

April 7, 1942.

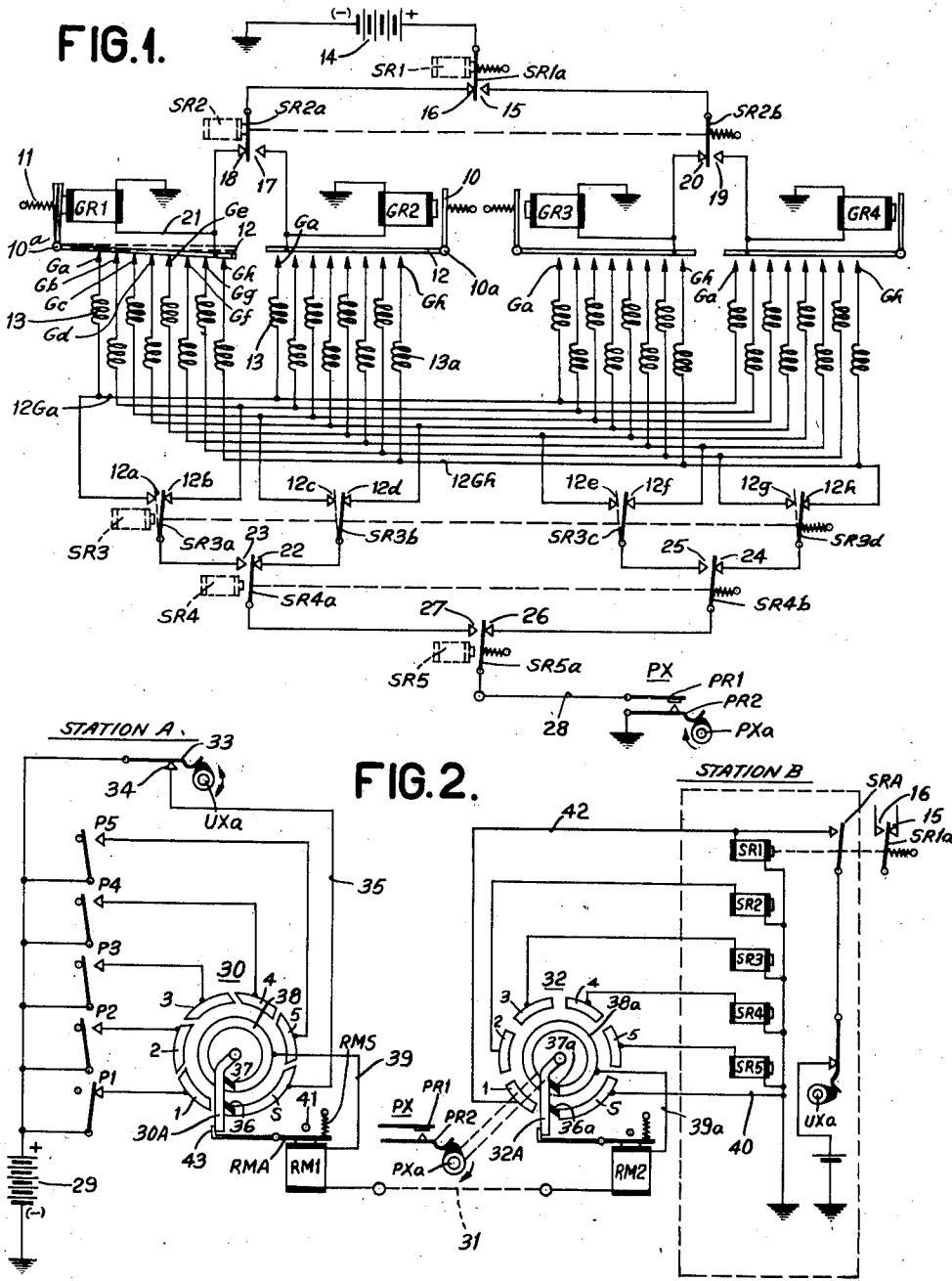
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2,279,009

COMMUNICATION SYSTEM

Filed Aug. 17, 1940

3 Sheets-Sheet 1



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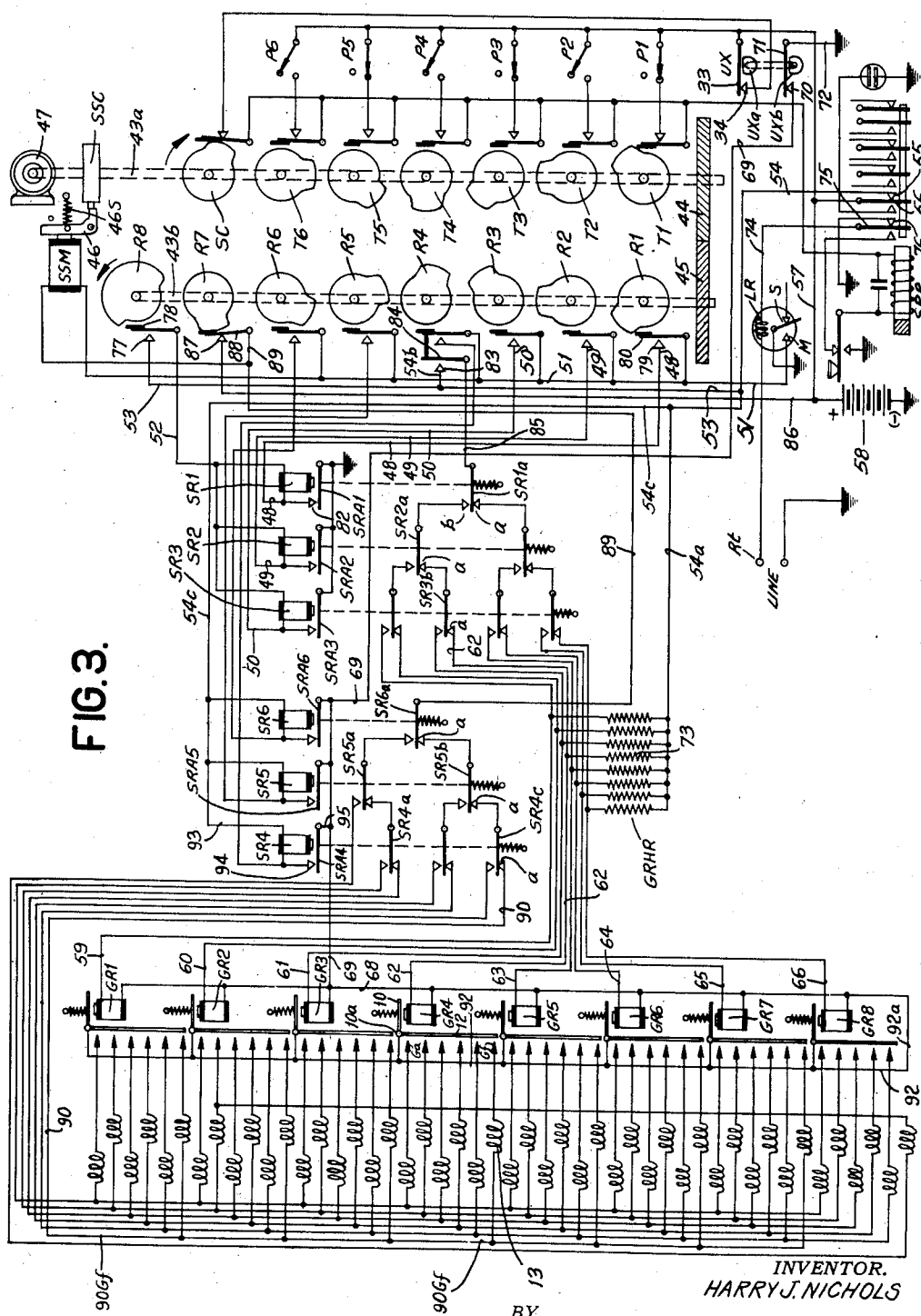
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2,279,009

