

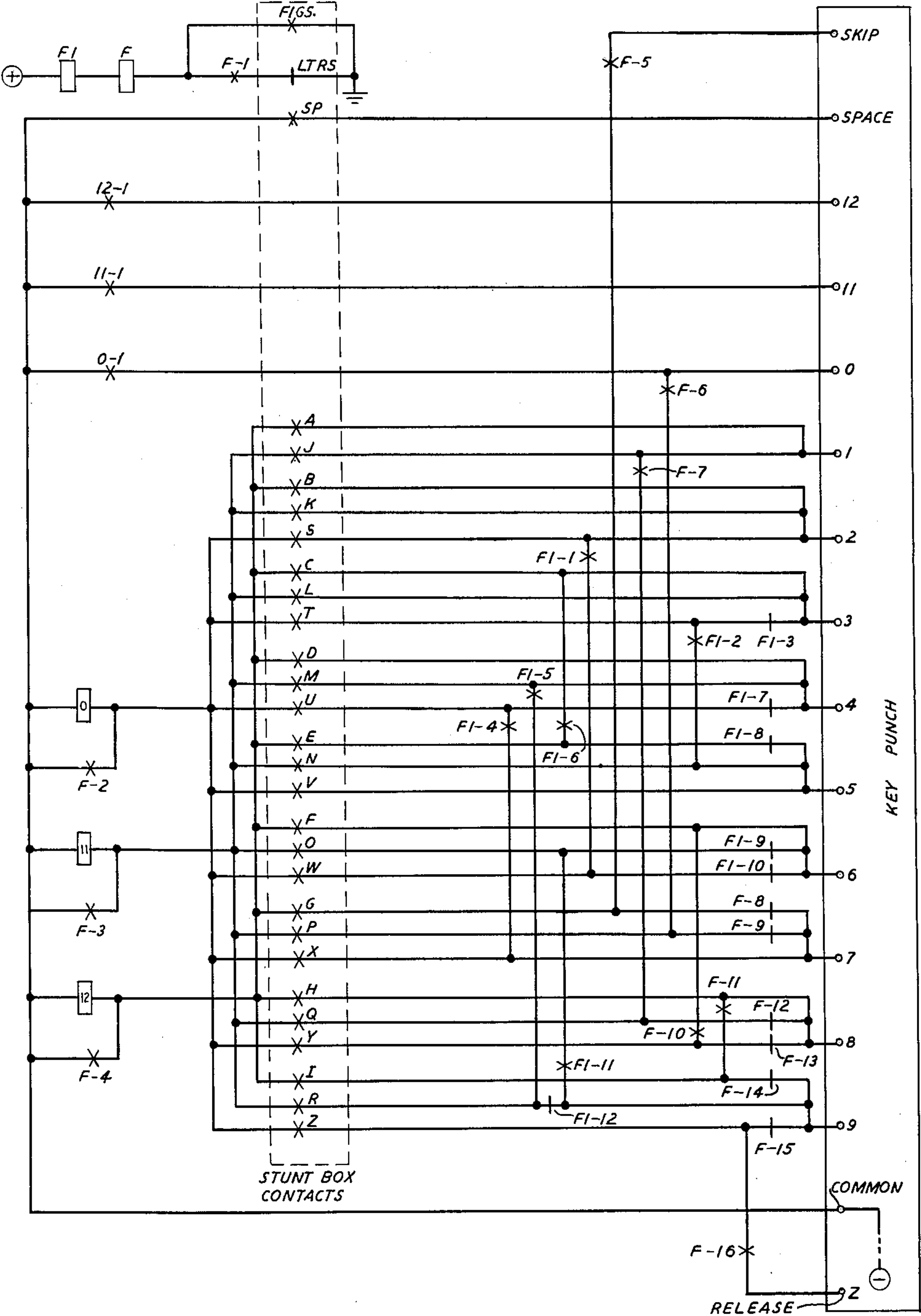
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CODE TRANSLATOR

