

April 26, 1949.

M. E. MALONEY ET AL  
AUTOMATIC TELEPHONE SYSTEM

2,468,300

Filed Aug. 14, 1945

6 Sheets-Sheet 1

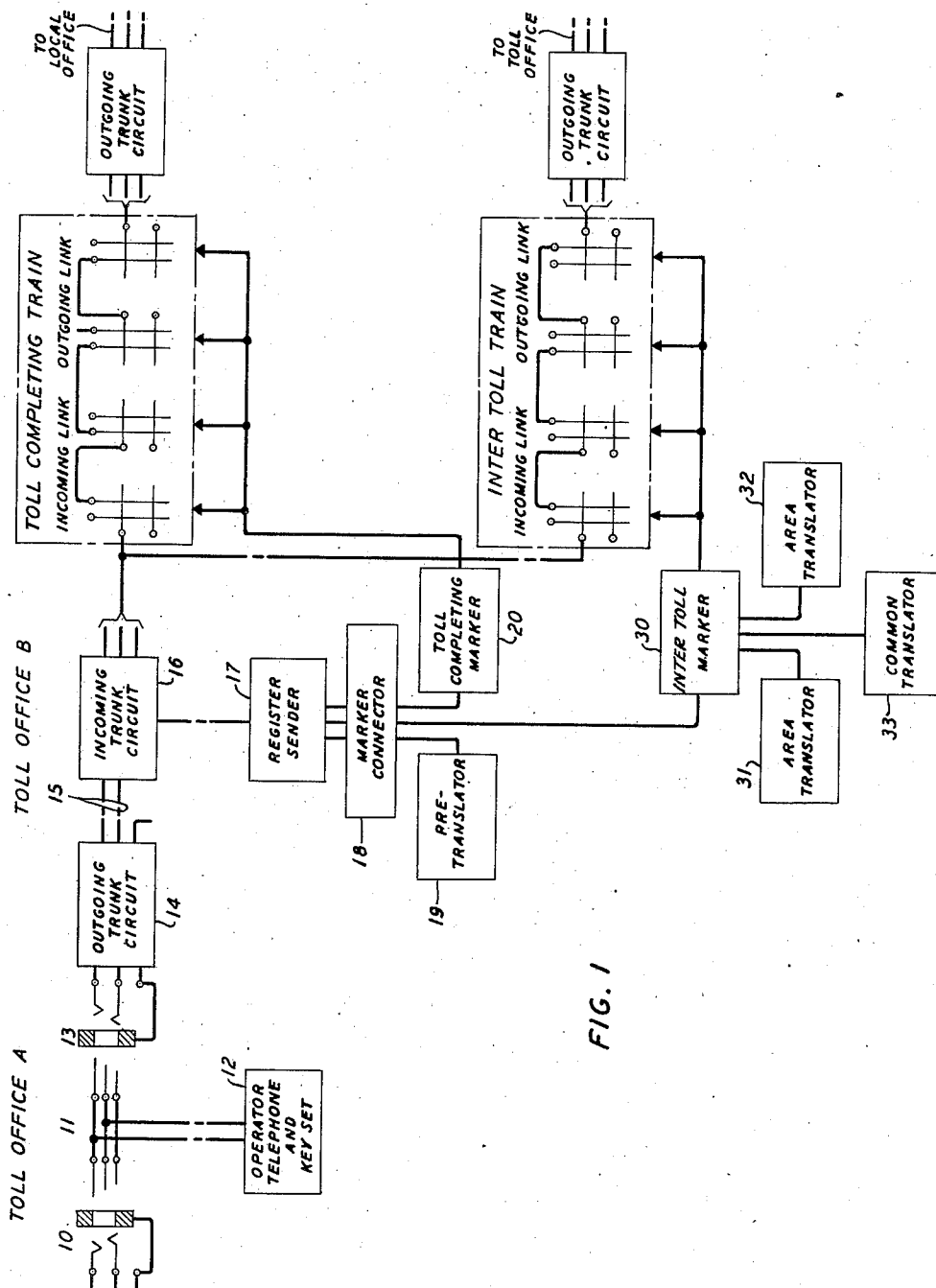


FIG. 1

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6 Sheets-Sheet 2

