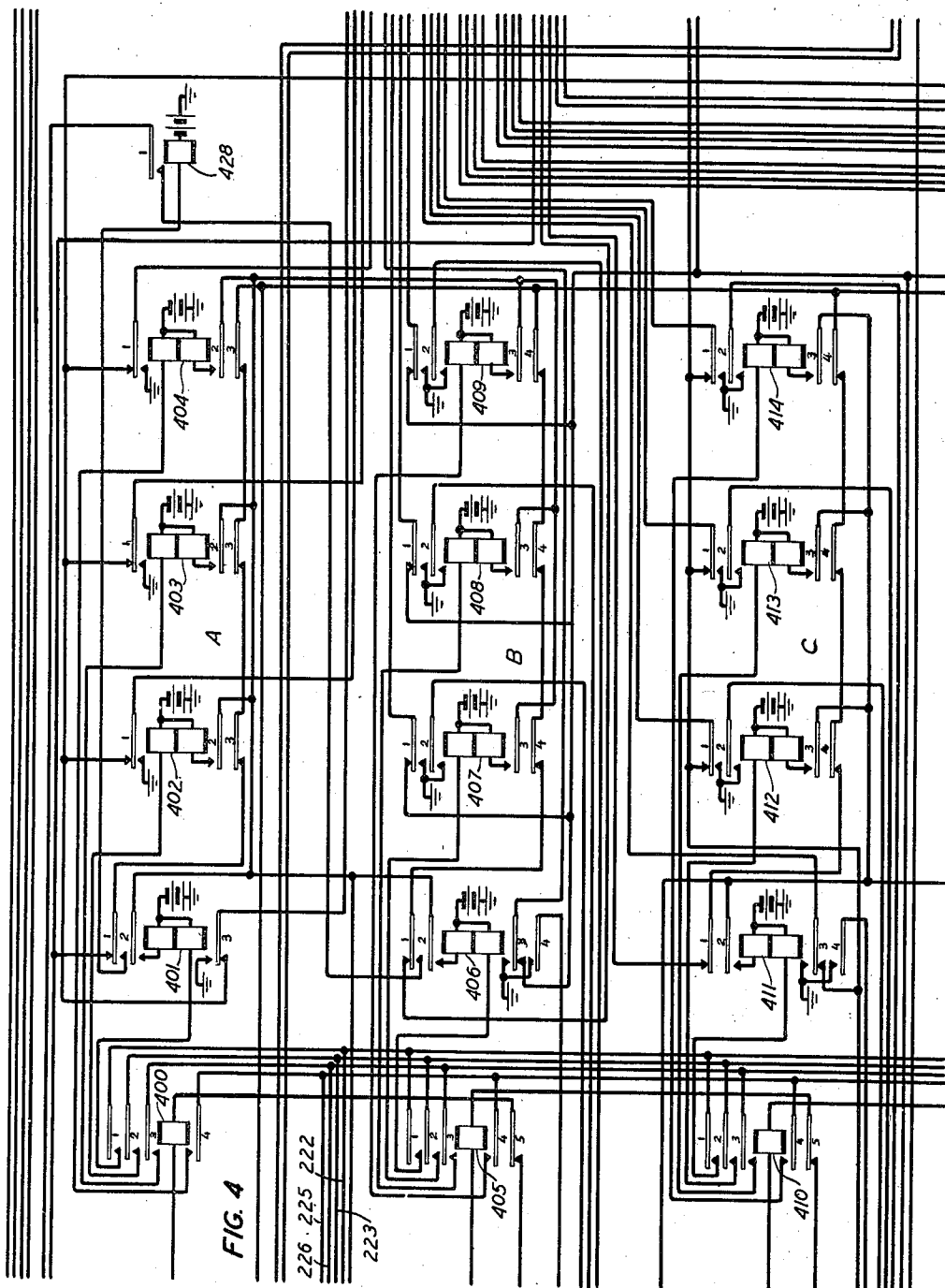
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8 Sheets-Sheet 5