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CODE TRANSLATOR

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This invention is a control circuit for translating multi-element two-condition permutation code signals into indicia on a record, such as perforations in a business machine card. The signals in accordance with the multi-element start-stop two-condition permutation code, are assumed to be impressed on a teletypewriter receiver, and by means of the receiver to operate a so-called stunt box mechanism, which is an adjunct of the receiver, both of which are well known in the art. Selections effected in the stunt box mechanism control the present circuit to effect selections in a punching machine to perforate the business machine card. The teletypewriter receiver which receives the permutation code signals and controls the stunt box may be the 28-type teletypewriter receiver manufactured by the Teletype Corporation and described in Patent 2,505,729, granted to W. J. Zenner on April 25, 1950. The stunt box may be the 28-type stunt box also manufactured by the Teletype Corporation and described in Patent 2,568,264, granted to W. J. Zenner on September 18, 1951. The card punching machine may be, for instance, the IBM 024 or the IBM 026 key punch manufactured by the International Business Machines Corporation and described in Patent 2,263,291, granted to T. L. Dowey on November 18, 1941. These patents are incorporated herein by reference.

While the control circuit of the present invention is primarily adapted to function intermediate the 28-type stunt box and either of the IBM key punches, all identified in the foregoing, it is not so limited and may be employed to control any suitable indicating or recording mechanism.

An object of the invention is the simplification of control circuits which translate multi-element two-condition permutation code signals into indicia on a business machine card.

The punching machine which is assumed to be employed with the present circuit is equipped with twelve punches each of which perforates an individual localized area in a vertical column of a business machine card. When a numeral from 0 to 9 is to be defined, some one of the ten lower punches in the column perforates its respective area. For purpose of defining a letter, some one of the nine lower punches in the column and some one of the three upper punches in the column are operated simultaneously. The three upper punches are called overpunches. One overpunch is assigned to each of three groups of letters into which the twenty-six letters of the alphabet are separated. One overpunch perforation taken together with one underpunch perforation defines a letter. In the punching machine as thus arranged, one of the punches, which when used alone defines a numeral, is employed as an overpunch when operated simultaneously with another to define a letter.

The present circuit, therefore, is required to control the punching machine to perforate one or two areas to define a number or letter, respectively. To do this it must be first informed which of the two it is to identify so that it may adjust for the proper control of the punch. Although either a letter or a number, in a series of letters or numbers, is identified by a single permutation, the present circuit is first adjusted to control the punch to perforate a single area in a column of the card or two areas by first impressing on the teletypewriter receiver and through it on the stunt box an individual preliminary

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permutation preceding the permutation identifying the first of a series of letters and another different permutation preceding the permutation identifying the first of a series of letters. This will be explained more fully hereinafter.

The manner in which the circuit of the invention operates may be understood from the following description taken with reference to the associated drawing herein. As an aid in understanding the detailed description hereinafter, first the invention will be described generally.

In the drawing each electromechanical relay winding and core is represented, according to the usual convention, by a rectangle and an appropriate designation. The relay contacts are represented according to the detached contact convention in which an X intersecting a circuit path represents an open contact therein and a short line, at right angles to the circuit path, represents a closed contact. Each relay contact bears a designation such as F-16. In this designation the letter F identifies the winding and core which actuates the contact, and the numeral 16 identifies contact 16 on relay F. There are five relays shown on the drawing, relays F1 and F at the top left in the drawing and relays 0, 11 and 12 at the lower left. Relays F1 and F operate in series and in unison. The two relays are required to provide the requisite number of contacts. There are sixteen contacts on relay F designated F-1 through F-16. There are twelve contacts on relay F1 designated F1-1 through F1-12. There is one contact on each of relays 0, 11 and 12, designated 0-1, 11-1 and 12-1, respectively, shown at the upper left in the drawing.

The key punch is represented by a captioned rectangle shown at the right in the drawing.