COMMUNICATION SYSTEM

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3 Sheets-Sheet 2



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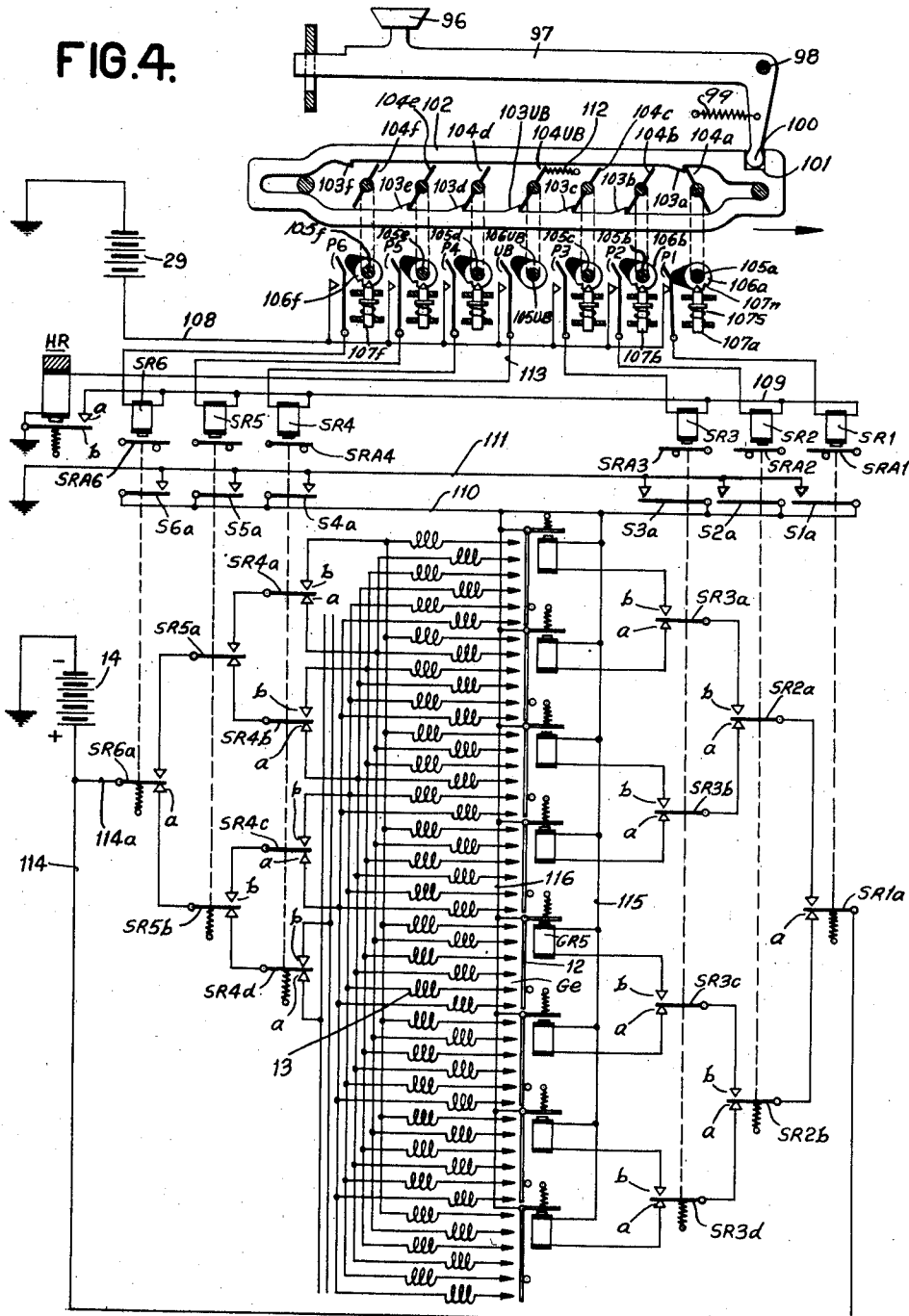
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3 Sheets-Sheet 3

FIG. 4.



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COMMUNICATION SYSTEM

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Application August 17, 1940, Serial No. 353,115

4 Claims. (Cl. 177-353)

The present invention relates to teleprinting devices and more particularly to translating systems for such devices.