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TELEPHONE SYSTEM

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8 Sheets-Sheet 6

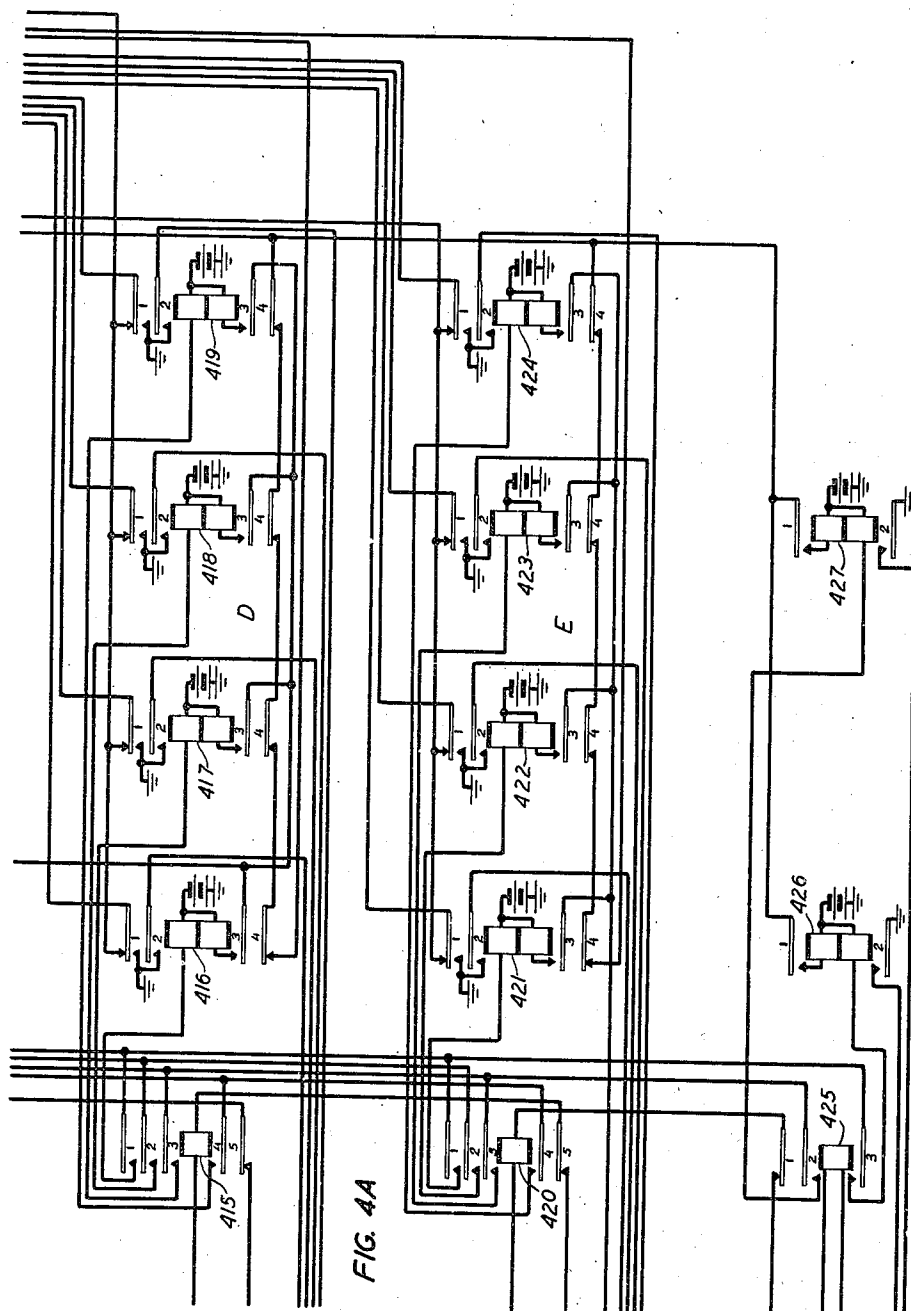


FIG. 4A

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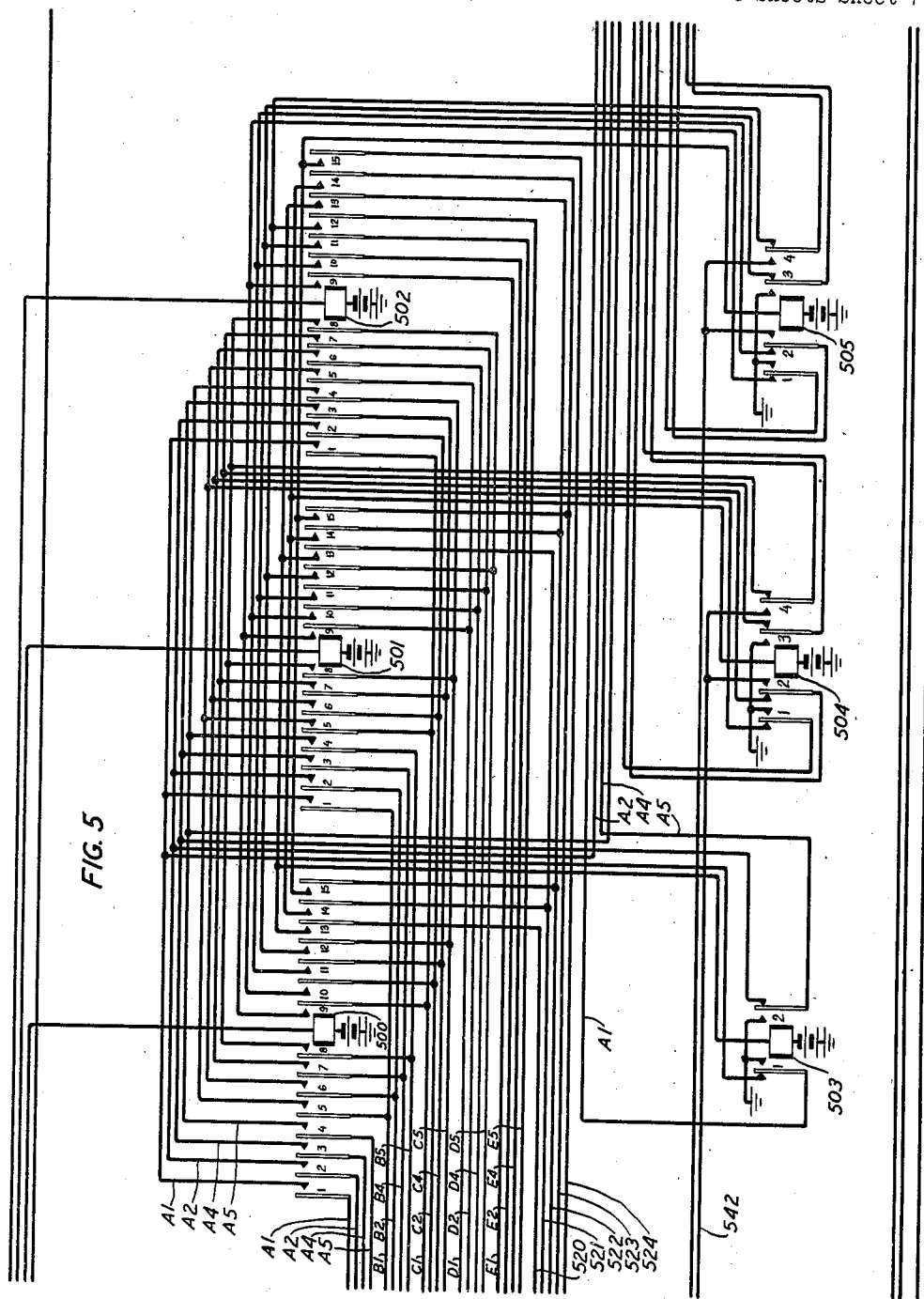
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8 Sheets--Sheet 7



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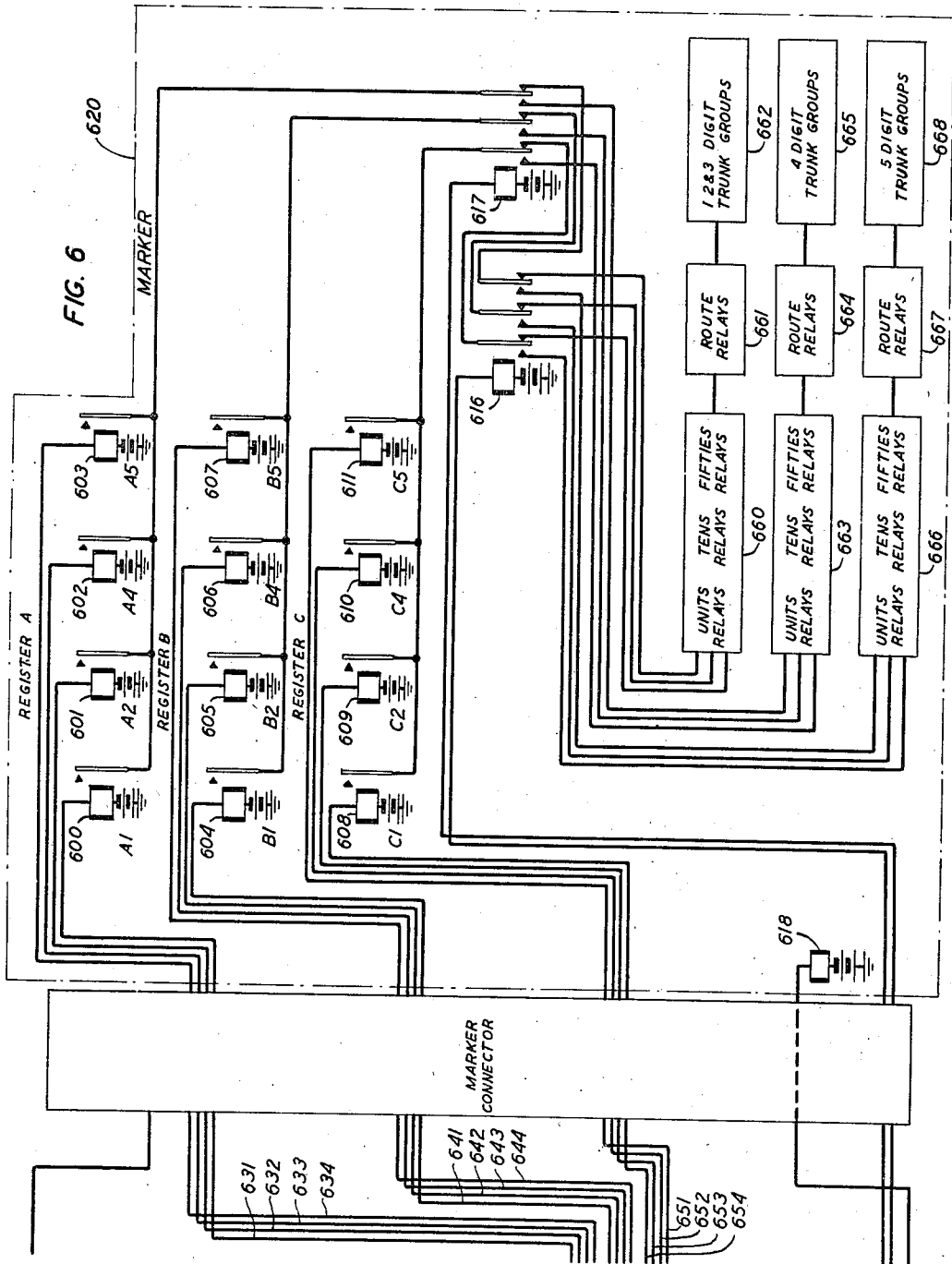
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8 Sheets-Sheet 8



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UNITED STATES PATENT OFFICE

2,283,395

TELEPHONE SYSTEM

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Application October 31, 1940, Serial No. 363,729

10 Claims. (Cl. 179—18)

This invention relates to telephone systems and more particularly to registering devices for automatic switching telephone offices.

The object of the invention is to simplify the registering system in an automatic telephone office which receives widely varying designation registrations.

A feature of the invention is a system of forming different combinations of a plurality of variably operable code registers in a registering device depending upon the number of digits in a code responsive to code digit pulses and in connecting the registers which are formed into the digit registering combination with the registers of a second registering device.

Another and related feature of the invention is a system of forming different combinations of said variably operable code registers responsive to the digits comprising the code and in operating a device cooperatively related to the combination formed for connecting the registers so combined with the registers of a second registering device.

Another and related feature of the invention is a system of forming different combinations of said variably operable registers responsive to pulses and in providing other devices selectively operable responsive to the registers formed into a code registering combination for connecting the code registering combination so formed to the registers of a second registering device.