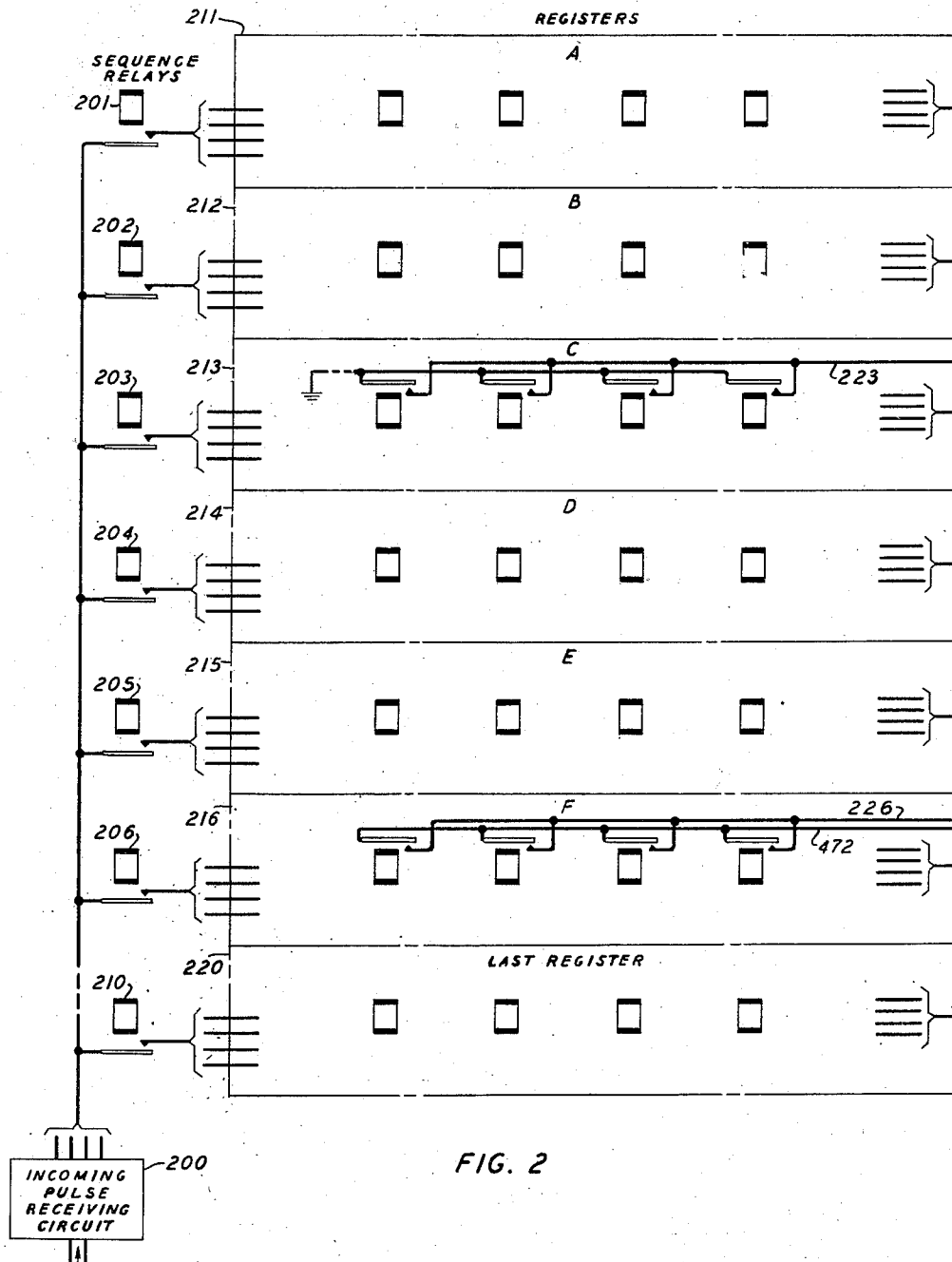


FIG. 2

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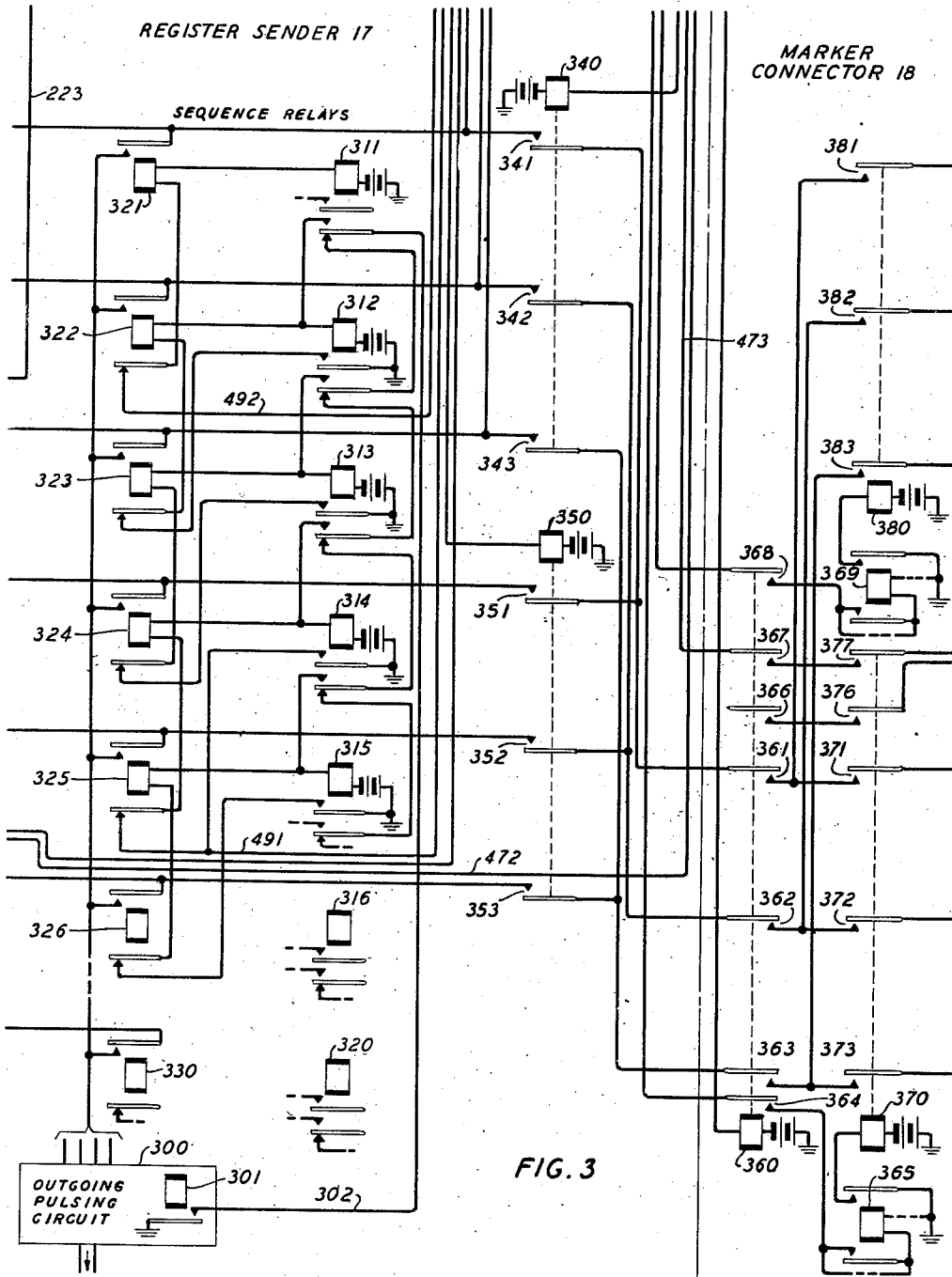
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AUTOMATIC TELEPHONE SYSTEM

