

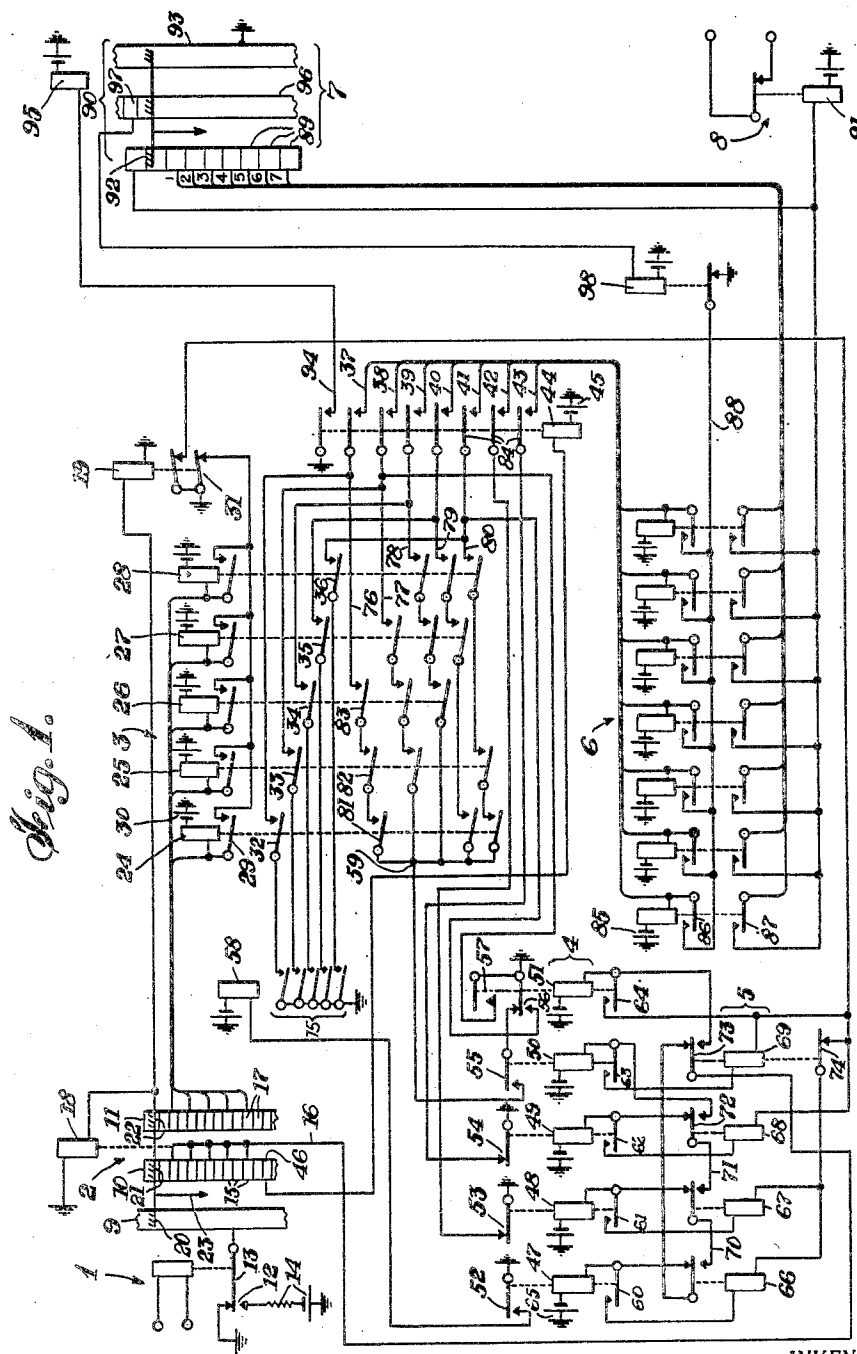
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J. A. HERBST
CODE TRANSLATOR