Another and related feature of the invention is a system of forming different combinations of said variably operable registers depending upon the number of digits in a code for controlling the operation of a second registering device to select different groups of trunks for association with the registers of said second registering device.

Another and related feature of the invention is a system of registering digits in a registering device having a series of registers and a circuit for transferring a pulsing device to successive registers, in which said series of registers may be variably formed into combinations using different numbers of said registers for a first code, in transferring said first code registrations to a second registering device and in registering another code on the next in order registers of said series following the last register formed into the combination, and in transferring said second digit registrations to a third registering device.

These and other features will be discussed more fully in the following description.

To illustrate the features of the invention ref-

erence may be had to the accompanying drawings in which:

Fig. 1 illustrates an office having a pulsing circuit therein, an incoming trunk circuit, a sender link and connector and a portion of an incoming sender.

Figs. 2, 3, 3A, 4, 4A and 5 illustrate the remainder of the sender to which the invention applies. Fig. 3 also diagrammatically illustrates a third sender and an outgoing pulse control circuit.

Fig. 6 illustrates a marker having code registers associated with different groups of trunks and a marker connector for associating a sender with this marker.

The drawings when arranged as shown in Fig. 7 illustrate the detailed structure of this registering system.

General description

The registering system herein disclosed may be economically employed in a large cross-bar switching toll telephone office such as fully disclosed in the patent application of G. V. King-J. B. McKim-O. Myers, Serial No. 295,010, filed September 15, 1939, issued as Patent 2,236,246, March 25, 1941, or a system such as disclosed in the patent application of A. J. Busch and F. J. Scudder, Serial No. 295,012, filed September 15, 1939.

The incoming sender disclosed in Figs. 1, 2, 3, 3A, 4, 4A and 5 may be energized by a pulsing circuit in a distant office or a pulsing circuit in the same office when required. The office indicated as 100 may be a distant toll office, a tandem office or other type of office known to the art, equipped with automatic pulsing circuits for operating registers in another office. In large toll offices, a switchboard may be in use having pulsing equipment for controlling senders of this character for handling delayed telephone calls. An incoming call enters an automatic switching telephone office such as the one disclosed herein, over trunk conductors such as 102 and 103 for actuating apparatus in an incoming trunk circuit such as 104. A sender link and connector circuit is diagrammatically shown for associating the incoming trunk circuits with an automatically operable sender. For a detailed description of the energizing of the link such as 105 for associating an incoming trunk circuit with a sender and for the energization of the sender in response to this association, reference may be had to the aforementioned patent application of A. J.

Busch and F. J. Scudder, Serial No. 295,012, filed September 15, 1939.

In response to the selection of a sender by a link and the association of this sender with an incoming trunk circuit, apparatus in the sender is energized for associating pulse responsive equipment with the distant office 100. This includes common pulse responsive relays, a series of registers separately responsive to the pulses for each digit and relays for transferring the common pulse responsive relays from one register combination to the next in successive order between digits. It has been the practice in telephone offices to employ separate senders for three, four and five-digit codes. The pulsing circuit according to this invention includes registers which may be variably operated for one, two or three-digit codes on the first three registers, four-digit codes using the first four registers and five-digit codes using the first five registers. These registers are combined in a manner for transferring the office code digits to three registers in a marker which controls the selection of an outgoing trunk to a terminating office, an outgoing trunk to a distant toll office or an outgoing trunk to a delayed outward toll switchboard. The relays 500, 501 and 502 shown in Fig. 5 are made selective by the sender registers according to the number of digits in a code which causes the operation of a particular one of these relays for associating certain combinations of registers of Figs. 4 and 4A with the three registers of the marker of Fig. 6. The registers of the marker have been diagrammatically shown since the contact and wiring arrangement may be identical with that fully disclosed in the aforementioned Patent 2,236,246 to King-McKim-Myers, Serial No. 295,010, March 25, 1941.

A three-digit office call is registered on the relays of sender registers A, B and C. Circuits are established for selecting and operating relay 500 for connecting registers A, B and C of the sender with registers A, B and C of the marker of Fig. 6. When the incoming call is to be routed through the apparatus of the toll office disclosed herein to a third toll office, a second code registration is made by the transmission of pulses from office 100. This second code registration is recorded on registers D, E and other similar registers which follow in consecutive order. When the incoming toll call terminates in the area of the toll office disclosed herein, numerical digits may follow the three digits registered on the registers A, B and C. In this case, the numerical digits are recorded on registers D, E and other registers following in consecutive order.

An arrangement of equipment and circuits is provided in the sender to determine the number of digits in the code being transmitted so that at the end of the code signals, the code registers may immediately be associated with the registers of the marker. For example, the registration of a three-digit code on registers A, B and C, the operation of the relays for advancing the pulsing circuit from one register to another and the establishment of other code determining circuits, energizes a starting circuit as soon as the last code register has been operated for immediately passing the signals to the marker registers. This circuit is established in different manners depending upon whether the registers are operated for a three-digit, four-digit or five-digit code. In this manner, the circuits are automatically rendered responsive at the end of the registration of any number of digits.

As previously stated, the four-digit code energizes registers A, B, C and D. Operation of the register A energizes a signaling circuit to indicate a four-digit code and a relay is operated in the marker to indicate that a particular group of toll trunks shall be employed for completing this telephone connection. The remainder of the four-digit code is set up on registers B, C and D and in this case relay 501 is operated to associate this combination of code registers, B, C and D with registers A, B and C in the marker. A five-digit code employs the use of registers A, B, C, D and E. The first two registers A and B energize signaling equipment to indicate a five-digit code and equipment in the marker is operated to associate the marker registers with a particular group of route relays to obtain access to a particular group of trunks. The registration of a five-digit code energizes apparatus and associated circuits for operating relay 502 to associate the sender registers C, D and E with marker registers A, B and C.

A plurality of additional sender registers similar to those shown in Figs. 4 and 4A are used in successive order for outgoing office codes and numerical digits to be transferred later to other registering devices. As previously stated, the next in order sender register following the last sender register used for the incoming office code is used for registering the outgoing office code or numerical digits. The sender registers on which the outgoing office code or numerical digits are recorded remain operated until after the first office code has been registered in the marker and the marker has selected an outgoing trunk. This outgoing trunk may be a completing trunk to an office within the area of this toll office or a toll trunk to a distant toll office. To obtain the effect of incoming and outgoing pulses as recorded on the sender registers, it may be assumed that two office codes have been registered and that the second office code is an outgoing code. If the first office code is a three-digit code, it is registered on the sender registers A, B and C. This code may be assumed as a toll code which will be transferred to a toll marker such as 620 for obtaining a trunk to a particular distant toll office. The second code may be a three-digit code which is registered on three successive registers starting with register D. After the outgoing trunk has been selected by the marker according to the first code and has been connected to the distant office, the second code registered may be transferred to another registering device, which latter code is registered in a distant office and represents the trunk to be obtained in that office for completing or continuing extension of the telephone connection.

The following detailed description explains the working of the sender equipment in forming the various combinations of registers responsive to different code pulses.

Detailed description

An incoming trunk 104, diagrammatically shown, is selected regardless of the number of digits to be transmitted to the sender. The seizure of an incoming trunk energizes the sender link and connector circuit 105 in order to find an idle sender and associate this sender with the calling incoming trunk. The selection of the sender energizes relay 141 to maintain this sender busy to prevent its selection by another link circuit energized by a different trunk. The energization of relay 141 establishes a circuit for

