

Nov. 17, 1942.

E. F. WATSON

2,302,080

TELETYPEWRITER SYSTEM

Filed March 15, 1940

3 Sheets-Sheet 1

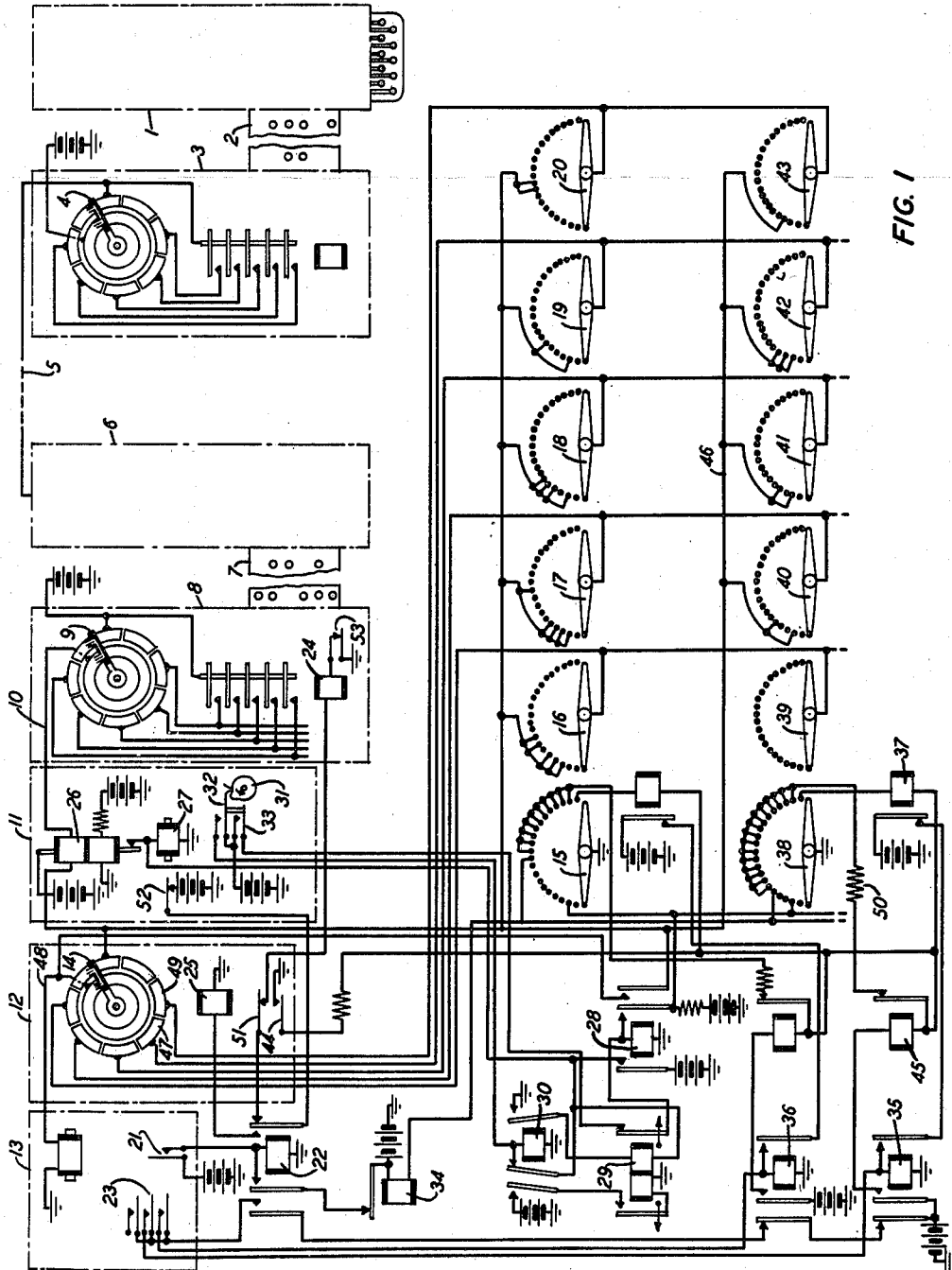


FIG. 1

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3 Sheets-Sheet 2

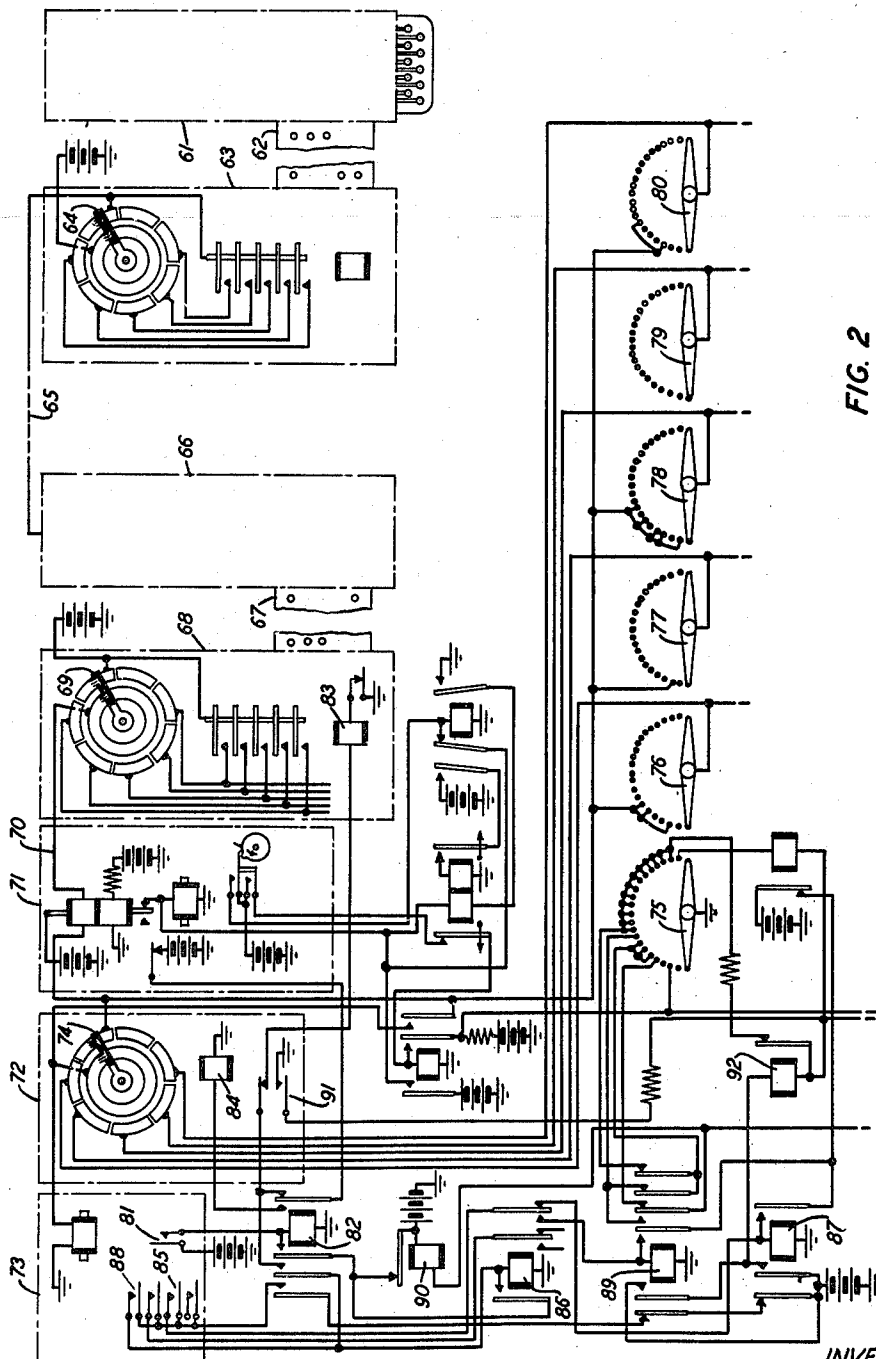


FIG. 2

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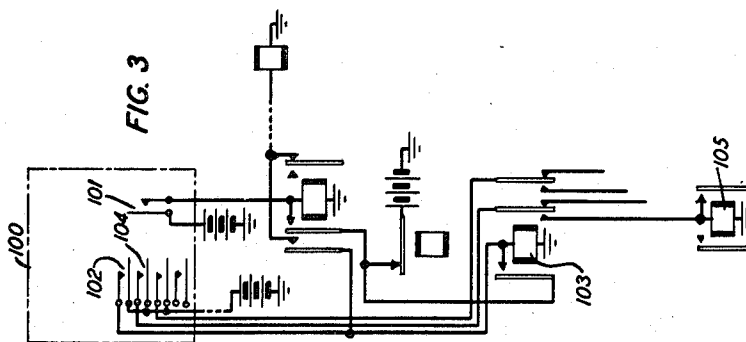
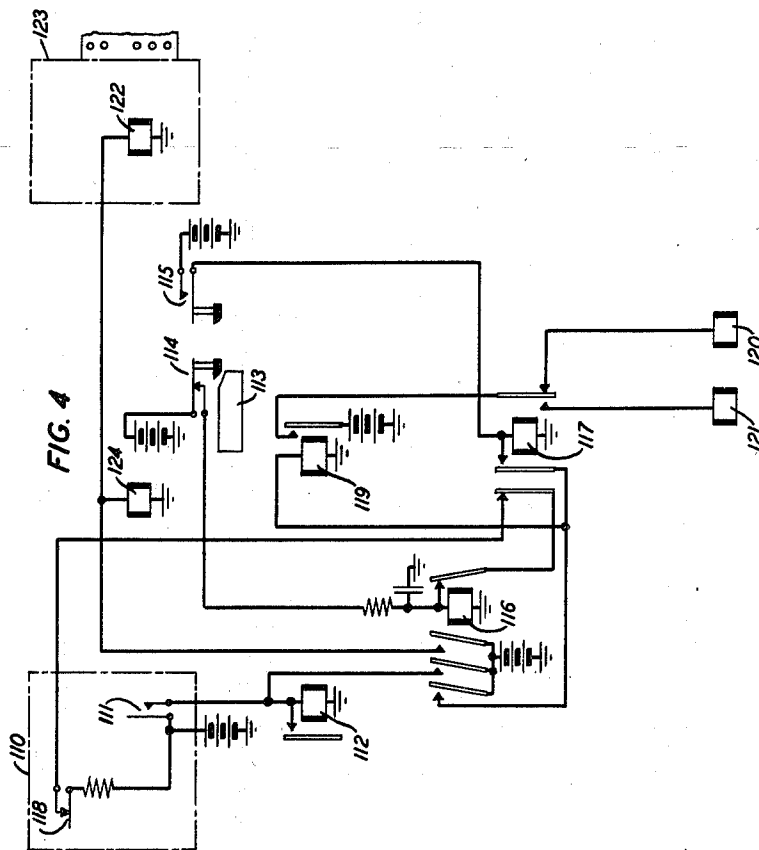
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TELETYPEWRITER SYSTEM

Filed March 15, 1940

3 Sheets-Sheet 3



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2,302,080

TELETYPEWRITER SYSTEM

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Application March 15, 1940, Serial No. 324,060

29 Claims. (Cl. 178—22)

This invention relates to communication systems and particularly to a system of machine telegraphy wherein means are provided to abbreviate a message by interpolating coded words and phrases which are mechanically decoded and recorded in full at the receiving end.

The object of the invention is to save time in the use of a communication channel by interpolating codes for longer words and phrases and to then mechanically correct the message actually transmitted over the line and record it in full where time is less valuable.

Accordingly, and by way of example, a message may be sent either mechanically or manually and recorded at the distant end on a medium from which it may be retransmitted over a local circuit. In the example given herein the message with coded words and phrases interpolated therein is punched on a teletypewriter tape, transmitted over a line and received by a teletypewriter instrument known as a reperforator which perforates a new tape. This tape is then placed in a tape transmitter which transmits the message over a local circuit to cause the message to be received by and recorded on a teletypewriter page or tape printer. When a coded word or phrase is encountered and transmitted by the tape transmitter, the further operation of such tape transmitter is suspended. The code for the word or phrase causes a selection from a plurality of local transmitters to be made and the selected one of such local transmitters to be started in operation to substitute the full text in the message being printed. When the operation of the local transmitter has been completed, the tape transmitter will again be started. The result is that the message in full is printed.

A feature of the invention is a means responsive to a coded word or phrase for suspending the further operation of the tape transmitter until the full text of the message as represented by the code has been transmitted and recorded locally.

Another feature of the invention is a means responsive to a coded word or phrase for preventing the code from being printed in the message in its final form.

Another feature of the invention is a means whereby a local transmitter used to print the full text of a word or phrase in response to the receipt of a particular code may be employed to respond to a plurality of codes and to correspondingly cause the printing of a plurality of words or phrases in full text.

A further feature is means whereby in the printing of the full text, carriage return and line spacing operations will be automatically performed.

A further feature is means whereby a word containing more than a given number of letters printed after the automatic line spacing means comes into operation will be automatically hyphenated and continued after the carriage return and line spacing operations have been performed.