2,520,142

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2 Sheets-Sheet 1



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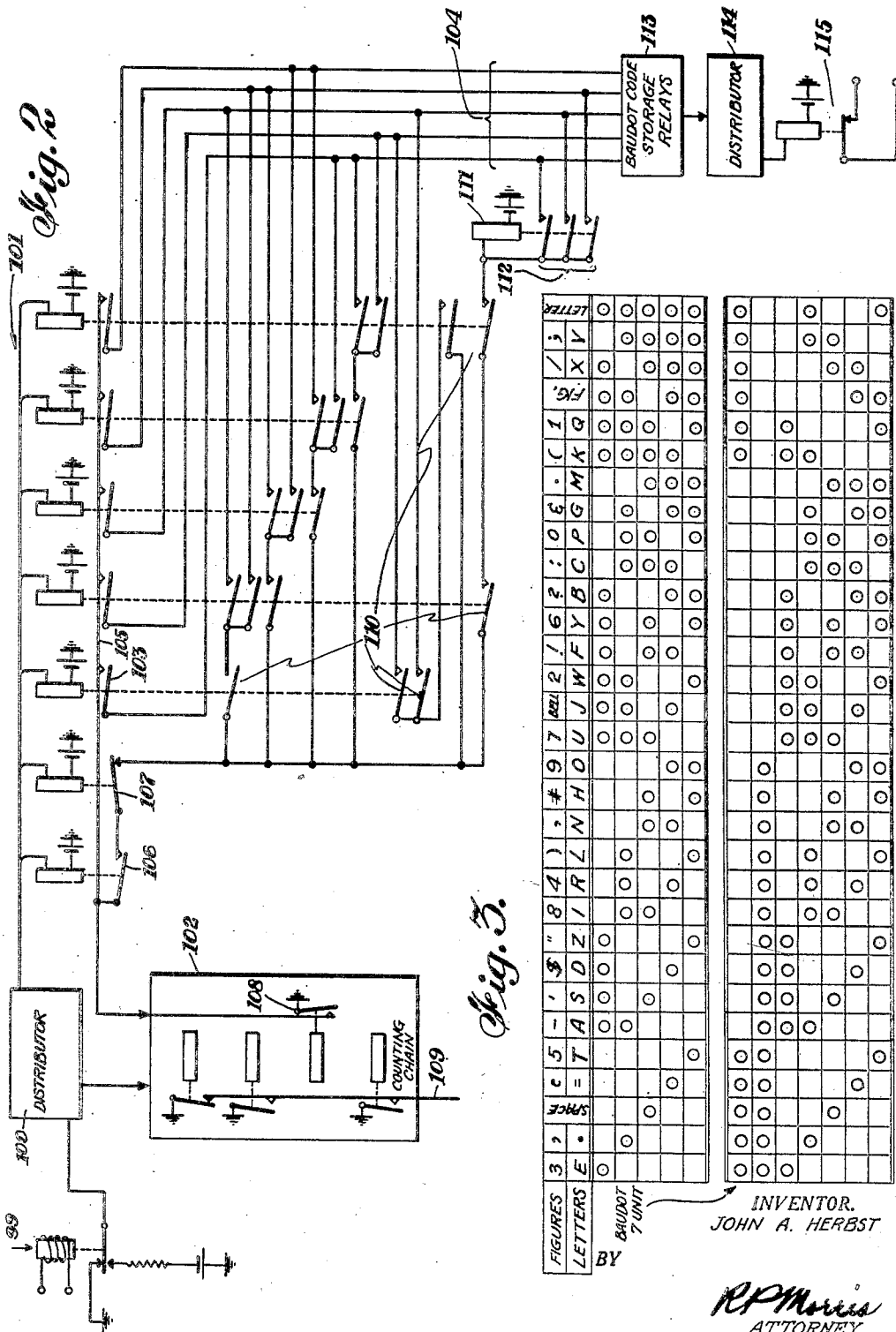
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CODE TRANSLATOR

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10 Claims. (Cl. 178—2)

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This invention relates to teleprinter circuits and more particularly to circuits for translating from one teleprinter code into another.