The teletypewriter receiver which is assumed to control the stunt box is not shown on the drawing. For purpose of the present description, the stunt box may be assumed to be equipped with twenty-nine contacts. These are shown in a vertical array slightly to the left of center in the drawing and are the only apparatus elements of the stunt box shown in block form enclosing the twenty-nine contacts on the drawing. Twenty-six of the contacts are designated from A through Z in accordance with the twenty-six letters of the alphabet. The remaining three are designated FIGS, LTRS and SP, respectively. The twenty-six code signal permutations assigned to the twenty-six letters of the alphabet are ordinarily employed to control a teletypewriter receiver, on which they are impressed, to print the letter of the alphabet corresponding to each permutation. In the present circuit each of these signal permutations is employed to control a contact in the stunt box corresponding to the letter. These twenty-six contacts on the drawing are each represented by the symbol X in a circuit path and by some one of the twenty-six letters of the alphabet from A to Z individual to the contact. The symbol X indicates that the contact in the path in which it appears is normally open, and is closed when the permutation code signal corresponding to the letter assigned to the contact is impressed on the stunt box through the receiver.

In addition to the code signal permutations which control a teletypewriter receiver to print the letters of the alphabet, certain other code signal permutations are employed to operate the teletypewriter to perform certain functions, which functions are performed by a typist in the operation of an ordinary typewriter, to adjust the element carrying the type so as to print different symbols at different times through the operation of a single key, and to control the typewriter to print neat copy. Three such additional code signal permutations are employed in the present circuit. One of these code signal permutations is the so-called "Figures Shift" permutation, hereinafter designated "FIGS." When applied to a tele-

typewriter receiver, the code signal permutation "FIGS" adjusts the teletypewriter mechanism so that it shifts from printing in the regular or lower case to printing in the upper case. In the present arrangement, however, when the stunt box is activated in response to permutation code signal for "FIGS," the circuit is adjusted so that it is in condition to actuate a single punch so as to perforate a selected discrete area in some one of ten discrete positions, called under punch positions, in a vertical column of a card. Each of the ten numbers from 0 to 9 is identified by a particular one of ten signal permutations corresponding to ten of the twenty-six letter permutations. Thus, in order to perforate an area in the card corresponding to some one of the ten numerals from 0 through 9, it is first necessary to impress the code permutation for "FIGS" on the stunt box. This effects a preliminary adjustment of the present circuit so that, in response to a succeeding permutation code combination defining a selected one of ten assigned letter permutations, the punch will perforate a corresponding assigned one of ten discrete areas to identify the numeral. This will be made more clear in the detailed description hereinafter. It is pointed out that in teletypewriter operation, once the code permutation signal for FIGS is received, the teletypewriter continues to print the symbols corresponding to the permutation signals which follow in the upper case until a permutation code signal designated "Letters Shift", and called hereinafter LTRS, is received, which readjusts the teletypewriter to print in the normal or lower case position. The circuit of the present invention operates in a generally corresponding manner. That is to say, once the FIGS permutation signal is received, it controls the punch to perforate a single selected underpunch area corresponding to a numeral in each vertical column until the permutation for LTRS is received.

Normally the present circuit is in condition to control the punch so that it perforates a vertical column in a card, to identify some one of the twenty-six letters in the alphabet. As mentioned in the foregoing, it does this by perforating a vertical column in two positions. One of the two positions is a so-called overpunch position of which there are three; namely, the 0, 11 and 12 overpunch positions. Each of the overpunch positions, as explained, is associated with a particular one of three groups of letters. Each of two groups of these letters consists of nine letters and the third group consists of eight letters making a total of twenty-six. The 12 overpunch has associated with it nine letter contacts; namely, contacts A, B, C, D, E, F, G, H and I. The 11 overpunch has associated with it nine letter contacts; namely, contacts J, K, L, M, N, O, P, Q and R. The 0 overpunch has associated with it eight letter contacts; namely, contacts S, T, U, V, W, X, Y and Z. Contacts A through I control the nine punches 1 through 9, respectively. When the punch perforates a vertical column in a card in overpunch position 12, and perforates it also in some one of the nine vertical underpunch positions, 1 through 9, the corresponding letter of the nine letters of the group A through I, respectively, is identified. Contacts J through R also control the same nine punches 1 through 9, respectively. When the punch perforates a vertical column in a card in overpunch position 11 and perforates it also in some one of the nine vertical underpunch positions, 1 through 9, the corresponding letter of the nine letters of the group J through R, respectively, is identified. Contacts S through Z control punches 2 through 9. When the punch perforates a vertical column in a card in overpunch position 0 and perforates it also in some one of eight of the nine vertical underpunch positions 2 through 9, the corresponding letter of the eight letters of the group S through Z, respectively, is identified.

