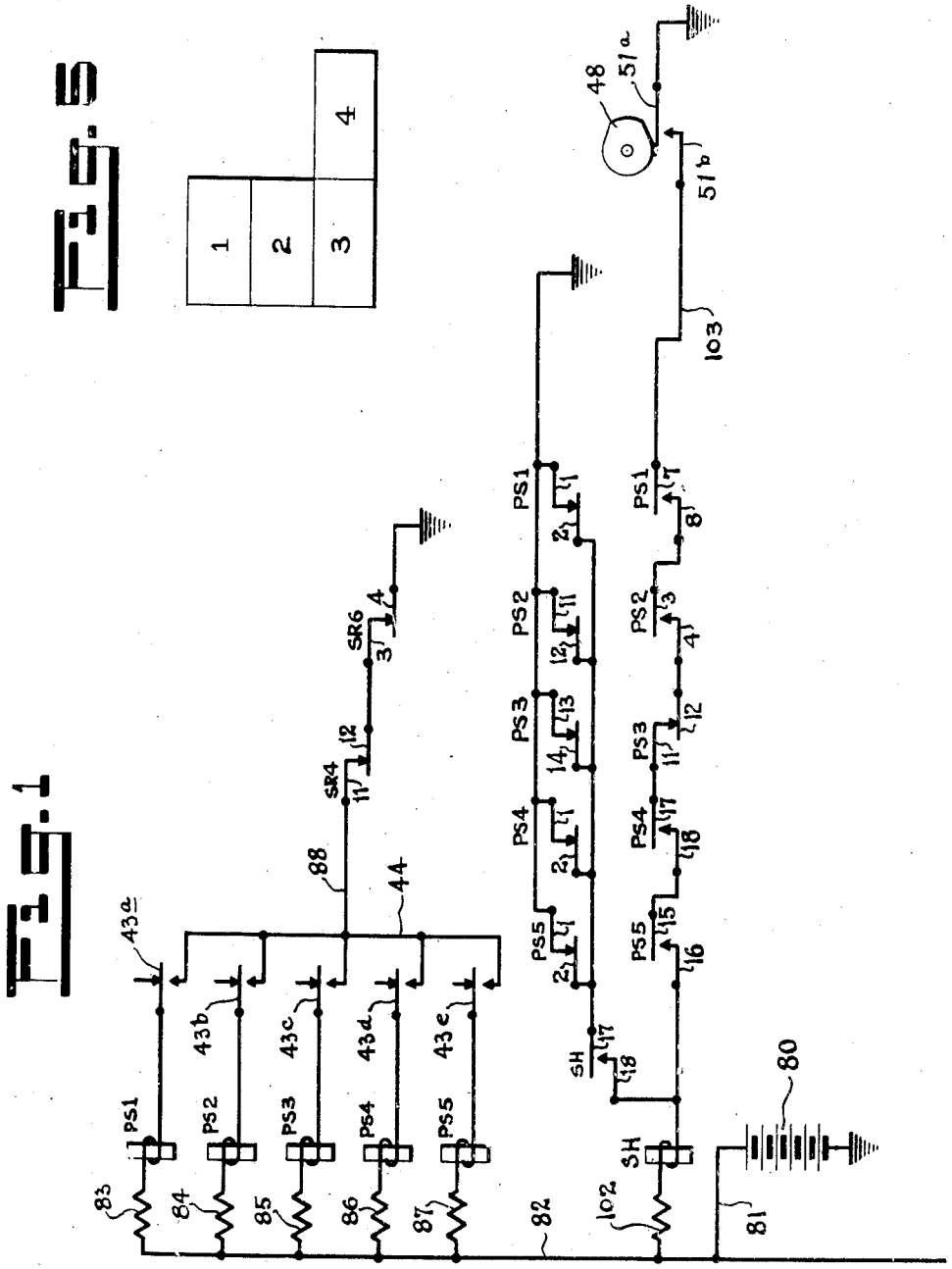
July 10, 1945. A. F. CONNERY ET AL 2,379,865

TELEGRAPH CODE CONVERTER

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Fig. 1

Fig. 1a



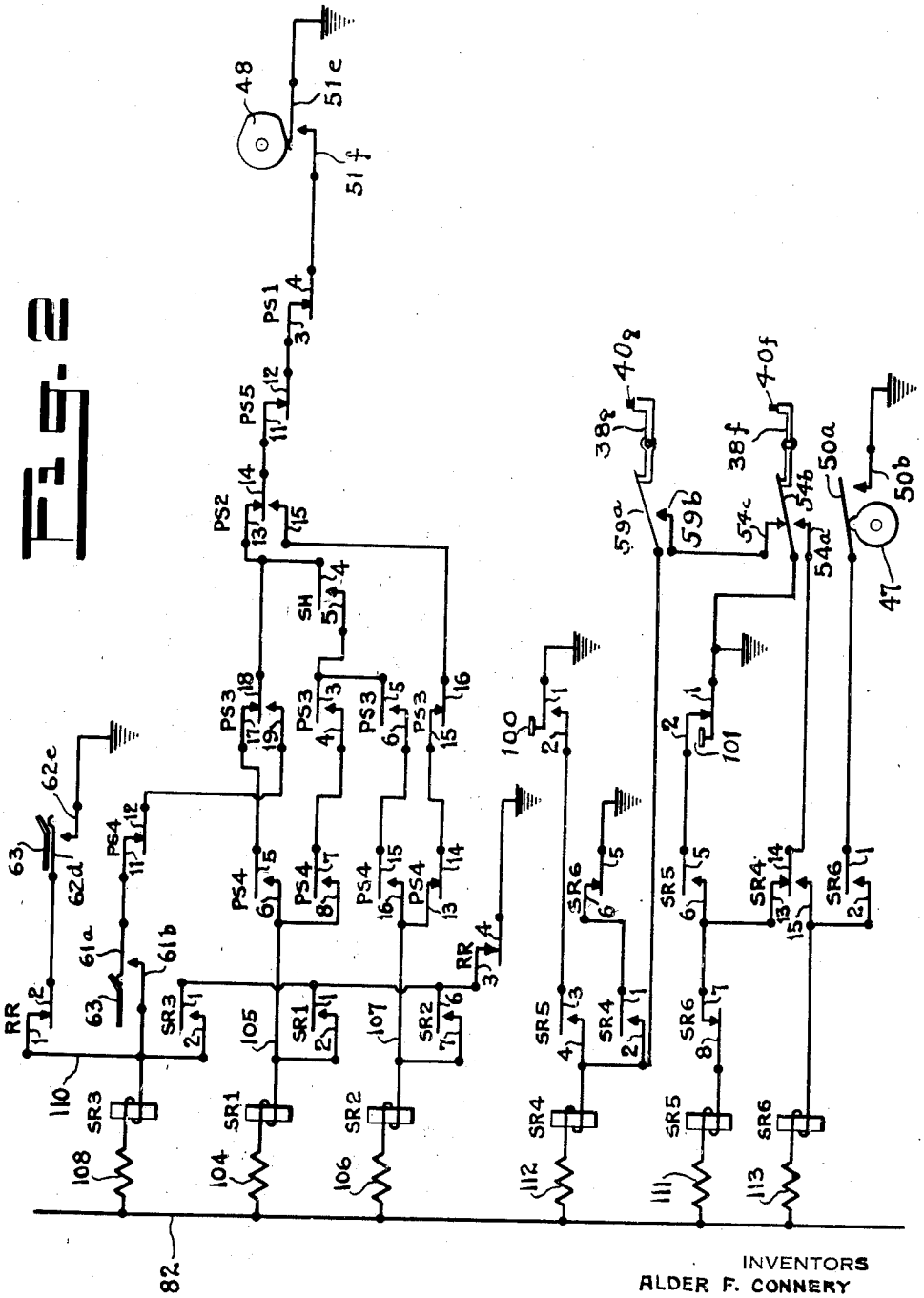
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TELEGRAPH CODE CONVERTER