Experience has shown that the use of teleprinters with radio links is greatly improved by the use of a so-called error-proof code in place of the standard five-unit Baudot code. In the type of codes under discussion each character consists of a fixed number of signal elements, each element of which may be one of two electrical circuit conditions, that is off or on, or in telegraph language marking or spacing. In the Baudot code, five such elements are used in permutation using all possible combinations. However, the Baudot code is subject to errors in that, for instance, a burst of static may insert a false marking pulse in place of one of the spacing elements. In order to avoid such possibilities of error, error-proof codes such as the 7 element code is preferably used. In such a code, instead of carrying the intelligence by means of variations in the number and arrangement of the marking elements, only the arrangement is varied of a fixed number of markings. In other words, each character would consist of for instance, three marking and four spacing elements, the arrangement of these 7 elements giving the intelligence. When such a code is used for transmission, the vagaries of the transmission medium would either remove one or more of the marking elements or add to them and by counting the number of marking elements received, this mutilation can be detected, and the printing of misinformation prevented. In the past, in order to transmit by error-proof code, the method in use required special printers, which method however, in view of the necessity of employing standard printers already available becomes undesirable.

It is an object of the present invention to provide a circuit for use with standard teleprinters for translating into and from an error-proof code immediately before and after transmission.

It is a further object of the invention to provide a simple method of translating the 5 unit Baudot code into an error-proof 7 unit code.

Still another object is to provide method and means for translating the 5 unit Baudot code into a 7 unit error-proof code by adding two elements to characters having one in the Baudot code, by adding one to characters having two, retaining characters having three without change and making a simple translation on the balance.

In accordance with the invention, I provide in connection with a teleprinter which supplies

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intelligence in standard Baudot or 5 unit code, a circuit for translating the Baudot code intelligence into a 7 unit error-proof code for transmission; and at the receiving end, I provide a circuit for translating from the 7 unit into the standard Baudot code for application to a standard teleprinter receiver or reproducer. The translator includes two sets of relays, one of which stores the incoming code and the other the marking impulses making up the respective characters. The operation of one or more of the relays of the two sets causes the energization of three circuits out of a possible seven which, in turn, energize the corresponding 7 unit code storing relays provided for that purpose. A suitable distributor "reads" the translated intelligence contained in the 7 unit storing relays and transfers it to a transmitter relay. At the receiver end, the translation of the seven unit into the Baudot code takes place by means of an analogous circuit including sets of code storing and marking-impulse-storing relays. Each time the combined operation of three relays in each of these sets takes place, the energization of corresponding Baudot code storage relays ranging in number from one to five is brought about. These latter relays are connected to supply suitable distributor and Baudot code output circuits for use by a standard teleprinter.

These and other features and objects of the invention will become more apparent and the invention best understood upon consideration of the following detailed description of an embodiment of the invention to be read in connection with the accompanying drawings in which:

Fig. 1 is a circuit diagram in schematic form of a 5 into 7 unit code translator circuit;

Fig. 2 is a circuit diagram partially in schematic and partially in block form of a 7 into 5 unit code translator; and

Fig. 3 is a table showing the alphabet and other characters represented in the Baudot and the 7 unit codes respectively.

Referring to the 5 into 7 unit code translator of Fig. 1, the circuit comprises several distinctive elements or portions including a Baudot or 5 unit code input circuit represented by relay 1; a distributor aggregate 2; a set of 5 unit code storing relays 3; a set of five marking impulse storage relays 4; a set of four storage locking circuit relays 5; a set of seven 7-unit code storage relays 6; a seven unit code output distributor aggregate 7; and a seven unit output circuit or relay 8.

