ELECTRICAL ANSWERBACK SYSTEM FOR A TELEGRAPHIC TRANSPONDER

Inventors: Brian Michael Patience, Eastbourne; Alan Ernest Gane, Burgess Hill; Terence John Holland, Brighton, all of England

Assignee: International Standard Electric Corporation, New York, N.Y.

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ABSTRACT

A teletype recognition and identification system wherein a sending station transmits a known interrogation serial pulse code responsive to which one particular receiving station transmits a serial pulse code which identifies the one receiving station and distinguishes it from all other subscribers. Such equipments are conventionally at least partially electromechanical. This disclosure illustrates how the use of much of the expensive and troublesome mechanical equipment may be avoided. Apparatus is also provided by which the receiving station identification code may be changed any time by untrained personnel, this not having been possible in the past.
Fig. 1.
BACKGROUND OF THE INVENTION

This invention relates to systems for relaying identification data including, but not limited to, a Teletype "answer-back" system.

In the past it has been the practice for a sending station to transmit a binary serial pulse interrogation code to a receiving station. Typically, each character in a conventional Teletype system has a single corresponding serial pulse code called a character code herein. When the interrogation is made, receipt of the interrogation code becomes a command for the receiving station to transmit a predetermined number of character codes in succession to identify the receiving station and distinguish it from all of the other subscribers.

Typically, an interrogation code might be the successive transmission of the character codes for the letters W, R and U in that order. The letters WRU may thus represent the phrase "who are you."

After the message WRU is sent and received, the receiving station then, again in a serial binary pulse code, transmits to the sending station the call letters or characters identifying the receiving station, herein called the identification code.

Prior art systems of the above-described type employ electromechanical equipment which is expensive to construct and maintain. Moreover, trained personnel is required to change the identification code of a receiving station.

SUMMARY OF THE INVENTION

In accordance with the system of the present invention, the above-described and other disadvantages of the prior art are overcome by providing an electronic device having a plurality of stable states to select an identification code.

It is also an outstanding feature of the present invention that the device is connected to transmitting means by quick detachable electrical connectors including, but not limited to, jumper wires or conductive strips on a printed circuit board. The identification code of a receiving station may thus be changed by essentially untrained personnel.

The above-described and other advantages of the present invention will be better understood from the following detailed description when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings which are to be regarded as merely illustrative:

FIG. 1 is a block diagram of one embodiment of the present invention;

FIG. 2 is a schematic diagram of a translator shown in FIG. 1;

FIG. 3 is a block diagram of a transmitting unit shown in FIG. 1; and

FIG. 4 is a block diagram of an alternative embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the drawings, in FIG. 1, a transmitter 10 and receiver 11 are shown. Transmitter 10 and receiver 11 may be employed at a single location remote from the remainder of the apparatus shown in FIG. 1. If desired, transmitter 10 and receiver 11 may be a portion of an entirely conventional Teletype equipment. For example, transmitter 10 may have an output lead 12 on which binary metal pulse codes may be transmitted, each code being representative of a letter in a telegraph alphabet. If desired, transmitter 10 may produce on output lead 13, one pulse before the beginning of or after the end of a single binary code representative of a single letter or character.

A shift register 14 is connected from transmitter 10. Shift register 14 has code input at 15, a reset input at 16 and a shift input at 17.

A flip-flop is provided at 18 having a set "0" input at 19, a set "1" input at 20, a "0" output at 21 and a "1" output at 22.

The "1" output of the last bit in shift register 14 is connected to the set "0" input 19 of flip-flop 18 via a lead 23.

Lead 87 is connected to the set "1" input 20 of flip-flop 18. A source of potential 24 is provided with an electronic switch 25. Electronic switch 25 is operated by the connection of lead 13 from transmitter 10. Electronic switch 25 may be any conventional electronic switch such as a transistor, but may also be a relay or otherwise. Source 24 and switch 25 are connected in series from ground to the reset input 16 of shift register 14.

