

May 24, 1949.

J. B. MOORE

2,471,076

PRINTING TELEGRAPH SYSTEM

Filed May 23, 1945

2 Sheets-Sheet 1

COLUMN I					COLUMN II					COLUMN III					COLUMN IV				
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
+	+	+	0	0	-	-	-	0	0	0	+	+	+	0	0	-	-	-	0
+	+	0	+	0	-	-	0	-	0	0	+	+	0	+	0	-	-	0	-
+	+	0	0	+	-	-	0	0	-	0	+	0	+	+	0	-	0	-	-
+	0	+	+	0	-	0	-	-	0	0	+	+	-	0	0	-	-	+	0
+	0	+	0	+	-	-	0	-	0	0	+	+	0	-	0	-	-	0	+
+	0	0	+	+	-	-	0	0	-	0	+	0	+	-	0	-	0	-	+
+	+	-	0	0	-	-	-	+	0	0	+	-	+	0	0	-	+	-	0
+	+	0	-	0	-	-	-	0	+	0	+	-	0	+	0	-	+	0	-
+	+	0	0	-	-	-	-	0	0	+	+	0	-	+	0	-	0	+	-
+	0	+	-	0	-	-	0	-	+	0	+	-	-	0	0	-	+	+	0
+	0	+	0	-	-	-	0	-	+	0	+	-	0	-	0	-	+	0	+
+	0	0	+	-	-	-	0	0	-	+	+	0	-	-	0	-	0	+	+
+	-	+	0	0	-	-	+	-	0	0	+	+	+	+	0	0	-	-	-
+	-	0	+	0	-	-	+	0	-	0	0	+	+	-	0	0	-	-	+
+	-	0	0	+	-	-	+	0	0	0	+	+	-	+	0	0	-	+	-
+	0	-	+	0	-	-	0	+	-	0	+	-	-	0	0	-	+	+	0
+	0	-	0	+	-	-	0	+	0	0	+	+	-	+	0	0	-	-	+
+	0	0	-	+	-	-	0	0	+	0	+	-	-	0	0	-	+	+	+
+	-	0	0	-	-	-	+	+	0	0	+	+	+	+	0	0	-	-	-
+	-	0	-	0	-	-	+	0	+	0	+	+	-	+	0	0	-	-	+
+	-	0	0	-	-	-	+	0	0	+	+	-	+	+	0	0	-	+	-
+	0	-	-	0	-	-	0	+	+	0	+	-	-	0	0	-	+	+	+
+	0	-	0	-	-	-	0	+	0	+	-	-	-	0	0	-	+	+	+
+	0	0	-	-	-	-	0	0	+	+	-	-	-	0	0	-	+	+	+

24 COMBINATIONS INVERSE OF COLUMN I

16 COMBINATIONS INVERSE OF COLUMN III

+ "MARK" FREQUENCY
0 "NEUTRAL" FREQUENCY (CARRIER)
- "SPACE" FREQUENCY

TOTAL No. OF COMBINATIONS 2X (24+16)=80

Fig. 1

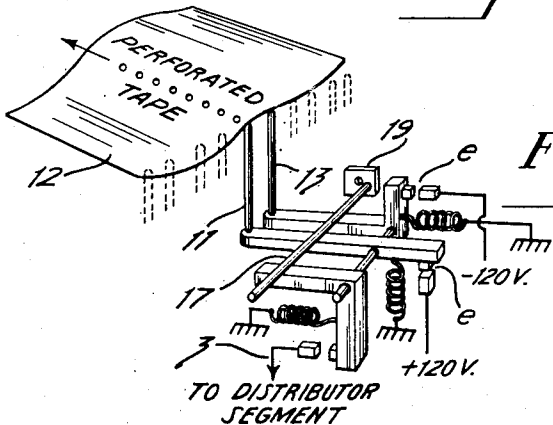


Fig. 3

INVENTOR.
John B. Moore
BY H. S. Brover
ATTORNEY.

May 24, 1949.