Another feature is a means for using codes consisting of one or more designations. In the example herein given the code may consist of the permutation code for "blank" followed invariably by the permutation code for a certain character again followed by the permutation code for the character representing the coded word or phrase or alternatively, the middle invariable character code may be left out. By using "blank A" as well as "blank ZA" (the Z being invariably the same) a larger selection of coded words and phrases may be employed.

Another feature is the use of step-by-step switches to perform the duties of local senders. These switches are set in operation and, upon each step, condition a common distributor to send a separate character. Thus, if the code "blank A" is received and assuming this represents the word "and", the step-by-step switch responding to this code will make five effective steps. On the first step the distributor will send the code for "space", on the second step the distributor will send the code for "a", on the third step the distributor will send the code for "n", on the fourth step the distributor will send the code for "d", and on the fifth step the distributor will send the code for "space". Thereafter, the step-by-step switch will move to its sixth step whereupon the distributor is shunted out and the primary sender will again begin to operate, the step-by-step switch automatically returning to its normal position.

The drawings consist of three sheets of circuit diagrams.

Fig. 1 shows one form of the invention and illustrates the use of single-letter codes which are expanded by local senders into full text words and phrases.

Fig. 2 is a similar circuit diagram showing the variation of the invention in which both one and two-letter codes are employed and in which local senders may be controlled to expand such different codes into different full text words and phrases. In this showing a single local

sender may be used for a plurality of such functions.

Fig. 3 is a skeletonized arrangement showing the use of both one and two-letter codes with an individual local sender for expanding each of said codes into full text words and phrases.

Fig. 4 is another skeletonized circuit diagram showing means for causing an automatic carriage return and line feed function to be performed by local means.

In order to illustrate this invention and by way of example the following code may be used for general news items. In the following table the period character is used to represent the sending of the "blank" combination. Thus the first column consists of codes in the form of "blank A", "blank ZA", "blank B", etc. All codes start with the sending of the "blank" combination and all codes containing two letters start with the "blank Z" combination. In the next column a number of asterisks appear. These are placed here to represent the sending of the code for "space". Thus, the first code "blank A" is expanded by the local sender into "space" A N D "space".

Code	Reproduces as
.A-----	*AND*
.ZA-----	*AMERICA*
.B-----	*CON
.ZB-----	*APPROPRIATION
.C-----	*COMMITTEE*
.D-----	*DEPARTMENT
.E-----	*FOR*
.ZE-----	*FROM*
.F-----	*GOVERN
.ZF-----	*GOVERNMENT
.G-----	*HAD*
.ZG-----	*HAVE*
.H-----	*ING*
.ZH-----	*CHAIRMAN*
.I-----	*ION*
.ZI-----	*ADMINIST
.J-----	*IN*
.ZJ-----	*REPRESENTATIVE
.K-----	*OF*
.ZK-----	*AMENDMENT
.L-----	*OF*THE*
.M-----	*PRESIDENT*
.ZM-----	*PRESIDENT*ROOSEVELT
.N-----	*NATION
.O-----	*SAID*
.P-----	*THAT*
.ZP-----	*THEIR*
.Q-----	*THE*
.ZQ-----	*HOUSE*
.R-----	*SENAT
.S-----	*TO*
.ZS-----	*TODAY*
.T-----	*WAS*
.ZT-----	*WASHINGTON
.U-----	*WERE*
.ZU-----	*CONGRESS
.V-----	*WHICH*
.W-----	*WITH*
.ZW-----	*WILL*
.X-----	*WOULD*
.Y-----	*UNITED*
.ZY-----	*UNITED*STATES*
.(Letters)-----	*DEMOCRA
.(Figures)-----	*REPUBLIC
.(Carriage Return)...	(Figs).(CR)(LF)*****
.(Carriage return)...	(Figs).(CR)(LF)***** (Figs)"(Ltrs)
.(Line feed)-----	(Figs)."(CR)(LF)***** (Figs)"(Ltrs)
.Z(Line feed)-----	(Figs)."(CR)(LF)***** (Figs)"(Ltrs)

The last four codes here listed will be very useful. When the operator operates the blank and then the carriage return key and the appropriate codes are punched in the tape, these two permutation codes will be expanded by a local transmitter into the printing of a period and then the operation of the receiving teletypewriter in its carriage return and line feed functions followed by five spaces thus ending a paragraph and positioning the platen for the start of a new paragraph. The code .Z(Carriage return) will be expanded into the ending of a paragraph and the beginning of another to be quoted. The code

.(Line feed) will be expanded into the ending of a quoted paragraph and the beginning of an unquoted paragraph and the code .Z(Line feed) will be expanded into the ending of one quoted paragraph and the beginning of another quoted paragraph.

With the above code, a news item may be considerably shortened in its transmission time. By way of example, the following news item, picked at random from a newspaper, is quoted in full:

WASHINGTON, JULY 18—AN OPEN THREAT TO BLOCK ALL END-OF-THE SESSION LEGISLATION SPONSORED BY THE ADMINISTRATION UNLESS THE HOUSE RULES COMMITTEE GAVE RIGHT-OF-WAY TO PROPOSED REVISION OF THE WAGE HOUR ACT WAS MADE TODAY BY REPRESENTATIVE EUGENE E. COX, DEMOCRAT OF GEORGIA, HIGH RANKING MEMBER OF THE GROUP.

INFORMED LATER THAT PRESIDENT ROOSEVELT HAD CRITICIZED THE AMENDMENT PROPOSAL FOR WHICH HE HAD FOUGHT IN THE RULES COMMITTEE, REPRESENTATIVE COX SAID HE WOULD RECOMMEND TO ITS ADVOCATES THAT THEY CONSULT THE WHITE HOUSE AND TRY TO WORK OUT A COMPROMISE. HE INDICATED THAT PENDING THE OUTCOME OF SUCH DISCUSSIONS HE MIGHT BE WILLING TO HOLD HIS DEMAND IN ABEYANCE IN THE HOPE THAT A MEASURE COULD BE DRAFTED THAT WOULD SATISFY BOTH THE PRESIDENT AND THE INTERESTS CLAMORING FOR EXEMPTION FROM THE ACT OF INDUSTRIES PROCESSING FARM PRODUCTS.

REPRESENTATIVE COX SERVED HIS NOTICE ON REPRESENTATIVE ADOLPH J. SABATH, DEMOCRAT OF ILLINOIS, CHAIRMAN OF THE RULES COMMITTEE, AFTER THE LATTER HAD DEMURRED TO A DEMAND THAT THE BARDEN BILL AMENDING THE WAGE HOUR LAW BE PLACED FIRST ON THE PREFERRED LIST.