More specifically, the device embodying the invention is provided for the purpose of selecting one item from a plurality of items where, in response to a code signal combination, electrical means, by successive steps, reduce the number of selected items until a single item is chosen.

In the prior art, devices have been utilized for similar purposes but such devices have been predicated upon electrical signals composed of elements having different characteristics, such as, for example, different polarity or different frequency or have been composed of signal elements having different periods of duration or having different intensities. In contradistinction to such systems, the novel selecting system of the present invention utilizes a plurality of equal duration signal elements having the same electrical characteristic whereby great simplicity and reliability of operation are obtained.

Still other devices of the prior art have utilized electrical signals composed of elements having the same characteristic and of equal duration and utilizing the principle of successive halving in a continuously decreasing sequence but such devices have not utilized such successive halving to select a chosen group of items and concurrently or sequentially one item from the chosen group whereby a system of great versatility and simplicity is provided.

Further, there have also been shown in the prior art, systems predicated upon the broad principle of successive halving wherein one item from a preselected group is chosen, but such systems have necessitated the utilization of a switching element coacting successively with every item in all groups, introducing an impractical, variable delay in effecting the final selection.

In view of the above conditions prevailing in the prior art, one of the objects of the present invention is to provide a novel electrical selecting system whereby the foregoing undesirable and impractical characteristics are eliminated and whereby certain objections to the systems previously appearing in the art are obviated.

Another object is to provide an electrical translator system which utilizes equal duration, entirely similar code components, so that all special or complicated devices for measuring, utilizing or sorting the respective signal components are eliminated and an extremely simple translator is thereby provided whereby a received

code signal permutation is translated into a selection of a corresponding item at a receiving mechanism.

Still another object is to provide a novel electrical translator comprising a plurality of individual signal component responsive means and movable cascade arranged switching means controlled thereby, whereby one chain, or cascade only of the switching means is selectively closed in accordance with a particular code permutation of components corresponding to a particular character so that one group of items is selected and whereby another single chain or cascade only of the switching means is selectively closed in accordance with others of the code permutation components so that a single item from the selected group is thereby chosen.

Another object is to provide a novel electrical translating or selecting system comprising a plurality of group relays, each controlling a substantially like number of circuits, a plurality of switching means actuatable into different cascade arrangements, a plurality of control relays, controlled by certain elements of a signal code combination, selectively, for producing a selected cascade arrangement of certain of said switching means to produce the selection of one group relay, a second plurality of control relays said relays controlled by certain others of said signal elements, selectively, for producing a selected cascade arrangement of certain others of said switching means to thereby close a certain selected one of the circuits controlled by the selected group relay.

Still another object is to provide a novel electrical translator including group relays and selector relays and means inoperative to initially operate said group relays but operative after selective operation of a chosen group relay to maintain said relay energized.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is an elementary schematic diagram of the electrical translator per se.

Fig. 2 is a diagrammatic view illustrating fundamentally the invention as applied to a typical teleprinter system utilizing the Baudot 5-unit code.

Fig. 3 is a diagrammatic view illustrating the invention as applied to a teleprinting system

utilizing a 6-unit code in which the code signal elements are sequentially transmitted over a single signal channel from a transmitting to a receiving station.

Fig. 4 is a diagrammatic view illustrating the invention as applied to a teleprinting system utilizing a 6-unit code, in which the code signal elements are simultaneously transmitted over a plurality of signal channels.

Referring to the drawings wherein like reference characters refer to like parts throughout the several views and more particularly to Fig. 1, the essential elements of the novel electrical translator are schematically disclosed therein.

It is to be noted that basically in the system disclosed, selection of a particular item is secured, not by a step by step successive halving method, whereby one item only, is selected from a given number, but in direct contradistinction a given number of items is divided into a predetermined number of groups, one group is selected, generally by successive halving; and thereafter or concurrently one item from the chosen group is selected by successive halving. Or conversely, the selection of a plurality of categorical items from each group is tentatively made, generally by successive halving; and thereafter or concurrently, one item only, is chosen by selecting one particular group by successive halving. Such a system is characterized by great versatility in that the number of groups and arrangement of relays can be varied as desired within the scope of the particular code and type of communication system.

As disclosed in Fig. 1, a plurality of four group relays GR1, GR2, GR3 and GR4 is provided, each relay having an armature 10 pivoted for rocking about a point 10a and biased in a counterclockwise direction by a spring element 11. In each case, armature 10, controls the position of a multi-contact switch tongue 12, for simultaneously opening and closing circuits through the relay contacts Ga, Gb, Gc, Gd, Ge, Gf and Gh, respectively, of the several group relays. Each relay contact is illustrated as connected to an operating element, such as a solenoid 13, which may be utilized, as disclosed in detail in the copending application of Harry J. Nichols and Henry L. Tholstrup, Serial No. 353,112, filed August 17, 1940, to control a key bar of a typewriter, one solenoid, in that event, being provided for each key of the keyboard. Corresponding key solenoids of the different groups are shown as connected to the same bus bar, for example, the key solenoid 13 connected to the relay contact Ga of the group relay GR1 is connected to the bus bar 12Ga and the key solenoid connected to relay contact Ga of group relay GR2 is likewise connected to the bus bar 12Ga, etc. Each of the bus bars is respectively connected to one of the cascade switch contacts 12a, 12b, 12c, 12d, 12e, 12f, 12g and 12h, respectively.

A plurality of cascade connected switch tongues are selectively conditioned, such as by positioning, for selecting a particular group relay, and a plurality of cascade connected switch tongues are also provided for selectively selecting one solenoid of the particular group pertaining to the group relay first chosen.

As is diagrammatically illustrated only, in Fig. 1, a plurality of selector relays SR1, SR2, SR3, SR4 and SR5, selectively energized in accordance with the five elements of the signal code, respectively, are provided for controlling the position of the respective cascade connected switch tongues.