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6 Sheets-Sheet 3



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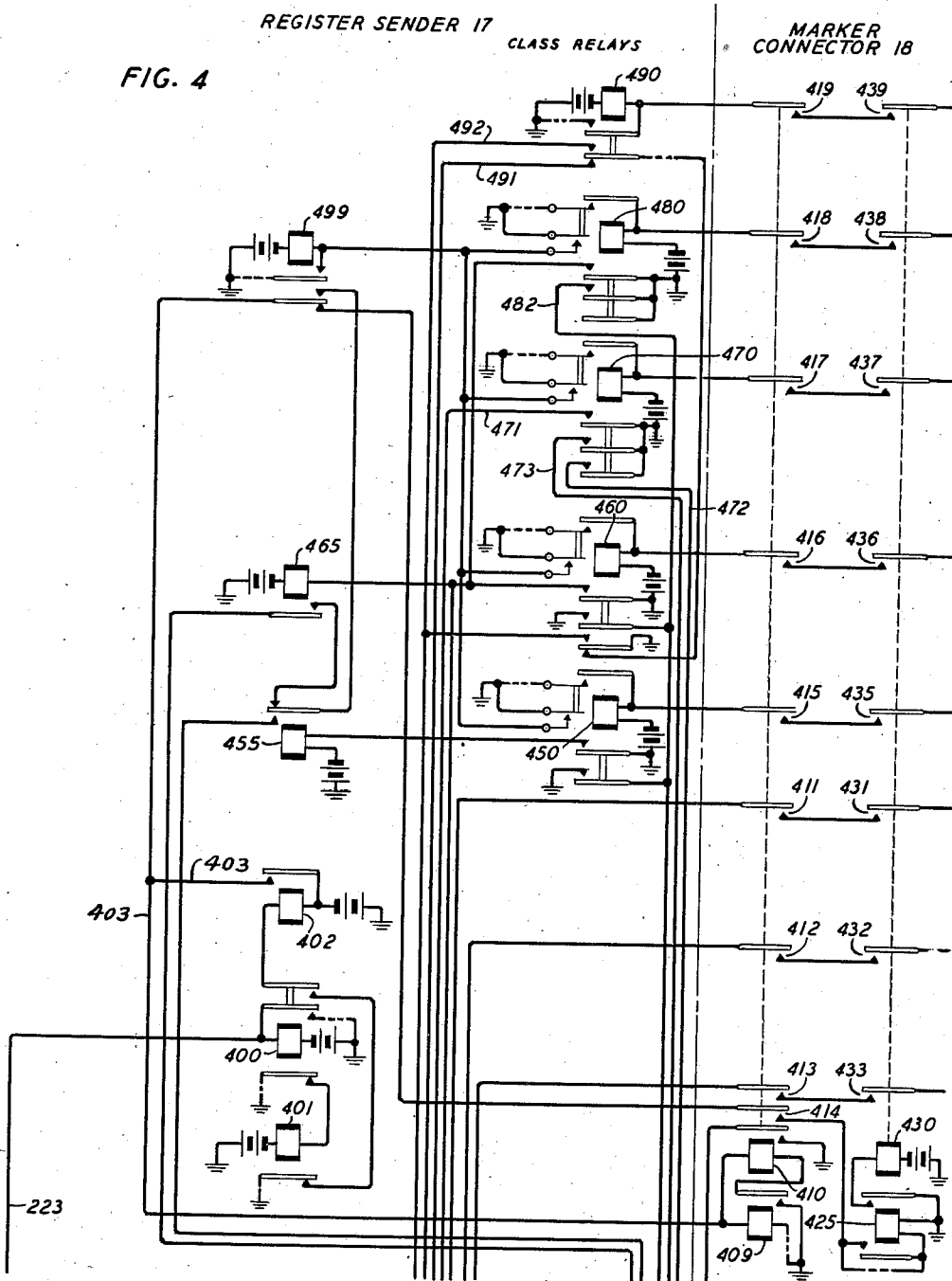
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AUTOMATIC TELEPHONE SYSTEM