This same news item is now shown as it would be transmitted:

.ZT, JULY 18—AN OPEN THREAT.SBLOCK ALL END-OF-THE SESS.I LEGISLAT.ISPONSORED BY.Q.ZIRAT.IUNLESS.Q.Z Q R U L E S .CGAVE RIGHT-OF-WAY.SPROPOSED REVISION.LWAGE HOUR ACT.TMADE.ZSBY.ZJ EUGENE E. COX.,(Ltrs)T.KGEORGIA, HIGH R A N K.HMEMBER.L G R O U P.(CR) (LF) INFORMED LATER.P.ZM.G CRITICIZED.Q.ZK PROPOSAL.E.VHE.GFOUGHT.J.QRULES C.,ZJ COX.OHE.X RECOMMEND.SIT'S ADVOCATES. P.THEY CONSULT.QWHITE .ZQ.ATRY.SWORK OUT A COMPROMISE. HE INDICATED.P PEND.H.QOUTCOME.KSUCH DISCUSSIONS HE MIGHT BE WILL.H.SHOLD HIS DEMAND. JABEYANCE.J.QHOPE.PA MEASURE COULD BE DRAFTED.P.XSATISFY BOTH.Q.M.A.QINTERESTS C L A M O R.H.EEXEMPT.IZE.QACT .KINDUSTRIES PROCESS.HFARM PRODUCTS .(CR) (LF)

.ZJ COX SERVED HIS NOTICE ON .ZJ ADOLPH J. SABATH.,(Ltrs)T.KILLINOIS, ZH.LRULES .C, AFTER.QLATTER.G DEMURRED.SA DEMAND .P.QBARDEN BILL AMEND.H.QWAGE HOUR LAW BE PLACED FIRST ON.QPREFERRED LIST.....

The start is a code "blank ZT" which from the table above will appear as the code for "Washington". Near the end of the first paragraph, after the name Cox, appears the code (Ltrs). It will be understood that this is actually a single letter code since the period represents the combination for "blank" and the word "Ltrs" in parentheses represents the code for the letters function.

At the end of the first paragraph and similarly at the end of the second paragraph appear the notations (CR) (LF). This represents the fact that the codes for carriage return and line feed have been transmitted at this point. No attempt has been made to indicate these functions within the paragraphs as it may here be assumed that such functions will be automatically performed in the manner hereinafter described.

In general, the operation of this system may be explained by the use of Fig. 1. In the extreme right-hand upper corner of this figure there is a rectangle designated 1 which represents a keyboard perforator. The perforated tape 2 from this perforator is fed into a transmitter distributor represented by the rectangle 3. Through the operation of the distributor 4 the coded message is transmitted over the line 5 which may be of considerable length. For example, it may extend between New York and Chicago. At the distant end of the line there is a receiving device 6 which responds to code impulses transmitted over the line 5 and perforates a tape 7 accordingly. The perforated tape 7 then causes the operation of a transmitter distributor 8, whereupon distributor 9 transmits over a local line 10 which passes through a teletypewriter 11, a code transmitter distributor 12, and a special teletypewriter receiving device 13. The teletypewriter 11 responds to the code signals transmitted over the line 10 as well as to signals transmitted over this same line by the distributor 14 which is part of the code transmitter 12. This code transmitter 12 is operated by local transmitters, one of which comprises the step-by-step switch including the switch arms 15, 16, 17, 18, 19 and 20, inclusive. The special teletypewriter receiving device 13 operates on the principle of the receiver disclosed in Patent 1,745,633 to Morton and Krum, but the function in the present instance is to close contacts rather than to type a message, so a plurality of type bar contacts are provided in the manner shown in the Patent 2,120,235 to J. F. Beattie et al.

In the normal operation of such a receiving device, a type bar contact is not closed until after a substantial percentage of a succeeding code has been received and registered. As is clearly described in the above-noted Morton and Krum patent, a temporary locking of the permutation bar occurs during the printing or contact closing operation and the arrangement permits overlap operation of the selecting and printing mechanisms. That is, it permits the setting or partial setting of the selecting fingers or the sword levers as a signal is received during the printing of the character or the operation of the contact selected by the previous signal code. It is only necessary that the printing or contact closing operation begin and lock the permutation bars before the next setting of the fingers is started. With this overlap operation well understood, it will be clear that a contact 21 in the receiving device 13, which is arranged to respond to the "blank" code of five successive spacing signals, may operate the relay 22 for stopping further transmission from the

transmitter distributor 8 without mutilating or interfering with the succeeding code designed to operate contact 23, for instance. When a coded word or phrase is transmitted over the line 5 and then retransmitted by the transmitter distributor 8, the first part of the code consists of the signals for the "blank" combination. The teletypewriter 11 will, of course, respond to this code but it will not make any record of such combination in the message which it records since this code combination is usually unassigned and causes no function to take place in the teletypewriter. The contact 21 in the receiver 13, however, will operate and, by operating the relay 22, will open the circuit of the magnet 24 and will close the circuit of magnet 25. Magnets 24 and 25, respectively, control the operation of the transmitter distributors 8 and 12 so that, upon the effective receipt of the blank combination in the receiving device, the transmitter distributor 8 will be stopped and the transmitter distributor 12 will be started. This is for the purpose of stopping the further transmission of the message recorded on the tape 7 until the transmitter distributor 12 in response to the operation of some selected local transmitter has expanded such code into a full text word or phrase.

Due to the overlap operation spoken of above, the distributor 8, however, will not be stopped until after the code letter or letters following the blank combination has been properly transmitted, that is, the contact 23 or some other similar contact is insured of operation even though the operation of contact 21 acts to stop the transmitter distributor 8.

Means are provided to prevent the teletypewriter 11 from printing the code letters. This means consists generally of certain selector cam contacts and an organization of relays which will now be described. The relay 26 in the teletypewriter 11 responds to the signals over the line 10. It is shown on its marking contact and on this contact it operates the magnet 27, which here represents the means for operating the selecting mechanism to cause the proper operation of the type bars. Connected to the front contact of relay 26 is a conductor leading to various points, such as the front contact of the left-hand armature of relays 28, the right-hand winding of relay 29, and the inner left-hand armature of relay 30. Cam 31 is mounted on the selector cam shaft and operates the contacts 32 and 33 just after the fifth pulse of a code has been received. When the next code is being received, the first signal will be a spacing start signal. Such signal will open the normal circuit through the inner left-hand armature and front contact of relay 30 and allow this relay to become deenergized. If any one of the succeeding five impulses is marking, then a circuit will be closed through the right-hand winding of relay 29 to ground at the right-hand armature of relay 30, and relay 29 will then lock up through its left-hand armature and front contact and the outer left-hand armature and back contact of relay 30. After all five impulses have been thus received, contact 33 will be closed but the effective circuit through this contact will be opened at the back contact and right-hand armature of relay 29 so that, upon the receipt of a normal code transmitted over line 10, the closure of contact 33 will be ineffective. At the same time contact 32 will be closed and this will result in the operation of relay 30 to allow the release of relay 29, but relay 29, being slow to release, does not close the circuit for the effective

use of contact 33 until after the cam 31 has advanced to the position where both contacts 32 and 33 are opened.