relay 202 which extends from ground or contact 3 of relay 141 through resistance 220, both windings of relay 202 and through the winding of a relay known as the splitting relay 106 in the incoming trunk circuit 104 to battery. Relay 202 is operated in the circuit traced but the splitting relay in the trunk circuit is not operated at this time. The operation of relay 202 establishes a circuit for relay 201. This circuit is obvious and need not be traced. Relay 201 establishes a number of circuits by association of ground through its contacts. A circuit for relay 204 is established from battery through its winding to ground on contact 4 of relay 201. A circuit is established for relay 300 from battery through its winding to ground on contact 5 of relay 201. Ground on contacts 1 and 2 of relay 201 are connected through the link circuit to the cut-off relay in the incoming trunk (not shown) and a second relay (not shown) which opens a link control circuit. The sender has now been prepared to receive signals over the trunk circuit conductors. The operation of relay 204 establishes circuits for the pulsing relays 209 to 214, inclusive. Contact 4 connects battery through relays 209, 211 and 213, resistance 120, contact 2 of relay 213, conductor 136 to the trunk circuit 104. Contact 5 connects battery through relays 210, 212 and 214, resistance 121, contact 5 of relay 113, conductor 137 to the trunk circuit 104. Battery is thus provided for signals from the trunk circuit which may operate the sender class relays for indicating the class of the call to the sender. As soon as battery is connected through the circuit traced by the operation of relay 204 either relay 209 or 210 or both of these relays are operated to indicate the type of equipment in the sender and the marker to be used for the incoming call. When relay 209 is operated by a ground associated with lead 136 in the trunk, a circuit is established for relay 111 from ground through the contact of relay 209 over lead 220, contact 1 of relay 113, contact 3 of relay 111, winding of relay 111 to battery. The operation of this relay indicates that toll completing equipment in the marker shall be selected for connecting the incoming trunk to a trunk associated with an office within the area of this toll office. A ground associated with lead 137 energizes relay 210 which connects ground through its contact, contact 4 of relay 113, contact 3 of relay 110, winding of relay 110 to battery. The operation of the latter relay will ultimately control the association of the sender with equipment in the marker for obtaining a trunk to another toll office. The energization of either of the above relays 110 or 111 establishes locking circuits for themselves and whichever relay is operated a circuit is established for relay 112. This circuit may be traced from battery through the winding of relay 112 through contacts 4 of either relay 110 or 111 to ground on either relay 209 or 210, whichever one is operated. The operation of relay 112 establishes a circuit for relay 203 from battery through the winding of the latter relay to ground on contact 2 of relay 112. The operation of relay 203 associated ground with the mid-point between the two windings of relay 202. This circuit may be traced from contact 3 of relay 141, or contact 3 of relay 201, contact 1 of relay 203 to the mid-point between the windings of relay 202, thence through the right winding of relay 202 and the winding of the splitting relay 106 in the trunk circuit to battery. This reduces the resistance in the circuit of the splitting relay in

trunk circuit 104, causing its operation. The operation of the splitting relay 106 opens leads 136 and 137, causing the release of relays 209 and 210 or whichever one was operated. This causes the operation of relay 113 in the following manner: When relay 112 was operated, its operating ground was connected through its contact 3 over lead 130 to the left winding terminal of relay 113. At this time, ground is also connected to the other winding terminal of relay 113 over lead 131 from contact 3 of relay 204. The release of relay 209 or 210 disconnects ground from lead 130. This circuit from ground through the contacts of relays 209 and 210 may be traced over leads 220 and 224 through contacts 1 and 4 of relay 113, contacts 4 of relays 110 and 111, contact 3 of relay 112 to the left winding terminal of relay 113. Thus the release of relays 209 and 210, or whichever one was operated, causes battery to flow through the winding of relay 112 and its contact 3, lead 130, winding of relay 113, conductor 131 to the ground on contact 3 of relay 204. Relay 113 operates and holds relay 112 operated. Relay 113 in operating disconnects the circuits extending through relays 209, 211, 213 and through relays 210, 212 and 214 from conductors 136 and 137 which associated these relays with the trunk circuit.

A circuit is now prepared for operating the registers and for steering the pulsing leads from one register to another after each digit has been registered by the association of pulsing relays 109 to 114, inclusive, with the pulsing circuit in the following manner. Relay 113 establishes a circuit through the windings of relays 320 and 400 for the association of the pulsing circuit relay contacts with the registers. This circuit may be traced from battery through the winding 320, winding of relay 400, contact 5 of relay 405, contact 1 of relay 328, thence over lead 230 to ground on contact 3 of relay 113. Relays 320 and 400 operate in the circuit traced and a locking circuit is established from battery through the windings of these relays, contact 5 of relay 405, contacts 4 and 3 of relay 320 to ground over the operating circuit on contact 3 of relay 113. Relay 328 is also operated from battery through its winding, contact 2 of relay 320 to ground on contact 3 of relay 113. It should be noted that the operation of relay 328 opens the original operating circuit for relays 320 and 400, so that when these relays are released they will not again operate over this circuit. The operation of relay 328 also establishes a circuit for relay 117. This circuit may be traced from battery associated with the distant pulsing circuit over lead 140 through contact 3 of relay 115, contact 4 of relay 116, contact 3 and winding of relay 117, contact 2 of relay 328 to ground on contact 7 of relay 300. The operation of relay 117 establishes a locking circuit for itself from battery through resistance 123, contact 3 and winding of relay 117 to the operating ground and associates pulsing leads 139 and 140 from the distant pulsing circuit with pulsing relays 109 to 114, inclusive. Pulsing leads 139 and 140 extend through contacts 2 and 3 of relay 115, contacts 2 and 4 of relay 116, contacts 1 and 2 of relay 117, thence through the pulsing relays 213, 211, 209 to battery on contact 4 of relay 204 and through the pulsing relays 214, 212 and 210 to battery through contact 5 of relay 204.

Telephone call using three-digit code

The following is given as an example of record-

ing a three-digit office code. The pulses transmitted over either pulse lead 139 or 140 operate either relay 209 or 210 for controlling the successive order in which the registers are operated. The pulse responsive operations of relay 211 or 213 over lead 139 or relay 212 or 214 over lead 140 regulate the number of relays operated in each register. Assuming that relay 209 is operated by a pulse over lead 139, ground is associated through its contact with conductor 220 which extends through contact 1 of relay 113, conductor 221, contact 1 of relay 320, which it will be remembered is operated, winding of relay 321 to battery. Relay 321 operates in this circuit for preparing a transfer operation as explained later. If this same pulse is of a character to operate the pulsing relay 211 a circuit is established for the A1 register relay 401 from ground through the contact of relay 211 over lead 222, contact 1 of relay 400, winding of the A1 register 401 to battery, operating this register relay. If the pulse was of a character to operate pulsing relay 213 instead of 211, a circuit is established for the A2 register relay 402 from ground through the contact of relay 213 over the conductor 223, contact 2 of relay 400, winding of the A2 register, relay 402 to battery. A pulse associated with the alternate pulsing conductor 140 will operate relay 210 which establishes the same circuit as relay 209 for operating relay 321 as traced. If this pulse is of a character to energize relay 212, ground is associated with conductor 225 which extends through contact 4 of relay 400 for energizing the A5 register relay 404 to battery. When pulsing relay 214 is energized, ground is associated with conductor 226 which extends through contact 3 of relay 400 to the winding of the A4 register relay 403 to battery. Each A register relay operated establishes a locking circuit through its alternate winding to ground on contact 4 of relay 300. The above gives an example of the operation of the various register relays responsive to pulses which selectively operate the pulsing relays 211, 212, 213 and 214. The digits are represented by numerals or letters and pulses are accordingly transmitted to effect the operation of certain registers in the following manner.

	Pulse relays operated	Sender registers operated
0.....	209 or 210.....	None
1.....	209, 211.....	1
A, B, C, 2.....	209, 213.....	2
D, E, F, 3.....	209, 211, 213.....	1, 2
G, H, I, 4.....	210, 214.....	4
J, K, L, 5.....	210, 212.....	5
M, N, O, 6.....	209, 210, 211, 212.....	1, 5
P, R, S, 7.....	209, 210, 213, 212.....	2, 5
T, U, V, 8.....	209, 210, 211, 213, 212.....	1, 2, 5
W, X, Y, 9.....	210, 212, 214.....	4, 5

For this example it may be assumed that the three-digit code is 247 and therefore that the A2 register relay 402 was operated by the first digit pulse.

After the pulses for a digit have been sent, the pulsing circuit is opened, causing the release of any of the pulsing relays 209 to 214, inclusive, which were operated to register the digit. The release of the pulsing relays after the first digit pulse opens the operating ground circuit for relay 321 previously traced through contact 1 of relay 320, contact 1 or 4 of relay 113 to ground on the contacts of relay 209 or 210. When this ground circuit is opened, relay 405 is energized in series with relay 321 over a circuit which may

be traced from battery through the winding of relay 321, winding of relay 405, contact 5 of relay 410, contacts 4 and 3 of relay 321 to ground over conductor 230 as previously traced on contact 3 of relay 113. The operation of relay 405 opens the locking circuit for both relays 320 and 400, causing their release. The operation of relay 405 associates relays 406, 407, 408 and 409 of the sender B register with the pulsing relays 211, 212, 213 and 214 so that the next series of pulses energize the relays of the B register in a selective manner according to the pulsing relays energized. The pulsing circuit and registers are now prepared for recording the second digit.