The "0" output 21 of flip-flop 18 is also connected to the reset input 16 of shift register 14. A one-shot multivibrator 26 is connected from the "1" output 22 of flip-flop 18 to the shift 17 of shift register 14. A combination of the "0" and "1" outputs of the bits in shift register 14 are connected to AND gate 27. This combination will depend upon what letter or group of letters or characters are employed to represent interrogation. For example, if each character is represented by a seven and one-half bit binary code, register 14 may contain 23 bits. If the interrogation code is WRU, the inputs to gate 27 will be appropriate to give an output when the codes for WRU are stored in register 14. At this point, a pulse will be impressed upon lead 23 to reset flip-flop 18. This is true because conventionally, the first bit in many teletype codes is always high.

A flip-flop 28 is provided having a set "1" input 29, a set "0" input 30, a "1" output 31 and a "0" output 32.

An oscillator 33 is also provided. Oscillator 33 has an input 34 connected from the "1" output 31 of flip-flop 28 and an output 35. Oscillator 33 produces a burst of pulses at its output 35 when the input 34 therefor is high. When the input 34 is low, oscillator 33 does not produce any pulses on its output lead 35.

Another shift register 36 is provided having a code input 37, a reset input 38 and a shift input 39.

The "1" output of each bit in shift register 36 is then connected to a translator 40. A lead 41 is then connected from transmitter 10 to the "0" input 30 of flip-flop 28. Lead 41 is, in fact, connected from the "1" output of the last bit in shift register 36, and could be shown connected directly from shift register 36, if desired.

As will be explained, translator 40 has a plurality of outputs connected to a transmitting unit 41. Transmitting unit 41 is also connected from the output 35 of oscillator 33.
The output of transmitting unit 41' is connected to receiver 11.

Translator 40 is shown in FIG. 2. Translator 40 and transmitting unit 41' both may be entirely conventional, if desired.

In FIG. 2, translator 40 is shown to have eight inputs from shift register 36. In many uses of the present invention, translator 40 will have 32 inputs from shift register 36, and will provide five outputs to transmitting unit 41'.

As shown in FIG. 2, translator 40 provides three outputs 42, 43 and 44 to transmitting unit 41'.

Translator 40 may be constructed in a known manner. Note will be taken that two to the power of three is equal to eight. Two to the power of five is equal to 32. Thus, in FIG. 2, relays 45, 46, 47, 48, 49, 50, 51 and 52 provide all possible combinations of contacts in the binary system. That is, the contacts of the relays shown in FIG. 2 are binary coded.

Note will be taken that relay contacts 45a, 47a, 49a and 51a are all connected to ground. Contacts 46a, 48a, 50a and 52a are all connected to a source of potential 53 and are, therefore, maintained at a potential above ground.

Contacts 45b, 46b, 49b and 50b are all maintained at ground potential. Contacts 47b, 48b, 51b and 52b are all connected to source 53.

Contacts 45c, 46c, 47c and 48c are all connected to ground. Contacts 49c, 50c, 51c and 52c are all connected to source 53.

From the foregoing, it will be appreciated that a different corresponding parallel binary code is provided on output leads 42, 43 and 44 responsive to the energization of a corresponding one of the relays 45--52, inclusive.

Transmitting unit 41' is shown in FIG. 3 including a one-shot multivibrator 54. A flip-flop 55 is also provided having a set "1" input 56, a set "0" input 57 and a "1" output 58.

Unit 41' also includes an oscillator 58, and six AND gates 60, 61, 62, 63, 64 and 65. Unit 41' also includes a shift register 66 having a shift input 67, and a serial output 68. An AND gate 69 is connected from the "0" outputs of each bit in shift register 66 to the set "0" input 57 of flip-flop 55.

The output of one-shot 54 is connected to the set "1" input 56 of flip-flop 55. The output of one-shot 54 also provides one of two inputs to each of the AND gates 60--65, inclusive. Only four of the AND gates 60--65 need be employed when there are only three outputs from translator 40. One AND gate, such as AND gate 60, is provided at each output of translator 40, and the output is connected to another input to each such AND gate. AND gate 65 is provided with an input from a source of potential 70.