J. B. MOORE

2,471,076

PRINTING TELEGRAPH SYSTEM

Filed May 23, 1945

2 Sheets-Sheet 2

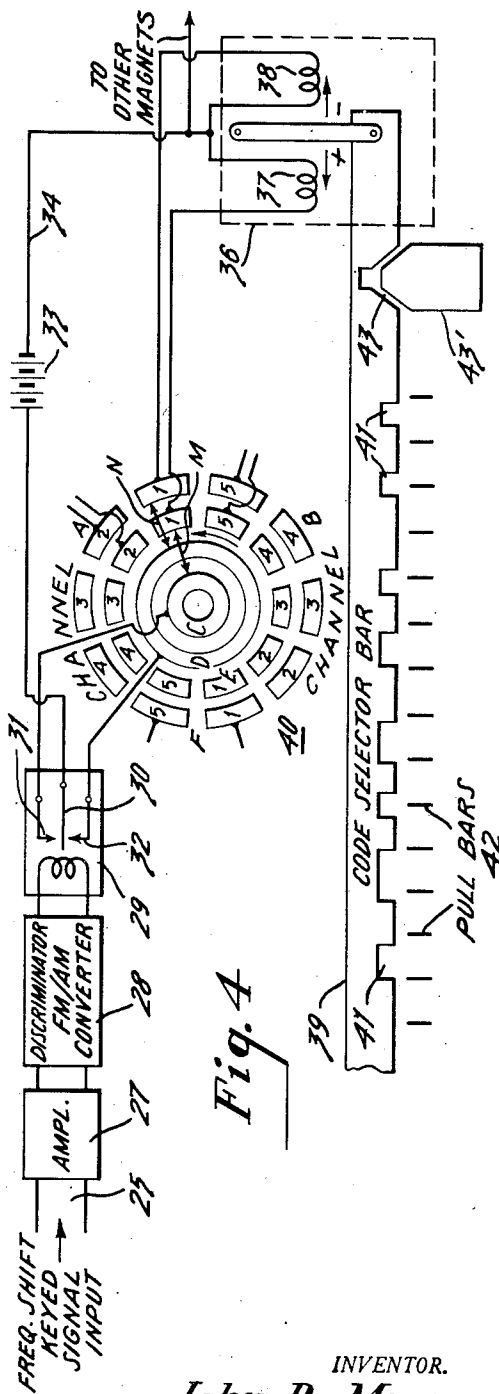
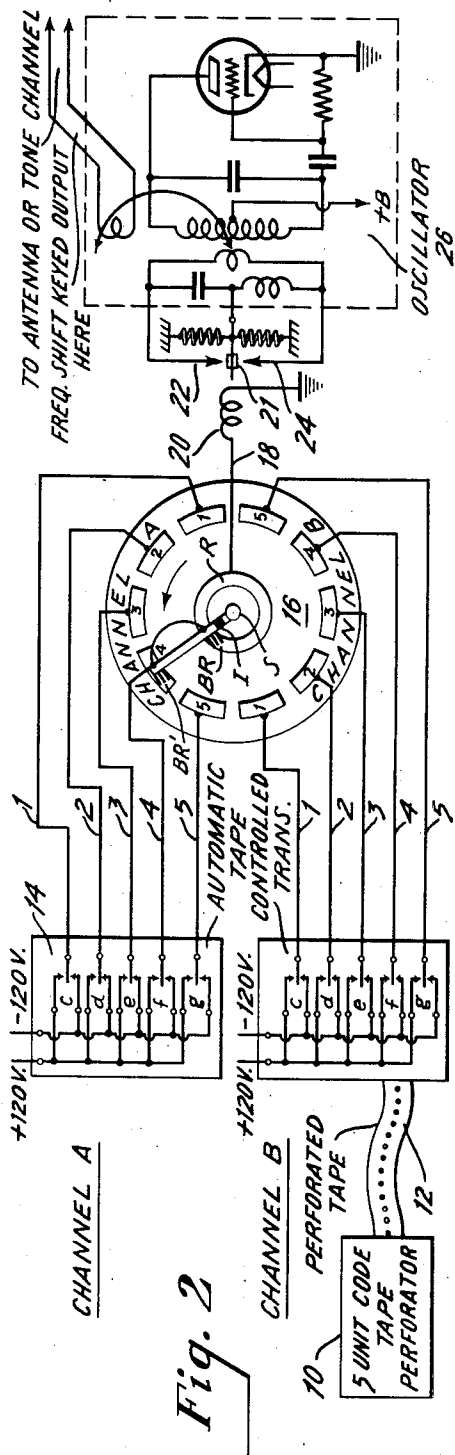


Fig. 4

INVENTOR.
John B. Moore
BY
H. S. Snover
ATTORNEY.