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6 Sheets-Sheet 4

FIG. 4



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AUTOMATIC TELEPHONE SYSTEM

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6 Sheets-Sheet 5

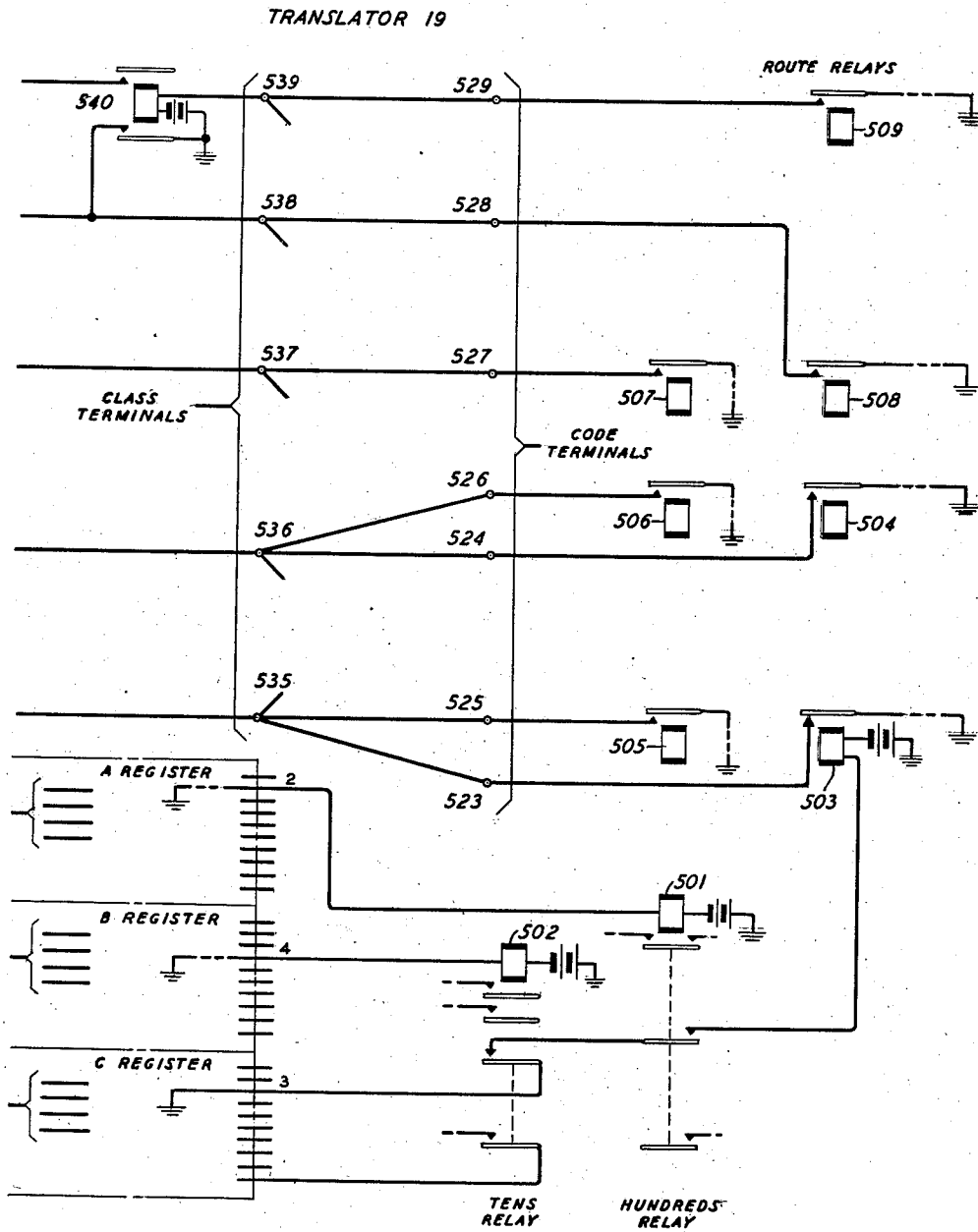


FIG. 5

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TOLL COMPLETING MARKER 20

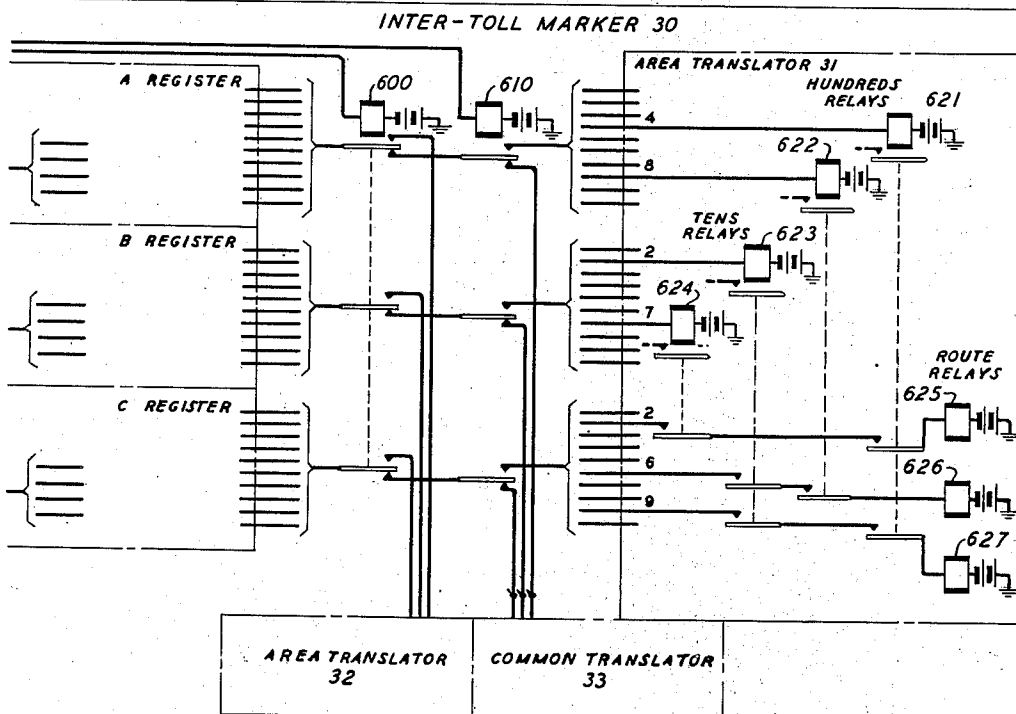
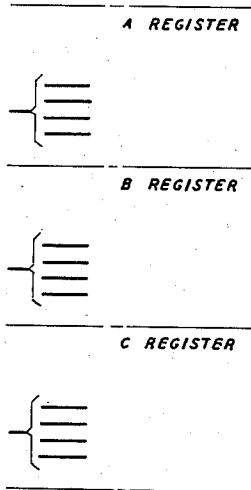


FIG. 6

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## UNITED STATES PATENT OFFICE

2,468,300

## AUTOMATIC TELEPHONE SYSTEM

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Application August 14, 1945, Serial No. 610,724

14 Claims. (Cl. 179—18)

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This invention relates to telephone systems and particularly to toll systems employing automatic switches for completing connections between calling and called subscribers and operators.

Objects of the invention are an increased efficiency in the automatic routing of toll calls, the minimization of the time required for completing such calls, and generally the improvement of the control of automatic switching in toll telephone systems.

In extending the use of automatic switching equipment in toll telephone systems and in enlarging the area within which toll calls may be completed without the aid of an operator and also in reducing to a minimum the number of operators involved in the completion of built-up connections through a plurality of toll offices in tandem, the register-senders used in routing a call must be capable of registering both the toll and local office code digits. The routing of a through call at a particular toll office depends on only the toll code, the routing of a terminating call depends only on the local office code, and the routing of calls to offices in toll areas in which there is more than one inward toll center may depend on both the toll and local office codes. If a marker were called in only after the number of digits registered equal the maximum number representing both office codes, toll and local, the extension of calls which are routed responsive to the toll code alone would be unnecessarily delayed while the local office code was being registered or until time enough had elapsed to determine whether any further digits would be registered. To seize a marker twice, once at the end of the toll code and again when the local code is registered if the routing depends on both codes, is also objectionable.

This invention is a telephone system comprising register-sender and marker controlled switches in which a pretranslator is called in by a register-sender after sufficient digits have been registered therein to represent a toll route code.

A feature of the invention is a telephone system comprising register-sender and marker controlled switches in which the register-sender used on an incoming toll call is connected to a pretranslator as soon as enough digits have been registered to represent either a toll or a local office code and in which the pretranslator receives these digits from the register-sender and then tells the register-sender what kind of a marker to use, when to call in the marker, and what informa-

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tion must be transmitted to the marker. If a call is one which is to be routed directly to the called local office, the pretranslator tells the register-sender to immediately call in a toll completing marker and to transmit to the marker the same digits which are transmitted to the pretranslator. If a call is one for which the terminating toll office is in the same numbering area as that in which the register-sender is located, the pretranslator tells the register-sender to immediately call in an intertoll marker and to transmit to the marker the same digits which were transmitted to the pretranslator. If a call is one for which the terminating toll office is in a toll area which is accessible through two or more direct trunk groups, the pretranslator tells the register-sender to wait until as many digits have been registered as are needed to identify both the toll and local office code and then call in a toll marker, transmit to the marker the local office code digits only and tell the marker to use the particular translator which is provided for the toll area in which the called local office is located. If a call is one for which the terminating toll office is in an area to which a single direct group of ring-down or dial trunks is provided, the pretranslator tells the register-sender to immediately call in a toll marker, transmit to the marker the same digits which were transmitted to the pretranslator and tell the marker to use the translator which is common to a plurality of areas. If a call is one for which the terminating toll office is in an area to which there is no direct group of trunks, the pretranslator tells the register-sender to immediately call in a toll marker, transmit to the marker the same digits which were transmitted to the pretranslator and tell the marker to use the translator common to a plurality of areas; and the pretranslator further tells the register-sender to transmit over the selected trunk all of the digits registered in the register-sender.

A clear and complete description of these and other features of the invention will be facilitated by considering a system in which the invention is embodied, one such system being represented schematically in the drawings which constitute a part of this specification. The invention is, however, not limited in its application to the system and arrangements shown in the drawing but is generally applicable to automatic switching and control systems.