The second digit again operates either relay 209 or 210, or both, depending upon whether the pulse is sent over lead 139 or 140. The operation of either or both relays associates ground through either conductor 220 or 224, or both, as previously traced. The conductors extend through the contacts 1 and 4 of relay 113 to conductor 221. Since relay 320 is now released, the ground circuit extends through contact 1 of the latter relay and contact 1 of relay 321 which is operated, winding of relay 322 to battery, which operates relay 322 and prepares the steering circuit for a subsequent transfer of the pulsing circuit. Assuming that the second digit causes the operation of relay 214 for registering the digit 4, the ground is associated with conductor 226 which extends through contact 3 of relay 405, winding of the B4 register relay 408 to battery, operating this relay, which locks through its lower winding to ground on contact 4 of relay 300. After the registration of this digit the pulsing relays are again released, which disconnects ground from the operating circuit which was traced for relay 322. This relay, however, is held through a winding of relay 410 for operating the latter relay. This circuit may be traced from battery through the winding of relay 322, winding of relay 410, contact 5 of relay 415, contacts 4 and 3 of relay 322 to ground over lead 230 as previously traced. Relay 410 is thus operated for associating the windings of relays 411 to 414, inclusive, of register C with the pulsing circuit. The operation of relay 410 causes the release of relays 405 and 321. When the pulses are received for the third digit, the energization of either relay 209 or 210 again associates ground with conductor 221 which extends through contact 1 of relay 320, released, contact 1 of relay 321, released, contact 1 of relay 322, operated, winding of relay 323 to battery, operating the latter relay.

Assuming that the third digit is 7 both relays 209 and 210 are operated and pulsing relays 213 and 212 are operated to energize the C2 and C5 register relays 412 and 414. Ground is therefore associated with leads 223 and 225 which extend through contacts 2 and 4 of relay 410, windings of relays 412 and 414 to battery. Both register relays lock through their lower windings to ground on contact 6 of relay 300. Upon the release of the pulsing relays ground is removed from lead 221 which permits relay 415 to operate in series with relay 323 in the manner explained for the preceding relays. The circuit for relays 410 and 322 is thus opened, causing their release and relays 323 and 415 remain operated. Relay 415 associates the relays of register D with the pulsing relays 211 to 214, inclusive, for recording numerical code pulses or pulses for another office code, whichever is required to follow after

the registration of the above three-digit office code which has been completed.

During the registration of the three-digit code a certain combination of apparatus has been energized so that registration in the marker takes place immediately after the last digit in the office code has been registered. When this call requires a trunk extending to another toll office, relay 326 is energized and when the call terminates within the area of this office relay 327 is energized. The operation of relay 326 arranges circuits for obtaining a routing in the marker for a toll trunk and the operation of relay 327 arranges the circuit for obtaining a terminating trunk routing in the marker. Three-digit codes are used for either extensions to another toll office or to a terminating office within the area of the switching office. A circuit for relay 326 is energized from battery through the winding of this relay to ground on contact 1 of toll relay 110. The circuit for relay 327 is energized from battery through its winding to contact 1 of relay 111 to ground on contact 1 of relay 110. It will be remembered that when a toll trunk is required relay 110 is operated and when a terminating trunk is required relay 111 is operated and relay 110 is normal. After the last code digit is recorded relay 323 remains operated for a sufficient length of time to establish a circuit for transferring the registrations to the marker by energizing relay 207. The circuit for relay 207 may be traced from battery through its windings over lead 225, contact 1 of relay 223, contact 2 of relay 303, contact 1 of relay 326 when a toll trunk is required, contact 1 of relay 341 to ground on contact of relay 300. If a terminating trunk is required, the circuit, after passing through contact 1 of relay 323, is carried through contact 4 of relay 302, contact 1 of relay 326 which is then normal, contact 1 of relay 341 to ground on contact 1 of relay 300.

The operation of relay 207 over a circuit as previously traced through relay 323 energizes relay 500 immediately after the third digit has been registered. The circuit for relay 500 may be traced from battery through its winding, contact 3 of relay 302 or contact 4 of relay 303 both of which are normal at this time. If relay 327 is operated for the selection of a completing trunk by the marker the circuit extends from contact 3 of relay 302, contact 3 of relay 327 to ground on contact 6 of relay 207. If, on the other hand, an extension is to be made to a distant toll office relay 327 is normal and relay 326 is operated. Consequently the circuit may be traced through contact 4 of relay 303, contact 3 of relay 326 to ground on contact 5 of relay 207. The operation of relay 500 connects the contacts of the A registers 401, 402, 403 and 404 to the windings of the A register relays in the marker. The A register in the marker constitutes relays 600, 601, 602 and 603. Lead A1 extends through contact 1 of relay 500, contact 1 of relay 503, winding of the A1 register relay 600 to battery. Lead A2 extends through contact 2 of relay 500, winding of the A2 marker register relay 601 to battery. Lead A4 extends through contact 3 of relay 500, contact 2 of relay 503, winding of the A4 marker register relay 602 to battery. Lead A5 extends through contact 4 of relay 500, through the winding of the A5 marker register relay 603. On a three-digit call relay 503 is not operated and therefore the purpose of this relay will be explained later. Leads B1, B2, B4 and B5 are extended from the contacts of the B

sender register through contacts 5 to 8 respectively of relay 500, thence through contacts 1 to 4 of relay 504 which is normal and through the windings of the marker B register relays 604, 605, 606 and 607 to battery. The C1, C2, C4 and C5 leads are extended from the C sender register through contacts 9 to 12, inclusive, of relay 500, contacts 1 to 4 of relay 505 which is normal, through the windings of the marker C registers 608, 609, 610, 611 to battery. It will be remembered that in giving this example of a three-digit office code the A register relay 402 was operated, B register relay 408 was operated and C register relays 412 and 414 were operated. Ground is therefore connected through contact 1 of relay 402 to lead A2 for operating the A2 marker register relay 601. Ground through contact 1 of relay 408 is connected to lead B4 for operating the B4 marker register relay 606. Ground through contact 1 of relay 412 is connected to lead C2 for operating the C2 marker register relay 609 and ground through contact 1 of the relay 414 is connected to lead C5 for operating the C5 marker register relay 611.

The purpose of relay 504 is to register a zero in the B marker register when zero is the second digit of a three-digit code. A zero is registered in the marker by the operation of the B1 and B4 relays 604 and 606, respectively. When a zero is recorded by the sender B register none of the relays 406, 407, 408 or 409 is operated. This establishes a circuit for relay 504 from battery through its left winding, contact 14 of relay 500, contact 1 of register relay 406, contact 4 of register relay 407, contact 4 of register relay 408, contact 4 of register relay 409 to ground on contact 3 of relay 300. The operation of relay 504 associates ground with lead 641 for operating the B1 marker register 604 and associates ground with lead 643 for operating the B4 marker register 606. Lead 542 connected to inner contacts 2 and 4 which are associated with the B registers 605 and 607 cause no operation in the marker B register. This lead is a check lead and not used for operating marker register relays. Relay 505 accomplishes the same result in the C register as described for the relay 504 associated with the B register.

Trunk groups

The marker register relays are operated in various combinations for causing the operation of particular units, tens and fifties relays in the marker as disclosed in detail in the aforementioned Patent 2,236,246 to King-McKim-Myers, March 25, 1941, and need not be described in detail in this application. When a three-digit code is recorded by the sender registers and transferred to the marker registers a particular group of units, tens and fifties relays are associated with the registers. This obtains one of many route relays extending over to completing trunks when relay 618 is operated or to toll trunks to other toll offices when this relay is normal. This of course includes a large plurality of groups of trunks extending to a large number of offices but it may be known herein as the three-digit group of trunks. In a large toll office there may not be sufficient routing paths which may be reached by three-digit codes and consequently a separate group is necessary which may be reached by four-digit codes. In this type of toll office a four-digit code associates the marker registers with a different group of fifties relays so that another plurality of route

relays is reached through the latter fifties relays and consequently another large group of toll trunks is reached through these relays. This may be known herein as the four-digit group of trunks. Relay 617 causes the transfer from the three-digit group of trunks to the four-digit group of trunks by associating a different group of fifties relays with the marker registers. A third large plurality of trunks is used for five-digit codes which may be known herein as the five-digit code group of trunks. Relay 616 is operated for the five-digit group which associates a third group of fifties relays with the marker A, B and C register relays. The latter group of fifties relays also has a third large plurality of route relays associated therewith for routing the five-digit code telephone calls to the five-digit group of trunks.