As diagrammatically illustrated, selector relay

SR1 controls the single cascade connected switch tongue SR1a. The selector relay SR2 similarly controls the position of switch tongues SR2a and SR2b. Selector relay SR3 similarly controls a plurality of switch tongues SR3a, SR3b, SR3c and SR3d. Selector relay SR4 similarly controls a pair of switch tongues SR4a and SR4b while the selector relay SR5 controls the cascade switch tongue SR5a.

A battery 14 is provided whereby upon selective energization of the selector relays SR1 and SR2, a circuit is closed from the positive side of the battery 14 through a chosen cascade arrangement of switch tongues to the coil of a chosen group relay to ground.

A similar circuit is also closed from the positive side of the battery 14 through a chosen cascade arrangement of switch tongues, the multiple contact switch tongue 12 of the selected group relay, a chosen contact, through the selected solenoid to a chosen bus bar, through a second cascade arrangement of switch tongues to the print contacts PR1 and PR2 of switch PX controlled by a print actuating element PXa.

The operation, briefly is as follows: Upon energization of selector relay SR1, provided such relay is energized by a received code signal element, the cascade switch tongue SR1a is moved out of engagement with contact 15 and into engagement with contact 16. If the relay SR2 is also energized, the cascade switch tongue SR2a is moved out of engagement with contact 17 and into engagement with the contact 18 and the switch tongue SR2b is moved out of engagement with the contact 19 and into engagement with the contact 20. Thereupon, the following circuit is closed: From the plus side of battery 14, switch tongue SR1a, contact 16, switch tongue SR2a, contact 18, line 21, the coil of the group relay GR1 to ground. Group relay GR1 is thereupon energized and its armature 16 is attracted against the force of spring 11 to rotate the armature about its pivot point 10a to thereby move its multiple contact switch tongue 12 into engagement with all the contacts Ga to Gh, inclusive.

If the selector relay SR3 is energized in response to a received code signal element, the switch tongue SR3a is moved out of engagement with the contact 12b and into engagement with the contact 12a. Similarly, the switch tongues SR3b, SR3c and SR3d are moved out of engagement with one contact and into engagement with the cooperating contact.

If the selector relay SR4 is also energized in response to a received code signal element, the cascade switch tongue SR4a is moved out of engagement with the contact 22 and into engagement with the contact 23. Likewise, switch tongue SR4b is moved out of engagement with the contact 24 and into engagement with the contact 25. Similarly, if a selector relay SR5 is energized in response to a received code signal element, the cascade switch tongue SR5a is moved out of engagement with the contact 26 and into engagement with contact 27. It is seen, therefore, that if all the selector relays are energized and the cascade connected switch tongues are therefore operated as described, upon closure of the print contacts PR1 and PR2, produced by operation of the printing cam PXa, a circuit is closed as follows: From the plus side of battery 14, switch tongue SR1a, contact 16, switch tongue SR2a, contact 18, the multiple contact switch tongue 12 of group relay GR1, contact Ga of group re-

lay GR1, the associated solenoid 13 to the contact 12a, switch tongue SR3a, contact 23, switch tongue SR4a, contact 27, switch tongue SR5a, line 28, the print contacts PR1 and PR2, to ground. Energization of the selected solenoid 13 will permit the solenoid to operate its associated element, such as a key bar of a typewriter, as described in detail in said copending application, Serial No. 353,112, filed August 17, 1940, so that in response to a particular received signal having a certain permutation of code signal elements, one solenoid 13 and one only, is energized in response to that particular code signal permutation. It is seen, therefore, that selection of a particular item is secured, not by a step by step successive halving method, whereby one item only is selected from a given number, but in direct contradistinction, out of a given number of items, divided into groups, there is selected one group, generally by successive halving, and as illustrated in Fig. 1 this selection is performed by selectively energizing one group relay only, and one item, from several included in said selected group, is selected by successive halving.

Referring to Fig. 2, the novel translator of the present invention is diagrammatically illustrated as applied to a start-stop single revolution 5-unit code system such as is commonly utilized in printing telegraph systems. An example of such a system, which is diagrammatically illustrated in skeleton outline only in Fig. 2, is disclosed in detail in the copending application of Harry J. Nichols, Serial No. 353,114, filed August 17, 1940, with the exception that in Fig. 2, a 5-unit code system is utilized rather than a 6-unit code system, as illustrated in said copending application.

Referring to Fig. 2, a source of electrical energy such as a battery 29 grounded at one side is provided at the sending station A and means are provided for transmitting, from the sending station A, over a single signal channel, to the receiving station, a chosen permutation of code signal elements set up by the permutation switches P1, P2, P3, P4 and P5, respectively, said signal comprising a characteristic representation, for example, of a letter to be typed by a typewriter located at the receive station B, all as disclosed in detail in said copending application Serial No. 353,114, filed August 17, 1940. A distributor 30 controlled by a release magnet RM1 is provided whereby the separate code signal elements, as set up by the permutation unit switches P1, P2, P3, P4 and P5, are sequentially transmitted over a signal channel comprising a line 31 to a release magnet RM2 controlling the receiving distributor 32 at the receive station B. As the receive distributor 32 is rotated, the code signal elements are sequentially applied to the selector relays SR1 to SR5, inclusive, respectively, so that the electrical translator will thereby be operated in response to the particular code signal permutation transmitted.

As disclosed in Fig. 2, the permutation unit is illustrated as set up so that the first code signal element only, will be transmitted. Upon actuation of the universal bail element UXa, all as described in detail in said copending application, Serial No. 353,114, the contacts 33 and 34 of the universal bail switch UX are opened and the following circuit is thereby opened at the contacts 33 and 34: From plus side of battery 29, switch contact 33, contact 34, line 35, distributor element S, brush 36 of rotative arm 30A, brush

37 of this arm, the inner ring distributor element 38, line 39, release magnet RM1, over the transmission line 31 to the release magnet RM2 at station B, line 39a, the inner ring 38a, brush 37a of arm 32A, brush 36a, the segment S of distributor 32, line 40, to ground. Deenergization of the release magnet RM1 permits the spring RMS attached to the armature RMA to thereby hold the armature against the stop 41 to release the arm 30A for rotation whereby the brush 36 successively connects the distributor segments 1, 2, 3, 4 and 5 to the inner ring 38 to thereby transmit the code signal permutation over the line to the release relay RM2 at station B and to the rotating arm 32A whereby the selector relays SR1 to SR5, inclusive, are selectively energized. It is to be particularly noted that simultaneously with the release of the arm 30A, the distributor arm 32A at station B is released so that the distributor arms 30A and 32A rotate in synchronism, in the manner well known in the art.