In the case of the receipt of the "blank" signal, however, relay 29 is not operated since the blank combination consists of five successive spacing impulses. Thus, at the end of this combination the contact 33 will be effective through the back contact and right-hand armature of relay 29 to cause the operation of relay 28. This relay then operates and locks over its front contact and right-hand armature. Through its left-hand armature relay 28 places a direct connection to the winding of magnet 27 to prevent this magnet from responding to further code impulses sent over the line 10. Thus, until relay 28 is released, no code signals passing over the line 10 can affect the teletypewriter 11, so that the code contacts 23 may be properly operated without mutilating the message being recorded by teletypewriter 11. It will be noted hereinafter that the first step of the step-by-step switch arm 15, or any one of the corresponding switch arms, such as 38, will close a circuit for releasing the relay 28 by short-circuiting its winding. Therefore, when the proper local sender has been selected and it starts in operation, the teletypewriter 11, through the release of relay 28, will again be put into condition to respond to impulses traversing the local line 10.

Assume that a coded word has been transmitted over the local line 10 which results in, first, the operation of the blank contact 21, and then the contact 23. In response to the closure of the contact 21 the relay 22 will become operated. This, as hereinbefore stated, opens the circuit of magnet 24 and closes the circuit of magnet 25. At the same time, relay 22 locks up through the back contact of relay 34 and its own inner left-hand armature and front contact. Relay 22 also prepares for the operation of contact 23 or any other similar contact by closing a circuit at its front contact and outer left-hand armature. Upon the operation of contact 23 a circuit will be closed from battery, the outer left-hand armature and back contact of relay 35, the outer left-hand armature and back contact of relay 36, the outer left-hand armature and front contact of relay 22, contact 23, to the winding of relay 35. Relay 35 may be so adjusted that its right-hand armature and front contact will effectively close before the circuit through its outer left-hand armature and back contact has been opened. Thus, relay 35 is operated and locked up to the back contact and armature of relay 37 and the circuit for the operation of relays similar to relay 35, such as relay 36, is opened. Relay 35 controls a local sender consisting of a step-by-step switch here designated by its arms 38, 39, 49, 41, 42 and 43.

The transmitter distributor 12 has been started by the operation of magnet 25. During the first revolution no signal is sent because the distributor 14 is short-circuited by a front contact on relay 28. Shortly after the start of the first revolution of the distributor 14 the stepping contact 44 is closed. This closes a circuit through the magnet 45 which now finds a circuit through the front contact and inner left-hand armature of relay 35. The energizing of magnet 45 causes no action. Near the end of the revolution of distributor 14, contact 48 reopens and releases magnet 45, which causes all six of the brushes 38 to 43, inclusive, of the selected local sender to advance to their first contacts. At the end of the next revolution of the distributor 14 the

magnet 45 will cause the brushes 38 to 43 to step to their second contacts. This causes a circuit to be established through the brush 38 to short-circuit the winding of relay 28 and thus release the short circuit on distributor 14 and also put the teletypewriter 11 into condition to properly record matter sent over the line 10 by the code transmitter 12. During the succeeding revolution of the distributor 14 marking and spacing impulses will be sent in accordance with the connections made to brushes 39 to 43, inclusive. As brush 14 begins to revolve in a clockwise direction, it first sends a start impulse out over the line 10. Following this, the brush 14 is connected to the first place segment which, it will be noted, connects to brush 43. In accordance with the code to be transmitted, the brushes 39 to 43 will be connected to a common conductor 46 which is part of the local line 10. As shown, the brush 42 connects to this common conductor on its second step contact and thus, when the distributor 14 reaches its second distributor segment, a connection will be made from the line 10 over the conductor 46, the brush 42, the second distributor contact 47, through the distributor brush 14, to the conductor 48, continuing the local line 10, to the receiving device 13, thus sending a marking impulse. When a connection of this kind is missing, such, for instance, as when the distributor brush 14 passes over its first contact 49 connected to the brush 43, since no connection is provided from the contact 49 for brush 43 to the common conductor 46, the local line 10 will be momentarily opened to send a spacing signal. At the end of the revolution of distributor brush 14 and as it comes on to its stop contact, the stepping contact 44 will be momentarily opened to cause another releasing operation of the magnet 45 to advance the step-by-step switch, moving brushes 38 to 43, inclusive, another step. When all but the last signal combination of the coded word or phrase has been sent, the brush 38 encounters on its fifth step a connection leading to the winding of relay 34, so that this relay is operated and opens the locking winding of relay 22. Relay 22 being somewhat slow to release does not open the circuit for magnet 15 in time to prevent one more revolution of brush arm 14, very early in which revolution contact 51 is opened to prevent the operation of magnet 24 of transmitter distributor 8 until later. As distributor brush 14 now revolves to send the last character of the code word, relay 22 releases, causing the release of magnet 25 to stop brush 14 at the end of this revolution, and also the operation of magnet 24 when contact 51 closes near the end of the revolution. At the same time contact 51 closes, contact 44 opens, causing magnet 45 to release again, thus stepping brush 38 to the sixth step. Thereupon brush 38 will make a connection to a series of strapped contacts leading through a resistance 50 to the back contact and armature of relay 45 so that relay 45 is now operated to automatically step the switch to its normal position. On the step before normal is reached, brush 38 will close a circuit for relay 37, at the same time effectively energizing magnet 45 for stepping the switch to normal. The operation of relay 37 opens the locking path for relay 35 and allows this relay to return to normal. Thus the transmitter distributor 8 is restarted and either matter in plain spelling or a further code may be transmitted. In this way the record on tape 7 is recorded by the tele-

typewriter 11 and anything in code is expanded by local transmitters into full text words and phrases.

Contact 52 in teletypewriter 11 is a "tabulate" control operated when a code for the tabulate function is received so that at that time either transmitter distributor 8 or transmitter distributor 12 will be stopped until the tabulation operation is complete. Contact 53 in transmitter distributor 8 is associated with a lever which rides on the tape so that contact 53 is opened to stop the transmitter when the tape becomes taut.

In Fig. 2 the general layout is the same. There is a keyboard perforator 61 by which a tape 62 is punched and which is fed into a transmitter distributor 63. The distributor 64 transmits over a line 65 into a reperforator 66 which perforates a tape 67 and feeds such perforated tape into a transmitter distributor 68. The distributor 69 of this piece of apparatus transmits into the local line 70, which operates the teletypewriter 71 and the teletypewriter contact apparatus 73. A local transmitter distributor 72, under the control of local senders such as that having brushes 75, 76, 77, 78, 79 and 80, transmits through the distributor 74 into the local line 70.