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Fig. 2



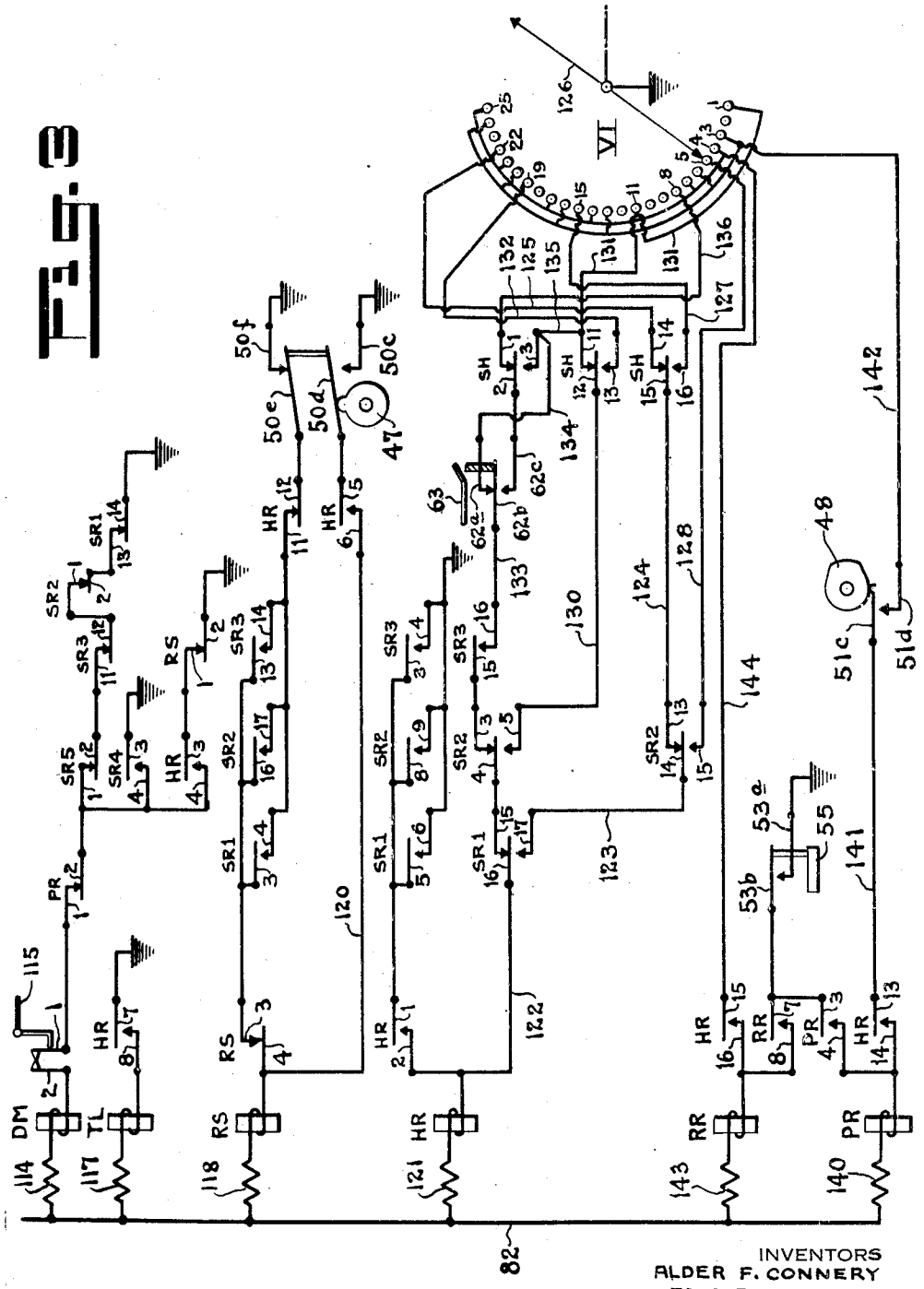
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TELEGRAPH CODE CONVERTER

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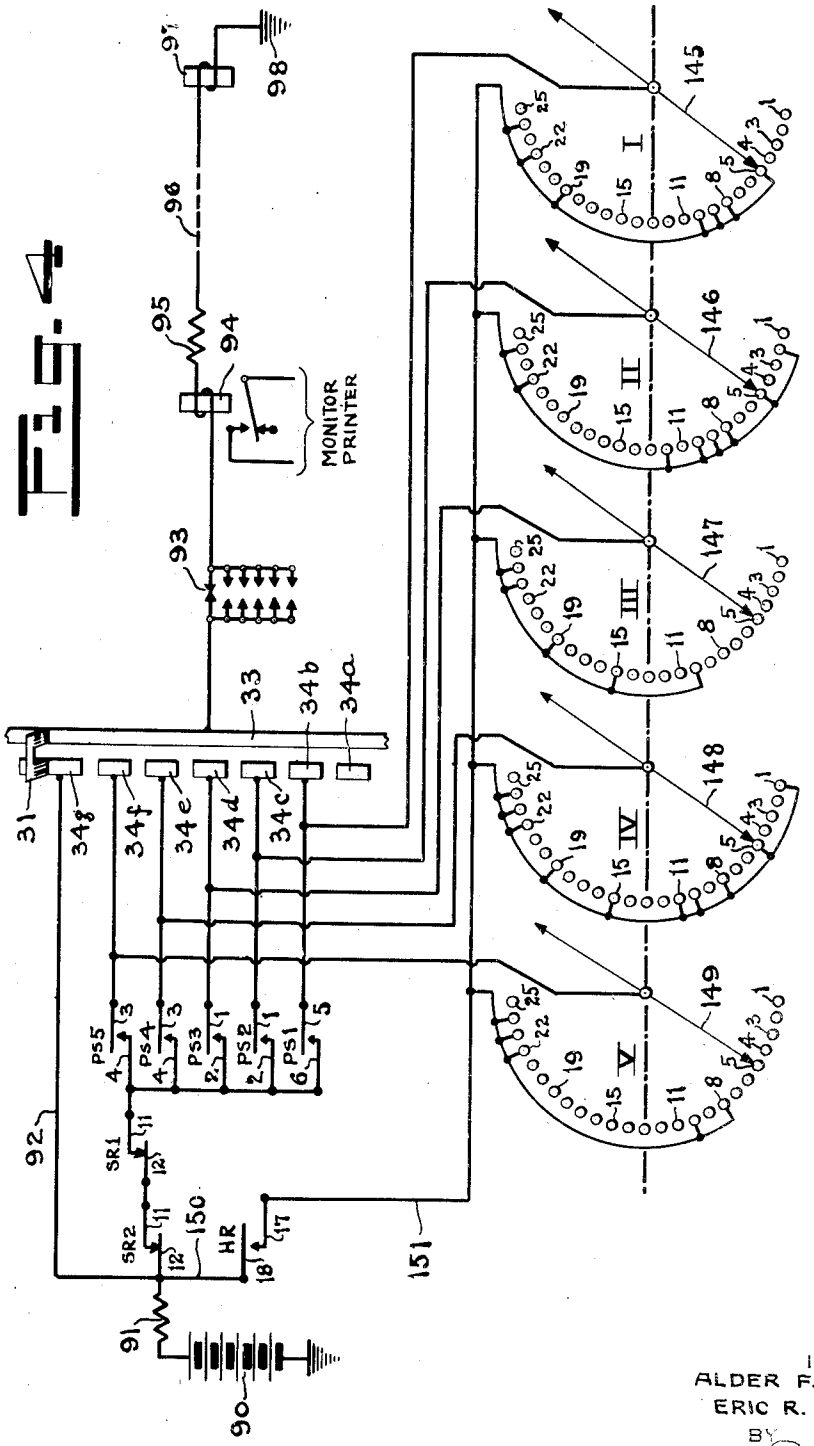
Fig. 3



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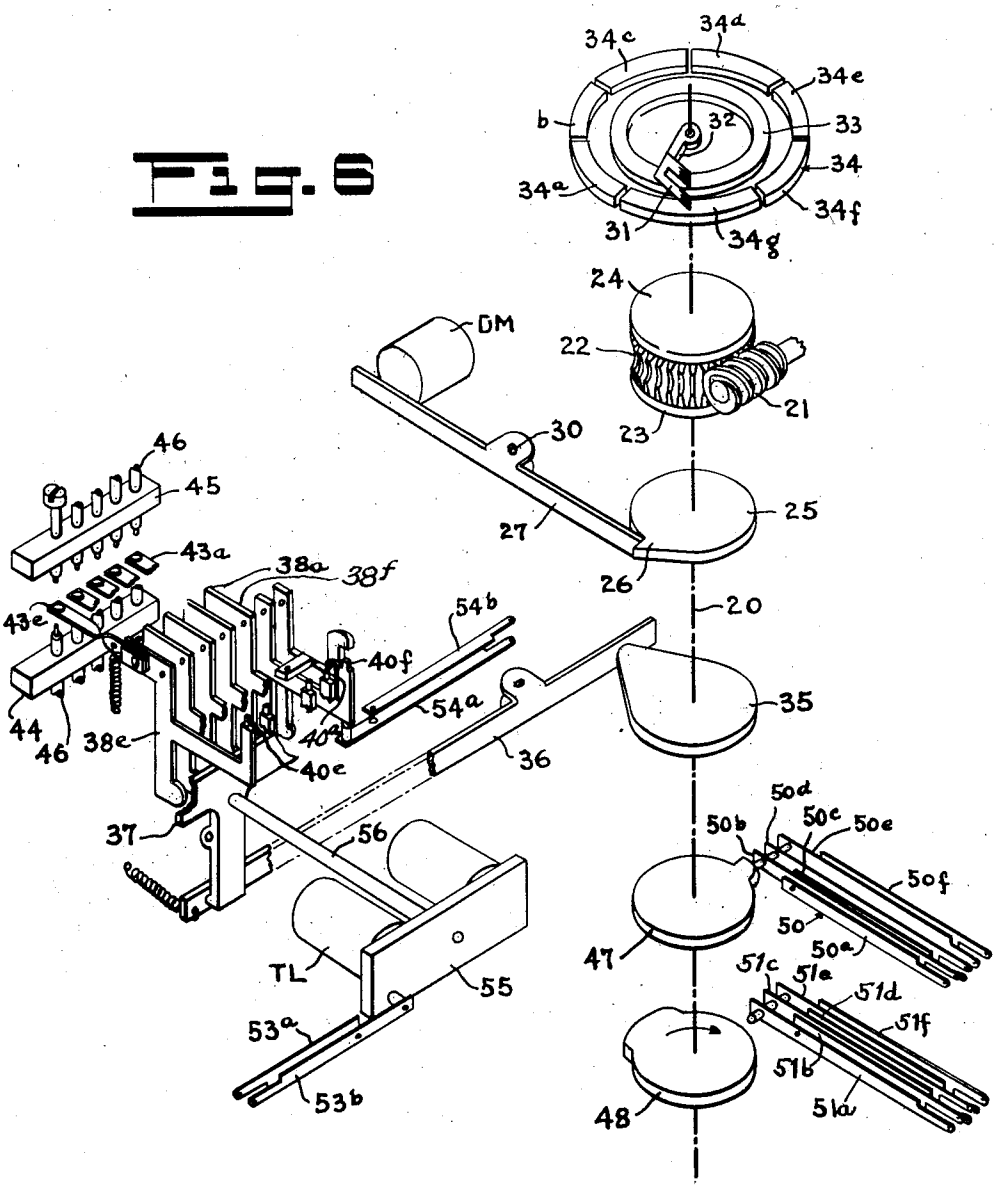
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Fig. 6