The distributor aggregate 2 is comprised of

three distributor bars 9, 10 and 11. The bar 9 is normally grounded through a make and break contact 12 controlled by the input relay 1. When the relay 1 is operated due to incoming code pulse, its armature 13 is moved to establish a circuit from the bar 9 to ground over a resistance and a source of potential 14. The distributor bar 10 consists of a number of adjacent commutator segments 15 insulated from one another, five of which are connected together to a line 16 to connect with the set of counting chain relays 4 and 5. The distributor bar 11, also consisting of the series of commutator segments 17 has five of the segments connected individually to respective relays of the code storing set 3. One of the segments on the bar 11 is also connected to a release magnet or relay 18 and to a counting chain release relay 19. Any voltage applied to the first distributor bar 9 is transferred to the other two bars 10 and 11 by means of a set of brushes or contact wipers 20, 21 and 22 associated with the three distributor bars respectively. These brushes or wipers are interconnected and means is provided to move the same with respect to the three bars in the direction of the arrow 23. The five code storing relays of the set 3 which will be referred to by reference numbers 24—28 are so arranged as to be self-locking when they become activated upon the reception of a code impulse. This is accomplished by means of make contacts 29 and a source of potential and a ground connection as at 30 for relay 24. Similar relay locking means are provided for the other relays. The locking circuit is completed over back contact 31 of counting chain release relay 19 to ground. The relays 24—28 by means of make contacts 32—36 control the grounding circuits of 7 lines leading to corresponding seven unit code storage relays in set 6, the 7 lines being indicated by references 37—43. The connection between the lines 37—43 to their grounding circuits just referred to is also under simultaneous control of a transfer relay 44 which is grounded through a source of potential at 45 and the energizing circuit of which is completed through a segment 46 in the distributor bar 10 arranged to become operative after the reception of each character in the Baudot code on the bar 10. The marking impulse storage relay set 4 includes individual relays 47—51 which respectively control make, break, break, and make contacts 52—55 and make-break and make contacts 56 and 57, whereby a grounding relay 58 is energized upon operation of relay 47; a ground removed from the seven unit storage circuit 42 by operation of relay 48; a ground removed from circuit 43 by operation of relay 49; a ground supplied to a common point 59 of circuits 37, 38, 39, 40 and 41 on operation of relay 50; a ground made for circuit 41, and another ground made for circuit 38 upon operation of relay 51. The relays 47—51 also control make contacts 60—64 which, in conjunction with grounded sources of potential as indicated at 65 for the relay 47 form a self-locking circuit after an initial energizing marking impulse has been received. The counting chain set-up relays 5, indicated individually at 66—69 control break and make contacts 70—73 which are arranged in such a way that the operation of one relay prepares the circuit for energization of the subsequent relay in the familiar counting chain arrangement. The relay 69 of this set also controls a break contact 74 which interrupts the ground circuits of relays 66, and 47, and relays 67 and 48

respectively whereby the grounding relay 58 controlling associated grounding contacts 75 becomes de-energized. Circuits 37—41 are connected to the common point 59 referred to hereinbefore over connections 76—80 each of which includes three make contacts as shown at 81, 82 and 83 for circuit 37. These series contacts in the respective circuits are controlled respectively by the five code storage relays 24—28. The connections between the circuits 37—43 to their respective grounding connections either through the three series contacts in the connections 76—80 or to contacts controlled by relays of the set 4 as at 53, 54 and 55, are controlled by make contacts 84 which are movable with the armature of the transfer relay 45. As the contacts 84 are closed, three of the seven unit code storage relays of the set 6 will become energized in accordance with the grounding connections of the circuits just described. These 7 storage relays of the set 6 each have a grounded source of potential circuit as at 85 and control two make contacts as shown at 86 and 87, the former to insure the self-locking of its associated relay over a common ground connection 88. The contacts 87 form a part of the output circuit of the relays, the armatures being connected to respective segments 89 of an output distributor aggregate 90 and the other part of the contact being connected to an output or signal relay 91 which is energized each time a contact wiper or brush 92 of the output distributor connects one of the energized segments 89 to ground over a grounding bar 93. Thus it will be seen that the distributor aggregate 90 acts as a means for scanning the condition of the set of seven unit code storage relays 6. The transfer relay 45 through the medium of a make contact 94 also controls the operation of the movement of the brushes 92 in respect to the distributor bars of the aggregate 90 by the energization of a transmission distributor release relay or magnet 95 which becomes operative as the seven unit storage relays become energized. The second of the three output distributor bars 96 is provided with an insulated segment at 97 which, as its associated brush or wiper contact passes it and thereby establishes a connection to ground over the distributor bar 93 effects the energization of a relay 98 controlling the grounding circuit of the self-locking arrangement for the seven unit storage relay set 6. This will effect a release of any of the storage relays 6 at the beginning of transmission of each character.