Normally, as stated in the foregoing, the circuit is in condition to perforate two areas in vertical alignment in a column in a card, one in an overpunch position and one in an underpunch position, to identify some one of twenty-

six letters. It does this in response to the reception of a single permutation code signal identifying the letter, after first being adjusted by the reception of the permutation, for LTRS. It continues to perforate two areas for each permutation code signal identifying a letter until the permutation for FIGS is received. In response to this the present circuit is adjusted to perforate a single one of ten areas in a vertical column to identify the number. It continues to do this as long as permutation code signals corresponding to any of the ten letters assigned to identify numerals is received and until the permutation code signal for LTRS is received. This will restore the circuit to the normal condition in which two perforations will be made in each column to identify one of the twenty-six letters.

The punch is arranged to operate intermittently through a cycle of fourteen steps, for instance. During this fourteen-step cycle it moves a card into the punch, through the punch, and out of the punch. During twelve of these cycles, twelve vertical areas or columns in the card are presented to the punches for perforation, one column per cycle, in succession, and during the other two cycles the card is moved into and out of the machine.

One of the permutation code signals in the present multielement permutation code is called the Spacing Signal, hereinafter called "SP". This is employed ordinarily to control a teletypewriter receiver to introduce a space between groups of printed symbols such as words. In the present circuit, this permutation code signal is employed to control the SP contact in the stunt box. This applies a condition to terminal Space in the punch. The punch is thereupon actuated to prevent the perforating of any area in the particular vertical column which is at the moment being presented to the punches for perforation.

The Key Punch is controllable by the present circuit to skip positions in the cycle. This is performed by impressing the permutation signal for FIGS followed by the permutation signal for the letter G on the stunt box. In response to this, a condition is impressed on terminal SKIP in the punch to perform this function.

To release the Key Punch the permutation signal for FIGS followed by the permutation signal for the letter Z is impressed on the stunt box. This impresses a condition on terminal Release in the punch which thereupon performs this function.

The operation of the circuit shown on the drawing will now be described in detail.

The circuit as shown on the drawing has its stunt box contact LTRS closed and its contact FIGS open. The circuit is therefore in condition to control the punches so as to perforate two areas in each vertical column of a card simultaneously to indicate any of twenty-six letters in each vertical column. Since contact FIGS is open, relays F1 and F are released. All of the contacts on these relays as well as relays 0, 11 and 12 are in the condition shown on the drawing. All of the contacts in the stunt box are in the condition shown on the drawing.

If the permutation code for the letter A is now impressed on the stunt box, its contact A will close. In response to this, in the punch a source of potential will be connected to terminal Common and to the left-hand terminals of the windings of relays 0, 11 and 12 in parallel. The right-hand terminal of the winding of relay 0 and the right-hand terminal of the winding of relay 11 are each connected to a group of contacts in the stunt box all of which are open, so neither one of these relays can operate. The right-hand terminal of the winding of relay 12 is connected through contact A to terminal 1 of the key punch. From this terminal the circuit extends through the winding of the 1 punch magnet, not shown, in the punch to ground. The punch magnets are shown and their operations described in the punching machine patent identified in the foregoing. Relay 12 will operate and punch magnet 1 will be energized. Relay 12 will close contact 12-1. This will impress the potential from punch

terminal Common on punch terminal 12 energizing punch magnet 12 in series with terminal 12. Punches 1 and 12 controlled by punch magnets 1 and 12 will be actuated simultaneously to perforate two areas in the column of the card momentarily being presented to the punches to define the letter A.