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Fig. 7

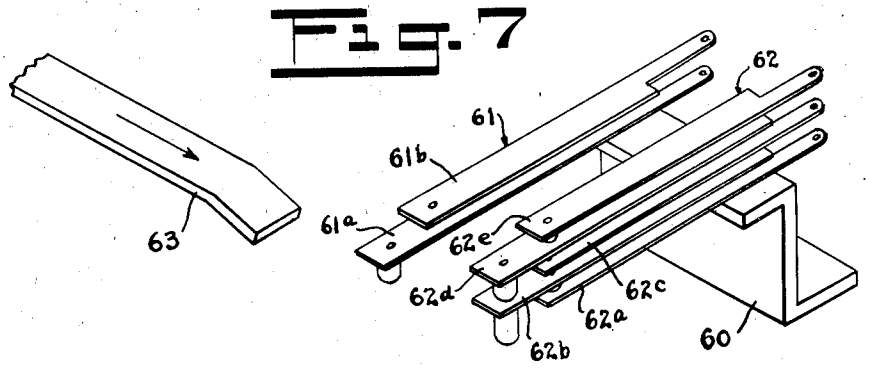


Fig. 8

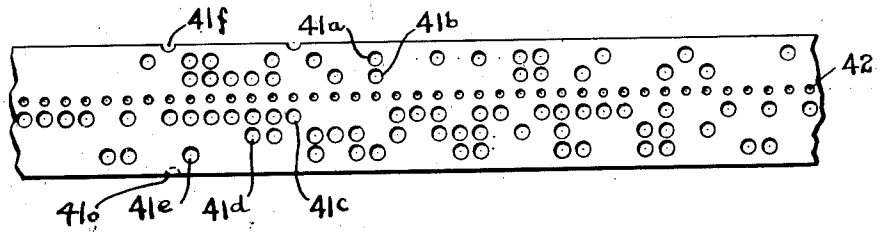
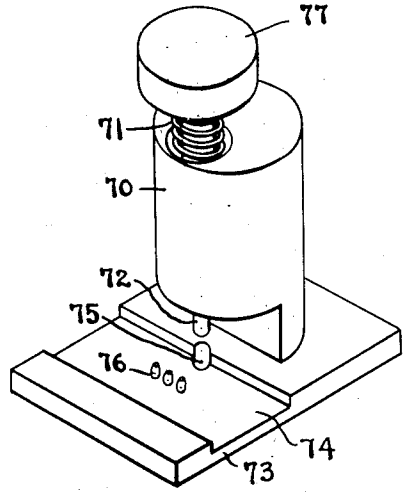


Fig. 9



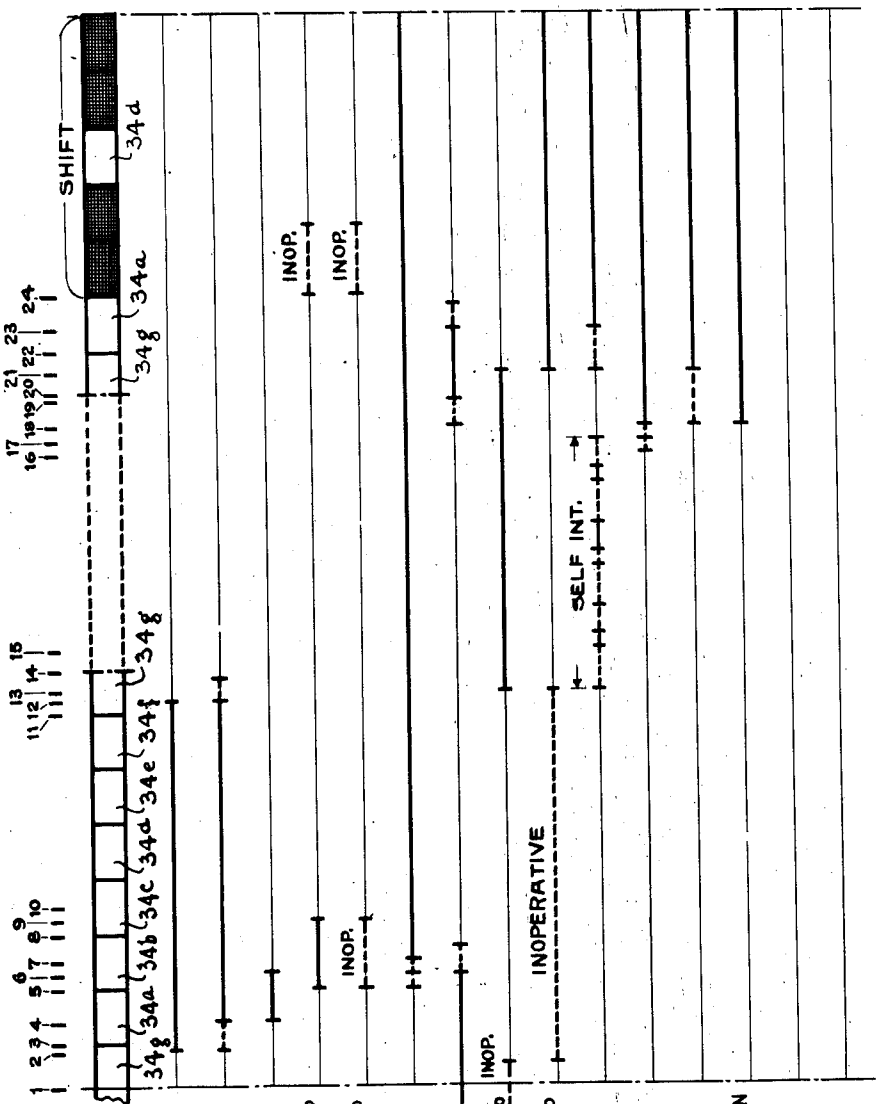
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FIG. 10