UNITED STATES PATENT OFFICE

2,471,076

PRINTING TELEGRAPH SYSTEM

John B. Moore, Brooklyn, N. Y., assignor to
Radio Corporation of America, a corporation
of Delaware

Application May 23, 1945, Serial No. 595,303

9 Claims. (Cl. 178—4)

1

This invention relates to printing telegraph systems and apparatus, and more particularly to such as use the five-unit or five-element Baudot code.

Heretofore, radio and land line printing telegraph systems employing the five-unit code have used either on-off keying of a carrier or plus (+) and minus (−) keying of a direct current for the elements of the code. Stated in other words, it has been the custom to transmit either current or no current, or positive and negative direct currents for the different elements of the five-unit code. The inherent limitation imposed by only two conditions of signal have limited the possibilities of printer operation on a channel of specified electrical bandwidth. This has resulted in a presently used (conventional) five-unit printer code which provides a total of only 32 possible combinations, and an error-indicating seven-unit code which provides only 35 possible combinations. These codes both permit of only a three-bank typewriter keyboard instead of the standard typewriter keyboard of four banks or rows of keys. Experience has shown that the three-bank keyboard does not satisfactorily meet the needs of the telegraph industry and the business world.

The present invention provides a telegraph system which makes use of three conditions of signal in the use of the five-unit code, thus providing eighty different possible code combinations or characters. This is achieved by employing an oscillator and using the unmodulated or "neutral" frequency in the absence of actual signalling, while shifting the frequency of oscillation either above or below the unmodulated condition in accordance with the code when signalling commences. The invention permits the use of not less than four rows or banks of keys on the transmitting printer apparatus and enables the printer equipment to be at least equivalent to the standard typewriter.

The apparatus of the invention employs polarized direct current relays which have a neutral position in addition to the plus (+) and minus (−) positions. These polarized relays may be of the conventional electromechanical type or a special design, for example, an electronic equivalent. Where tape transmission is employed in the invention, then the tape perforator and the tape transmitter each require ten pins, i. e., five pairs of pins. The perforator will use ten punch pins to perforate the tape, while the tape transmitter will use the ten pecker-pins for cooperation with the perforations punched in the tape.

2

The two pins of each pair are assigned to each unit or element of the five-unit code, one pin for the plus impulse and the other for the minus impulse. The absence of perforations in the tape at the location assigned to one pair of pins of the transmitter produces the unmodulated or neutral condition of signal for that time element or unit.

In the receiving printer of the invention, all code bars are normally in the neutral (middle) position. A selecting impulse moves the code bar either to the left or to the right from its neutral position through the medium of a suitable magnet system. In this receiving printer, there are five different magnet systems for the five different units or elements of the five-unit code. The direction of movement of the magnet, and hence of the code selector bar, is determined by the sign (sense or frequency) of the received selecting impulse. Restoration of the code bars to their neutral position is accomplished by a wedge or V-shaped member driven into correspondingly positioned V-shaped cuts in the code bars. Such restoring action takes place in a manner similar to that occurring in the normal sequence of operation in conventional printer apparatus.

The present invention utilizing the principle of three conditions of signal in the five-unit code is applicable to either radio or land line printing telegraph service in which frequency-shift keying is utilized.

A more detailed description of the invention follows in conjunction with drawings, wherein:

Fig. 1 illustrates code charts showing the different combinations possible with the code of the invention, as applied to a five-unit code;

Fig. 2 illustrates the apparatus of a transmitting station in accordance with the invention, suitable for use with my new code;

Fig. 3 illustrates, by way of example only, one arrangement which the five pairs of pecker pins in the tape transmitter of Fig. 2 may take for cooperation with the advancing perforated tape;

Fig. 4 illustrates one arrangement of the receiving printer apparatus of the invention, capable of receiving the signals transmitted by the transmitting apparatus of Fig. 1.

Referring to Fig. 1 in more detail, there are shown four code charts labeled columns I, II, III and IV showing a total of eighty different code combinations possible with the five-unit code of the invention. The reference numerals 1 to 5 at the top of each column represent five different units or elements of the code. The plus (+)

3

sign represents the "mark" signal condition; the minus (—) sign represents the "space" signal condition, while the 0 sign represents the "neutral" signal condition. Thus, the 0 sign may indicate the unmodulated (neutral) carrier frequency condition produced by an audio tone or radio frequency oscillator, while the plus and minus signs may indicate the frequencies on both sides of the unmodulated carrier which are produced by shifting the frequency of the oscillator to one side or the other in accordance with the particular sense or sign of the code unit or element. It should be noted that all code combinations contain three selecting elements and two non-selecting elements.