Telephone call using four-digit code

Four-digit codes are used only for extending a telephone call to another toll office. This call may originate in an associated tandem office or a distant toll office. The pulses are received in a similar manner to that described for the three-digit code with the exception that the four-digit code invariably starts with zero. For example, a four-digit code may comprise the numerals 0532. The class registration from the associated trunk operates relay 110 to indicate that the call is to be extended to another toll office. As previously traced, the circuit for this relay is from battery through its winding and contact 3, contact 4 of relay 113 to ground on relay 210. The preceding operations of relays 141, 201, 202, 204 and 300 are the same as described for the telephone call using a three-digit code. After relay 110 is operated a circuit is established for relay 326 which is a toll call relay for guiding the energization of the start relays after the four-digit code has been received. Relays 112 and 203 are operated in a manner previously described which cause the operation of relay 113 to disconnect the class of call leads 136 and 137 from the pulsing relays 209 to 214, inclusive. Relays 320 and 400 are operated by ground on contact 3 of relay 113 and relay 328 is operated to this same ground through contact 2 of relay 320. An operating circuit for relay 117 is established by the operation of relay 328 extending from battery in the pulsing circuit over lead 140 through the winding of relay 117 to ground on contact 7 of relay 300. The operation of relay 117 connects the pulsing relays 209 to 214, inclusive, to the pulsing circuit over leads 139 and 140. Since zero is the first digit dialed from the distant office, none of the A register relays 401, 402, 403 or 404 is energized, since the first pulse does not energize any of the relays 211, 212, 213 or 214. Relay 210, however, is operated on this first pulse which places ground on lead 221, causing the advance of the transfer relays and the advance from the A register to the B register takes place. As will be remembered, this advance is accomplished by the operation of relay 321 and relay 405. Upon the termination of the first pulse the operation of relay 405 releases relays 320 and 400. It may therefore be assumed at this time that relay 321 is operated in the transfer group and relay 405 is operated for extending the pulsing circuit to the B register relays 406 to 409, inclusive. If the second digit to be recorded is 5, pulse relays 210 and 212 are operated, which places ground on leads 225 and 221. The ground on lead 225 extends through contact 4 of relay 405, winding of B reg-

ister relay 409 to battery, operating relay 409 which locks through its lower winding and contact 3 to ground on contact 4 of relay 300. The ground on lead 221 operates relay 322. Upon the release of the pulsing relays a transfer takes place for associating the C register relay with the pulsing circuit. The release of relay 210 removes ground from lead 221 which removes the shunt from relay 410, causing the operation of relay 410 from battery through the winding of relay 322, winding of relay 410, contact 5 of relay 415, contacts 4 and 3 of relay 322 over lead 230 which extends to ground on contact 3 of relay 113. The operation of relay 410 opens the circuit for relays 321 and 405 which release. The pulse relays are again operated for the third digit and assuming that this digit is 3, C register relays 411 and 412 are operated. Consequently the incoming pulse would operate pulsing relays 209, 211 and 213. The operation of relay 209 associates ground over lead 220 through contact 1 of relay 113, lead 221, contact 1 of relay 320, contact 1 of relay 321, both of which are normal, contact 1 of relay 322, which is operated, winding of relay 323 to battery, operating relay 323. Relays 322, 323 and 410 are therefore now energized. Pulse relay 211 associates ground with lead 222 and pulse relay 213 associates ground with lead 223. Lead 222 extends through contact 1 of relay 410 for energizing relay 411 and lead 223 extends through contact 2 of relay 410 for energizing relay 412. These are the C1 and C2 register relays which are operated for recording the numeral 3. Both relays lock through their alternate windings to ground on contact 6 of relay 300. At the end of the third pulse relays 209, 211 and 213 release which removes the shunt from relay 415, causing its operation. The operating circuit for relay 415 extends from battery through winding of relay 323, winding of relay 415, contact 5 of relay 420, contacts 3 and 4 of relay 323, lead 230 to ground on contact 3 of relay 113. The operation of relay 415 associates the D register relays 416 to 419 with the pulsing relay contacts. It may be assumed that the fourth digit is represented by the numeral 2 which causes pulse relays 213 and 209 to energize. The energization of relay 209 associates ground with lead 221 extending through contact 1 of relay 320, contact 1 of relay 321, contact 1 of relay 322, all of which have been released, contact 2 of relay 323 which is operated, winding of relay 324 to battery, operating relay 324. The ground on the contact of relay 213 extends over lead 223 to contact 2 of relay 415, upper winding of the D2 register relay 417 to battery, operating the latter relay. This relay locks through its lower winding and contact 3 to ground on contact 6 of relay 300. The four digits have thus been registered.

Since no relays were operated in the A register a circuit was established for the four-digit relay 303 which may be traced from battery through its winding, contact 1 of the A1 register 401, contact 3 of the A2 register 402, contact 3 of the A4 register 403, contact 3 of the A5 register 404 to ground on contact 3 of relay 300. Certain circuit combinations are arranged when relay 303 and toll relay 326 are operated to indicate a four-digit call to the marker as will hereinafter be described. Also, a circuit is established at this time for transferring the registrations from the sender registers B, C and D to the marker registers A, B and C. The fact that relay 324 was the last of the transfer relays to operate also completes the four-digit circuit combinations so

that certain relays can operate. A circuit for relay 207 is established through the contact of relay 324 which may be traced from battery through the winding of relay 207 over lead 255, contact 1 of relay 324, contact 2 of four-digit relay 303, contact 1 of relay 326, contact 1 of relay 343 to ground through contact 1 of relay 300. A circuit is established for relay 617 in the marker to associate the marker registers with particular fifties relays which associate the register with route relays for selecting trunks used for four-digit toll connections. This circuit may be traced from battery through the winding of relay 617, contact 1 of four-digit relay 303 which is operated to ground on contact 1 of the five-digit relay 302 which is normal. Relay 501 is operated to associate the sender registers B, C and D with the marker registers A, B and C. The circuit for relay 501 may be traced from battery through its winding, contact 4 of four-digit relay 303, contact 3 of toll trunk relay 326 to ground on contact 5 of relay 207. It should be noted that the foregoing circuit is traced through the contact of the four-digit relay 303 and the contact of the toll relay 326 which must be operated to establish this circuit.

The contacts of the sender B relays 406, 407, 408 and 409 are now extended over leads B1, B2, B4 and B5 through contacts 1 to 4 of relay 501, conductors 631 to 634 to the windings of the marker A register relays A1, A2, A4 and A5. In giving this example it will be remembered that the sender register relay 409 was operated for registering the numeral 5 and consequently the ground is associated with the B5 lead which extends through contact 4 of relay 501, winding of the A5 marker, register relay 603 to battery which causes the registration of the numeral 5 in the toll marker register. The contacts of the sender C registers 411 to 414, inclusive, are extended over leads C1, C2, C4 and C5 through contacts 5 to 8, inclusive, of relay 501, through the normal contacts of relay 504 over conductors 641, 642, 643 and 644 to the windings of the toll marker B register relays. In this example the numeral 3 was registered which associates ground with the B1 and B2 leads in the sender for operating the marker register relays 604 and 605. The contacts of the D sender register relays are carried over leads D1, D2, D4 and D5 through contacts 9 to 12 of relay 501, normal contacts of relay 505, conductors 651, 652, 653 and 654, windings of the toll marker C register relay, to battery. In this example the numeral 2 was registered in the sender and consequently a ground is associated through contact 1 of relay 417 with lead D2 for operating the toll marker C2 register relay 609. If a zero should have been registered in the C sender register in place of 3, the C sender register relays would have remained normal, but in all cases the zero is recorded in the marker register by the operation of the 1 and 4 register relays. In this instance the zero registered in the C sender register would record a zero in the toll marker B register by operating the B1 relay 604 and the B4 relay 606. For this purpose a circuit is established for relay 504 extending from battery through its left winding, contact 14 of relay 501, thence over lead 522 through contact 1 of the C register relay 411, contacts 4 of register relays 412, 413 and 414 to ground on contact 3 of relay 300. The operation of relay 504 associates ground with leads 641 and 643 which extend through the windings of relays 604 and 606 to battery, operating the

B1 and B4 register relays for registering the zero in the toll marker register.