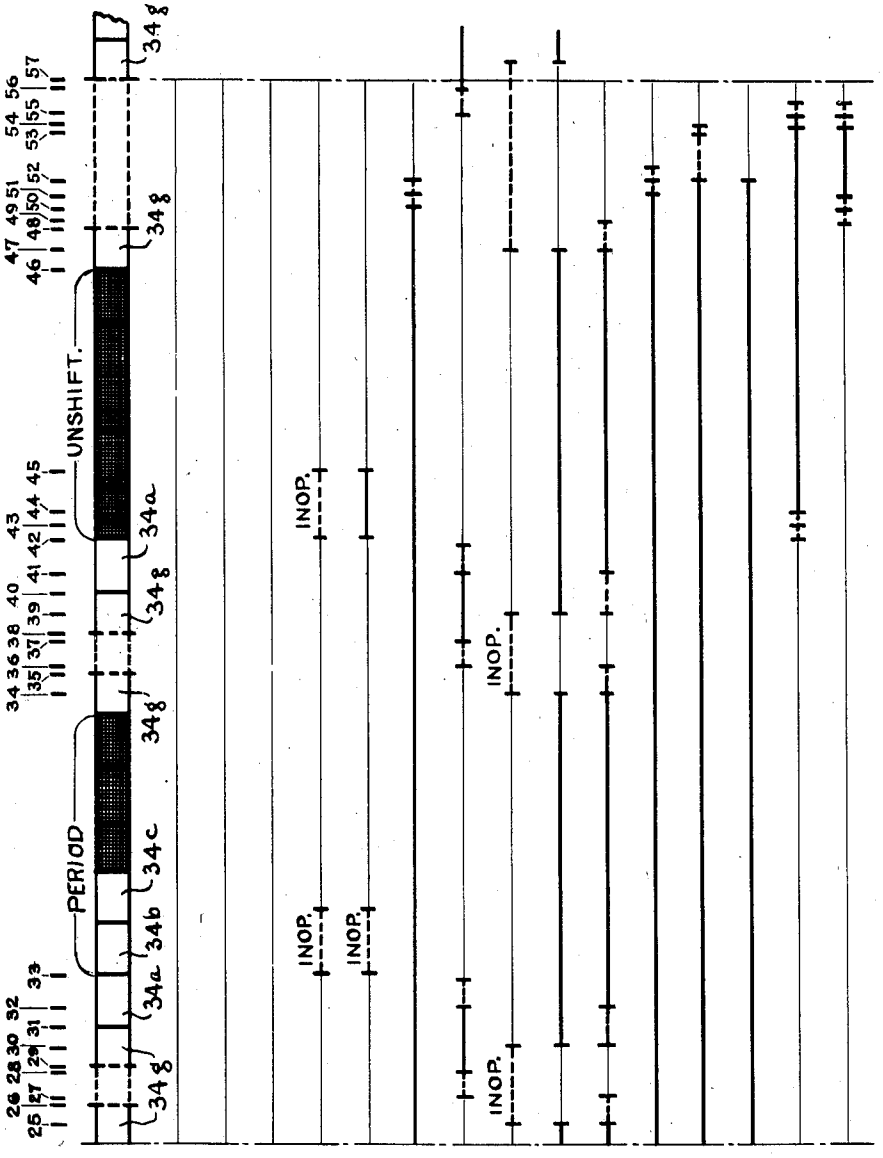
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Fig. 11



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UNITED STATES PATENT OFFICE

2,379,865

TELEGRAPH CODE CONVERTER

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Application May 14, 1943, Serial No. 486,990

23 Claims. (Cl. 178—4)

The present invention relates to automatic printing telegraph systems and particularly to such systems in which transmission is effected by tape transmitters and reception is by printing telegraph mechanism. More particularly still the invention relates to the conversion of the code signals appearing on the perforated tape to code impulses differing from those normally transmitted whereby the signals are effective to properly operate a receiving printing telegraph mechanism of a type different from that normally employed and for control of which the code perforated tape is intended.

A specific example of the system described generally above may serve to define the problem of which the present invention is a solution.

At the present time there is in rather wide use a system of printing telegraphy in which messages are received at a main receiving office on reperforators (well known in the art), and the perforated tapes thus produced placed in tape transmitters and sent to the subsidiary offices where they are received on telegraph printers.

The great majority of printers in such a service are of the tape type, i. e. printers which produce the message as printed characters upon a narrow tape and the originating mechanisms are designed to send signals coded in accordance with the construction of these printers. However, there are instances in which outlying customers of the telegraph company employ printers of the page type, i. e. printers which produce the messages on an endless web of paper. Since this type of printer is normally constructed in such manner that the code representations for certain characteris differ from the representations of the same characters in tape printer operations, it is necessary to convert the code signals transmitted from the tape transmitters to the proper code signals to operate these page printers.

It may be noted here that two tape printers or two page printers may have variations in their construction such that different code representations are necessary to effect printing of the same character.

In addition to the variations in code representations as between tape and page printers, the page printers require certain signals to initiate the performance of functions which are not necessary in tape printer operation. For example, page printers must receive signals to initiate operations of line feed and carriage return to which functions there are no corresponding functions of a tape printer.

It is thus obvious that in utilizing both tape and page printers in the same system, it is desirable that the perforated tape received at a main station be utilized without substantial alteration to transmit messages to the branch offices whether those offices are supplied with tape or page printers. It is further clear that in order to do this differing character signals must be converted from one code representation to another and that code signals must be interpolated to cause functional signals to be transmitted to the page printers.

In connection with the conversion of code signals it should be mentioned that two types are necessary arising from the fact that most five unit code signals are representative of two characters depending upon the position of the printer platen at the time of reception. In other words the printer, whether of the tape or page type, has shift and unshift positions similar to those of a typewriter and the character produced by transmission of any signal and operation of the corresponding type bar depends upon whether the printer is at that moment operating in the upper or lower case.

Our invention solves the problem defined above by providing a secondary transmitter which upon the presence of a signal to be converted or upon certain operation of a monitor printer included in the system to indicate an interpolation, stops the tape transmitter and disconnects it from its associated distributor. The secondary transmitter then advances to a predetermined position in accordance with the signal in the tape transmitter or the operation of the monitor printer and is then connected to the distributor, replacing the tape transmitter in this respect, and thereafter the distributor and the secondary transmitter operate step by step to transmit the converted or interpolated signal to the printer at the outlying office.

A further problem in systems such as that under consideration is that erasures (commonly called rub-outs) are normally taken care of in a tape printer system by simply tearing out the portion of the printed tape which is erroneous or by gumming a portion of the correct tape over the erroneous portion. When such rub-outs occur and a page printer is used, this method cannot be employed and consequently some means must be provided to assure that there will be clean copies of incoming messages at the receiving office. This is accomplished in our invention by the use of an editing punch at the main line transmitting, or relaying, office and modification of the tape transmitter which, together with control circuits operating upon the modified trans-

mitter, assures the elimination of the unwanted erroneous signals in the tape.

It is an object of the present invention to translate or convert any code differences existing between two printing telegraph codes and to transmit signals in accordance with the translation.

It is another object of the invention to so translate code differences whether the differences involve differences in printer platen position or not.

It is another object of the invention to interpolate carriage return and line feed signals where necessary in order to permit transmission to a page printer from a peforated tape intended for transmission to a tape printer.

It is a further object of the invention to provide for the interpolation of a hyphen whenever a carriage return signal is transmitted in the middle of a word.

It is a still further object of the invention to provide means for deleting a hyphen, which would normally be interpolated upon transmission of a carriage return signal in the middle of a word, whenever the printer is operating in the upper case at this time.

A still further object of the invention is the suppression of erasures and other errors in a message in order to provide a clean copy at the receiving office.

Other objects and features of the invention will appear when the annexed specification is considered in connection with the appended drawings, in which

Figures 1, 2, 3 and 4 taken together and arranged as shown in Figure 5 form a complete schematic diagram of a preferred embodiment of our invention;

Figure 5 shows the arrangement of Figures 1, 2, 3 and 4;

Figure 6 is an isometric view of the essential portions of a start-stop tape transmitter showing particularly the modifications of the distributor to adapt it to use in connection with the present converter;

Figure 7 is an isometric view of certain contacts mounted upon the frame of a monitor page printer to adapt it to exert control functions in the system of the present invention;

Figure 8 is a fragmentary view of a piece of perforated tape as used in the system showing particularly notches along the upper edge thereof to control the non-printing of erased portions of the message;

Figure 9 is an isometric view of a manually operated punch which is utilized for editing the tape to eliminate erasures; and

Figures 10 and 11 together form a timing diagram for one of the functions performed by the system, namely the conversion of the period signal in the tape printer code to the period signal in the page printer code.

The preferred embodiment of our invention comprises a plurality of relays and rotary switches in combination with a modified start-stop transmitter distributor and a modified monitor page printer. As indicated, both the start-stop transmitter and page printer are of types well known in the art but are slightly modified for the present purpose. The code differences existing as between the tape printer code and the page printer code will, of course, vary for various species of the two printers considered. It will be clear, however, that while the present system is described with reference to a particular set of code changes and code interpolations, the device or system may be readily adapted to other sets of code differences. In the particular set of code differences illustrated it so happens that none of the characters to be translated makes use of the first of the five signal impulses. For this reason certain of the relays have ample time in which to operate and it is unnecessary to provide "complete overlap." If it should become necessary to translate characters including the first signal impulse, a second set of five relays could be interposed between the receiving pulse relays and the distributor segments thereby delaying the transmission of the message by one character. Thus the system as described is not usable when the translations involve the first signal impulse but by the mere addition of a second set of relays this may be accomplished and it is, therefore, to be understood that our invention comprehends such translations.