If desired, the invention may be utilized with receiver printers equipped with error indicating mechanism for producing a characteristic indication whenever more or fewer than three selecting impulses are received per code combination. Such error indicating mechanism is described in my Reissue Patent No. 22,394, granted November 23, 1943, and in my copending application Serial No. 548,206, filed August 5, 1944, now abandoned.

Columns I and II each contain twenty-four different code combinations or characters which are the inverse of each other. Columns III and IV each contain sixteen different code combinations or characters which are the inverse of each other. If it is desired to avoid the use of inversions (complementary combinations), then the code charts of column I and III or II and IV only can be used. It should be noted from an inspection of the charts of Fig. 1 that sixty of the eighty possible combinations contain three conditions of signal, while others contain two conditions of signal. Obviously, if desired, the code can be set up to use only the sixty code combinations containing the three conditions of signal.

In view of the greater number of code combinations available in the code of the invention as compared to the conventional five-unit code, it is possible to transmit a practical maximum of intelligence for a given number of time elements per code combination and for a given band width of the communication channel, and to more completely realize the full possibilities of frequency-shift keying.

Fig. 2 shows a two-channel or duplex transmitting arrangement for utilizing the five-unit code in accordance with the invention. Although apparatus for two channels are shown, it should be understood that, if desired, only one channel may be used. Two or more channels are preferred, however, because they permit the use of local functions in the apparatus, such as tape advance or type-bar operation in one channel during selection on the other channel.

It should be understood that the apparatus of Fig. 2 utilizes standard practice applied to start-stop printer telegraph systems, except as modified in the manner described herein, and for this reason only those features are described which are essential to an understanding of the operation of the invention.

Channels A and B each include a five-unit code tape perforator 10 having five pairs of punch pins for punching perforations in an advancing tape 12 in accordance with the code characters of the signal to be transmitted. Each unit or time element of the five-unit code has one pair of punch pins assigned to it in the tape perforator and these pins are controlled by suitable punch magnets, in turn controlled by the printer keys. The perforated tape 12 is fed into an automatic

4

tape-controlled transmitter 14 which is also provided with five pairs of pecker pins, one pair for each unit or time element of the five-unit code. The positions of pecker pins are arranged to correspond to the positions of the punch pins in the perforator 10 in relation to the tape 12. Thus, if the tape 12 is perforated such that all holes are in a straight line transverse to the direction of movement of the tape, then the pecker pins of tape transmitter 14 should also be arranged in a straight line transverse to the moving tape. This is shown in Fig. 3. Alternatively, the holes in the tape 12 can be arranged in two straight parallel lines extending transversely of the direction of the moving tape, in which case the five pairs of pecker pins in the tape-controlled transmitter should also be arranged correspondingly in two straight parallel lines of five pins each, with the pins of each pair being arranged in different lines. In this last case, the tape should be advanced by the sprocket (star wheel) drive two center holes for each code character.

Each tape-controlled transmitter 14 is provided with contacts *c, d, e, f, and g* which are controlled by the tape and these contacts serve to supply either positive 120 volts direct current, negative 120 volts direct current, or no current at all to the leads 1, 2, 3, 4, and 5 extending to the similarly designated segments on the distributor 16, which are assigned to that particular channel.

Fig. 3 illustrates how the five pairs of pecker pins of the automatic tape controlled transmitter 14 are arranged in a single straight line transverse to the advancing tape 12 when the perforations in the tape are similarly positioned. Only one pair of pecker pins 11, 13 have been shown in some detail in order to illustrate the manner in which the pins are pivoted and arranged to close contacts *e* whenever the pins pass through the perforations in the tape. The pins are permitted to project through the perforations in the tape when the tape is in position for a code signal to be sent out. If pin 11 projects through a perforation, then an obvious circuit is closed to pass positive direct current from source +120 volts over lead 3 to the distributor segment 3. Similarly, if pin 13 projects through a perforation, then an obvious circuit is closed to pass negative direct current from source -120 volts over lead 3. If neither pin 11 nor 13 projects through a perforation, then the circuit through lead 3 is open and no current passes to the distributor over lead 3. Upon completion of the transmission of a code signal, the pins 11 and 13 (and the other pecker pins as well) are withdrawn from the tape downwardly under control of a member 17 secured to a cam 13. The star or ratchet wheel for feeding the perforated tape is not shown since this feature follows standard practice, but this feed mechanism and the movement of member 17 are correlated to the speed of rotation of the brush arm on distributor 16, in turn synchronized with the distributor in the receiver apparatus of Fig. 4.