Oscillator 59 may be identical to oscillator 33; provided, however, that the pulse repetition frequency (PRF) of oscillator 59 must be high enough for the code of a character to be serially transmitted between two immediately adjacent output pulses of oscillator 33.

The outputs of AND gates 60--65, inclusive, are impressed on the respective "1" inputs of the bits in shift register 66.

In accordance with a special feature of the invention, shift register 36 may be of the type shown in FIG. 4 including flip-flops 71, 72, 73, 74, etc. The "1" output of each of flip-flops 71--74 may be respectively connected to terminals 75, 76, 77 and 78. Translator 40 may have input terminals 79, 80, 81 and 82. Thus, jumpers 83, 84, 85 and 86 may be employed to connect corresponding output terminals of shift register 36 in certain input terminals of translator 40. Alternatively, one or more printed circuit boards may be employed to accomplish this same purpose. In either case, the identification code transmitted by unit 41' can thereby be changed by untrained personnel. This is an advantage because trained personnel were required to make any change in the identification code transmitted by unit 41', i.e., in the prior art.

In FIG. 1, switch 25 makes sure that each bit in register 14 is set to zero before the next succeeding binary coded character is inserted serially at input 15 to register 14.

Flip-flop 18 automatically resets all the bits in register 14 to zero when the last bit goes to one. Transmitter 10 produces an output pulse on lead 87 each time a binary bit is transmitted over lead 12.

A differentiator 88 is connected from the "0" output 32 of flip-flop 28 in FIG. 1 to the reset input 38 of shift register 36.

Differentiator 88 has a junction 89 connected to the code input 37 of shift register 36. A capacitor 90 is connected from the "1" output 31 of flip-flop 28 to junction 89. A resistor 91 is connected from junction 89 to ground.

**OPERATION**

In the operation of the invention shown in FIGS. 1--4, inclusive, a serial binary code is impressed upon shift register 14 and entered bit by bit therein. The entry is made into the left-hand bit or flip-flop. After such entry, all bits are shifted from left to right. Shift register 14 thus has a length which is adequate to contain enough character codes for the interrogation message, e.g., for the codes for the letters WRU. As stated previously, the message WRU or the equivalent thereof is called the interrogation code therein. Entry of each serial bit is made at the input 15. Shift of the bits is made when a pulse is received upon input 17.

Gate 27 sets flip-flop 28 when the interrogation code has been entered in register 14. A "1" is then set in the first or left-hand bit in shift register 36 through differentiator 88 which is connected from the "1" output 31 of flip-flop 28. The "1" so inserted into shift register 36 is then shifted in position, bit by bit, to the right end of shift register 36. Shift register 36 thus acts as a portion of a ring counter which may be entirely conventional.

In accordance with the foregoing, only one of the outputs of shift register 36 impressed upon translator 40 is high at one time. Thus, only one of the relays 45--52, inclusive, is energized at one time. The code at the outputs 42, 43 and 44 of translator 40 is then a parallel binary code corresponding to a single character. This single binary code is then converted to a serial binary code by transmitting unit 41', and then transmitted to receiver 11.

The outputs of shift register 36 are high in succession. It is, therefore, possible to transmit eight different binary codes on the outputs 42, 43 and 44 of translator 40 in succession. Again, in succession, each parallel binary code is converted to a serial binary code and transmitted by transmitting unit 41'.
Which parallel binary codes are impressed upon transmitting unit 41', and in which order depends upon which terminals the jumpers 83, 84, 85 and 86 connect in FIG. 4.

In FIG. 1, the burst of pulses at the output of oscillator 33 performs the shift function in shift register 36.

A plurality of pulses are produced by oscillator 59 in response to a single pulse at the output of oscillator 33.

In FIG. 3, one-shot 54 receives the output of oscillator 33 and gates flip-flop 55 in turn on oscillator 59. The output pulses of oscillator 59 shift the character stored in register 66 by AND gates 60–65, inclusive. The character stored in register 66 is thus determined by the parallel binary code at the output of translator 40. The right-hand or last bit in register 66 always stores a "1," this being conventional for many types of Teletype equipment. The pulses supplied by oscillator 59 shift the character used in register 66 serially out thereof on lead 68. Hence, all the bits in register 66 will eventually return to the "0" state which is detected by AND gate 69. AND gate 69 then resets flip-flop 55.

