

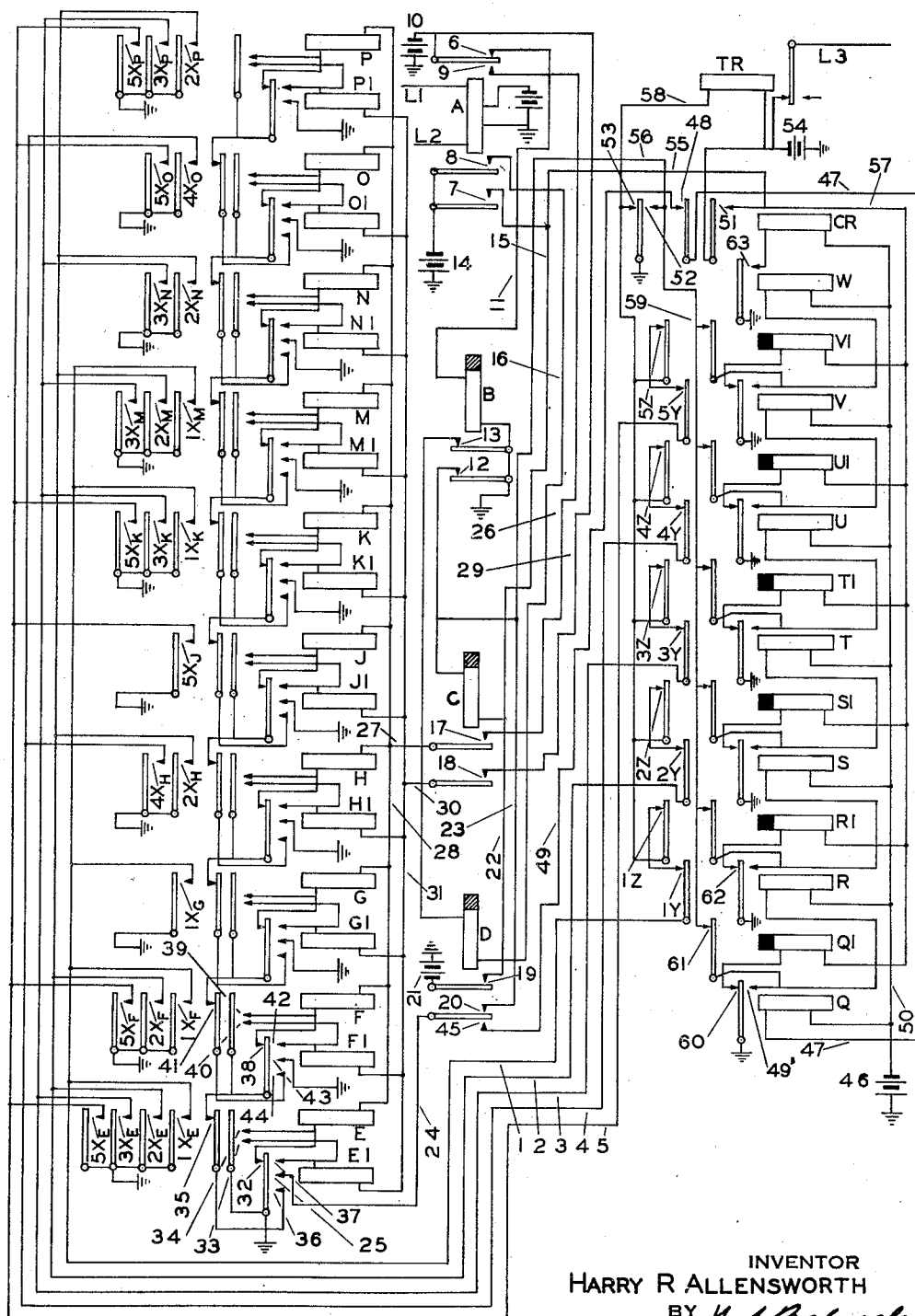
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SELECTOR-TRANSLATOR

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## SELECTOR-TRANSLATOR

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4 Claims. (Cl. 177—380)

My invention relates to electromagnetic communication systems and more particularly to a selector-translator comprising a plurality of electromagnetic relays, interconnected by electric circuits; the whole forming a network, the constituent members of said network being so disposed into groups and sequences as to function as a selector of certain operating sequences as required in pulsing and timing signal impulse sequences or trains and as a translator of signal impulse sequences or trains into signal impulse sequences differing in character from the original signal impulse sequences.