Transmitter Distributor

Referring now to the drawings, Figure 6 illustrates the transmitter distributor of the present system. This transmitter distributor, hereinafter for convenience called "distributor," comprises a main shaft **20** driven through the worm **21** and worm wheel **22** and friction clutch plates **23** and **24** by a synchronous or governed motor (not shown). Unless restrained, shaft **20** will rotate at constant speed. Shaft **20** carries a stop cam **25** having on the periphery thereof a projection **26** which may be engaged by one end of stop arm **27**. When the stop arm is in the position of Figure 6, it engages the projection **26** and causes the shaft **20** to stop and the clutch to slip. Stop arm **27** is under control of a magnet DM which, when energized, attracts that end of the stop arm remote from lug or projection **26**, thereby causing the arm to pivot about point **30** and to disengage from projection **26** and to permit the shaft to rotate. The shaft **20** carries at its upper end a pair of brushes **31** electrically connected together and mounted on the shaft but insulated therefrom by means of the arm **32**. These brushes bear on the plain and segmented contact rings **33** and **34**, the latter of which comprises seven contact segments **34***a* through **34***g*, **34***a* being the start signal segment and **34***g* the stop signal segment, the intervening ones being the signal impulse segments. Shaft **20** also carries thereon a cam **35** which through levers **36** and **37** operates the contact levers **38***a* through **38***e* and the feed lever of a tape transmitter. This feed lever operates a feed wheel which engages in feed holes **42** and controls feeding of the tape in the usual manner. The contact levers **38***a* through **38***e* carry at one end pins **40***a* through **40***e* which are adapted to engage the signal holes **41***a* through **41***e* of the perforated tape (see Fig. 8). Levers **38***a* to **38***e* carry at the ends remote from pins **40** insulated flexibly mounted contact springs **43***a* through **43***e* which are adapted to make contact with either of the contact bridges **44** and **45**, such contact being made through adjustable contact screws **46**.

The orientation of brush arm **32**, brushes **31** and cam **35** with respect to the lug or projection **26** is such that when the shaft is stopped by stop arm **27**, the outer brush **31** is approximately in the middle of the stop segment **34***g* of segmented contact ring **34**; pins **40***a* through **40***e* are lowered out of engagement with the perforated tape and contact springs **43***a* through **43***e* are raised and in contact with the contact screws **46** of the upper or spacing contact bridge **45**.

The above description refers to a transmitter distributor of a well known type which is modified in the manner set forth immediately below in order to cooperate with the other portions of the instant system.

A lever **38***f* carries at one end a projection or pin **40***f* adapted to engage in notches **41***f* (Fig. 8) in the edge of the tape. Lever **38***f* is operated by the above mentioned feed lever in the following manner. When the feed lever makes its downward stroke under compulsion of lever **37**, it presses down on lever **38***f* so as to lower pin **40***f*. On the upstroke of the feed lever, pin **40***f* is permitted to rise unless prevented by the tape. In some instances as will hereinafter appear, an additional lever **38***g* and pin **40***g* (Fig. 2) are provided, the location being such that the pin **40***g* is in position to cooperate with notches in the forward edge of the tape as distinguished from the cooperation of pin **40***f* with notches in the rear edge of the tape. Moreover, the pin **40***g* is supplied with a shorter horizontal arm than the pin **40***f*, wherefore it is permitted to rise through the tape only after the tape has been advanced one position beyond the code representation with which the notch aligns.

Mounted on shaft **20** are two additional cams **47** and **48** which are adapted to operate each upon a set of contact springs generally designated **50** and **51** respectively. The set or stack of contacts **50** comprises contact springs **50***a* through **50***f* while the set **51** comprises springs **51***a* through **51***f*. The orientation of cams **47** and **48** with respect to the tip of the outer brush **31** is such that contacts **50***a* and **50***b* open, **50***c* and **50***d* open and **50***e* and **50***f* close, when the outer brush **31** has traveled about a quarter of the way along stop segment **34***g*, that is some 20 degrees before the stop position of the shaft. About 20 degrees after the stop position contacts **50***a* and **50***b* close, **50***c* and **50***d* close and **50***e* and **50***f* open. In a similar manner contacts **51***a* and **51***b* close, **51***c* and **51***d* close and **51***e* and **51***f* close when the brush **31** has traveled over stop segment **34***g*, start segment **34***a* and to the beginning of the first pulse or selector segment **34***b*. Contacts **51***a*, **51***b*, **51***c*, **51***d*, **51***e* and **51***f* open again when the brush has traveled about a quarter way along the second selector segment **34***c*.

In addition to the cams **47**, **48** and their contacts, there is added to the transmitter-distributor a magnet TL and two pairs of contact springs **53** and **54**, one of which (**53**) cooperates with the magnet and the other (**54**) with lever **38***f*. The magnet TL when energized acts through armature **55** and plunger **56** upon the transmitter lever **37**. By this means lever **37** may be held operated and the transmitter stopped even though shaft **20** may be rotating. As indicated above, the contact springs **53***a*, **53***b* cooperate with the magnet TL. This is accomplished by disposing the contact set **53** in such manner that when magnet TL is de-energized its armature **55** at the end of the release stroke opens the contacts **53***a* and **53***b*. The contact set **54** is so disposed as to cooperate with lever **38***f* and as long as the projection **40***f* is prevented from rising above the level of the tape, contacts **54***a* and **54***b* are maintained in their open position, but as soon as the projection **40***f* is permitted to rise either through a notch **41***f* punched in the edge of the tape (Fig. 8) or by reason of there being no tape in the transmitter, contacts **54***a* and **54***b* are allowed to close.

Monitor Printer

As has been indicated hereinabove, the monitor printer is a page printer of any of the usual well known types. It is, however, modified by the addition of the control contacts shown in detail in Figure 7. A bracket **60** is mounted on the frame of the printer and carries two sets of contact springs **61** and **62** in a position to cooperate with a shoe **63** which is fixed to the moving carriage of the printer and, of course, travels with it. The contact shoe **63** and the bracket **60** are relatively so disposed that as the printing nears the end of a line say, for example, 10 letter spaces from the extreme end of its travel, the shoe **63** presses upwardly on contact spring **61***a* causing contacts **61***a* and **61***b* to close. If the carriage continues to travel beyond this point, contacts **61***a* and **61***b* are held closed by the shoe **63** and when the carriage comes within a second predetermined distance from the extreme end of its travel, say 2 letter spaces, shoe **63** causes contact **62***b* to break from contact **62***a* and to make with contact **62***c* and also causes closure of contacts **62***d* and **62***e*.

It should be noted at this point that a letter counter arranged with two sets of contacts successively operable after two predetermined numbers of characters have been registered may be substituted for the monitor printer described above.

Selector Relays

The selector relays, shown in schematic form in Figures 1 through 4, are electrical relays of usual type and, therefore, their mechanical construction need not be described.

Rotary Switch

The rotary switch (Figs. 3 and 4) is of a type which is well known in the art. It comprises a contact bank having a plurality of levels and a wiper for each level, the wipers being mechanically connected but insulated from each other. An operating magnet, by means of a feed pawl, causes the wipers to pass step by step over the contacts of their respective levels. The arrangement is such that when the stepping magnet is energized it withdraws the feed pawl but does not step the switch. Thereafter when the magnet is released the pawl returns to normal position under spring tension causing the switch wipers to step to the next succeeding contacts of all levels.

Tape Editing Punch

As an adjunct to the system there is provided a tape editing punch shown in Figure 9. This punch comprises a body **70** carrying a spring retracted plunger **71**, the lower end of which is formed into a punch **72**. The body **70** is mounted on a base **73** which has a channel **74** milled therein for guiding the perforated tape. A hole **75** drilled through the base at the edge of the channel **74** serves as a die for punch **72**. Pins **76** mounted in the channel **74** cooperate with the feed holes of the perforated tape to hold the tape in correct longitudinal relationship with the punch **72**. Thus when the tape is correctly placed in the guide channel **74** and held in proper register by the pins **76**, depression of the plunger **71** as by striking the upper handle end **77** will cause a notch of approximately semi-circular shape to be punched in the rear edge of the tape as shown at **41***f* of Figure 8.

Of course, if the added transmitter pin **40***g* is to be utilized as has been described above, an

additional editing punch will be supplied to punch this hole.

CIRCUIT CONNECTIONS

In general the relays, stepping switch, transmitter-distributor contacts and monitor printer contacts are so interconnected that when a signal which is to be converted is received it causes the transmitter to stop, the rotary switch to step ahead to a predetermined position under control of a self-interrupting circuit of the stepping magnet of the switch, the distributor to then be restarted and under control of the distributor the rotary switch to be stepped ahead once for each rotation of the distributor, sending out, following each stepping action, a portion of the converted signal or if the signal is one which is transmissible in a single revolution (or character), sending out during the single rotation of the distributor that converted signal.