Referring to the drawing,

Fig. 1 represents a toll system comprising two toll offices A and B;

Figs. 2, 3 and 4 represent a register-sender 17 in office B;

Fig. 5 represents a pre-translator 19 in office B; and

Fig. 6 represents marker equipment in office B. The system represented schematically in Fig. 1 comprises switches of the cross bar type and is generally similar to that disclosed in the patent to G. V. King, J. B. McKim and O. Myers, No. 2,236,246, granted March 25, 1941. The toll office A comprises an operator position 12 which includes an operator's telephone and key-set, a cord 11, jacks 10 and 13, and an outgoing trunk circuit 14. Jack 10 may terminate a toll recording completing trunk from a local office and we may assume that one end of cord 11 has been connected with jack 10 to answer a call initiated at a local subscriber's station. The cord, position and key-set equipment, and the outgoing trunk circuit 14, may be similar to like equipment and trunk circuits disclosed in the patent to P. B. Murphy, No. 2,288,251, granted June 30, 1942, and the patent to G. Hecht, A. A. Lundstrom and E. R. Taylor, No. 2,332,912, granted October 26, 1943. The incoming trunk circuit 16 and register-sender 17 may be similar to the incoming trunk circuit shown in Fig. 6 and register-sender shown in Figs. 23 to 35 of Patent No. 2,382,893, granted Aug. 14, 1945 to B. McKim and O. Myers, except that the register-sender is modified to incorporate therein features of the present invention. The marker-connector 18 is similar to the marker-connectors disclosed in the aforementioned patent to King, McKim and Myers and in the aforementioned patent to McKim and Myers except that it is arranged to provide for the connection of the register-sender to a pretranslator in addition to providing for the connection of the register-sender to a toll completing marker or an intertoll marker. The toll completing marker 20 is similar to the marker disclosed in the aforementioned King-McKim-Myers patent and so also is the intertoll marker 30 except that it includes a plurality of translators, area translators 31 and 32 being individual to the marker 30 and translator 33 being common to all intertoll markers in office B. An area translator is provided for an area to which there is a large volume of traffic and a plurality of direct trunk groups from office B. A translator common to all intertoll markers may be provided for all areas to which there is a single group of trunks. The aforementioned McKim-Myers patent discloses both toll completing and intertoll trains of switches for connecting incoming trunks with outgoing trunks to local and toll offices and discloses a marker which may be either a toll completing marker, an intertoll marker, or a combined toll completing and intertoll marker. Reference may also be had to the patent to Strickler No. 2,283,395, granted May 19, 1942, for disclosure of a register-sender arranged to give to the marker the particular code digits which determine the routing of the call and tell the marker which of a plurality of translators is to be used in connecting the calling incoming trunks to an idle outgoing trunk in a desired trunk group.

Assume now that a toll call has been initiated over intertoll trunk 15 by the interconnection of cord 11 and outgoing trunk circuit 14 and that the associated incoming trunk circuit 16 has been connected to the register-sender 17. When the key-set at position 12 is operated to transmit the required code and numerical digits for complet-

ing the call, the digit signals thus transmitted are received by the incoming pulse receiving circuit 200 of register-sender 17 and are successively registered under the control of sequence relays 201 to 210, inclusive, in the registers 211 to 220, inclusive, one digit on each register beginning with register 211 in the manner disclosed in detail in the aforementioned Hecht-Lundstrom-Taylor patent. As soon as three digits have been registered, ground is connected to conductor 223 to effect the operation of relay 400 and thereby cause the release of relay 401, relay 401 having been operated at the time of the connection of register-sender 17 to trunk circuit 16. The release of relay 401 causes the operation of relay 402, whereby battery is connected to conductor 403 to effect the operation of the sender preference relay 409 and sender connector relay 410 in an idle marker-connector as described in detail in the aforementioned King-McKim-Myers patent. The operation of relay 410 closes a circuit for operating the auxiliary sender connector relay 360 and closes a circuit for operating a translator preference relay 425 associated with an idle pretranslator 19, this circuit being traced from battery through a front contact of relay 402, conductor 403, a back contact of relay 409, contact 414 of relay 410 and winding of relay 425 to ground. The broken line connections to the winding of relay 425 represent other relay contacts similar to those shown in detail in the operating circuit of a marker preference relay in the aforementioned King-McKim-Myers patent. The operation of relay 425 causes the operation of relay 435 whereby the register-sender 17 is connected through contacts of relays 410 and 430 to the pretranslator 19. Each of the contacts 411, 412 and 413 of relay 410 and contacts 431, 432 and 433 of relay 430 represents a set of four contacts through which the registers of the sender are connected to the registers of the pretranslator. Thus the A, B and C registers of the pretranslator 19 are set to correspond to the setting of registers 211, 212 and 213 of the register-sender. Relay 501 represents one of the translator hundreds relays and relay 502 represents one of the translator tens relays, the translator being similar to the translator of a toll completing or intertoll marker as disclosed in detail in the aforementioned King-McKim-Myers patent. Seven route relays 503 to 509, inclusive, are shown. The route relay 503 corresponds to route code 243 and the other route relays may correspond to codes such as 426, 353, 762, 515, 316 and 414, respectively. The operating circuit of the route relay 503 for route 243 is shown and a similar operating circuit is closed for each of the other route relays when the corresponding route code is registered.

While the route relays of the pretranslator 19 are operated in similar manner to that in which the route relays of a marker are operated, the operation of a route relay of the pretranslator is not effective to control the operation of cross bar switches but merely serves to give the register sender information as to the class of the call. Code terminals, one for each route relay, are provided for cross-connection to class terminals, one for each different class of call. Route relays 503 and 505, corresponding to codes 243 and 353, represent local offices to which calls are routed directly from toll office B; and both of the associated code terminals 523 and 525 are cross-connected to class terminal 535. Route relays 504 and 506, corresponding to codes 426 and 762, represent local



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offices which are reached through the same toll office to which there is a direct group of trunks from office B; and both of the associated code terminals 524 and 526 are cross-connected to class terminal 536. Route relay 507, corresponding to code 515, represents a toll area to which there are a plurality of direct trunk groups, the trunks in each group terminating in a different toll office; and the associated code terminal 527 is cross-connected to class terminal 537. Route 508, corresponding to code 316, represents an area which is reached over a single direct group of trunks; and the associated code terminal 528 is cross-connected to class terminal 538. Route relay 509, corresponding to code 414, represents an area to which there is no direct group of trunks; calls to this area are routed through a group of direct trunks to an intermediate toll office and the associated code terminal 529 is cross-connected to class terminal 539.