An object of the invention is a new and improved combination comprising a novel selector-translator by means of which heretofore unrealized results are attained in selection and translation of signal impulse sequences or trains into signal impulse sequences or trains differing in character from the original signal impulse sequences; and/or the translation of signal impulse sequences of uncertain and varying timing or periodicity into isochronal signal impulse trains the timing or periodicity of which isochronal sequences or trains are in conformity to a predetermined timing or periodicity, which predetermined timing or periodicity may be asynchronous or synchronous in relation to the original impulse sequences.

A further object of the invention is to attain these results by means of an electric network comprising relays only for connecting and/or disconnecting various circuit combinations within the network and for timing such connecting and/or disconnecting operations.

A further object resides in the attainment of these results without the aid or employment of rotating contacts, rotary switches or rotating cam actuated contacts.

In accordance with my invention these objects are attained by a selector-translator comprising a network including a plurality of quick acting, slow to release and slow to operate electromagnetic relays interconnected by electric circuits and so disposed into groups and sequences as to function as a selector of such circuit and relay combinations as will cause signal impulse sequences of one character to be translated into signal impulse sequences of a different character as may be required; the timing of said translated sequences being independent of the timing of the original impulse sequences.

My invention will be best described and understood from a consideration of the following described practical application and detailed de-

scription taken in connection with the accompanying drawing forming a part of the specification, with the understanding however that the invention is not confined to the one practical application herein selected for purposes of illustration nor is the invention confined to any strict conformity with the showing of the drawing but may be changed or modified so long as such changes and/or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

Illustrative of one, only, of the practical applications of my invention: The conventional fire alarm signal (box) circuit, in manually operated systems, terminates in a central office relay responsive to numerical impulse trains; the local circuit of which relay—neglecting other provided facilities for signal reception—comprises an electromechanical tape register. The operation of a signal box causes the number of digit impulses corresponding to the number of that box to be "marked"—printed, punched, cut or otherwise—on the tape which marking will always correspond to the numerical impulse train communicated to said tape register by the signal line relay.

Applying my invention to this circumstance, the electromechanical tape register is replaced with a printing telegraph printer. The numerical impulse sequences communicated to the printing mechanism are translated into printing telegraph code impulse sequences and the number of the signal box from which the signal originates is recorded on the tape in printed numerals.

Referring now to the accompanying drawing: L1 is closed on L2 by the operation of a relay (not shown) responsive to numerical impulse sequences or trains of short and long impulses originating in a fire alarm signal (box) circuit or other source which causes relay A to operate responsive to the said impulse sequences, alternately opening and closing contact 6 and alternately closing and opening contacts 7 and 8 and pulsing contact 9. The closing of 6 completes a circuit from grounded battery 10 through 11 and slow to release relay B to ground. For purpose of this illustration, assume 6 to be normally closed. Relay B being energized, closes 12 and 13 which, because of B being slow to release, remain closed for the duration of impulse sequences communicated to it by the operation of contact 6. Closed contacts 12 and 13 put one side of slow to release relays C and D, respectively, to ground thus completing two circuits

from grounded battery 14; through contact 7 through 15 and slow to release relay C to ground through 12; and also through contact 8 through 16 and slow to release relay D to ground through 13. Relay C, upon becoming energized, closes 17 and 18 which, because of C being slow to release, also remain closed for the duration of the impulse sequence communicated to C by the operation of contact 7. Relay D, upon becoming energized, closes 19 and 20 which, because of D being slow to release likewise remain closed for the duration of the impulse sequences communicated to D by the operation of contact 8.