The circuit diagram of Figures 1 through 4 is drawn in accordance with the detached contact method of showing relays, that is the relay contacts are not shown associated with their own relay windings but are instead shown as part of the circuit which they control. By this method, the conditions for operation, holding and release of any relay or magnet are clearly shown. As a matter of convenience the contacts are all shown in their non-operated position and all moving springs move downwardly upon operation. Further, all cams shown in Figures 1 through 4 are in the home position, that it are shown in the position which they occupy when the distributor shaft 20 is stopped by the stop arm 27.

For the sake of brevity, the contacts of the relays are referred to by means of the relay designation together with a numeral designating the contact number as, for example, contact No. 7 of relay SH will be referred to as SH–7.

Selector relays

The five transmitter contacts 43*a* through 43*e* (Figs. 1 and 6) control five selector relays PS1 through PS5 respectively. The energizing circuits for these relays may be traced through local battery 80 (Fig. 1) over conductors 81 and 82 and through separate resistance 83, 84, 85, 86, 87 to the windings of the relays PS1 through PS5 and thence through any operated contact, i. e. contact lying on the marking bridge 44 of the transmitter, to conductor 88 and thence through contacts SR4—11, SR4—12 and contacts SR6—3, SR6—4 to ground.

Relays PS1 through PS5 have make contacts supplying current to the five selector segments 34*b* through 34*f* of the transmitter distributor (see Figs. 4 and 6). These circuits extend from signaling battery 90 (Fig. 4) throught limiting resistance 91 and thence over contacts SR2—12, SR2—11, contacts SR1—12, SR1—11 to the make contacts of PS1 through PS5 and thence over closed ones of these contacts to the segments 34*b* through 34*f* of the distributor. The stop segment 34*g* of the distributor is supplied with current over conductor 92 directly from the limiting resistance 91. The solid ring 33 of the distributor is connected through the keyboard contacts 93 of the monitor printer and the winding of local relay 94 (which controls the magnet of the monitor printer) and thence through current equalizing resistance 95 to the line 96 and from the line through the winding of the customer's or branch office printer magnet 97 to ground at 98.

When any of the transmitter pins 40 (see Fig. 6) is allowed to rise by virtue of there being a hole in the tape above the pin, the corresponding PS relay is energized. Upon energization this relay closes its make contact thereby connecting signaling battery to the corresponding selecting segment 34*b* through 34*f*. Distributor brush 31 sweeps over the segments in turn thus sending the code signal to the distant printer. This operation continues as long as the signal in the tape is to be transmitted directly to the distant printer without conversion, the operation being essentially the same at it would be were the code conversion equipment not provided. In fact, the only difference lies in the interposition of the selector relays PS between the contacts 43 and segments 34.

When typical tape and page printers are utilized the code differences are those set forth below, the remaining character code representations being identical for the tape printers and page printers of the system. In the table below, the minus signs indicate spacing impulses and the plus signs marking impulses.

Tape printer code	Tape printer function	Page printer code	Page printer function
−+−−−	Print = (separation sign).	−−−+−	Carriage return
		−+−−−	Line feed
(shift) −+−−−	Print # (numbers or pounds).	(shift) +−++−	Print #
−−−+−		++−++	Shift (upper case)
	Print . (period)	−−+++	Print .
		+++++	Unshift
(shift) −−−+−	Print , (comma)	(shift) −−+−−	Print ,
(shift) −−++−	Print ' (apostrophe)	(shift) ++−+−	Print '

In the above table wherever "shift" appears in parentheses, it indicates that inasmuch as both the tape and page printers have to shift into upper case to print the particular character involved, it is unneccessary to perform any conversion with respect to the shift signal which is transmitted in the regular way. The notation is put in simply to make it clear that the particular character is an upper case character. It is, of course, also true that the unshift signal is transmitted in the regular manner to return the receiving printer to its lower case position.

There are instances in which the code for a particular character differs both in the code representation thereof and the case in which the printer is operated. Of course, in these instances the conversion involves the transmission of a shift signal and an unshift signal as well as the transmission of the signal impulses. An example of this in the above table is the period.

In addition to the translations or conversions set forth above there are certain interpolations which must be provided for. These interpolations occur due to the necessity of sending carriage return and line feed signals in order that the page printer may perform these functions at the end of each line of typing. They are controlled primarily by the contacts 61 and 62 mounted upon the monitor printer frame and are modified in accordance with the presence or

lack of a space signal on the tape subsequent to the operation of contacts 61 and prior to the operation of contacts 62. They are also modified whenever the printer is in the shift position at the closure of contacts 62.

For example, if the signal for a spacing movement of the printer carriage (———+——) is received after the closing of contacts 61 then upon that reception the transmission is stopped and a carriage return signal (———+—) followed by a line feed signal (—+———) is transmitted from the rotary switch via the distributor segments to the monitor and receiving page printers. It will be seen from the above that upon the termination of a word within the predetermined distance of the line end, say 10 letter spaces, the receiving page printer performs its line feed and carriage return functions and the next word starts at the beginning of the ensuing line.

There are cases, however, in which a word does not terminate within the last ten letter spaces of the line. In this case provision is made so that upon the closure of contacts 62 a succession of signals consisting of shift (++—++), hyphen (++———), unshift (+++++), carriage return (———+—), and line feed (—+———) is transmitted from the contacts of the rotary switch to the distant printer.

There will, of course, be times when a word does not terminate within the last 10 letter spaces of the line and in which the printer is at the time operating in the upper case. When this occurs it is desirable to eliminate the printing of the hyphen inasmuch as it would occur either in the midst of numeral characters or following punctuation marks of one sort or another. For this reason provision is made so that whenever the shift relay is operated and the space signal is not received in the last ten letter spaces, the hyphen which would otherwise be sent is deleted and only the carriage return and line feed signals are transmitted.

In addition to the translations and interpolations rub-outs or erasures occur and must be provided for. This may be done by the use of the editing punch described above. When it is desirable that the portion which has been erased should be automatically cancelled from the transmission a hole is punched in the forward edge of the tape at the beginning of the portion to be deleted and a hole is punched in the rear edge of the tape at the end of that portion (see 41*g* and *f* Fig. 8). When the first of these semicircular notches in the tape edge arrives at the transmitter it causes suppression of the transmission but permits the tape to be fed through the transmitter. Upon the arrival of the second notch the suppression ceases and normal transmission is resumed.

Frequently it is desirable to have suppression only partially automatic. In this case a notch is punched in the rear edge of the tape both at the beginning and at the end of the portion to be deleted. Upon arrival of the first notch in the transmitter, the transmitter stops and the operator or supervisor in charge of the circuit may then supply, by use of the monitor printer keyboard, substitution for the erasure, if desired. Whether or not this is done the operator may then either cause the transmitter to resume normal operation or cause feeding of the tape with transmission suppressed until the second notch is presented to the sensing pins. Upon the presentation of the second notch to the sensing pin normal transmission is automatically resumed.

Shift and stop relays

The shift relay SH operates whenever the shift signal appears in the tape and remains operated until an unshift signal is sensed by the sensing fingers 40*a*—40*e*. This relay functions in combination with the stop relays SR1, SR2 and SR3 to determine the particular group of signals to be transmitted from the rotary switch. It also functions in combination with relays PS to determine whether relays SR1 and SR2 are to be energized alone or together.

Relay SH is energized under control of the contacts of relays PS1 through PS5. The energizing circuit for relay SH may be traced from battery 80 (Fig. 1) over conductors 81 and 82, through resistance 102, winding of relay SH and thence over contacts PS5—16, 15, PS4—18,17, PS3—14,12, PS2—4,3, PS1—8,7, thence over conductor 103 and through cam contacts 51*b*, 51*a* (controlled by cam 43) to ground, the relay being energized upon the closure of contacts 51*a* and 51*b*. As indicated above, relay SH is, therefore, operated upon the closure of contacts 51*a* and 51*b* subsequent to the sensing of a shift signal (operation of relays PS1, PS2, PS4, PS5), the cam 43 delaying energization of relay SH until all PS relays have been completely operated.

Once energized, relay SH is held operated due to the completion of its locking circuit which extends through its own contacts SH—18, 17 and thence over parallel contacts PS5—2,1, PS4—3,1, PS3—14,13, PS2—12,11, PS1—2,1 to ground. Due to this locking circuit all five PS relay must be operated, that is the unshift signal must be sensed, in order for SH to be released.

Stop relay SR1 functions whenever the transmitter senses the signal for a period and causes the transmission of the signals necessary to operate the page printer to print a period, namely, shift, period and unshift signals. When relay SR1 operates while relay SH is operated a comma is transmitted to the distant page printer, such transmission consisting (as shown in the above table) of the comma signal alone inasmuch as the shift signal is transmitted in the regular fashion. As indicated above relay SR1 is energized every time a period or comma, that is a signal having the fourth impulse only a marking impulse, occurs on the tape. The rising of the fourth transmitter pin 40*d* causes operation of relay PS4 as has been described. The energizing circuit for relay SR1 may then be traced from battery 80 (Fig. 1) over conductors 81 and 82 (Figs. 1 and 2) and thence through resistance 104 (Fig. 2), winding of relay SR1, conductor 105, contacts PS4—6,5, PS3—17,16, PS2—13,14, PS5—11,12, PS1—3,4 to contacts 51*f*, 51*e* operated by cam 48. Upon closure of contacts 51*e*, 51*f* ground is supplied to the circuit just mentioned and relay SR1 is energized. The holding circuit for relay SR1 extends from the relay winding over its own contacts SR1—2,1 and over contacts RR—3,4 to ground, wherefore SR1 is held operated until relay RR is operated, as will hereinafter be described.