By inspection of the diagram of Fig. 1 it can now be seen that, as impulses and spacings representative of a given character are applied to the input relay at 1, the source of potential 14 in response to a releasing action, which may be based on the start-stop or synchronous release and timing arrangement ordinarily used with teleprinters, becomes connected to energize over a distributor bar 9 and its associated brush contact both the release magnet 18 and the relay 19, of which magnet 18 releases for movement the wiper contacts 20, 21 and 22 with respect to the distributing bars 9, 10 and 11 and at the same time relay 19 clears by opening their grounding circuits both the code and marking impulses storage relay sets 3, 4 and 5. After momentary opening, contacts 31 return to their make position so that both grounding circuits controlled thereby are restored. As the object of the circuit is to translate the Baudot code into a so-called seven unit code each character of

which will be characterized by three marking impulses suitably arranged, a reference to Fig. 3 will be helpful in visualizing such translation. In Fig. 3 all possible characters that may be used in the transmission of intelligence have been represented first in the five unit or Baudot code and also in the corresponding seven unit-3 marking impulse code. If, for example, the letter "S" were being transmitted, relays 24 and 26 would operate in the set 3 in the order of arrangement of the two impulses, and relays 47 and 48 of the set 4 indicating that the character consisted of two marking impulses. Relays 24 and 26, operated, close contacts 32 and 34 respectively. Relay 47, operated, energizes, by grounding, the common relay 58 and relay 48, operated, breaks a grounded circuit at contact 53. The energization of relay 58 causes circuits 37 and 39 to be grounded through the now closed contacts 32 and 34; and the simultaneous opening of contact 53 removes the ground through circuit 42, while the ground maintained by contact 54 on circuit 43 remains intact. In consequence circuits 37, 39 and 43 are energized to operate the corresponding associated storage relays of the set 6 which will be the second, third and fifth relays thereof, counted from the left, to correspond with the desired arrangement of the marking impulses for the letter "S" in the seven unit code. Other characters undergo similar translations, marking impulses being added or subtracted from the total available in the Baudot code character. Although a method has been described here wherein for two of the circuits the grounds are removed upon energization of the corresponding counting chain relays, it will be understood by those skilled in the art that other arrangements may be made wherein the selected circuits will all be grounded first with subsequent circuit variations to produce the ultimate three marking impulse-seven unit-code.

Referring now to the circuit for retranslating back to the Baudot code shown in Fig. 2, analogous circuit portions may be seen comprising an input relay 99 coupled to a distributor aggregate 100 shown in block form which in turn, is connected to a code storage relay set 101 and to a counting chain shown in the box 102 which is used for error indication. Each of the last five relays, of the set 101 counted from the right, controls a contact as at 103 each connecting one of the five unit or Baudot code output circuits indicated at 104 to a grounding line 105. The contacts controlled by the first two relays of the set 101 serve to control the balance between the fixed number of marking impulses in the seven unit code and the varying number of marking impulses in the Baudot code. Thus, if the character in the seven unit code as applied is comprised of markings 1, 2 and 3 as in the letter "E", the first relay of the set 101 will operate to close its contact at 106, while the second relay will operate to open its contact 107; the third relay will be the only one, however, to effectively ground its associated output circuit which is the first one counted from the left in the set 104 with the result that only the first of the five Baudot code output circuits will be energized. It will also be seen that unless the third of the four relays shown in the counting chain 102 is operated indicating that three marking pulses were received, no translation can take place. This is due to its arrangement that it controls the connection to ground at 108 of the grounding lead 105. Instead, whenever two or four of the re-

lays 102 are energized a lead 109 marked "error" is grounded. This may be used to cause the printer to print a special symbol by one of several means as by addition of a special print hammer, or by the elimination of one of the codes as for example the number 2 marking character. The last five relays of the set 101 each operate, outside of the grounding contacts as at 103, a number of additional make contacts indicated at 110 which control connections between any of the five Baudot code output circuits 104 and the closed contact 107 and among each other. Under certain conditions, an auxiliary relay 111 becomes energized to provide ground connections for the first, third, and fourth circuit of the set 104 by operation of associated contacts 112. The circuits 104 are connected to energize suitable Baudot code storage relays shown in block form at 113 analogous to the set of relays 6 in Fig. 1. Similar to the arrangement in Fig. 1, storage relays 113 through a distributor aggregate 114 transfer the five unit code information into a Baudot code output relay 115.

Should, for example, the letter "E" be transmitted in the seven unit code, that is the marking impulses 1, 2 and 3 be received, the operation of the first three relays of the set 101 would result in the grounding of the first of the five circuits 104 as will be apparent by inspection. If again the letter S were transmitted, which is comprised of marking impulses 2, 3 and 5, the first and the third of the circuits 104 would become grounded. Should the three marking impulses be transmitted in the order of 1, 4 and 7, the second and fifth circuit would be grounded directly by the corresponding contacts 103. The closing of the contact 106 by the first of the seven relays at 101 and the closing of contacts 110 controlled by the fourth and seventh relays of the set 101 would energize the auxiliary relay 111. Operation of relay 111 has the effect of grounding the first, third and fourth of the circuits 104 over the contact 107 so that all five of the circuits become energized and transmit a full set of five marking impulses in accordance with the last column in Fig. 3.