Assume first that the code, registered on the first three registers of the register sender and transferred to the A, B and C registers of the pretranslator, is the code 243. With the hundreds relay 501 operated under the control of the A register, and the tens relay 502 operated under control of the B register, a circuit is closed from ground in the C register for operating route relay 503. The operation of relay 503 connects ground to code terminal 523, thence through class terminal 535, contact 435 of relay 430 and contact 415 of relay 410 to effect the operation of class relay 450 in the register sender. Relay 450 locks and closes circuits for operating relays 499, 465 and 340. Relay 499 locks, opens the circuit energizing the winding of translator preference relay 425 and closes a circuit for energizing the winding of marker preference relay 369. The release of relay 425 causes the release of relay 430 thereby disconnecting the register sender from the pretranslator. The circuit for operating marker preference relay 369 is traced from battery through the front contact of relay 402, a front contact of relay 499, a front contact of relay 455, contact 368 of relay 360 and the winding of relay 369 to ground. The operation of relay 369 closes a circuit for operating relay 380 whereby the control conductors from the A, B and C registers 211, 212 and 213 of the register sender are connected through contacts 341, 342 and 343 of relay 340, contacts 361, 362 and 363 of relay 360, and contacts 381, 382 and 383 of relay 380 to the A, B and C registers of the toll completing marker 20. Each of the contacts 341, 342 and 343 of relay 340, each of the contacts 361, 362 and 363 of relay 360 and each of the contacts 381, 382 and 383 of relay 380 represent a set of four contacts through which the A, B and C registers of the register sender are connected to the A, B and C registers of the marker. Thus the registers of the marker 20 are set to register the same digits which were transmitted to the pretranslator. The marker 20 thereupon controls the selection of a trunk in a group of trunks leading directly to the called local office and the establishment of the connection through the toll completing train of switches between the incoming trunk circuit 16 and the selected outgoing trunk circuit. On such a call the register sender transmits over the outgoing trunk the succeeding digits registered in the register sender, which digits are numerical digits of the called subscriber's number. These digits are transmitted by the outgoing pulsing circuit 300 under the control of the sequence relays beginning with relays 314 and 324 in the

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manner described in detail in the aforementioned McKim-Myers patent. The circuit for operating relays 314 and 324 is traced from battery through the windings of these relays in series, through a back contact of relay 325, conductor 491, back contact of class relay 490, to ground at a back contact of relay 460.

Consider next a call on which the code registered on the A, B and C registers of the register sender 17 and transferred to the registers of the pretranslator 19 is a code which effects the operation of the route relay 506. The operation of relay 506 connects ground to code terminal 526, thence through class terminal 536, contact 436 of relay 430 and contact 416 of relay 410 to operatively energize the winding of class relay 460 in the register sender. Relay 460 locks and closes circuits for operating relays 499, 465 and 340. Relay 499 locks, opens the circuit energizing the winding of translator preference relay 425 and closes a circuit for energizing the winding of marker preference relay 365. The release of relay 425 causes the release of relay 430 so as to disconnect the register sender from the pretranslator. The circuit for operating marker preference relay 365 is traced from battery through the front contact of relay 402, a front contact of relay 499, a back contact of relay 455, a front contact of relay 465, contact 364 of relay 360 and the winding of relay 365 to ground. The operation of relay 365 closes a circuit for operating relay 370 whereby the control conductors from the A, B and C registers 211, 212 and 213 of the register sender are connected through contacts 341, 342 and 343 of relay 340, contacts 361, 362 and 363 of relay 360 and contacts 371, 372 and 373 of relay 370 to the A, B and C registers of an intertoll marker 30. Each of contacts 371, 372 and 373 represents a set of four contacts through which the registers of the intertoll marker are connected to the registers of the register sender. Thus the same digits that were registered in the pretranslator are registered in the intertoll marker; and, with both of relays 690 and 610 normal, the common translator 33 is used to effect the operation of a route relay and thereby select an outgoing trunk in a group leading directly to the terminating toll office which is in the same toll area as is office B. The operated route relay effects the connection of the incoming trunk circuit 16 through the intertoll train of switches to the selected outgoing trunk circuit. On such a call there are only seven digits registered in the register sender, these digits being the local office code and numerical digits of the called subscriber's number. These digits are transmitted under the control of the sequence relays beginning with relays 311 and 321 as above described. With relay 460 operated, ground is connected to conductor 492 to operate sequence relays 311 and 321 instead of relays 314 and 324 as above described; whereby the transmission of digit impulses starts with the digit registered on the A register and all seven digits are transmitted over the selected outgoing trunk.

Assume next a call on which the code registered on the A, B and C registers of the register sender 17 and transferred to the registers of the pretranslator 19 effects the operation of the route relay 507. Relay 507 connects ground to code terminal 527, thence through class terminal 537, contact 437 of relay 430 and contact 417 of relay 410 to operatively energize the winding of class relay 470 in the register sender. Relay 470 locks and closes a circuit for operating relays 499 and

350. Relay 499 locks and opens the circuit for energizing the winding of marker preference relay 425; and the release of relay 425 causes the release of relay 430, whereby the pretranslator 19 is disconnected from the register sender 17. The register sender 17 is not connected to a marker after the pretranslator is released until an additional three digits have been registered in the register sender, these three digits being the local office code digits which are to be transmitted to the marker for use in selecting the trunk group through which the call is to be completed. When the F register 216 has been set and class relay 470 is operated, a circuit is closed from ground through the lowest front contact of relay 470, conductor 472, a front contact of one or more of the register relays of the register 216, conductor 226 and winding of relay 465. Relay 465 is thus operated after the local office code digits have been registered and closes the circuit for operating the marker preference relay 365 as above described to effect the operation of relay 370. With relays 350 and 370 operated, the D, E and F registers of the register sender are connected through contacts 351, 352 and 353 of relay 350, contacts 361, 362 and 363 of relay 360 and contacts 371, 372 and 373 of relay 370, to the A, B and C registers of the intertoll marker 30, so that the registers of the marker are set in accordance with the local office code digits registered in the register sender. The operation of relay 370 also closes a circuit for operating relay 610 in the marker 30, the circuit for operating relay 610 being traced through contact 377 of relay 370, contact 367 of relay 360, conductor 473 and a front contact of class relay 470. The operation of relay 610 connects the A, B and C registers of marker 30 to the area translator 31, this translator being used for all calls outgoing to a particular toll area into which there are a plurality of direct groups of trunks, the particular group of trunks over which a call is to be routed depending on the local office code. Relay 600 is similarly operated in case the class relay operated by the pretranslator is one which indicates that the area translator 32 is to be used on a call. A route relay is operated which effects the connection of the incoming trunk circuit 16 through the intertoll train of switches to an outgoing trunk circuit in a group which leads to a toll office in the called toll area through which toll office the called local office is accessible over a direct group of trunks. On such a call the local office code and numerical digits registered in the register sender are transmitted over the selected outgoing trunk under the control of the sequence relays beginning with relays 314 and 324.