The closing of contacts 19 and 20 completes a circuit from grounded battery 21 through 22, relay C, 23 and 24 to ground at 25. Thus with 25 closed C cannot start to release until after D has released.

The closing of 17 completes a circuit from grounded battery 10 through pulsing contact 9, through 26, 27 and 28 to one side of relays E, F, G, H, J, K, M, N, O and P. The closing of 18 completes a circuit from grounded battery 10 through 29, 30 and 31 to one side of relays E1, F1, G1, H1, J1, K1, M1, N1, O1 and P1.

Thus is the way prepared for relays E, F, G, H, J, K, M, N, O and P to receive digit impulses emanating from pulsing contact 9 which is responsive to impulse sequences in L1, L2.

The closing of contact 9 completes a circuit from grounded battery 10, through 9, through 26, 17, 27, 28 and relay E to ground through contact 32. It will be noted that at this stage no relay common to 28, other than E, can take battery from 10.

E upon becoming energized closes contacts 1Xe, 2Xe, 3Xe, 5Xe, 33 and 34 and opens 35, for the duration of the impulse. The closing of 34 enables E to hold its ground subsequent to the opening of 32. The closing of 33 completes a circuit from grounded battery 10 through 29, 18, 30, 31 and relay E1 to ground. E1 upon becoming energized closes 25, 36 and 37 and opens 32. The closing of 37 holds E1 energized as long as 18 remains closed. The closing of 25 puts ground on 24.

At the termination of the impulse, 9 opens and E is deenergized opening 1Xe, 2Xe, 3Xe, 5Xe, 33 and 34 and closing 35. E thus becomes no longer operable from battery in 28 as long as E1 remains energized. The closing of 35 puts ground on F through 38, 35 and 36. The next succeeding digit impulse closes 9 and completes a circuit from grounded battery 10, through 9, 26, 17, 27, 28 and relay F to ground through 38, 35 and 36. F upon becoming energized closes 1Xf, 2Xf, 5Xf, 39 and 40 for the duration of the impulse and opens 41 for the duration of that impulse. The closing of 39 enables F to hold its ground subsequent to the opening of 38. The closing of 40 completes a circuit from 10 through 29, 18, 30, 31 and relay F1 to ground through 35 and 36. F1 upon becoming energized closes 42, 43 and 44 and opens 38. The closing of 42 and 43 holds F1 energized as long as 18 remains closed. At the termination of the impulse, 9 opens and F is deenergized opening 1Xf, 2Xf, 5Xf, 39 and 40 and closing 41. F thus becomes no longer operable from battery in 28 as long as F1 remains energized. The closing of 43 and 44 puts ground on 41 and renders G operable in response to the next succeeding digit impulse.

This explanation of the operation of E and F in response to the initial and next succeeding impulse will explain fully how each succeeding im-

pulse operates the next succeeding relay in the group G, H, J, K, M, N, O and P and how G1, H1, J1, K1, M1, N1, O1 and P1 perform the same functions with relation to G, H, J, K, M, N, O and P, respectively, as E1 and F1 perform with respect to E and F. From this it will be readily understood that one digit impulse will operate relay E and E1 only. Two digit impulses will progress to relay F and F1 and so on through the series. Obviously ten digit impulses will operate relay P and its associated relay P1.

It will be well to explain at this point that, in the kind of a signal system here under consideration a digit impulse is a marking impulse and also that in conventional fire alarm signal circuit operation the final impulse in a single numerical impulse train is a long impulse. Contrasted to this, the standard five unit printing telegraph code is a combination of marking and spacing impulses in various combinations, each combination totaling five impulses. The standard five unit code for the ten numerals is as follows:

Figure one; marking, marking, marking, spacing, marking.

Figure two; marking, marking, spacing, spacing, marking.

Figure three; marking, spacing spacing, spacing, spacing.

Figure four; spacing, marking, spacing, marking, spacing.

Figure five; spacing, spacing, spacing, spacing, marking.