As is seen from Fig. 2, only the first code signal element is to be transmitted. Upon release of the distributor arm 30A, the brush 36 sweeps over the segment 31 of the distributor and the following circuit is thereby closed: From plus of the battery 29, contacts of permutation switch P1, segment 1 of distributor 30, brush 36, arm 30A, brush 37, inner ring 38, line 39, release magnet RM1, line 31, release magnet RM2, line 39a, inner ring 38a, brush 37a, arm 32A, brush 36a, segment 1 of distributor 32, line 42, selector relay SR1, to ground, thereby energizing the selector relay SR1. Since the remaining permutation switches P2 to P5, inclusive, respectively, are not closed, the particular permutation of code signal elements comprises the first element only. Upon termination of a single complete rotation of arms 30A and 32A, the universal bail switch having been reclosed after its initial operation, as described in detail in said copending application, Serial No. 353,114, the release magnet RM1 is energized to attract its armature RMA against the force of spring RMS and a stop element 43 thereupon engages arm 30A to stop the same in its initial start position. The arm 32A at the station B is likewise stopped after a single complete revolution.

It is seen by reference to Fig. 1 that upon energization of the single selector relay SR1, the following circuit is closed: From plus of the battery 14, switch tongue SR1a, contact 16, cascade switch tongue SR2a, contact 17, the coil of group relay GR2 to ground whereby the multiple contact switch tongue 12 of the group relay GR2 is oscillated about its pivot 10a to thereby engage the series of contacts Ga to Gh, inclusive. Since none of the selector relays SR3, SR4, SR5 has been energized, the following circuit will therefore be closed: From the plus of battery 14, switch tongue SR1a, contact 16, switch tongue SR2a, contact 17, multiple contact switch tongue 12 of group relay GR2, contact Gh, the solenoid 13a, bus bar 12Gh, contact 12h, switch tongue SR3d, switch contact 24, switch tongue SR4b, contact 26, switch tongue SR5a, line 28, the print contacts PR1 and PR2 to ground, upon closure of these contacts by the printing actuating element PXa. As is diagrammatically illustrated in Fig. 2, the print contacts of the printing switch PX are controlled in timed relation with respect to the transmission of the signal elements so that the print circuit is closed after the last code signal has been transmitted.

In order to maintain the selector relays SR1 to SR5, energized, subsequent to the termination of the respective signal elements which selectively energize the selector relays, the particular relay armature SRA of the selector relay energized, may be utilized to close a holding circuit simultaneously with the operation of the cascade switch tongues, as disclosed in skeleton outline only in Fig. 2, in connection with the selector relay SR1, and as disclosed in greater detail in the embodiment of Fig. 3, whereby the particular selector relay is maintained energized until all of the signal elements have been sequentially transmitted and received and the electrical translator has therefore been set up in accordance with the received permutation of code signal elements. Upon completion of translation, the holding circuit is opened by the operation of the universal bail simultaneously with printing, as will be described presently in connection with Fig. 3.

Referring to Fig. 3, there is disclosed therein, various aspects of the novel electrical translator as applied to a start-stop 6-unit code system generally of the type as disclosed in said copending application of Harry J. Nichols, Serial No. 353,114, filed August 17, 1940. Generally, as disclosed in said application, the code signal components are set up by a plurality of switch operating cams T1, T2, T3, T4, T5 and T6, mounted on the start-stop shaft 43a and their associated switches, in accordance with the setting of the permutation switches P1, P2, P3, P4, P5 and P6 and a stop signal, which is always a line marking condition, is transmitted by means of the stop cam SC, also mounted on the start-stop shaft, and its associated contacts.

A plurality of receive cams R1, R2, R3, R4, R5 and R6 mounted on the start-stop shaft 43b control the sequential reception of the received code signal components. A print cam R7 controls the print pulse and the timing cam R8 closes a holding circuit through the selector relays SR1, SR2 and SR3.

The start-stop shafts 43a and 43b are connected for simultaneous rotation by means of gears 44 and 45 mounted on the shafts 43a and 43b, respectively. A start-stop clutch SSC is controlled by a pawl 46 and start-stop magnet SSM, as disclosed in detail in said copending application, Serial No. 353,114. A motor 47 supplies power to one side of the clutch for driving the shafts 43a and 43b upon engagement of the clutch operating members.

Upon reception of the start or spacing line condition, the line relay LR permits its armature to move into engagement with the spacing contact S so that the start-stop magnet SSM is deenergized, the pawl 46 is moved by its spring 46s to release the clutch SSC and the shafts 43a and 43b are started in rotation. The send-receive relay SRR is assumed to be deenergized so that the device is in a receive condition.

As the signals are received over the line, the line relay LR actuates its armature to the marking or spacing condition in accordance with the character of the received code signal element. When a marking signal element is received, the armature is moved into engagement with the marking contact M and a circuit is closed, by the proper receive cam and its associated receive switch, through the corresponding selector relay.

Novel means are now provided whereby the received code signal elements are sequentially stored to thereby produce selection of one item

only from a plurality of items in accordance with the particular code signal received. A plurality of selector relays SR1, SR2, SR3, SR4, SR5 and SR6 are provided, each controlling its associated armature, respectively, and one or more cascade arranged switch tongues, each tongue cooperating with its contacts a and b.

One side of the coils of the selector relays SR1, SR2, SR3 are connected by lines 48, 49 and 50, respectively, to one of each of the pairs of contacts controlled by the receive cams R1, R2 and R3, respectively, so that upon closure of the contacts of the cams R1, R2 and R3, respectively, the selector relays will be selectively energized whenever a marking signal component is received over the line. Upon such reception, line relay LR moves its armature into engagement with the marking contact M to thereby connect to ground the others of the respective pairs of contacts of the cams R1, R2 and R3, via line 51, as explained in detail later.