Telephone call using five-digit code

The five-digit code is again different from the one, two, three and four-digit codes since the character of the trunk routing must be given by signals to the registering device ultimately receiving the call indication. To give this call indication each of the first two digits of the five-digit code is ordinarily registered as one. This number is arbitrarily selected and other numbers may be used if so desired. An example of a five-digit code may be assumed as 11648. Consequently, in response to the pulses transmitted from a pulsing station or pulsing circuit the sender register relays will be operated in the following manner. A register relay 401, B register relay 406, C register relays 411 and 414, D register relay 418, E register relays 421, 422 and 424. The above registers the numerals 11648 on registers A to E consecutively.

An idle incoming sender of the character disclosed is selected by the energization of an incoming trunk such as 104 and the sender link and connector circuit 105 in the manner previously described and relays of the sender are energized in response to this selection also as previously described. This includes the class registration for operating either relay 110 or 111 and the transfer of the pulsing relays 209 to 214 from leads 136 and 137 to the pulsing leads 139 and 140. Relay 113 is operated to dissociate leads 136 and 137 from the pulse relays and relay 117 is operated to associate pulse leads 139 and 140 with the pulsing relays. The operation of relay 113 also connects the contacts of relays 209 and 210 to the armature of relay 320 as previously traced to operate the steering or progression relays for transferring the pulsing relay contacts from one sender register to another. It will be remembered that relays 320 and 400 are originally operated over a circuit from battery through the windings of relays 320 and 400, contact 5 of relay 405, contact 1 of relay 328, thence over lead 230 to ground on contact 3 of relay 113. The operation of relay 320 associates ground from lead 230 through contacts 3 and 4 for maintaining this circuit established and locking relays 320 and 400 operated. A circuit is established from this ground through contact 2 of relay 320 to operate relay 328, dissociating the original operating circuit from relays 320 and 400 so that they are maintained over the locking circuit through contacts 3 and 4 of relay 320. The operation of relays 320 and 400 arranges the register circuit for receiving the first pulse. Since the first pulse is 1, relays 209 and 211 are operated. Relay 209 connects ground with lead 220 which extends through contact 1 of relay 113 to lead 221, contact 1 of relay 320, winding of relay 321 to battery, operating relay 321. The operation of the pulse relay 211 associates ground with relay 322 which extends through contact 1 of relay 400 for energizing the A1 register relay 401. Relay 401 is locked to ground on contact 4 of relay 300. When the pulsing circuit is opened relays 201 and 211 release. The release of relay 209 dissociates ground from conductors 220 and 221 which removes the shunt from relay 405, permitting it to operate in series with relay 321 as previously traced. The operation of relay 405 opens the circuit for relays 320 and 400, causing their release, and associates the sender B register relays 406 and 409 with the pulsing circuit.

Since the second pulse is 1, relays 209 and 211 are again operated. In this instance ground is connected from relay 211 to lead 222, which extends through contact 1 of relay 405 to operate the B1 register 406, which locks to ground on contact 4 of relay 300. Ground from the contact of relay 209 in this instance is extended through contact 1 of relay 320, contact 1 of relay 321, winding of relay 322 to battery as previously described.

After the sender A and B registers have been operated a circuit is established for the five-digit relay 302 and also for the auxiliary register relay 428. The circuit for relay 428 extends from battery through its winding, contact 1 of A register relay 401, contacts 3 of A register relays 402, 403 and 404 to ground, contact 3 of relay 300. The circuit for the five-digit relay 302 extends from battery through its winding, contact 1 of relay 428, contact 1 of B1 register relay 406, contacts 4 of B register relays 407, 408 and 409 to ground on contact 3 of relay 300. The operation of the five-digit relay 302 established a circuit for a five-digit trunk group relay in the marker which is effective whenever the marker is selected by the sender. This circuit may be traced from battery through the winding of the marker five-digit trunk group relay 616, contact 2 of relay 302, contact 3 of the normal four-digit relay 303 to ground. It will be noted that the four-digit relay 303 must be normal and the five-digit relay 302 operated in order to complete this circuit.

The pulsing circuit continues to function in the manner previously described for setting the sender C, D and E register relays. After the fourth digit has been registered on the D registers relay 420 is operated and when the pulsing relays are operated for registering the fifth digit, relay 325 is operated. After the fifth pulse has been completed and the pulsing circuit restored to normal a circuit is established through relay 325 for establishing the start circuit to transfer the code digit from the sender to the marker. This circuit energized relay 207 through the contact of relay 325. This circuit may be traced from battery through the winding of relay 207 over conductor 255, contact 1 of relay 325, contact 4 of five-digit relay 302, contact 1 of relay 326, contact 1 of relay 341 to ground on contact 1 of relay 300. For a five-digit call relay 327 is operated over a circuit from battery through its winding, contact 1 of relay 111 to ground through contact 1 of relay 110. The operation of relay 207 therefore establishes a circuit for relay 502 from battery through its winding, contact 3 of five-digit relay 302, contact 3 of relay 327 to ground on contact 6 of relay 207. The operation of relay 502 now associates the contacts of sender registers C, D and E with the windings of the marker registers A, B and C. Since the numeral 6 was registered on the sender C, register relays 411 and 414 were operated. This connects ground from contact 3 of relay 411 with the C1 lead which extends through contact 1 of relay 502, contact 1 of relay 503, conductor 631, winding of the marker A1 register relay 600 to battery. The marker register relay 600 is thus operated and locked in the manner described for the sender register relay. Ground is also connected from contact 1 of relay 414 to lead C5 which extends through contact 4 of relay 502, lead 634, winding of the A5 register relay 603 to battery, operating this register relay which locks in the manner described for the sender register relay. The leads from the sender D

register are connected through contacts 5 to 8, inclusive, of relay 502. Since the digit 4 was registered on the sender D register, ground is connected through contact 1 of relay 418 to the D4 lead, through contact 7 of relay 502, contact 3 of relay 504, lead 643, winding of relay 606 to battery. In the sender E register three relays E1, E2 and E5 were operated to record the numeral 8. Consequently, ground is associated with leads E1, E2 and E5 from contacts 1 of relays 421, 422 and 424. These leads extend through contacts 9, 10 and 12, respectively, of relay 502 which are carried through contacts 1, 2 and 4 of relay 504, thence over leads 651, 652 and 654 for energizing the marker register relays 608, 609 and 611. The marker registers having been operated are associated through the contacts of the five-digit relay 616 with a particular group of units, tens and fifties relays which have the particular group of route relays associated therewith and therefore particular trunks are selected when a five-digit call is registered.

The various trunk routes or trunk groups are shown diagrammatically in Fig. 6 associated with the units, tens and fifties relays and route relays for extending incoming calls to trunks over these routes. The one, two and three-digit trunk groups are shown diagrammatically as a triangle 662, the four-digit trunk groups are shown diagrammatically as a triangle 665 and the five-digit trunk groups are shown diagrammatically as the triangle 668. After registration of the three-digit code on the marker registers A, B and C, ground is associated through the contacts of these registers with the units, tens and fifties relays 660 for energizing a particular route relay 661 to obtain an idle trunk in the trunk group 662. The contacts from the register relays are shown diagrammatically extending through the back contacts of the four-digit relay 617 and the five-digit relay 616 to the relays 660. When a four-digit code is registered on the marker registers A, B and C, relay 617 is operated. Consequently the contacts of the registers are extending through the inner contact of relay 617 to the units, tens and fifties relays 663 for energizing a particular route relay to obtain an idle trunk in the trunk groups 665. A five-digit code register on the marker registers A, B and C obtains access to the five-digit trunks through the inner contact of the five-digit relay 616 which is energized when a five digit code is registered. The contacts of the register relays are extended through the back contacts of relay 617, inner contacts of relays 616 to the units, tens and fifties relays 666 for operating a particular route relay 667 to select an idle trunk in the five-digit trunk groups 668.