It will be apparent of course, that other specific circuit arrangements can be worked out for accomplishing the type of code translation discussed hereinabove.

While the above is a description of the principles of this invention in connection with specific apparatus, particularly treating of the Baudot and the seven unit codes, other permutation-combination and fixed number element codes are contemplated. It is therefore to be clearly understood that this description is made only by way of example and not as a limitation on the scope of this invention.

I claim:

1. For use with a source of intelligence carrying code impulses of a multiple element permutation and combination code type of a variable number of marking elements, an electric circuit for translating the permutation and combination code into a second multiple element code having a fixed different number of marking elements than said first code type, comprising means for storing the permutation code impulses, counting chain means for counting the impulses of the permutation intelligence, a plurality of circuits equal in number to the elements of said second code for activating means for utilizing the second code impulses, and means for energizing a fixed number of said circuits in accordance with the

activation of said storing and said counting chain means by a given permutation code character controlled by said storing and said counting chain means.

2. For use with a source of intelligence carrying code impulses of the five-unit or Baudot code type, an electric circuit for translating the five unit code into a seven unit code having three marking elements, comprising means for storing the five unit code impulses, counting chain means for counting the impulses of the five unit intelligence, seven circuits corresponding to the seven unit code, means for energizing three of said seven circuits in accordance with the activation of said storing means and said counting chain means by a given five unit code character controlled by said storing means and said counting chain means, and means for scanning the condition of said seven circuits, said scanning means under control of said means for energizing three of said seven circuits.

3. A circuit according to claim 2, wherein said five unit storing means includes five relays controlling energization circuit connections for five of said seven circuits.

4. A circuit according to claim 2, wherein said counting chain means includes one of said relays controlling five, two controlling two, and two controlling five of said seven circuits.

5. A circuit according to claim 2, further including seven unit code storing means comprising seven relays having self-locking means, and input circuits therefor.

6. For use with a source of intelligence carrying code impulses of the five unit or Baudot code type, an electric circuit for translating the five unit into a seven-unit code, having three marking elements comprising means for storing the five unit code impulses, counting chain means for counting the impulses of the five unit intelligence, means for storing the seven unit code impulses, code impulse distributor means operatively connected to said storing and said counting means, and means controlled by said five unit code storage means and said counting chain means for translating the five unit into the seven unit code including seven energization circuits for supplying impulses to said seven unit code storage means in accordance with the characters being supplied from said source.

7. A circuit according to claim 6, wherein said seven energizing circuits for said seven unit storing means include connections to ground that are partly controlled by said five unit storing means and partly by said counting chain means.

8. A circuit according to claim 6, wherein said translating means includes means to add and to subtract to the number of completed energization circuits as determined by the number and arrangement of the five unit code impulses to provide for the energization of three of said seven circuits.

9. A circuit according to claim 6, wherein said translating means includes means to energize combinations of three of said seven unit storage means in response to characters in Baudot code from said source.

10. For use with a source of intelligence carrying code impulses of the five unit or Baudot code type, an electric circuit for translating the five unit into a seven unit code having three marking elements, comprising means for storing the five unit code impulses including five self-locking relays, counting chain means for counting the number of impulses of the five-unit intelligence including five relays having self-locking circuit means, means for distributing the five unit intelligence code impulses to said five unit storing and said counting means, means for storing seven unit code impulses having seven energizing circuits, means for effecting grounding of five of said seven circuits controlled by said five storing relays and one of said counting relays, means for effecting grounding of five of said seven circuits controlled by three different of said five storing relays for each of said five circuits and by two of said counting relays, means for effecting grounding of two of said seven circuits controlled by two of said counting chain relays, means for simultaneously controlling the ground connection of all of said seven circuits operatively controlled by said distributing means, and a seven-unit-code output circuit for said seven unit storing means including distributing means associated with said seven relays, whereby any five unit code character activates three of said seven relays in a given arrangement.

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