The other sides of these coils of the relays SR1, SR2 and SR3 are all connected by means of a line 52 to one of the contacts controlled by the receive cam R3. The other contact of the receive cam R3 is connected via lines 53 and 54, contacts 55 and 56 of the send-receive relay SRR and line 57, to the positive side of battery 58 so that upon the respective closure of the contacts of cams R1, R2 and R3, and upon the closure of the contacts of cam R3 the selector relays SR1, SR2 and SR3 are selectively energized and a holding circuit is closed through the contacts of cam R3 to hold the relays SR1, SR2 and SR3 selectively energized, until cam R8 has rotated to present the drop of the cam to the cooperating contacts.

Upon selective operation of the selector relays SR1, SR2 and SR3, the cascade switch tongues are operated, as described presently, to close a cascade circuit through one only of a plurality of group relays GR1, GR2, GR3, GR4, GR5, GR6, GR7 and GR8. One side of each of the group relays respectively is connected via lines 59, 60, 61, 62, 63, 64, 65 and 66, respectively, to one of the contacts controlled by the cascade switch tongue associated with selector relay SR3 while all of the other sides of all of the group relay coils are connected via bus bar 68, line 69, contacts 70 and 71 of the universal bail switch UXb, line 72 to ground.

Upon selection of any group relay by the selector relays, a circuit is closed via the cascade circuit set up by the selector relays SR1, SR2 and SR3 through the coil of the selected group relay, as described presently, and a holding circuit is simultaneously closed as follows: From battery 58, line 57, contacts 56 and 55 of send-receive relay SRR, line 54, line 54a, the group relay holding resistance GRHR in parallel, the selected group relay, bus bar 63, line 69, contacts 70 and 71 of the universal bail switch, line 72 to ground. Upon operation of the universal bail switch UXb, which takes place upon printing of the selected character, the contacts of the universal bail switch UXb are opened and the holding circuit through the selected group relay is released. The group relay holding resistances GRHR are so chosen that the current through the group relays, respectively, is sufficient to hold a relay, once it has been energized to attract its armature, but this current is insufficient to initially operate the relay, which operation must be performed under the control of received code signal elements. Therefore, upon selection of one

of the group relays by the selector relays SR1, SR2 and SR3, the selected group relay will be held energized by the circuit just described until printing occurs, by means of the current supplied through that holding resistor in series with the chosen group relay coil.

The selector relays SR4, SR5 and SR6 are selectively energized, in the same manner as relays SR1, SR2 and SR3, upon closure of the respective switches of the receive cams R4, R5 and R6, provided that the corresponding received code signal element is a marking line condition. A certain cascade connection is thereby closed by the cascade switch tongues controlled by the relays SR4, SR5 and SR6, as described presently, so that a circuit is closed through one only of the solenoids 13 in the group of solenoids connected to the relay contact points of the selected group relay, as will now be described.

Assuming that the sending station is ready to transmit the particular code signal permutation in which the permutation switch P1, only, is closed at the sending station, so that only the first code signal element of the character representing signal, proper, will be a marking line condition. The operation is as follows: Upon release of a start-stop shaft at the sending station, as described in said copending application Serial No. 353,114, the start-stop shafts at the receive station are also released, as described above, so that the sending and receiving stations are in synchronism and the respective receive cams R1, R2, R3, R4, R5 and R6 will close their respective switches as the corresponding code signal elements are received at the line terminals.

Assuming as stated above, that only the first code signal element is a marking line condition. Upon reception of this signal element, the coil of line relay LR is energized as follows: The terminal R1, energized by the received marking element, coil of LR, line 74, contacts 75 and 76 to ground. Upon such energization, the armature of relay LR is moved into engagement with the marking contact M. Since the start-stop shafts at the sending and receiving stations are in synchronism, the cam R1 will close its associated contact upon reception of this #1 code signal element and the following circuit is thereupon closed: From battery 58, line 57, the send-receive relay contacts 56 and 55, line 54, line 53, contacts 77 and 78 of cam R8 (now closed), line 52, coil of the selector relay SR1, line 48, contacts 79 and 80 of the receive cam R1, line 51 to the marking contact M of the line relay LR, the armature of this relay to ground. Selector relay SR1 will remain energized as long as the cam R8 maintains its contacts 77 and 78 in engagement, via the following circuit: Battery 58, line 57, contacts 56 and 55, line 54, line 53, contacts 77 and 78, line 52, coil of SR1, contact 82 of selector relay SR1, armature SRA1 to ground. Since the selector relays SR2 and SR3 are not energized by the signal, under the conditions assumed, selector relays SR2 and SR3 remain deenergized and the selector relays SR1, SR2 and SR3, therefore close the following cascade circuit upon closure of the contacts of receive cam R4: From battery 58, line 57, contacts 56 and 55, line 54, line 53, line 54b, contacts 83 and 84 of receive cam R4, line 85, cascade switch tongue SR1a, contact point b of this switch tongue, cascade switch tongue SR2a and its associated a contact, cascade switch tongue SR3b and its associated contact a, line 62, the

coil of group relay GR4, bus bar 68, line 69, contacts 70 and 71 of the universal bail switch UXb, line 72 to ground. Simultaneously the following holding circuit is closed through the coil of group relay GR4: From battery 58, line 57, contacts 56 and 55, line 54, line 54a, group relay holding resistor 73, line 62, the coil of group relay GR4, bus bar 68, line 69, contacts 70 and 71, line 72 to ground, thereby holding the group relay GR4 even though the selector relays SR1, SR2 and SR3 are released by the cam R8 and its associated switch contacts.

Energization of group relay GR4 attracts its armature 10 to pivot the same about the pivot point 10a to thereby close the multiple contact switch blade 12 against all the relay contact points Ga, Gb, Gc, Gd, Ge and Gf.