Figure six; marking, spacing, marking, spacing, marking.

Figure seven; marking, marking, marking, spacing, spacing.

Figure eight; spacing, marking, marking, spacing, spacing.

Figure nine; spacing, spacing, spacing, marking, marking.

Figure naught; spacing, marking, marking, spacing, marking.

Furthermore, in "start-stop" printing telegraph practice the five unit code is actually a seven unit code because each five unit sequence is preceded by a start impulse and followed by a stop impulse. The start impulse is a spacing impulse. The stop impulse is a marking impulse.

Returning now to further description and explanation of my invention: Referring again to the accompanying drawing; assume that relay A responds to a single digit impulse (this in a numerical sequence represents the Figure one) there being only one impulse in this train it will be the last impulse in that train and accordingly, a long impulse. As heretofore explained this single impulse will operate relay E which will in turn cause E1 to operate under which condition 1Xe, 2Xe, 3Xe, 5Xe, 25, 33, 34, 36 and 37 are closed and 32 and 35 are open. The closing of 1Xe, 2Xe, 3Xe and 5Xe puts ground on 1, 2, 3 and 5. The closing of 25 puts ground on 24.

This condition is established because of 9 being closed. With 9 closed 6 is open and 7 and 8 are closed. 6 remains open past the holding time of slow to release relay B which upon releasing opens 12 and 13 taking ground off C and D. Slow to release relay D will be next to release, opening 19 and 20 and closing 45. This completes a circuit from grounded battery 46 through relay Q, through 47, contact 48, through 49, 45, 24 and 25 to ground.

Relay Q upon becoming energized closes 49'. This completes a circuit from grounded battery 75

46 through 50, relay R and 49' to ground. Likewise, relay R upon becoming energized operates relay S and so on through the chain so that with the closing of 45 relays Q, R, S, T, U, V, W and control relay CR operate and are successively released as will be shown.

Control relay CR upon becoming energized closes 51 and 52 and opens 48 and 53. The closing of 51 and 52 completes a circuit from grounded battery 54 through 55, relay C, 56 to ground at 52. This holds slow to release relay C energized as long as control relay CR remains energized. The closing of 51 likewise puts grounded battery from 54 on 57 which renders slow to operate relays Q, R, S, T, U and V operable upon the releasing of relays Q, R, S, T, U and V as is shown.

It will be noted that transmitting relay TR is normally closed, its circuit being; grounded battery 54, TR, 58 to ground at 53. CR upon becoming energized opens 48 and 53. The opening of 53 removes ground from TR which releases. The opening of 48 removes ground from Q which releases and a five unit code sequence starts through TR.

The closing of 52 also puts ground on 59. Q releases with the opening of 48. The releasing of Q opens 49' and closes 60. The opening of 49' does not release R because with 52 closed it takes ground from 59 at 61. The closing of 60 energizes slow to operate relay Q' with battery from 54. The operation of Q' releases R by opening 61.

The normally closed circuit comprising transmitting relay TR is opened at 53 by the operation of CR and has remained open during the time required for Q to release, Q' to operate and R to release. Accordingly the combined action of Q and Q' has transmitted a start (spacing) impulse to TR. Relay R upon releasing puts slow to operate relay R' to ground at 62 and also closes 1Y which puts ground on 58 through 1X<sub>E</sub>, 1, 1Y and 1Z. This closes TR which remains closed until slow to operate relay R' operates and removes ground at 1Z. Accordingly the start (spacing) impulse transmitted to TR by the action of Q and Q' has been followed by a marking impulse by the action of R and R'. It will be noted however that with no ground on 1 at 1X<sub>E</sub> this later impulse would be a spacing impulse.

Relays S, S'; T, T'; U, U' and V, V' operate in pairs as explained with reference to R and R'. 1, 2, 3 and 5 are grounded at 1X<sub>E</sub>, 2X<sub>E</sub>, 3X<sub>E</sub> and 5X<sub>E</sub> by the operation of relay E. 1, 2, 3 and 5 put ground on 58 successively by the closing and opening, respectively, of 1Y, 1Z; 2Y, 2Z; 3Y, 3Z and 5Y and 5Z.