The main difference between the organization shown in this figure and that shown in Fig. 1 is that the local senders, such as that having brushes 75 to 80, inclusive, may be operated to send two different full text words or phrases. In the contact operating receiving device 73 the contact 81 is operated by the "blank" code. This, in turn, operates relay 82 which, in the same manner as heretofore stated, opens the winding of magnet 83 and closes the winding of magnet 84. If the code received is now a one-letter code, a contact, such as 85, will be operated, whereupon a circuit will be closed through the outermost right armature and back contact of relay 86 to the winding of relay 87. If the code being received is a two-letter code, then a common contact 88 will first be operated before a contact such as 85 is operated. The operation of contact 88 will result in the operation of relay 86, so that, when contact 85 is later closed, relay 89, instead of relay 87, will be operated.

Moreover, if contact 88 is closed, then a circuit for magnet 83 will be closed through the front contact and middle left-hand armature of relay 82 through contact 83 in order to allow the distributor 69 to transmit a second letter of the code.

Let us assume that a single-letter code has been sent and that relay 87 has been operated. Thereupon the step-by-step switch designated by its brushes 75 to 80, inclusive, steps around as previously described until the brushes reach their fourth contact, whereupon a circuit is established from ground, brush 75, its fourth contact, the back contact and second inner right-hand armature of relay 89 to the winding of relay 90 whose operation results in the deenergization of relay 82 and which, in turn, results in the starting of the transmitter distributor 68 in the same manner as hereinbefore described. Near the end of the last revolution of the brush 74 the contact 91 will be opened and the stepping magnet 92 will cause the brush 75 and its companion brushes to move on to their next contacts. With the relay 89 in its normal position and through its two outermost right-hand armatures, the rest of the contacts to be traversed by brush 75 are effectively strapped together so that from now

on the magnet 92 will be caused to automatically step the brushes to their normal positions.

Had the relay 89 been first energized, then the circuit for relay 90 could not have been closed until the eighth contact had been reached by brush 75. Thus, in the one case the step-by-step switch will control the local sender 72 to record on the teletypewriter 71 a full text word of three letters while, if relay 89 had been first operated, a full text word or phrase of four additional letters could have been transmitted. When the brush 75 reaches its ninth contact, the magnet 92 will be automatically operated as hereinbefore described.

In Fig. 3 the rectangle 100 represents a receiving teletypewriter contact device in which the contact 101 is operated by the "blank" code and the contact 102 is operated by the common letter to cause the operation of a relay 103 corresponding to relay 86. Thereafter the closure of contact 104 will operate a relay 105 to control a local sender. There are a number of relays, such as 105, connected to the front and back contacts of the right-hand armatures of relay 103 and each of these relays acts in the same manner as the relay 35 or the relay 36, shown in Fig. 1. There is no relay in Fig. 3 corresponding to relay 89 of Fig. 2. Each such relay 105 controls a separate local sender.

In Fig. 4 the rectangle 110 represents a receiving teletypewriter device having contacts operated by various code combinations. The contact 111 operates on the "blank" combination and, in turn, causes the operation of relay 112 which performs the same function as relay 22 in Fig. 1. The teletypewriter, such as that designated by the numeral 11 in Fig. 1, in this case has cam 113 on the carriage which operates a set of contacts 114 when it has been shifted about sixty spaces in the line and another contact 115 which it operates when it has moved about seventy-one spaces or to near the end of the line. As the signals are being transmitted over the local line 10 in Fig. 1, the teletypewriter will operate and after about sixty characters have been recorded the contact 114 will be operated. Thereupon the main operating path for relay 116 will be opened to allow this relay to be deenergized. It is, however, locked through its front contact and right-hand armature and through the outer left-hand armature and back contact of relay 117, the contact 118, to battery. Contact 118 is operated on the "space" combination so that relay 116 becomes deenergized upon the transmission of the first "space" code transmitted after the carriage of the teletypewriter has been moved sixty spaces. Upon the deenergization of relay 116, relay 112 is operated and this results in the stopping of the transmitter distributor, such as 8 in Fig. 1, and the start of the local transmitter distributor, such as 12 in Fig. 1. Through the outer left-hand armature and back contact of relay 116 a relay 119 is operated. This closes a circuit through its armature and front contact and the right-hand armature and back contact of relay 117 to a relay 120, which corresponds to such relays as 35 and 36 in Fig. 1 and to relays, such as 105, in Fig. 3.

Through the inner left-hand armature and back contact of relay 116 circuits are closed to energize two magnets, the one designated 122 in transmitter distributor 123 corresponding to the transmitter distributor 8 in Fig. 1 and magnet 124 in the receiving teletypewriter. Magnet

122 is a "tape feed withhold" magnet which will prevent the feeding of the next character after the "space" which has caused the release of relay 116. Due to the overlap operation of the teletypewriter mechanism the contact 118 will not be opened until the following character has been started in transmission and as it is not wished to lose this character during the carriage return and line feed operations, it is held in the transmitter distributor 123 for retransmission after these functions have been performed.

Magnet 124 is a magnet in the receiving teletypewriter which will prevent printing and spacing of this character which is being set up at the time contact 118 is opened. Since printing and spacing are regularly prevented by well-known mechanical means during the various functional operations the use of this magnet 124 presents no new features. It operates in the present instance to "lose" a character which will be retransmitted after the following functional operations are completed. The operation of relay 120 will set into motion a local transmitter, similar to the transmitter having brushes 15 to 20, inclusive, which is wired to cause the local distributor, such as 12, to transmit "carriage return" and "line feed" codes. This will cause the teletypewriter to position itself to start the next word at the beginning of a new line. As the teletypewriter moves to this new position, the contact 114 will be closed, resulting in the energization of relay 116 so that transmission from the transmitter distributor 123, corresponding to that designated 8 in Fig. 1, will be restarted after the code sender has completed its functions.

If the word being transmitted carries the cam 113 to the point where contact 115 is operated, then relay 117 will become operated and this will perform the same function in the energizing relay 116 as the contacts 118. At this time, however, upon the energization of relay 119, a relay 121, instead of relay 120, will be operated. This relay will cause the local sender to transmit into the local line 10 the codes for "figures", "hyphen", "carriage return", "line feed" and "letters" so that a word which is longer than can be accommodated by the teletypewriter will be automatically hyphenated.

It will be noted that the small step-by-step switches forming the local senders may be easily wired to transmit any given code. Through this feature this code may be arranged to suit the needs of any particular teletypewriter subscriber. If, for instance, a subscriber wishes to use this invention in a business where standard articles of commerce are frequently mentioned, the code might be arranged accordingly. Many variations of this may be devised.