Since the selector relays SR4, SR5 and SR6 remain deenergized in the particular example chosen, the following cascade arranged circuit is closed through their associated cascade switch tongues upon closure of the contacts of the print cam R7: From battery 58, line 86, contacts 87 and 88 of receive cam R7, line 89, cascade switch tongue SR6a and its associated a contact, cascade switch tongue SR5b and its associated a' contact, the cascade switch tongue SR4c, and its associated a contact, line 90, bus bar 90Gf, solenoid 13, relay contact Gf of group relay GR4, multiple switch blade 12, bus bar 92, line 92a, bus bar 68, line 69, contacts 70 and 71 of the universal bail switch UXb, line 72 to ground. Upon operation of the associated key bar by solenoid 13, the universal bail switch UXb is opened and the group relay current and printing current is cut off.

If any of the selector relays SR4, SR5 and SR6 had been energized, for example, if selector relay SR4 had been energized, the following holding circuit would have been closed through the coil of selector relay SR4: From battery 58, line 57, contacts 56 and 55, line 54, line 54c, line 93, the coil of selector relay SR4, contact 94, the armature SRA4, line 95, line 69, contacts 70 and 71, line 72 to ground. It is seen therefore that any one of the selector relays SR4, SR5 or SR6 which is selectively energized, will be held in operated condition, until printing occurs, whereupon the holding circuit is opened at the universal bail switch UXb.

Novel means are therefore provided whereby chosen selector relays are selected in accordance with the code signal elements of a particular code signal combination and said selected selector relays are maintained energized as long as required, while a holding circuit is also provided through the particular group relay selected by the selector relays, which holding circuit is entirely independent of the cascade switch circuits controlled by the selector relays. It is obvious that the novel translator system as disclosed in Fig. 3, can also be applied to a system wherein the code signal elements of a signal are simultaneously transmitted, if such be desired.

The novel selecting means of the present invention may also be applied to a teleprinting system wherein the code signal elements are transmitted simultaneously, as for example, in a system such as disclosed in said copending application of Harry J. Nichols and Henry L. Tholstrup, Serial No. 353,112, filed August 17, 1940. An example of such a system, with means for setting up the code signal combinations, characteristic of the respective characters to be typed, is diagrammatically illustrated in Fig. 4.

Referring to Fig. 4, the novel electrical trans-

lator of the present invention is illustrated as applied to a 6-unit code teleprinting system wherein the code signal permutations are set up by operation of means such as a typewriter key, for example, controlling a slider, and a permutation unit of the type as disclosed in the copending application of Harry J. Nichols, Serial No. 353,114, filed August 17, 1940. The principle of operation of such a permutation unit is illustrated in skeleton outline in Fig. 4. A group of six selector relays SR1—SR6, inclusive, are controlled by the respective code signal elements, which elements are simultaneously transmitted from a sending station including a permutation unit as in Fig. 4 to a receiving station including a translator system as in Fig. 4.

Referring to Fig. 4, a typewriter key 96 is attached to a key bar 97 pivoted at 98 and biased for rotative movement about said pivot in a clockwise direction by means of spring element 99. An operating element 100 attached to the key bar is mounted in a cooperating opening 101 of a slider 102 whereby upon depression of the key 96, the slider is moved in the direction as indicated by the arrow. The slider 102 is provided with a series of operating lugs 103a, 103b, 103c, 103UX, 103d, 103e and 103f cooperating with the rotative elements 104a, 104b, 104c, 104UB, 104d, 104e and 104f, respectively. Upon movement of slider 102 to the right, certain of the permutation rock shafts 105a, 105b, 105c, 105UB, 105d, 105e and 105f are rotated clockwise while others are rotated counterclockwise and still others which have been previously operated by the operation of other sliders will remain in their set position. The setting of the permutation switches P1 to P6, inclusive, respectively, therefore, is by difference, as described in detail in said copending application Serial No. 353,114, filed August 17, 1940. As disclosed in Fig. 4, upon depression of the key 96, the slider 102 is moved to the right and upon release of key 96, the slider returns to its initial position, as shown, under the control of spring 99. Upon the movement of the slider to the right, the operating lug 103a abuts the element 104a to rotate it clockwise to thereby rotate the rock-shaft 105a in a clockwise direction to permit the permutation switch P1 to open and the switch actuating member 106a is held in non-operative position by means of a detent 107a spring-biased by its spring 107s into engagement with a notch 107n in the switch actuating element 106a. Permutation switch P1, therefore, will remain open and the selector relay SR1 will remain deenergized so that the switch tongue SR1a controlled thereby will remain in engagement with the contact point a.

Also upon the movement of the slider 102 to the right, as before, the lug 103b rotates the element 104b and rock-shaft 105b counterclockwise whereby the switch operating element 103b closes the permutation switch P2 which is held in closed position by means of the detent 107b locking the operating element 106b as described in connection with the operation of the switch P1. Upon closure of switch P2, the following circuit is closed: From battery 29, line 108, switch P2, the coil of selector relay SR2, line 109, to the contacts a and b of holding relay HR (when HR is energized) to ground. Upon energization of selector relay SR2, its armature SRA2 is attracted against the force of its holding spring and the switch tongue S2a is moved into engagement with its cooperating contact point to thereby close the following circuit: From bus bar 110, switch tongue

S2a, its cooperating contact, bus bar 111, to ground. Simultaneously, with the operation of the armature SRA2 and switch tongue S2a, the switch tongue SR2a is moved from engagement with its contact a and into engagement with its contact b and switch tongue SR2b is similarly operated so that it is moved into engagement with its contact b. Likewise, upon said movement of slider 102 to the right, the permutation switch P3 is closed, the selector relay SR3 is energized and switch tongues SR3a, SR3b, SR3c and SR3d are moved out of engagement with their respective contacts a and into engagement with their respective contacts b.

Similarly, the permutation switches P4 and P5 are closed, selector relays SR4 and SR5 are energized and the cascade switch tongues SR4a, SR4b, SR4c and SR4d, associated with selector relay SR4 are moved out of engagement with their respective contacts a and into engagement with the respective contacts b, and cascade switch tongues SR5a and SR5b of selector relay SR5 are moved out of engagement with their respective contacts a and into engagement with their respective contacts b.