V', when energized by the releasing of V, in addition to removing ground from 58 by the opening of 5Z, removes ground from W which upon releasing opens 63 which causes CR to release opening 51 and 52 and closing 48 and 53. The opening of 51 and 52 permits C to release. The releasing of C opens 17 and 18 which permits E and E' to release. The opening of 51 removes battery from 57 which permits Q', R', S', T', U' and V' to release. Opening of 52 removes ground from 59. Closing of 53 restores ground to 58 closing TR and the network is restored to normal, awaiting the next impulse sequence to be communicated to A from L1, L2.

Thus with 1, 2, 3 and 5 taking ground at 1X<sub>E</sub>, 2X<sub>E</sub>, 3X<sub>E</sub> and 5X<sub>E</sub> the code impulse sequence communicated to TR by the joint action of re-

lays Q, R, S, T, U and V and associated relays Q', R', S', T', U' and V' is; start (spacing), marking, marking, marking, spacing, marking, stop (marking) which transmitted to a start-stop telegraph printer (not shown) in L3 will cause the printer to print the figure 1.

Likewise any numerical impulse train of from one to ten digit impulses ending with a long (marking) impulse, originating in L1, L2; will, by the operation of the selector-translator herein described, be translated into corresponding five unit code combinations of marking and spacing impulses—each of which five unit combinations will be preceded by a start (spacing) impulse and followed by a stop (marking) impulse—and in that form be transmitted in L3. Furthermore, the timing of the five unit impulse sequence transmitted in L3 will be isochronal and independent of the timing of the numerical impulse sequence originating in L1, L2.

In the single practical application of the invention herein selected for purposes of illustration, numerical impulse sequences are translated into five unit printing telegraph code impulse sequences although some printing telegraphs employ a six unit code. Obviously, for the printing of numerals only, a four unit code will suffice. But whatever may be the code requirements of various printing telegraphs or other signaling systems the adaptability of the selector-translator herein described to meet those requirements should, from the foregoing description, be self evident.

The adaptability and operation of the selector-translator herein described in translating signal impulse sequences of uncertain and varying timing or periodicity into isochronal signal impulse trains, the timing or periodicity of which isochronal sequences or trains are in conformity to a predetermined timing or periodicity; i. e., translating from numerical impulse sequences or trains into other numerical impulse sequences or trains; will be fully understood, by those skilled in the art, from the following explanation. X contacts of relays E, F, G, H, J, K, M, N, O and P are rearranged as follows. Relay E, 1 X contact; F, 2 X contacts; G, 3 X contacts; H, 4 X contacts and so on to O which will have 10 X contacts. Conductor group 1, 2, 3, 4, 5 is increased to 10 to accommodate X contacts on those relays (K, M, N, O and P) having from 6 to 10 X contacts. The chain of relays Q, Q' to V, V' is increased by the addition of 5 pairs of relays all connected as shown with respect to R—R', etc. and the five additional conductors from additional contacts are disposed in relation to these added relays as is shown at 1Y and other Y contacts.

From the foregoing description the operation of the selector-translator under these conditions should be fully obvious to any one skilled in the art.

I claim:

1. In combination, a source of numerical impulse series, a quick acting relay responsive to each impulse of the series, two slow release relays operated by the quick acting relay and maintained operated during the impulses of a series of impulses but releasing between impulse series, a chain of numerical impulse counting relays, means including one of said slow release relays for rendering the counting chain of relays variably responsive to the impulses of the series by counting the number of impulses therein and to maintain such variable responsiveness, a chain of

impulse distributing relays for timing the transmission of impulses, means operated by the other slow release relay for energizing all of the relays of the distributing chain when it is released, means whereby the distributing chain of relays when energized maintains the first mentioned slow release relay operated independent of the impulses of the series, means including the distributing relays for thereafter releasing the distributing relays sequentially during a time interval less than the interval between impulse series, means controlled by the counting relay chain in its variably operated conditions for determining whether a marking or spacing impulse is to be transmitted by the distributing relays upon their sequential release at each release independent of the other releases and, at the termination of the release of all the distributing relays, means for releasing the slow release relay maintained operated by the distributing chain of relays.