Distributor 16 is provided with five spaced segments 1 to 5 for each channel A or B, and these are located on a single circle. There also are provided such other segmented rings as are required to fulfill known functions according to standard practice. Those other rings and segments on the distributor which do not relate to the invention have not been shown. The distributor 16 is also provided with a solid ring R to which are electrically connected brushes BR and BR'. These brushes are directly connected

5

together and are secured to a movable arm which is driven in the direction of the arrow by a shaft S driven by a motor (not shown). Brush BR makes continuous contact with ring R, while brush BR' makes contact with the different spaced segments 1 to 5 of each channel as the brush arm rotates. The brush arm is insulated from the shaft S by insulation I.

The speed of rotation of the brush arm is correlated to the operation of the automatic tape-controlled transmitters so that the segments of the distributor assigned to each channel are all swept over by the brush BR' once for each code character or combination of that channel.

The output from the distributor is taken off by lead 18 which is connected to polarized direct current relay 20. The armature 21 of relay 20 remains in a neutral position midway between contacts 22 and 24 unless pulled over to engage one of these contacts or the other. A positive current derived from a particular segment on the distributor and applied to relay 20 from lead 18 will cause the armature 21 to engage one of the contacts, let us say 22, while a negative current applied to relay 20 will cause armature 21 to engage contact 24. In the absence of current on lead 18, the armature 21 will return to its neutral or midway position between both contacts.

Polarized relay 20 serves to shift the frequency of an oscillator 26 to one side or the other of a mid frequency. Oscillator 26 is designed to generate a tone in the audio frequency range if the system of the invention is to be used on land lines, but is designed to generate radio frequency waves if the system of the invention is to be used in a radio system having an antenna. When the relay 20 is unenergized, the oscillator 26 generates a carrier frequency representative of the neutral signal condition and indicated by the 0 (zero) designation on the code charts of Fig. 1. When the relay 20 is energized with a positive current representative of the mark signal condition and indicated by the plus designation on the code charts of Fig. 1, the frequency of the oscillator is shifted in one direction a desired amount above (or below) relative to the unmodulated carrier (neutral position). When the relay 20 is energized with a negative current representative of the space signal condition and indicated by the minus designation on the code charts of Fig. 1, the frequency of the oscillator is shifted in the other direction a desired amount below (or above) relative to the unmodulated carrier (neutral position). The frequency shifts of the oscillator for the mark and space signal conditions are preferably equal on both sides of the unmodulated carrier.

Fig. 4 schematically illustrates only those details of the receiving system necessary for an understanding of its operation. The frequency-shift-keyed, five-unit-code signal combinations sent out by the system of Fig. 1 are received from leads 25 and applied to an amplifier 27. If the system of the invention utilizes land lines as a transmission medium between the transmitter and the receiver, then the signals on leads 25 will be a tone in the audio frequency range. If, however, the system of the invention provides radio service, then the signals on leads 25 will comprise radio frequency waves. In this last case, leads 25 can be fed by a suitable antenna circuit. Amplifier 27 feeds a suitable discriminator circuit whose output, in the form of direct current, controls a direct-current polarized re-

6

lay 29. Discriminator 28 serves to convert the received frequency-shift-keyed signals of an alternating current character to direct current, and supplies the winding of relay 29 with a positive direct-current voltage or a negative direct-current voltage, or no voltage, depending upon the characteristics of the time elements of the received code combinations constituting the five-unit code.

Polarized relay 29 has its armature 30 normally maintained in a position midway between its two contacts. The energization of the relay winding by a positive direct current will cause the armature to move in one direction, while the application of a negative direct current to the winding will cause the armature to move in an opposite direction. In the absence of current applied to the relay winding, the armature will remain in or return to a neutral position midway between the contacts 31 and 32, as shown. Armature 30 is connected to the positive terminal of a battery 33 whose negative terminal is connected in common, via lead 34, to the five polarized magnets 35 of each five-unit code receiver printer.