As disclosed in Fig. 4, the rotative element 104f of permutation switch P6 was rotated clockwise by a previously operated slider so that the switch actuating element 106f is maintained in position, as shown, by the detent pin 107f and the switch P6 remains open, the lug 103f being moved to the right with slider 102 but, as is seen from Fig. 4, such lug is inoperative to rotate the element 104f. Since permutation switch P6 remains opened, the selector relay SR6 remains deenergized and the cascade switch tongue SR6a remains in engagement with its contact a. Upon operation of any slider 102, a universal bail operating lug 103UB rotates the element 104UB counterclockwise against the force of its bias spring 112 to rotate the rock-shaft 105UB counterclockwise whereby the universal bail switch UB is closed to complete the following circuit: Battery 29, line 108, universal bail switch UB, line 113, the quick-acting, slow-release holding relay HR to ground, thereby closing the contacts a and b of this relay so that the selector relays are selectively energized, as described above, the switch elements associated therewith are operated and bus 110 and bus 111 are connected to ground during the period that holding relay HR holds the contacts a and b in engagement.

Upon energization of the selector relays SR2 and SR3, as described above, the following circuit is closed: From battery 14, line 114, switch tongue SR1a and its cooperating contact a, switch tongue SR2b and its cooperating contact b, switch tongue SR3c and its cooperating contact b, group relay GR5, bus bar 115, bus bar 110, the switch tongues S2a, S3a, S4a and S5a and their cooperating contacts, in parallel, bus bar 111 to ground. It is to be particularly noted that upon energization of any selector relay, a circuit is closed through one group relay and that the selector relays and therefore the chosen group relay is maintained energized, as long as the holding relay HR holds its contacts a and b in engagement. It is to be noted that the relay HR is energized upon closure of the universal bail switch UX simultaneously with the energization of the selector relays and that it maintains its contacts a and b in engagement for a period dependent upon the particular design constants of the relay, as is well known in the art.

Likewise upon energization of the selector re-

lays SR4 and SR5, the following circuit is closed: From battery 14, line 114a, switch tongue SR5a and its contact a, switch tongue SR5b and its contact b, switch tongue SR4c and its contact b, bus bar Ge, solenoid 13, relay contact Ge of the group relay GR5, the multiple contact switch tongue 12 of the group relay GR5, bus bar 116, the bus bar 110, switch tongues S2a, S3a, S4a and S5a and their associated contacts in parallel, bus bar 111 to ground. The solenoid 13, therefore, is energized to operate its associated key bar and the period of operation is dependent upon that of the holding relay HR.

Novel means are therefore provided whereby efficient, quiet and accurate translation of received signals is produced which can be applied to a start-stop transmission system or to a system in which the signal elements are transmitted simultaneously, and the number of items from which a certain one only, is to be selected, is controlled solely by the limitations of the code utilized.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a plurality of modifications, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. An electrical translator comprising a plurality of group relays, gang controlled switch elements controlled in groups, respectively, by said relays, a power source, code signal component receiving means directly receiving signal components and including a first plurality of selector relays, controlled selectively by certain of the signal components comprising the code permutation of a signal received, first switching means controlled by said relays, respectively, the switching means being arranged in a single cascade in a predetermined numerical progression and each element of said progression comprising solely the switching means of one selector relay to tentatively selectively pick a chosen one of said group relays for connection to said power source, and a second plurality of selector relays, controlled selectively by others of the signal components and independently of said first switching means, switching means controlled by said second plurality of relays, said switching means being arranged in cascade in a predetermined numerical progression and each element of said progression comprising solely the switching means of one selector relay, and a plurality of operating solenoids connected to said gang controlled switch elements, respectively, said second plurality of relay switching means selectively closing a circuit including a chosen one of said gang controlled switch elements pertaining to said chosen group relay and one only of said solenoids in accordance with the certain code permutation received, and said switching means controlled by said first plurality of relays and said second plurality of relays connecting said power source to said chosen group relay, only upon operation of at least one of said selector relays and positively so connecting said

power source, upon operation of any one of said relays.

2. In combination, means producing a signal comprising a code permutation of a plurality of similar electrical signal components, each permutation being characteristic of a predetermined item, a control solenoid, one for each predetermined item, a plurality of selector relays, one only, for each signal component, a plurality of group relays, circuits controlled by said group relays for selecting said control solenoids in groups, a first plurality of circuit controlling elements arranged in a progression to produce successive halving of circuits selected, and controlled by certain of said selector relays for selecting one of said group relays in accordance with certain of the respective components of a certain code permutation, and a plurality of circuit controlling elements arranged in a progression to produce successive halving of circuits selected, and controlled by the remaining selector relays in accordance with the remaining components and independently of said first plurality of circuit controlling elements for selecting a chosen one of the control elements of the selected group relay and in accordance with the said certain code permutation only, means for energizing said group relays, and means rendered effective, only upon operation of at least one of said selector relays, for rendering said energizing means effective, said means being so rendered effective, upon operation of any one of said relays.

3. An electrical translator responsive to received code signal elements comprising a plurality of selector relays, a slow-release relay, means including said slow-release relay and controlled upon operation of certain of said relays, selectively, to maintain the energized relay in energized condition for a chosen time interval, a plurality of group relays, a first plurality of cascade arranged switches controlled by certain of said first plurality of relays to selectively energize one of said group relays in response to selective energization of certain of said selector relays, respectively, a second plurality of cascade arranged switches controlled by others of said selector relays, a group of operating elements controlled by each of said group of relays, said second plurality of switches closing a circuit through one only of the group of operating elements pertaining to the energized relay, and means including said cascade arranged switches for maintaining said selected group relay energized after selective energization thereof.

4. An electrical translator responsive to received code signal elements comprising a plurality of selector relays controlled by received signal elements, a plurality of group relays, means constantly energizing said group relays, said energization being insufficient to initially operate said relays but being sufficient to maintain said relays in operated condition after signal controlled energization thereof, and a plurality of cascade arranged switches so controlled by certain of said plurality of selector relays as to selectively, additionally energize, one only, of said group relays to operate the same during signal reception, in response to signal controlled, selective energization of certain of said selector relays, respectively.

HARRY J. NICHOLS.