What is claimed is:

1. In a communication system, a permutation code sender, a permutation code recorder responsive thereto, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said sender, a corresponding plurality of local senders for operating said recorder and means for suspending the operation of said sender after said sender has selectively operated one of said contact sets until said corresponding local sender has completed its full cycle of operation; whereby the record recorded by said recorder consists of the message transmitted by said sender with selected messages from said local senders interpolated therein.

2. In a communication system, a permutation code sender, permutation code instrumentalities

responsive thereto, a permutation code receiving device provided with a plurality of contact sets selectively operated by said sender, means under control of said sender for rendering a selected one of said contact sets effective, a plurality of local senders each responsive to the effective operation of one of said contact sets for operating said instrumentalities and means for suspending the operation of said sender after said sender has effectively operated one of said contact sets until said corresponding local sender has completed its full cycle of operation; whereby the response of said instrumentalities is in accordance with the message transmitted by said sender with selected messages from said local senders interpolated therein.

3. In a communication system, a permutation code sender, a permutation code printer responsive thereto, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said sender, local sending means for operating said printer, means whereby said local sending means are selectively operated by said contact sets, and means for suspending the operation of said sender during the operation of said local sending means; whereby the record produced by said printer consists of the message transmitted by said sender with selected messages by said local sending means interpolated therein.

4. In a communication system, a permutation code sender, a permutation code printer responsive thereto, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said sender, a plurality of local senders less in number than the number of said contact sets, means whereby said local senders are selectively operated by said contact sets, and means for suspending the operation of said sender during the operation of said local senders; whereby the record produced by said printer consists of the message transmitted by said sender with selected messages by said local senders interpolated therein.

5. In a communication system, a permutation code sender, a permutation code recorder responsive thereto, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said sender, a plurality of local senders, each constructed and arranged to operate said recorder to produce a predetermined word or phrase, means whereby said local senders are selectively operated by said contact sets, and means for suspending the operation of said sender during the operation of said local senders; whereby the record produced by said recorder consists of the message transmitted by said sender with selected predetermined words or phrases interpolated therein.

6. In a communication system, a permutation code sender, a permutation code printer responsive thereto, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said sender, a plurality of local senders each constructed and arranged to operate said printer to produce a predetermined word or phrase, certain of said local senders being each constructed and arranged to operate said printer to produce alternatively one or another predetermined word or phrase, means whereby said local senders are selectively operated by said contact sets, and means for suspending the operation of said sender during the operation of said local senders; whereby the record produced by said printer consists of the message transmitted

by said sender with selected predetermined words or phrases interpolated therein.

7. In a communication system, a permutation code sender, a permutation code printer responsive thereto, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said sender, local sending means constructed and arranged to operate said printer to produce a predetermined word or phrase preceded and followed by spaces, means whereby said local sending means are selectively operated by said contact sets, and means for suspending the operation of said sender during the operation of said local sending means; whereby the record produced by said printer consists of the message transmitted by said sender with selected words or phrases interpolated therein.

8. In a communication system, means including a permutation code sender for transmitting a message with symbols representing coded words and phrases interpolated therein, a permutation code printer responsive thereto, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said transmitted symbols, local sending means constructed and arranged to operate said printer to produce the full text of said words and phrases represented by said symbols, means whereby said local sending means are selectively operated by said contact sets, and means for suspending the operation of said sender during the operation of said local sending means; whereby the record produced by said printer consists of the message transmitted by said sender with the full text of said symbolized words and phrases interpolated therein.

9. In a communication system, a permutation code sender for transmitting a message with symbols comprising an invariable non-character printing code followed by a variable character code representing coded words and phrases interpolated therein, a permutation code printer responsive to said sender, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said transmitted symbols, local sending means constructed and arranged to operate said printer to produce the full text of said words and phrases represented by said symbols, means whereby said local sending means are selectively operated by said contact sets, and means for suspending the operation of said sender during the operation of said local sending means; whereby the record produced by said printer consists of the message transmitted by said sender with the full text of said symbolized words and phrases interpolated therein.

10. In a communication system, a permutation code sender for transmitting a message with symbols comprising an invariable non-character printing code followed in some cases with a variable character printing code and in other cases with an invariable character printing code and variable character printing code representing coded words and phrases interpolated therein, a permutation code printer responsive to said sender, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said transmitted symbols, local sending means constructed and arranged to operate said printer to produce the full text of said words and phrases represented by said symbols, means whereby said local sending means are selectively operated by said contact sets, and means for suspending the operation of said sender during the operation of said local sending

means; whereby the record produced by said printer consists of the message transmitted by said sender with the full text of said symbolized words and phrases interpolated therein.

11. In a communication system, a permutation code sender for transmitting a message with symbols representing coded words and phrases interpolated therein, a permutation code printer responsive to said sender, means for preventing said printer responding to said symbols, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said transmitted symbols, local sending means constructed and arranged to operate said printer to produce the full text of said words and phrases represented by said symbols, means whereby said local sending means are selectively operated by said contact sets and means for suspending the operation of said sender during the operation of said local sending means; whereby the record produced by said printer consists of the message transmitted by said sender with the full text of said symbolized words and phrases interpolated therein.

12. In a communication system, a permutation code sender for transmitting a message with symbols representing coded words and phrases interpolated therein, a permutation code printer responsive to said sender, means comprising a relay circuit selectively responsive to a code consisting wholly of spacing impulses for preventing said printer responding to said symbols, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said transmitted symbols, local sending means constructed and arranged to operate said printer to produce the full text of said words and phrases represented by said symbols, means whereby said local sending means are selectively operated by said contact sets, and means for suspending the operation of said sender during the operation of said local sending means; whereby the record produced by said printer consists of the message transmitted by said sender with the full text of said symbolized words and phrases interpolated therein.

13. In a communication system, a permutation code sender for transmitting a message with symbols representing coded words and phrases interpolated therein, a permutation code printer responsive thereto, a local sending means responsive to said symbols for operating said printer to produce the full text of said words and phrases, means for suspending the operation of said sender during the operation of said local sending means; whereby the record produced by said printer consists of the message transmitted by said sender with the full text of said symbolized words and phrases interpolated therein, and means for automatically interpolating line feed and carriage return operations in the operation of said printer.

14. In a communication system, a permutation code sender, a permutation code recorder responsive thereto, means in said recorder responsive to the first spacing code after a predetermined number of characters have been recorded for automatically interpolating line feed and carriage return operations in the operation of said recorder, means responsive to the recording of another predetermined number of characters after said first predetermined number of characters have been recorded without the inclusion of a spacing code for automatically interpolating the recording of a hyphen and executing line feed

and carriage return operations in the operation of said recorder, and means for suspending the operation of said sender during said automatic operations of said recorder.