The receiving apparatus is also provided with a distributor 40 having two solid rings C and D and two segmented rings E and F. Each of the segmented rings E and F are provided with ten equal length spaced segments, there being five segments provided for each of the channels A and B. The five upper segments on each of the rings E and F are assigned to channel A, while the five lower segments on these same rings are assigned to channel B. Solid ring C is connected to contact 31 of polarized relay 29, while solid ring D is connected to contact 32 of polarized relay 29. Suitable brush carrying arms M and N individually connect solid rings C and D to segmented rings E and F, respectively. These arms are only shown diagrammatically and are driven in the direction of the arc-shaped arrow by means of a rotatable shaft, not shown, to thereby electrically connect the rings C and D sequentially with the individual segments of the rings E and F.

The five upper spaced segments designated 1 to 5 of rings E and F are connected to the five different code-selector-bar control magnets 36 of the receiver printer of channel A, while the five lower spaced segments 1 to 5 of rings E and F are connected to the five different code-selector-bar control magnets of the receiver printer of channel B. The same numbered segments of the rings E and F for the same channel are connected to different windings of the same code-selector-bar magnet in its associated receiver printer, as shown.

Only one magnet has been shown as part of the receiver printer, but it should be understood that there are other such magnets and their individually associated code-selector-bars in the receiver printer. Each receiver printer is provided with individual magnets for the five time elements or units of the five-unit code. Since the duplication of elements follows standard practice, it is not deemed necessary to show more than one magnet system. Each polarized magnet 36 is provided with two windings 37 and 38 to control the movement of its code selector bar 39 in either of two directions, depending upon which magnet winding is energized. The energization of magnet winding 37 will pull code selector bar 39 to the left, while the energization of magnet

winding 33 will pull code selector bar 39 to the right. When there is no current applied to either magnet winding, the code selector bar 39 will remain in its normal or reset position.

During the reception of a code signal combination, in accordance with the invention, in which three selecting elements are employed, three code selector bars 39 will be moved longitudinally so as to bring into alignment certain notches 41 into which a selected pull bar 42 will drop. The pull bars are at right angles to the five code-selector bars. Each code-selector bar is provided with a V-shaped cut 43. In this V-shaped cut 43 there is lodged a wedge or V-shaped solenoid- or magnet-operated member 43' which functions to re-set all code-selector bars 39 to their neutral or normal position after each selection has been made and a letter printed in the receiver.

The speed of the distributor 40 is synchronized with, and has the same speed as, distributor 16 at the transmitting end of the system. Thus, the time duration of a brush arm in passing over a segment of the distributor 16 is correlated to the time interval of one of the units of the five unit code.

At this time it should be noted that apparatus 27, 28, 29, 33 and 40 are common to the receiver printers of both channels.

For the purpose of exposition, let it be assumed that the brush arms of distributor 40 are on the number 1 segments, as shown, and that the sense of the signal character received at that particular moment is such as to cause polarized relay 29 to close contacts 30 and 32. A circuit will then be completed over a path from the positive terminal of battery 33, over contacts 30 and 32 of relay 29, solid ring D, brush arm N, segment 1 of segmented ring F, through winding 38 of polarized magnet 36 and lead 34 back to the negative terminal of battery 33. This closed circuit will energize winding 38 and cause the magnet 36 to pull code selector bar 39 to the right. If, however, it is assumed that the sense of the received signal is such as to operate relay 29 to close contacts 30 and 31 at the particular moment when the distributor 40 is in the position illustrated, then a circuit will be completed over a path including solid ring C, brush arm M and winding 37 of magnet 36 to cause the code selector bar 39 to be pulled to the left. The continued receipt of signals while the distributor brush arms are rotating will cause the polarized relay 29 to assume different contact positions in accordance with the sense of the signals and hence set up the control magnets in the receiver printers to print the desired letter.

The principles of the invention are equally applicable to a four-unit printer code, although it should be understood that by reducing the total number of time elements per character to four, in place of five, it is possible to obtain thirty-two combinations and to transmit five-fourths times as many words per minute over existing channels compared to the conventional five-unit on-off code, at the same keying speeds in bands. This five-fourths increase in words per minute requires no increase in channel width.