Relay SR2 is operated whenever a separation (=) sign or a number (#) sign occurs on the tape. In this connection it should be noted that the separation mark is used to indicate to the receiving operator on a tape printer that the tape is to be broken at that point and a new line

started. The separation sign is used primarily to separate the name and the portions of the address and likewise to separate the signature from the body of the message. Therefore, in converting to page printer operation a line feed and carriage return signal must be interpolated whenever the separation sign appears.

Relay SR2 is energized over a circuit which leads from local battery 80 (Fig. 1) over conductors 81 and 82 (Figs. 1 and 2) and thence over resistance 106, through the winding of SR2, thence over conductor 107, through contacts PS4—13,14, PS3—15,16, PS2—15,14 (PS2 is operated due to the fact that the code has only its second impulse a marking impulse), PS5—11,12, PS1—3,4 and contacts 51*f*, 51*e* of cam 48 to ground. Thus upon reception of a separation (=) sign, relay SR2 is energized as soon as cam 48 closes its contacts 51*e*, 51*f*. This relay is held in its operated position by virtue of a holding circuit extending over its contacts SR2—7,6 and RR—3,4 of release relay RR to ground and is released upon the operation of RR. As state above, SR2 is also energized upon the reception of a number (#) sign, the circuit in this case extending over the same path just traced for the separation sign, since the code representation for the number sign is the same as that for the separation sign except that it is preceded by a shift signal. Thus the only difference is that of operation of the shift relay SH to alter the pick-up point.

Relays SR1 and SR2 are energized together whenever an apostrophe (') (upper case character, ——++—) occurs on the tape. Inasmuch as the signal is representative of an upper case character it has, of course, been preceded by a shift signal and, therefore, relay SH has been operated and is still held operated at the time when the apostrophe signal is presented to the transmitter pins. The rising of the third and fourth transmitter pins 40c and *d* causes operation of relays PS3 and PS4 over circuits already traced. The closure of contacts of these relays sets up energizing circuits for relays SR1 and SR2 which may be traced as follows:

(1) From local battery 80 (Fig. 1) over conductors 81 and 82 (Figs. 1 and 2) thence over resistance 104, through the winding of relay SR1 to conductor 105, thence over contacts PS4—8, 7, PS3—4, 3, SH—5, 4, PS2—13, 14, PS5—11, 12, PS1—3, 4 and contacts 51*f*, 51*e* of cam 48 to ground, and

(2) From local battery 80 over conductors 81 and 82, resistance 106, winding of relay SR2, conductor 107, contacts PS4—16, 15, PS3—6, 5 to SH—5 and thence over the circuit traced in (1) to ground.

The locking circuits for the two relays are the same as are present when these relays are energized separately and consequently the operation of RR releases both SR1 and SR2.

Relay SR3 is energized whenever a "space" signal (——+——) occurs on the tape provided that contacts 61 on the monitor printer are at that time closed. SR3 is furthermore energized by closure of certain of the contacts 62 on the monitor printer whether or not a space signal is present in the tape. In the first instance, that is when a "space" signal occurs on the tape and contacts 61 are closed, the energizing circuit for relay SR3 extends from local battery 80 (Fig. 1), through conductors 81 and 82 (Fig. 2) over resistance 108 and the winding of relay SR3, through contacts 61*b*, 61*a* now closed by virtue of the position of shoe 63, and thence over PS4—11, 12, PS3—19, 18 (PS3 is operated owing to the fact that the code for space has the third impulse a marking impulse), PS2—13, 14, PS5—11, 12, PS1—3, 4 and contacts 51*e*, 51*f* of cam 48 to ground.

In the second instance SR3 is energized over a circuit extending from its winding thence, over conductor 110, contacts RR—1, 2 and contacts 62*d*, 62*e* of the monitor printer, now closed by virtue of the position of shoe 63 within two letter spaces of the end of the line, to ground. SR3 upon operating closes a holding circuit for itself over contacts SR3—2, 1 and contacts RR—3, 4 to ground. Thus whenever a space occurs on the tape after contacts 61*a*, 61*b* have closed, SR3 is energized as soon as cam 48 closes its contacts and further if no space occurs then SR3 is energized, immediately upon closure of contacts 62*d* and 62*e*. Relay SR3 is, of course, released by operation of relay RR.

Relay SR5 is effective to stop the distributor and is energized by the rising of the transmitter 6th pin 40*f* provided, however, that relay SR4 is not at that time operated. When the tape runs out or if a notch is punched in the rear edge of the tape (e. g. by means of the tape editing punch) the 6th pin 40*f* is allowed to complete its upward stroke and close its contacts 54*a* and 54*b* as described above in connection with Figure 6. The energizing circuit for relay SR5 extends from local battery 80 (Fig. 1) through conductors 81 and 82, (Figs. 1 and 2), resistance 111 and thence through winding of relay SR5 and over contacts SR6—8, 7, SR4—13, 14, 54*a*, 54*b* to ground. The relay is locked in its operative position by reason of a circuit extending from its winding over contacts SR6—8, 7, SR5—6, 5 and contacts 2, 1 of start key 101 to ground.

Relay SR4 is energized in either one of two ways. One of these is possible only when SR5 has previously been operated and comprises a circuit completed by depressing the non-print key 100 (Fig. 2), the circuit then extending from local battery 80 over conductors 81 and 82, resistance 112, winding of relay SR4, contacts SR5—4, 3 (now closed) and contacts 2, 1 of the non-print key 100 to ground. Upon such operation relay SR4 closes a locking circuit extending over contacts SR4—2, 1 and contacts SR6—6, 5 to ground.

In the second instance relay SR4 is energized by the rising of transmitter pin 40*g* which then completes a circuit extending from battery to the winding of relay SR4 as traced and thence over contacts 59*a*, 59*b* associated with sensing pin 40*g*, 54*c*, 54*b* to ground. This operation of SR4 is independent of the operation of SR5. The energization of relay SR4 in either event serves to disable all of the PS relays and to thus suppress transmission, this being accomplished by removing, at contacts SR4—11, 12 (Fig. 1), ground from the marking bridge 44 of the transmitter.

Relay SR6 is energized whenever relay SR4 has been energized and the sensing pin 40*f* rises through a notch in the edge of the tape. The energizing circuit for this relay extends from local battery 80 over conductors 81 and 82 through resistance 113, winding of relay SR6, contacts SR—15, 14, contacts 54*a*, 54*b* to ground. Since the 6th pin 40*f* rises at about the same time as cam 47 permits contacts 50*a*, 50*b* to close, the holding circuit for SR6 is closed at about the same time that the relay is energized and is main-

tained closed for nearly a complete revolution of shaft 20 and then opens releasing SR6 just prior to the time at which brush 31 comes to rest on stop segment 36f.

It connection with the operation of relays SR4, SR5, SR6, it should be noted, as has been explained above, that the transmitter pin 40g which under certain circumstances controls relay SR4 is arranged to operate subsequently to the pin 40f which controls relay SR5. Consequently when the tape runs out relay SR5 is operated stopping the transmitter, and thus, of course, preventing the operation of relay SR4.

Transmitter start magnet

As has been described hereinabove, the transmitter start magnet DM when operated removes the stop arm 27 from the path of the projection 26 on cam 25 thereby permitting the distributor shaft 20 to rotate. The magnet DM is normally energized and, therefore, the shaft 20 permitted to rotate continuously. The energizing circuit extends from local battery 80 (Fig. 1) over conductors 81 and 82 (Figs. 1, 2 and 3), thence over resistance 114 (Fig. 3) to the winding of magnet DM, thence over contacts 2 and 1 of the tape lever 115 (the auto stop lever which is well known in the art) contacts PR—1,2, SR5—1,2, SR3—11,12, SR2—1,2, SR1—13,14 to ground. The circuit just described may, of course, be broken by operation of any of the relays PR, SR5, SR3, SR2, or SR1.