15. In a communication system, a permutation code sender for transmitting a message with symbols representing coded words and phrases interpolated therein, a permutation code printer responsive thereto, a local sending means responsive to said symbols for operating said printer to produce the full text of said words and phrases, means in said printer responsive to the first spacing code after a predetermined number of characters have been printed for automatically interpolating line feed and carriage return operations in the operation of said printer, means responsive to the printing of another predetermined number of characters after said first predetermined number of characters have been printed without the inclusion of a spacing code for automatically interpolating the printing of a hyphen and carrying out line feed and carriage return operations in the operation of said printer, and means for suspending the operation of said sender during the operation of said local sending means and during said automatically interpolated operations; whereby the record produced by said printer consists of the message transmitted by said sender with the full text of said symbolized words and phrases interpolated therein in lines of substantially uniform length properly spaced.

16. In a communication system, a tape transmitter, a teletypewriter responsive thereto, a receiving device provided with a plurality of contact sets selectively responsive to code characters transmitted by said tape transmitter, a corresponding plurality of local senders each for operating said teletypewriter to record a different predetermined word or phrase, and means responsive to the actuation of said receiving device for suspending the further operation of said tape transmitter until the particular local sender selected has completed a full cycle of operations; whereby the matter recorded by said teletypewriter comprises matter sent directly by said tape transmitter and interpolated words or phrases.

17. A system for communication which comprises means for transmitting a message having coded words and phrases interpolated therein, means for receiving and recording said message on a medium from which it may be retransmitted, means automatically retransmitting said message therefrom, means for suspending the retransmission of said message under control of said medium when a coded word or phrase is encountered, means for automatically transmitting a full translation of said coded word or phrase, and means for automatically resuming the retransmission of said message under control of said medium.

18. In a communicating system, means including a permutation code sender for transmitting a message with symbols representing coded words and phrases interpolated therein, means responsive to said sender for recording said coded message on a medium from which it may be retransmitted, a retransmitter for retransmitting said coded message, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said transmitted symbols, local sending means constructed and arranged to produce the full text of said words and phrases represented by said symbols, connections whereby said local sending means are

selectively operated by said contact sets, and means for suspending the operation of said retransmitter during the operation of said local sending means; whereby the total transmission from said retransmitter and said local sending means comprises the full text of the message including said symbolized words and phrases interpolated therein.

19. In a communication system, means including a permutation code sender for transmitting a message with symbols representing coded words and phrases interpolated therein, a permutation code printer responsive thereto, a permutation code receiving device provided with a plurality of contact sets selectively responsive to said transmitted symbols, local sending means comprising a plurality of step-by-step switches and a common distributor arranged to operate said printer, each said step-by-step switch arranged to cause said distributor to transmit a character code per step to cause said printer to produce the full text of said words and phrases represented by said symbols, connections whereby said step-by-step switches are selectively operated by said contact sets, and means for suspending the operation of said sender during the operation of said step-by-step switches; whereby the record produced by said printer consists of the message transmitted by said sender with the full text of said symbolized words and phrases interpolated therein.

20. In a system of impulse transmission, a storage transmitter of code combinations, supplemental transmitting means, means controlled by said storage transmitter to suspend its operation temporarily, means operable under control of said storage transmitter to initiate transmission from said supplemental means during such suspension, and means selectively controllable by said storage transmitter to selectively determine the code combinations transmitted by said supplemental means during said suspension.

21. In a system of impulse transmission, a conductor, a transmitter of code combinations operably related to said conductor to transmit thereupon, supplemental transmitting means, and means controlled by said transmitter to suspend its own transmission and cause the transmission from said supplemental transmitting means of code combinations of a nature selectively controlled by the transmitter.

22. In a system of impulse transmission, a conductor, a transmitter of code combinations operably related to said conductor to transmit thereupon, supplemental transmitting means, and means controlled by said transmitter to suspend its own transmission and cause the transmission from said supplemental transmitting means of code combinations whose number is selectively controlled by the transmitter.

23. In a system of impulse transmission, a conductor, a transmitter of code combinations operably related to said conductor to transmit thereupon, supplemental transmitting means, means controlled by said transmitter to suspend its own transmission and cause the transmission from said supplemental transmitting means of code combinations of a nature selectively controlled by the transmitter, and means controlled by said supplemental transmitting means to control the reinitiating of transmission from said transmitter.

24. In a system of impulse transmission, a storage medium, a transmitter controlled thereby, a plurality of supplemental means for storing

code combinations of impulses, and means controlled by said transmitter for selectively causing the selection of one of said supplemental means and the interpolation in its own transmission of code combinations stored thereby in combination with means whereby said transmitter is caused to resume transmission after such interpolation.

25. In a system of impulse transmission, a storage medium, a transmitter controlled by and in accordance therewith, stepable instrumentalities having different code combinations stored thereupon, a transmission channel, means including said storage medium for controlling said transmitter, means including said storage medium for suspending operation of said transmitter, means including said medium for selecting from said instrumentalities one thereof and causing it to step, means operable upon the stepping thereof to impress code combinations upon said channel, and means operable after said stepping and as an incident thereto to reinitiate transmission from said transmitter upon said channel.

26. In a selective system having means for initiating code combinations representing intelligence, means controlled by one of said code combinations to establish a preparatory condition, selectable devices selectable after establishment of said preparatory condition, means operable under control of one code combination to select some one of one group of said devices, and means operable under the control of a succession of more than one of said code combinations to select some one of another group of said devices, and means for initiating transmission of code combinations from said selected devices.

27. In combination, a permutation code con-

trolled selective device, a path or channel of transmission, a transmitter operably related to said path to transmit thereover, supplemental transmitters connectible to said path, means controlled by single code combinations to select and cause one of said supplemental transmitters and cause it to transmit upon said path, and means controlled conjointly by a plurality of code combinations to select another of said transmitters and cause it to transmit upon said path.

28. A storage medium for code combinations, transmission means controlled thereby, said transmission means comprising a plurality of sources of code combinations, selective means operable under control of said storage medium to select some of said sources of code combinations according to a single code combination, and selective means operable under control of said storage medium to select other of said sources of code combinations according to a succession of code combinations.

29. A storage medium for code combinations, transmission means controlled thereby, said transmission means comprising a plurality of sources of code combinations, selective means operable under control of said storage medium to select some of said sources of code combinations according to a single code combination, selective means operable under control of said storage medium to select other of said sources of code combinations according to a succession of code combinations, a line, means for transmitting over said line in accordance with the storage of said medium, and means for withholding said transmission at times and causing transmission thereover from said selected sources.

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