If any of the permutation code signals corresponding to the letters B, C, D, E, F, G, H or I had been received, instead of the permutation code for the letter A, relay 12 would have operated, the corresponding contact in the stunt box would have been closed, and some one of punch magnets 2 through 9 would have been energized, simultaneously with punch magnet 12, to perforate two areas in the card column, one under punch 12 and one under some other one of the punches controlled by magnets 2 through 9 dependent on the particular permutation received.

If the permutation defining letter J, K, L, M, N, O, P, Q or R is received, a correspondingly lettered contact in the stunt box will be closed. Relay 11 will be actuated. Contact 11-1 will be closed. Punch magnet 11 will be operated and again some one of punches 1 through 9 will be operated simultaneously with punch 11 to define the particular letter corresponding to the permutation.

If a permutation code signal defining some one of letters S, T, U, V, W, X, Y or Z is received, the correspondingly lettered contact in the stunt box will be closed. Relay 0 will be operated. Contact 0-1 will be closed. Punch 0, assumed to be connected to terminal 0 in the punch, will be activated simultaneously with some one of the punches assumed to be connected to terminals 2 through 9 to define the letter corresponding to the permutation code signal.

In order to adjust the circuit so as to control the machine to indicate numerals, first the signal permutation for FIGS is transmitted. In response to this, the terminal designated FIGS at the top of the drawing is closed and a circuit is established from grounded battery through the winding of relays F1 and F and contact FIGS to ground operating relays F1 and F. The operation of relay F1 closes each one of contacts F1-1 through F1-12. The operation of relay F closes each one of contacts F-1 through F-16. The closing of contact F-1 locks relays F1 and F in the operated condition by closing a circuit from grounded battery through the windings of relays F1 and F and through contact F-1, which is now closed, and contact LTRS which is normally closed and which has remained closed.

When the circuit is in condition, it will be observed that the windings of relays 0, 11 and 12 are each shunted by the closure of contacts F-2, F-3 and F-4, respectively. As a result of this, if any of the contacts from A through Z in the stunt box is closed, battery from the punch machine through terminal Common to the left-hand terminal of the winding of each of relays 0, 11 and 12 will pass through the respective shunting contact and none of relays 0, 11 or 12 will be operated. As a result of this, contacts 0-1, 11-1 and 12-1 will remain open and none of the punches connected to terminals 0, 11 or 12 in the punch machine can be energized to perforate an overpunch area in a column.

If the permutation for the letter P is impressed on the teletypewriter to actuate contact P in the stunt box, a circuit will be established from battery through terminal Common, contact F-3, contact P, contact F-6, terminal 0 and through the winding of the 0 magnet, assumed to be connected to terminal 0 in the punching machine, to perforate an area to define the numeral 0. In response to the reception of the permutation defining the letter Q, battery through terminal Common, contact F-4, contact Q, contact F-7, terminal 1 and magnet 1, assumed to be connected to terminal 1 in the punch machine, to ground will energize magnet 1 and perforate an area to define the numeral 1. For numeral 2 the path will extend

through contact F-2, contact W and contact F1-1 to terminal 2.

Continuing with the numerals, and assuming that relays F and F1 are operated, when the permutation for letter E is impressed on the receiver and contact E of the stunt box is closed, the punch magnet selecting path is extended through contact F-4, contact E, contact F1-6 and terminal 3 to designate the numeral 3. For numeral 4 stunt box contact R is closed and the path extends through contact F-3, contact R, contact F1-5 and terminal 4 to indicate numeral 4. For numeral 5, the path extends through contact F-2, contact T and terminal F1-2 to terminal 5 in the punch machine. For numeral 6 punch contact Y is closed, the path extends through contact F-2, contact Y, contact F-10 and terminal 6 in the punch machine to indicate numeral 6. For numeral 7 the permutation for letter U closes stunt box contact U, and the path extends through contact F-2, contact U and contact F1-4 to terminal 7 in the punch machine to indicate numeral 7. For numeral 8 the path extends through contact F-4, contact I and contact F-11 to terminal 8 in the punch machine to designate numeral 8. For numeral 9 the path extends through contact F-3, contact 0 and contact F1-11 to terminal 9 in the punching machine to designate numeral 9.