What is claimed is:

1. A printing telegraph system for transmitting intelligence by means of an m -unit code, the individual elements of which comprise one of three predetermined conditions of signal, comprising an m -unit-code tape perforated in accordance with the code combinations to be transmitted, an m -unit-code automatic tape-controlled trans-

mitter fed with said tape and having m pairs of pins for cooperation with the perforations in said tape, the pins in said tape-controlled transmitter being arranged in similar relation to the perforations in said tape, said tape-controlled transmitter having m pairs of contacts controlled by its m pairs of pins, a distributor having m different connections for operative association with the m different pairs of contacts of said tape-controlled transmitter, and means in said tape-controlled transmitter for supplying each connection with a positive voltage when one contact of its associated pair of contacts is closed, with a negative voltage when the other contact of its associated pair of contacts is closed, and with no voltage when neither contact of its associated pair is closed, an oscillator, means in circuit with said oscillator and under control of the output from said distributor for changing its frequency of operation to a second frequency when a positive voltage is supplied by said distributor and to a third frequency when a negative voltage is supplied by said distributor, means for transmitting signal waves of said three different frequencies, receiving apparatus including frequency responsive means for converting the received signal waves to three conditions of signal constituting positive, negative and no current, a receiving distributor having m pairs of contacts coupled to said converting means, and a printer having m selector bars and associated therewith m polarized code-selector-bar magnets corresponding to the m units of the code coupled to said receiving distributor, said magnets controlling different code selector bars to cause said bars to assume any one of three different positions corresponding to said positive, negative, and no current conditions of signal.

2. A printing telegraph system for transmitting intelligence by means of a fixed-unit-code, the individual elements of which comprise one of three predetermined conditions of signal, comprising a tap perforated in accordance with the code combination to be transmitted, the perforation pattern of said tape being arranged in pairs of perforations, one of said perforations representing one of said conditions of signal, the other of said perforations representing another of said conditions of signal and the absence of said perforations representing a further condition of signal, a tape-controlled transmitter fed with said tape and having pairs of pins for cooperation with the perforations in said tape, the pins in said transmitter being arranged in relation to the pairs of perforations in said tape, said transmitter having pairs of contacts controlled by each of its pairs of pins, a distributor having different connections for operative association with the different pairs of contacts of said tape-controlled transmitter, an oscillation generator having a frequency determining circuit, an output circuit for said generator, a polarized relay having a winding controlled by the output from said distributor and a pair of contacts connected to different points on said frequency determining circuit, said polarized relay being responsive to one of said conditions of signal from said distributor to cause said generator to change its frequency in one direction from its normal carrier frequency and being responsive to another of said conditions of signal from said distributor to cause said generator to change its frequency in an opposite direction from its normal carrier frequency whereby said generator supplies three conditions

of signal frequency to said output circuit, transmission means coupled to said output circuit, frequency detecting means coupled to said transmission means for developing one current corresponding to one condition of signal frequency, a second current corresponding to another condition of signal frequency, and no current corresponding to a further condition of signal frequency, polarized relay means coupling said detecting means to a printer having polarized code-selector-bar magnets corresponding to the units of said code, said magnets controlling different code-selector bars in said printer to cause said bars to assume one of three different positions corresponding to said three conditions of signal, each of said code-selector bars having a V-shaped slot therein, and a V-shaped solenoid-operated mechanism for re-setting said bars to normal after each selection and printing operation.

3. Printing telegraph transmitting apparatus for transmitting intelligence from a transmitting tape having five-unit-code perforations in accordance with the code combination to be transmitted, comprising a five-unit-code automatic tape-controlled transmitter fed with said tape and having five pairs of pins for cooperation with the perforations in said tape, the pins in said tape-controlled transmitter being arranged in similar relation to the perforations in said tape, said tape-controlled transmitter having five pairs of contacts controlled by its five pairs of pins, a distributor having five different connections for operative association with the five different pairs of contacts of said tape-controlled transmitter, and means in said tape-controlled transmitter for supplying each connection with a positive voltage when one contact of its associated pair of contacts is closed, with a negative voltage when the other contact of its associated pair of contacts is closed, and with no voltage when neither contact of its associated pair is closed.