Assume now a call on which the code registered on the A, B and C registers of the register sender 17 and transferred to the registers of the pretranslator 19 effects the operation of route relay 508. Relay 508 connects ground to code terminal 428 thence through class terminal 538, contact 438 of relay 430 and contact 418 of relay 410 to operatively energize the winding of class relay 480 in the register sender. Relay 480 locks and closes circuits for operating relays 499, 465 and 340 whereby the A, B and C registers of the register sender are connected to the registers of an intertoll marker 30 in the manner hereinbefore described. The registers of marker 30 are connected to the common translator 33, whereby a route relay is operated to effect the selection of a trunk in a group leading directly to the called toll office. If the trunk is a ring-down trunk,

the operated route relay does not cause the transmission of any of the digits registered in the register sender. But if the trunk is a dial trunk, the operated route relay causes the transmission of the local office code and numerical digits registered in the register sender under the control of the sequence relays beginning with relays 314 and 324 as hereinbefore described.

Assume now that the call is one on which the code registered on the A, B and C registers of the register sender 17 and transferred to the registers of the pretranslator 19 effects the operation of route relay 509. Relay 509 connects ground to code terminal 529, thence through class terminal 539 to operate relay 540. Relay 540 closes circuits through contacts 438 and 439 of relay 430 and contacts 418 and 419 of relay 410 for operating class relays 480 and 490. The operation of relay 480 causes the operation of relays 499, 465 and 340 whereby the A, B and C registers of the register sender are connected to the registers of an intertoll marker 30 and the marker registers are connected to the common translator 33 as hereinbefore described. The operation of the route relay corresponding to the toll code digits effects the selection of a trunk in a group of trunks outgoing to another toll office through which the called toll office is accessible, and it is necessary to send to the intermediate toll office not only the local office code and numerical digits but also to send the toll code digits to enable the further routing of the call. To this end, the class relay 490 disconnects ground from conductor 491 to prevent the immediate operation of the sequence relays 314 and 324 and connects ground to conductor 492 to cause the operation of sequence relays 311 and 321, so that the sending of digits by the outgoing pulsing circuit 300 will start with the digit registered on the A register of the register sender, the succeeding digits registered being transmitted one after the other under the control of the succeeding sequence relays.

It is to be noted that whereas on a call on which route relay 507 of the pretranslator 19 is operated, the class relay 470 effects the transmission of only the local office code digits to the intertoll marker, the arrangement might be modified to have the toll code digits transmitted to the intertoll marker to effect selection of the translator and then the transmission of the local office code digits to the marker to effect the selection of a trunk and extension of the connection thereto. This and other modifications may be made within the scope of the invention as defined by the claims.

What is claimed is:

1. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits, translating means effective to translate a predetermined number of digits each of any value as soon as registered in said register-sender, markers each including individual translating means for controlling the operation of said switching means to connect a calling incoming trunk to an idle outgoing trunk, and means controlled by said first-mentioned translating means for immediately effecting the association of a marker with said register-sender.

2. In a toll office of a switching system com-

prising a plurality of toll and local offices, incoming trunks, outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits, translating means effective to translate a predetermined number of digits each of any value as soon as registered in said register-sender, markers each including individual translating means for controlling the operation of said switching means to connect a calling incoming trunk to an idle outgoing trunk, means controlled by said first-mentioned translating means for immediately effecting the association of a marker with said register-sender and the transmission of the same digits to said marker as were transmitted to said first-mentioned translating means.

3. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits, translating means effective to translate a predetermined number of digits each of any value as soon as registered in said register-sender, toll completing markers, intertoll markers, each of said markers including individual translating means for controlling the operation of said switching means to connect a calling incoming trunk to an idle outgoing trunk, and means controlled by said first-mentioned translating means for immediately effecting the selective association of a toll completing marker or an intertoll marker with said register-sender.

4. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits, translating means effective to translate a predetermined number of digits each of any value as soon as registered in said register-sender, markers each including individual translating means for controlling the operation of said switching means to connect a calling incoming trunk to an idle outgoing trunk, and means controlled by said first-mentioned translating means for effecting the association of a marker with said register-sender as soon as an additional predetermined number of digits are registered in said register-sender.

5. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits, translating means effective to translate a predetermined number of digits each of any value as soon as registered in said register-sender, markers each including individual translating means for controlling the operation of said switching means to connect a calling incoming trunk to an idle outgoing trunk, and means controlled by said first-mentioned translating means for effecting the association of a marker with said register-sender as soon as an additional predetermined number of digits are registered

in said register-sender and for transmitting to said marker said additional digits registered in said register-sender.

6. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits, translating means effective to translate a predetermined number of digits each of any value as soon as registered in said register-sender, markers for controlling the operation of said switching means to connect a calling incoming trunk to an idle outgoing trunk, each of said markers including a plurality of different translators, means in said register-sender controlled by said first-mentioned translating means for effecting the association of an idle one of said markers with said register-sender and for effecting the selection of a desired one of said translators in the associated marker.

7. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits, translating means effective to translate a predetermined number of digits each of any value as soon as registered in said register-sender, markers for controlling the operation of said switching means to connect a calling incoming trunk to an idle outgoing trunk, each of said markers including a plurality of different translators, means in said register-sender controlled by said first-mentioned translating means for effecting the association of an idle one of said markers with said register-sender as soon as an additional predetermined number of digits are registered in said register-sender, for effecting the selection of a desired one of said translators in the associated marker, and for transmitting to said associated marker said additional digits registered in said register-sender.

8. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits and comprising means for transmitting over a selected outgoing trunk a plurality of the digits registered, translating means effective to translate a predetermined number of digits each of any value as soon as registered in said register-sender, markers each including individual translating means for controlling the operation of said switching means to connect a calling incoming trunk to an idle outgoing trunk, and means controlled by said first-mentioned translating means for immediately effecting the association of a marker with said register-sender, the transmission of the same digits to said marker as were transmitted to said first-mentioned translating means, and for effecting, the transmission over the outgoing trunk selected by said marker of all of the digits registered in said register-sender.

9. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, outgoing trunks, switching means for connecting incoming trunks with outgoing trunks,

a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits and comprising means for transmitting over a selected outgoing trunk a plurality of the digits registered, translating means effective to translate a predetermined number of digits each of any value as soon as registered in said register-sender, markers for controlling the operation of said switching means to connect a calling incoming trunk to an idle outgoing trunk, each of said markers including a plurality of different translators, means in said register-sender controlled by said first-mentioned translating means for effecting the association of an idle one of said markers with said register-sender and for effecting the selection of a desired one of said translators in the associated marker and for effecting the transmission over the outgoing trunk selected by said marker of all of the digits registered in said register-sender.

10. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, groups of outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits, pretranslators, means effective to connect an idle pretranslator to said register-sender as soon as a predetermined number of digits have been registered in said register-sender, registers in said pretranslator set in accordance with the setting of said predetermined number of registers of the register-sender, route relays in said pretranslator and means for operating a route relay corresponding to the setting of the registers of said pretranslator, class relays in said register-sender, means including the operated route relay in said pretranslator for effecting the operation of one or more of said class relays, toll completing markers, intertoll markers, each of said markers comprising means including translating means for effecting a connection between a calling incoming trunk and an idle outgoing trunk in a desired group of trunks, means controlled by an operated one of said class relays for connecting the register-sender to an idle toll completing marker if the call is to be extended over a trunk in a group outgoing to a local office, and means controlled by an operated one of said class relays for connecting the register-sender to an idle intertoll marker if the call is to be extended over a trunk in a group outgoing to another toll office.

11. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, groups of outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits, pretranslators, means effective to connect an idle pretranslator to said register-sender as soon as a predetermined number of digits have been registered in said register-sender, registers in said pretranslator set in accordance with the setting of said predetermined number of registers of the register-sender, route relays in said pretranslator and means for operating a route relay corresponding to the setting of the registers of said pretranslator, class relays in said register-sender, means including the operated route relay in said pretranslator for effecting the operation of one or more of said class relays, toll completing markers, intertoll markers, each of said markers comprising means for effecting a connection be-

tween a calling incoming trunk and an idle outgoing trunk in a desired group of trunks, each of said intertoll markers comprising a plurality of different translators, means controlled by an operated one of said class relays for connecting the register-sender to an idle toll completing marker if the call is to be extended over a trunk in a group outgoing to a local office, and means controlled by an operated one of said class relays for connecting the register-sender to an idle intertoll marker if the call is to be extended over a trunk in a group outgoing to another toll office and for effecting the selection of the particular one of said plurality of translators which is capable of effecting the selection of an idle trunk in a particular group of trunks.

12. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, groups of outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits and means for transmitting over a selected outgoing trunk a plurality of the digits registered in said register-sender, pretranslators, means effective to connect an idle pretranslator to said register-sender as soon as a predetermined number of digits have been registered in said register-sender, registers in said pretranslator set in accordance with the setting of said predetermined number of registers of the register-sender, route relays in said pretranslator and means for operating a route relay corresponding to the setting of the registers of said pretranslator, class relays in said register-sender, means including the operated route relay in said pretranslator for effecting the operation of one or more of said class relays, toll completing markers, intertoll markers, each of said markers comprising means including translating means for effecting a connection between a calling incoming trunk and an idle outgoing trunk in a desired group of trunks, means controlled by an operated one of said class relays for connecting the register-sender to an idle toll completing marker if the call is to be extended over a trunk in a group outgoing to a local office, and means controlled by an operated one of said class relays for connecting the register-sender to an idle intertoll marker if the call is to be extended over a trunk in a group outgoing to another toll office and for effecting the transmission over the selected outgoing trunk of all of the digits registered in said register-sender following said predetermined number of digits in case the selected outgoing trunk is in a group leading directly to the terminating toll office through which the call is routed.

13. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, groups of outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits and means for transmitting over a selected outgoing trunk a plurality of the digits registered in said register-sender, pretranslators, means effective to connect an idle pretranslator to said register-sender as soon as a predetermined number of digits have been registered in said register-sender, registers in said pretranslator set in accordance with the setting of said predetermined number of registers of the register-sender, route relays in said pretranslator and means for op-

erating a route relay corresponding to the setting of the registers of said pretranslator, class relays in said register-sender, means including the operated route relay in said pretranslator for effecting the operation of one or more of said class relays, toll completing markers, intertoll markers, each of said markers comprising means including translating means for effecting a connection between a calling incoming trunk and an idle outgoing trunk in a desired group of trunks, means controlled by an operated one of said class relays for connecting the register-sender to an idle toll completing marker if the call is to be extended over a trunk in a group outgoing to a local office, means controlled by an operated one of said class relays for connecting the register-sender to an idle intertoll marker if the call is to be extended over a trunk in a group outgoing to another toll office and for effecting the transmission over the selected outgoing trunk of all of the digits registered in said register-sender in case the selected outgoing trunk is in a group leading to an intermediate toll office through which the call is routed to a terminating toll office.

14. In a toll office of a switching system comprising a plurality of toll and local offices, incoming trunks, groups of outgoing trunks, switching means for connecting incoming trunks with outgoing trunks, a register-sender connected to a calling incoming trunk, said register-sender comprising registers for registering a plurality of digits and means for transmitting over a selected outgoing trunk a plurality of the digits registered in said register-sender, pretranslators, means effective to connect an idle pretranslator to said register-sender as soon as a predetermined number of digits have been registered in said register-sender, registers in said pretranslator set in accordance with the setting of said predetermined number of registers of the register-sender, route relays in said pretranslator and means for operating a route relay corresponding to the setting of the registers of said pretranslator, class relays in said register-sender, means including the operated route relay in said pretranslator for effecting the operation of one or more of said class relays, toll completing markers, intertoll markers, each of said markers comprising means for effect-

ing a connection between a calling incoming trunk and an idle outgoing trunk in a desired group of trunks, each of said intertoll markers comprising a plurality of different translators, means controlled by an operated one of said class relays for immediately connecting the register-sender to an idle toll completing marker if the call is to be extended over a trunk in a group outgoing to a local office and for effecting the setting of the registers of the toll completing marker in accordance with the setting of the same registers of the register-sender as controlled the setting of the registers of the pretranslator, means controlled by an operated one of said class relays for immediately connecting the register-sender to an idle intertoll marker if the call is to be extended over a trunk in a group outgoing to another toll office and the same digits are to be translated by the marker as were translated by the pretranslator, means controlled by an operated one of said class relays for connecting the register-sender to an intertoll marker after an additional predetermined number of digits have been registered in said register-sender and said additional digits are to be translated by the marker to determine the group of trunks in which an idle outgoing trunk is to be selected, means controlled by an operated one of said class relays for selecting a particular translator in the connected intertoll marker, and means controlled by a class relay for selectively effecting the transmission over a selected trunk of all of the digits registered in said register-sender following said predetermined number of digits or the transmission over a selected trunk of all the digits registered in said register-sender.

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