After a permutation designating a numeral, or a series of numerals, has been received, and it is desired to again record letters, the permutation for LTRS, defining letters, is impressed on the teletypewriter receiver and opens contact LTRS shown in the upper portion of the drawing. It will be recalled that when a numeral or a series of numerals was being received, the permutation signal for FIGS was impressed on the teletypewriter receiver and contact FIGS shown at the top of the drawing was closed to operate relays F1 and F in series. Thereupon, as explained, relays F1 and F were locked through a path extending through the now-closed contact F-1 and the normally closed contact LTRS. In response to the reception of the LTRS permutation signal, contact LTRS now opens, releasing relays F1 and F and restoring the circuit to its normal condition. When in this condition, the present circuit is arranged to control the associated punching machine to indicate letters as explained in the foregoing.

Attention is called to the fact that when a permutation is received which is intended to designate a numeral, which permutation would ordinarily designate a letter, relays F or F1 actuate a contact in the path between the stunt box contact designating the letter and the terminal in the punch which would ordinarily control a perforation to designate the letter. Thus, for instance, when the circuit is in condition to designate numerals and relays F and F1 have been operated in response to the reception of the permutation for FIGS, if the permutation code signal for the letter P is received to designate the numeral 0 through contact F-6, contact F-9 is opened to prevent the application of a potential condition to terminal 7 in the punch to prevent the simultaneous operation of the punch controlled through contact 7. Correspondingly, when contact Q in the stunt box is closed to identify numeral 1 through contact F-7, contact F-12 will have previously been opened to prevent the operation of the punch associated with punch terminal 8. It will be observed that contact F1-10 is opened when numeral 2 is identified by the closing of stunt box contact W. Contact F1-8 is opened to prevent the operation of magnet 5 when stunt box contact E is closed to control the number 3 punch. Contact F1-12 prevents punch 9 from operating when stunt box contact R is closed to designate numeral 4. Contact F1-3 is opened at the time stunt box contact T is closed to prevent punch 3 from operating when numeral 5 is to be designated. Contact F-13 is opened at the time stunt box contact Y is closed to prevent the operation of punch 8 when numeral 6 is to be designated. Contact F1-7 is opened at the time stunt box contact U is closed to prevent the operation of punch 4 when numeral 7 is

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to be designated. Contact F-14 is opened when stunt box contact I is closed to prevent the operation of punch 9 when numeral 8 is to be designated. And, finally, contact F1-9 is opened when stunt box contact 0 is closed to prevent the operation of punch 6 when numeral 9 is to be designated.

What is claimed is:

1. A code translator for translating Baudot code signals into a record in the Hollerith code, said translator comprising a first element selectively actuatable in response to the reception of an individual Baudot code permutation, twenty-six other elements each selectively actuatable in response to the reception of an individual one of twenty-six other permutations, said twenty-six other elements being arranged in three groups, a first group of three output terminals, a second group of output terminals, a source of energy, a relay individual to each of said groups of other elements and associated with each of said first group output terminals, means responsive to the actuation of each of said twenty-six other elements in each of said groups of other elements for selectively extending said source of energy through the winding of said relay individual to said group thereof to one of said second group output terminals, and means responsive to the energization of said relay for extending said source of energy to said first group output terminal associated therewith.

2. A code translator in accordance with claim 1 wherein an individual path is provided for shunting each of said relay windings, and means responsive to the actuation of said first element for closing each of said shunt paths.

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