4. Printing telegraph transmitting apparatus for transmitting intelligence from a transmitting tape having five-unit-code perforations in accordance with the code combination to be transmitted, comprising a five-unit code automatic tape-controlled transmitter fed with said tape and having five pairs of pins for cooperation with the perforations in said tape, the pins in said tape-controlled transmitter being arranged in similar relation to the perforations in said tape, said tape-controlled transmitter having five pairs of contacts controlled by its five pairs of pins, a distributor having five different connections for operative association with the five different pairs of contacts of said tape-controlled transmitter, an oscillator, and means in circuit with said oscillator and under control of the output from said distributor for changing its frequency of operation to a second frequency when a positive voltage is supplied by said distributor and to a third frequency when a negative voltage is supplied by said distributor.

5. Printing telegraph transmitting apparatus for transmitting intelligence from a transmitting tape having five-unit-code perforations in accordance with the code combination to be transmitted, comprising a five-unit-code automatic tape-controlled transmitter fed with said tape and having five pairs of pins for cooperation with the perforations in said tape, the pins in said tape-controlled transmitter being arranged in similar relation to the perforations in said tape, said tape-controlled transmitter having five pairs of contacts controlled by its five pairs of pins, a

distributor having five different connections for operative association with the five different pairs of contacts of said tape-controlled transmitter, an electron discharge device oscillation generator having a frequency determining circuit, an output circuit for said oscillator, a polarized relay having a winding controlled by the output from said distributor and a pair of contacts connected to different points on said frequency determining circuit, said polarized relay being responsive to a positive voltage from said distributor to cause said oscillator to change its frequency in one direction from its normal carrier frequency and being responsive to a negative voltage from said distributor to cause said oscillator to change its frequency in an opposite direction from its normal carrier frequency, whereby said oscillator supplies three conditions of signal to said output circuit.

6. In a receiving station for receiving from a transmitting station sending five-unit-code combinations having three conditions of signal, a receiver printer having five polarized code-selector-bar magnets corresponding to the five units of the code, a distributor having different segments connected to different ones of said magnets, individual code-selector bars for said magnets, said magnets controlling different code-selector bars in said receiver printer to cause said bars to assume any one of three different positions corresponding to said three conditions of signal.

7. In a five-unit-code signaling system wherein the code combinations make use of three conditions of signal, a receiver printer having five polarized code-selector-bar magnets corresponding to the five units of the code, a distributor having different segments connected to different ones of said magnets, individual code-selector bars for said magnets, said magnets controlling different code-selector bars in said receiver printer to cause said bars to assume any one of three different positions corresponding to said three conditions of signal.

8. In a five-unit-code signaling system wherein the code combinations make use of three conditions of signal, a receiver printer having five polarized code-selector-bar magnets corresponding to the five units of the code, a distributor having different segments connected to different ones of said magnets, individual code-selector bars for said magnets, said magnets controlling different code-selector bars in said receiver printer to cause said bars to assume any one of three different positions corresponding to said three conditions of signal, each of said code-selector bars having a V-shaped slot therein, and a V-shaped solenoid-operated mechanism for re-setting said bars to normal after each selection and printing operation.

9. In a telegraph system having printing telegraph transmitting apparatus comprising a five-unit-code transmitter supplying three conditions of signal for different code combinations and means for converting said three conditions of signal to waves of three different frequencies, receiving apparatus including means for converting the received code combinations to three conditions of signal constituting positive, negative and no current, and a receiver printer having five polarized code-selector-bar magnets corresponding to the five units of the code, a distributor having different segments connected to different ones of said magnets, individual code-selector

11

bars for said magnets, said magnets controlling different code selector bars to cause said bars to assume any one of three different positions corresponding to said positive, negative, and no current conditions of signal and pull bars selectively positioned in coded slots in said code selector bars dependent on the position thereof.

JOHN B. MOORE.

REFERENCES CITED

The following references are of record in the file of this patent:

5

10

Number
1,861,988
2,025,190
2,070,418
2,095,144
2,195,857
2,232,912
2,264,186
2,284,266
2,300,434
2,433,362

12

UNITED STATES PATENTS

Name	Date
Tevis	June 7, 1932
Beverage	Dec. 24, 1935
Beverage	Feb. 9, 1937
Masson	Oct. 5, 1937
Fitch	Apr. 2, 1940
Hanley	Feb. 25, 1941
Noxon	Nov. 25, 1941
Bellesize	May 26, 1942
Reiber	Nov. 3, 1942
Hartley	Dec. 30, 1947