After all of the digit pulses have been transmitted from the pulsing circuit 107 to the sender, a terminating pulse is transmitted to disassociate the pulsing circuit 107 from the sender. As previously stated, these pulses may include the digits for an office code which is transmitted to the marker registers and the digits for a second office code or numerical digits which may be transmitted over a terminating toll trunk. The number of sender registers operated depends upon the number of digits transmitted and consequently the register following the last register used for the digits is operated by the terminating pulse. This terminating pulse energizes pulse relays 211 and 214 representing the numerals 1 and 4. This combination is chosen for a terminating signal since it is not used for any digit,

Register relays 426 and 427 are operated by the terminating pulse when all of the other registers have been taken for use. When all of the other registers have not been taken for use the next successive register operates in the manner hereinafter described instead of the registers 426 and 427. Assuming that relay 325 has been operated in the regular routine of registering digits and that this is the last regular digit to be registered, relay 330 would have been operated when the pulses were recorded on the register relays 421 to 424, inclusive. At the termination of this pulse a circuit would have been established for relay 425 from battery through the winding of relay 330, winding of relay 425, contact 2 of relay 330, lead 230 to ground on contact 3 of relay 113. When the terminating pulse is received for operating relays 211 and 214, a ground is connected with lead 222 which extends through contact 3 of relay 425, winding of relay 426 to battery, operating relay 426 which locks to ground on contact 3 of relay 300. Ground is also extended from relay 214 over lead 226, contact 2 of relay 425, winding of relay 417 to battery which operates relay 427 and locks this relay to the same ground as relay 426. Ground from the contacts 2 of register relays 426 and 427 is connected through contacts 2 and 3 of out-pulsing relay 314 for controlling the operation of steering relays 304 to 308 and 310 to 313 for sending out the pulses registered in any of the registers after the office code registration is transferred to the marker. The outgoing pulses are transmitted after an outgoing trunk is selected in the manner fully described in the patent application of A. J. Busch and F. J. Scudder, Serial No. 295,012, filed September 15, 1939.

The operation of relays 211 and 214 also associates ground through the left and right windings of relay 205 for operating the latter relay. Relay 205 when operating establishes an obvious circuit for relay 206 which locks to ground on contact 8 of relay 300. Relays 211 and 214 are released at the termination of the transmission of the last pulse which causes the release of relay 205. Since relay 206 remains operated a circuit is now established for relay 208 from ground on contact 8 of relay 300 through the contact of relay 206, back contact of relay 205, winding of relay 208 to battery. Relay 208 establishes a locking circuit for itself to ground on contact 8 of relay 300 and establishes an operating circuit for relay 115. The latter circuit may be traced from ground on contact 1 of relay 208 through contact 3 of relay 116, winding of relay 115 to battery. The operation of relay 115 connects battery through resistance 122 to lead 140 and battery through the right winding of relay 114 to lead 139. Leads 139 and 140 extend through the windings of a polarized relay in the pulsing circuit which is now energized to indicate to the pulsing circuit that the registers in the sender have satisfactorily operated for recording the digits as transmitted from the pulsing circuit. This polarized relay in operating connects ground to lead 139 which causes the energization of relay 114. The latter relay in operating associates its left winding in circuit with the winding of relay 116 which extends to ground on contact 6 of relay 113. The operation of relay 116 opens the pulsing leads 139 and 140 extending to the sender pulsing relays 209 to 214, inclusive, and causes the release of relay 115. The operation of relay 116 and the release of relay 115 places resistances 124 and condenser

125 across the pulsing leads 139 and 140 as a signal to the pulsing operator or to an automatically operating pulsing circuit that the sender has advanced and cut off the pulsing circuit.

What is claimed is:

1. In a digit registering system, a registering device, a plurality of individual registers in said registering device each capable of variably registering digits, pulse responsive means, means in said registering device variably responsive to said pulse responsive means for forming said individual registers into different combinations, each combination including different individual registers, a second registering device, and means in said first registering device for connecting the registers so formed into said combinations with the registers of said second registering device for setting the registers of said second registering device.

2. In a digit registering system, a registering device, a plurality of individual registers in said registering device each capable of variably registering digits, pulse responsive means, means in said registering device variably responsive to said pulse responsive means for forming said individual registers into different combinations, each combination including different individual registers, a second registering device, and a plurality of means in said first registering device, equivalent in number to the number of possible register combinations for digit registrations, selectively operable in response to circuits established in the registers so combined for connecting the registers formed into said combinations with the registers of said second registering device for setting the registers of said second registering device.

3. In a digit registering system, a registering device, a series of individual registers in said registering device, each capable of variably registering digits, pulse responsive means, second and third registering devices each having individual registers, means in said first registering device variably responsive to said pulse responsive means for variably forming different numbers of said individual registers into different digit registering combinations, means individual to each combination so formed for connecting the registers formed into said combinations with the registers in said second registering device, and means in said first registering device for operating the next in order registers in said series following the last register formed into said combination for controlling the registers of said third registering device.

4. In a digit registering system, a sender having a plurality of individual code registers each capable of variably registering digits, a marker having a plurality of individual code registers less in number than the sender code registers each capable of variably registering digits, means in said sender responsive to pulses for operating different pluralities of said individual sender registers in successive order for registering different characters of office codes, said plurality depending upon the number of digits in each character of code, and means in said sender selectively operable by said registrations for invariably associating a number of said sender registers with said marker registers equivalent to the number of said marker registers.

5. In a digit registering system, a sender having a plurality of individual registers each capable of variably registering digits, a marker having a plurality of individual code registers less in number than the sender code registers each capa-

ble of variably registering digits, means in said sender responsive to pulses for operating different pluralities of said individual sender registers in successive order for registering different characters of office codes, said plurality depending upon the number of digits in each character of code, and selectively operable devices in said sender responsive to said registrations for connecting a set number of the sender registers on which the code is registered with said marker registers, said sender registers being combined in different orders to make up said set number of registers dependent upon the number of digits registered in an office code.

6. In a digit registering system, a sender having a plurality of individual registers each capable of variably registering digits, a marker having a plurality of individual code registers less in number than the sender code registers each capable of variably registering digits, means in said sender responsive to pulses for operating different pluralities of said individual sender registers in successive order for registering different characters of office codes, said plurality depending upon the number of digits in each character of code, selectively operable devices in said sender responsive to said registrations for connecting a set number of the sender registers on which the code is registered with said marker registers, said sender registers being combined in different orders to make up said set number of registers dependent upon the number of digits registered in an office code, and means in said marker selectively responsive to the registers operated in the sender for directing the operation of said marker for associating the marker registers with different units of equipment.

7. In a digit registering system, a sender having a plurality of individual registers each capable of variably registering digits, a marker having a plurality of registers each capable of variably registering digits, means in said first sender responsive to pulses for operating different pluralities of said individual sender registers in successive order for registering different characters of office codes, said plurality depending upon the number of digits in each character of code, means for registering other digits on the next successive registers following the registers used for said office code, means in said first sender selectively operable by said registrations for connecting a

set number of the sender registers on which the code is registered with an equivalent number of registers in the marker, and means for associating the next successive registers following the registers used for said office code with said second sender.

8. In a digit registering system, a sender having a plurality of individual registers each capable of variably registering digits, a marker having three individual registers each capable of variably registering digits, means in said sender for registering office codes on three, four or five of said individual registers, respectively, and means in said sender for connecting different combinations of three of said sender registers with the registers of the marker for transferring said respective office codes to the marker.

9. In a digit registering system, a sender having a plurality of individual registers each capable of variably registering digits, a marker having three individual registers each capable of variably registering digits, means in said sender for registering office codes on three, four or five of said individual registers, respectively, and means in said sender for connecting different combinations of three of said sender registers with the registers of the marker for transferring said respective office codes to the marker, and means in said sender selectively operable by said registrations for directing the association of the marker registers with three-digit, four-digit or five-digit trunk routing equipment units.

10. In a digit registering system, a registering device having a plurality of individual code registers each capable of variably registering digits, a second register device having individual code registers less in number than the individual code registers in said first registering device, pulse responsive means in said first registering device, means in said first registering device variably responsive to said pulse responsive means for setting all or part of said plurality of individual code registers in said first registering device, and means in said first registering device responsive to said register settings for connecting a number of said individual code registers with the individual registers of said second registering device for transferring a code setting to the latter registers, the number of registers in the first registering device so connected being not greater than the number of registers in said second registering device.

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