Although relays have been shown in FIG. 2, note will be taken that diode and other gates may be substituted therefor and integrated circuits may be employed in pulses or all of the apparatus disclosed herein.

Note will be taken that only a portion of teletype equipment has been disclosed herein. Other portions may be, if desired, entirely conventional. For example, a teletype equipment generally has a translator and transmitting unit which are connected from apparatus including a teletypewriter keyboard. The present invention may be employed with the same. Further, it is not necessary to duplicate the translator 40 and transmitting unit 41' in a conventional teletypewriter to practice the present invention. All that is necessary is for one to connect the output of the shift register 36 to the translator already provided.

What is claimed is:

1. A telegraphic transponder or the like comprising: first means at a first location for receiving a first predetermined interrogation serial pulse code incoming from a second location, receipt of said first predetermined interrogation pulse code by said first means acting as an interrogation of said first means as to what a second predetermined serial code of said first means is; second means connected from the output of said first means for producing a first pulse at its output each time said first code is received by said first means; a first burst oscillator connected from the output of said second means, said first oscillator being responsive to said first pulse of said second means for producing a serial pulse train of a plurality of second pulses; a digital pulse counter connected from the output of said first oscillator, said counter being adapted to count the output pulses of said first oscillator, said counter having a plurality of stable states and changing from one to the next on receipt of a second pulse; third means connected from the output of said counter for developing said second serial pulse code corresponding respectively to at least one stable state of said counter; and fourth means connected from the output of said third means to transmit said second pulse code serially to said second location.

2. The invention as defined in claim 1, wherein said counter is a plurality of output conductors, said third means having a plurality of input conductors, and quick detachable electrical connector means connecting at least two of said input conductors to the same one or to two different respective ones of the said output conductors.

3. The invention as defined in claim 2, wherein said second means includes a first shift register having a plurality of bits wherein and having a binary digital serial code input, a reset input, a shift input, and a "1" output from the last bit therein, a first flip-flop having a set "1" input connected to receive said first code, the "0" output of said first flip-flop being connected to said first register reset input, a first one-shot multivibrator connected from the "1" output of said first flip-flop to said first register shift input, said first register code input being connected to receive said first code, said first shift register "1" output from the last bit therein being connected to the set "0" input of said first flip-flop, a first AND gate connected from the bit outputs of said first shift register corresponding to said first code, a second flip-flop having a set "1" input connected from the output of said first AND gate, a second burst oscillator, a second shift register having a plurality of bits and having a set "1" input for the first bit, a shift input, a reset input, and a "1" output from the last bit thereof, the "1" output of said second register last bit being connected to the set "0" input of said second flip-flop, said second oscillator being connected from the "1" output of said second flip-flop to produce a burst of pulses during the high excursion thereof, the output of said second oscillator being connected to said shift input of said second register, the "0" output of said second flip-flop being connected to the reset input of said second register, a differentiator connected from the "1" output of said second flip-flop to the set "1" input of the first bit in said second register, said third means being connected from the "1" outputs of the bits in said second register, said fourth means being connected from the output of said third means and from the output of said second oscillator.

4. The invention as defined in claim 3, wherein said third means includes at least two inputs from said second register and two outputs to said fourth means, said third means being adapted to provide a parallel binary code at the outputs thereof corresponding to which of the inputs thereto is high, said fourth means including a third shift register having a shift input, a plurality of second AND gates connected respectively from the outputs of said third means to enter the said parallel code into said third register, a third flip-flop, a second one-shot multivibrator connected from the output of said first oscillator to the set "1" input of said third flip-flop, a second AND gate connected from the "0" outputs of said third shift register hits to the set "0" input of said third flip-flop, a third burst oscillator of a frequency at least double that of said second oscillator, said third oscillator being connected to the shift input of said third register, each of said second AND gates having an additional input connected from the output of said second one-shot multivibrator.