2. In combination, a source of numerical impulse series, a quick acting relay responsive to each impulse of the series, two slow release relays operated by the quick acting relay and maintained operated during the impulses of a series of impulses but releasing between impulse series, a chain of numerical impulse counting relays, means including one of said slow release relays for rendering the counting chain of relays variably responsive to the impulses of the series by counting the number of impulses therein and to maintain such variable responsiveness, a chain of impulse distributing relays for timing the transmission of impulses, means operated by the other slow release relay for energizing all of the relays of the distributing chain when it is released, means whereby the distributing chain of relays when energized maintains the first mentioned slow release relay operated independent of the impulses of the series, means including the slow release relays for sequentially releasing the slow release relays whereby the second mentioned slow release relay releases at the termination of each numerical impulse series and the first mentioned slow release relay releases at the termination of each impulse series transmitted, means including the distributing relays for thereafter releasing the distributing relays sequentially during a time interval less than the interval between impulse series, means controlled by the counting relay chain in its variably operated conditions for determining whether a marking or spacing impulse is to be transmitted by the distributing relays upon their sequential release at each release independent of the other releases and, at the termination of the release of all the distributing relays, means for releasing the slow release relay maintained operated by the distributing chain of relays.

3. In combination, a source of numerical impulse series, a quick acting relay responsive to each impulse of the series, two slow release relays operated by the quick acting relay and maintained operated during the impulses of a series of impulses but releasing between impulse series, a chain of numerical impulse counting relays, means including said chain of numerical impulse counting relays and one of said slow release relays

for rendering the counting chain of relays variably responsive to the impulses of the series by counting the number of impulses therein and to maintain such variable responsiveness, a chain of impulse distributing relays for timing the transmission of impulses, means operated by the other slow release relay for energizing all of the relays of the distributing chain when it is released, means whereby the distributing chain of relays when energized maintains the first mentioned slow release relay operated independent of the impulses of the series, means including the distributing relays for thereafter releasing the distributing relays sequentially during a time interval less than the interval between impulse series, means controlled by the counting relay chain in its variably operated conditions for determining whether a marking or spacing impulse is to be transmitted by the distributing relays upon their sequential release at each release independent of the other releases and, at the termination of the release of all the distributing relays, means for releasing the slow release relay maintained operated by the distributing chain of relays.

4. In combination, a source of numerical impulse series, a quick acting relay responsive to each impulse of the series, two slow release relays operated by the quick acting relay and maintained operated during the impulses of a series of impulses but releasing between impulse series, a chain of numerical impulse counting relays, means including one of said slow release relays for rendering the counting chain of relays variably responsive to the impulses of the series by counting the number of impulses therein and to maintain such variable responsiveness, a chain of impulse distributing relays for timing the transmission of impulses, means operated by the other slow release relay for energizing all of the relays of the distributing chain when it is released, means whereby the distributing chain of relays when energized maintains the first mentioned slow release relay operated independent of the impulses of the series, means including the distributing relays for thereafter releasing the distributing relays sequentially during a time interval less than the interval between impulse series, means controlled by the counting relay chain in its variably operated conditions for determining whether a marking or spacing impulse is to be transmitted by the distributing relays upon their sequential release at each release independent of the other releases, means controlled by the first relay of the distributing chain whereby each impulse series controlled by the counting relay chain in its variably operated conditions is preceded by a spacing impulse and means controlled by the last relay of the distributing chain whereby each impulse series controlled by the counting relay chain in its variably operated conditions is followed by a marking impulse, and, at the termination of the release of all the distributing relays, means for releasing the slow release relay maintained operated by the distributing chain of relays.

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