Although it was stated above that this circuit might be broken by operation of relay PR, this does not happen in practice inasmuch as relay PR operates only after the operation of SR5, SR3, SR2, or SR1. Consequently, PR is effective only to hold the circuit open after it has been opened by operation of the relays SR1, SR2, SR3 or SR5. Also after being broken at the contacts of relays SR1, SR2, SR3 or SR5 the circuit to transmitter magnet DM may be closed by the operation of relay SR4 as has been described above in connection with that relay. Further, after being broken in the manner described above the circuit may be closed and broken repeatedly by operation of rotary switch magnet RS provided relay HR has been operated, the means for so making and breaking the circuit extending from contacts PR—1,2 over contacts HR—4,3 and contacts RS—1,2 to ground. In brief, magnet DM may be released, stopping the distributor, by operation of any of the relays SR1, SR2, SR3 or SR5. It may be re-energized by operation of SR4 or it may be repeatedly energized and released by operation of rotary switch magnet RS.

Transmitter lock magnet TL

The transmitter must at times be prevented from operating even though the distributor shaft 20 is rotating in order that signals may be sent from the rotary switch contacts in substitution for and addition to those indicated by the perforated tape. The circuit for lock magnet TL extends from local battery 80, through conductors 81 and 82, and thence over resistance 117 (Fig. 3), through the winding of magnet TL and over contacts HR—8,7 to ground. It is clear that this magnet is energized by the operation of relay HR and released by the release thereof.

Rotary switch magnet RS

This magnet is normally not operated. It is, however, provided with two energizing circuits, the first one of which extends from battery 80, thence over conductors 81 and 82 (Figs. 1, 2 and 3) resistance 118 (Fig. 3) through the winding of magnet RS, thence over the self-interrupting contacts RS—4,3 and over parallel contacts SR1—3,4, SR2—16,17, SR3—13,14, and over contacts HR—11,12 and contacts 50e and 50f controlled by cam 47, to ground. The circuit just described is completed by the closure of contacts 50e and f at the end of a revolution of the brush shaft provided that one of the relays SR1, SR2, SR3 has been previously operated. When magnet RS is energized through this circuit it operates, withdrawing the feed pawl and opening its self-interrupting contacts RS—4,3.

The opening of the contacts breaks the circuit, releasing magnet RS and also releasing the feed pawl thereby causing the switch to be stepped to the next point under spring tension as previously described. At the same time that the switch is stepped to its new position contacts RS—3,4 close restoring the energizing circuit of the magnet which thereupon repeats its operation and continues to step from point to point until finally the circuit is broken by the operation of relay HR, as will be described hereinafter.

The second of the two energizing circuits for magnet RS extends to the winding in the same manner as described above and thence over conductor 120, contacts HR—6,5 and contacts 50d, 50c of cam 47 to ground. This circuit is completed upon the closure of contacts 50d and 50c subsequent to the operation of relay HR. At the time of the closure the distributor shaft 20 is in motion.

The circuit is broken by opening of the contacts 50d and 50c at approximately 15 degrees after the shaft passes the home position, that is the position in which it would be stopped were magnet DM de-energized. This circuit continues to be made and broken as long as the shaft rotates until it is finally broken by the release of holding relay HR.

Holding and release relays HR, PR and RR

The energizing circuits for relays HR, PR and RR (Fig. 3) are connected to the contacts of control level VI of rotary switch RS. Certain of the contacts points of this level, namely those designated 1, 5, 8, 11, 15, 19 and 22 are the "pick-up points" for which magnet RS hunts when energized through its self-interrupting contacts RS—4,3. These pickup points are selected in accordance with the operation of relays SH, SR1, SR2 and SR3 together with the operation of contacts 62 of the monitor printer, all of these contacts being effective either singly or in combination with others mentioned. The various pickup pionts are thus identified with the signal to be transmitted whether such transmission is of an interpolated signal or of a converted signal.

When HR is energized it breaks, at contacts HR—11, 12, the self-interrupting circuit to magnet RS and places the latter under control of cam 47 through the medium of contacts 50d and 50c which are in a circuit previously described. The various energizing circuits for HR may be traced as follows:

(1) When SR1 is alone operated the energizing circuit for HR extends from battery 80 through conductors 81, 82 (Figs. 1, 2 and 3) thence over resistance 121 (Fig. 3), winding of HR, conductor 122, contacts SR1—16, 17, conductor 123, contacts SR2—14, 13, conductor 124,

contacts SH—15, 14, conductor 125 to contact point 22 of level VI of the rotary switch, and thence over the wiper 126 of that level to ground. It is clear that this circuit is completed and HR operated only when the wiper 126 has hunted for and found contact 22 of level VI. Contact 22 of the level VI is identified with the transmission of a period.

(2) When SR1 and SH operate together the circuit extends as in (1) above to SH—15 and proceeds thence over SH—16 and conductor 127 to contact point 15 of level VI, and thence over wiper arm 126 to ground. The contact point 15 of level VI is identified with the transmission of a comma.

(3) SR1 and SR2 operated. In this case the circuit extends as in (1) above to SR2—14, thence to SR2—15 and over conductor 128 to contact 5 of level VI and thence over wiper 126 to ground. Contact point 5 is identified with the transmission of an apostrophe.

(4) SR2 alone operated. In this case, the circuit extends from the winding of relay HR over conductor 122, contacts SR1—16, 15, contacts SR2—4, 5, conductor 130, contacts SH—12, 11, conductor 131 to contact 11 and also to contact 1 of level VI of the rotary switch and thence over wiper 126 to ground. Contact points 1 and 11 are identified with the transmission of carriage return and line feed signals, the only purpose in supplying two contacts being to lessen the time spent by the rotary switch in hunting for "pickup points." The contact is duplicated with respect to the carriage return and line feed signals because these are frequently recurring.

(5) SR2 and SH operated. The circuit in this instance proceeds as in (4) above to SH—12, thence to SH—13 and over conductor 132 to contact point 19 of level VI of the rotary switch and over wiper 126 to ground. This contact point is identified with the number sign.

(6) SR3 alone operated with the carriage not at the end of a line but within the prescribed number of spaces from the end so that contacts 61 of the monitor printer are closed. In this case the circuit proceeds as in (4) above to SR2—4, thence over SR2—3, SR3—15, 16, conductor 133, contacts 62*b* and 62*a*, conductor 134, conductor 135 and conductor 131 to points 1 and 11 of contact level VI of the rotary switch and thence over wiper 126 to ground. Contacts 1 and 11 are, as has been above stated, identified with the transmission of carriage return and line feed signals.

(7) SR3 operated at a time when the carriage of the monitor printer is at the end of a line and consequently contacts 62*b* and 62*c* are closed by virtue of the pressure exerted upon contact 62*b* by shoe 63. In this case the circuit proceeds as in (6) above to contact 62*b* and thence over contact 62*c*, contacts SH—2, 1 and conductor 136 to contact point 8 of level VI and thence over wiper 126 to ground. Contact point 8 is identified with the transmission of signals for hyphen, carriage return and line feed.

(8) SR3 and SH operated at a time when the carriage is at the end of the line and consequently contacts 62*b*, 62*c* are closed. In this case the circuit extends as described in (7) above to contact SH—2, thence to contact SH—3 and over conductors 135 and 131 to contact points 11 and 1 which, as has been stated hereinabove, are identified with carriage return and line feed signal transmission.

Irrespective of how operated, HR closes its holding circuit over its own contacts HR—2, HR—1 and over parallel make contacts SR1—5, 6, SR2—3, 2 or SR3—3, 4 to ground. Thus relay HR is operated whenever the wiper arm 126 of the rotary switch reaches a selected one of the pickup points or contacts and is held operated by any one of the relays SR1, SR2 or SR3, and is released when these relays are released.

Relay PR

The energizing circuit for pre-release relay PR extends from local battery 80, over conductors 81 and 82, through resistance 140 (Fig. 3), thence through the winding of relay PR over contacts HR—14, 13 to conductor 141 and thence over contacts 51*c* and 51*d* (when closed by the operation of cam 48) and over conductor 142 to contact points 3, 6, 13, 16, 20 and 24 of level VI of the rotary switch. Therefore, relay PR is energized by the closure of contacts 51*e* and 51*d* at any time when relay HR has been operated and wiper arm 126 has reached any one of the contacts of level VI above mentioned. It should be noted that pre-release contact 3 is associated with pickup contact 1, pre-release contact 6 is associated with pickup contact 5, pre-release contact 13 is associated with pickup contacts 8 and 11, pre-release contact 16 with pickup contact 15, pre-release contact 20 with pickup contact 19 and pre-release contact 24 with pickup contact 22.

Upon operation PR closes its holding circuit over its own contacts PR—4, 3 and over contacts 53*b* and 53*a* associated with armature 55 of transmitter lock magnet TL and thence to ground. It will be recalled that magnet TL is energized by the operation of relay HR. Contacts 53*a* and 53*b* of magnet TL are adjusted to open only when the armature 55 of the magnet TL has reached the end of its release stroke, and therefore, PR is held operated as long as magnet TL is operated and in fact until the magnet has completely unlocked the transmitter.

Relay RR

The energizing circuit for release relay RR extends from local battery 80 through conductors 81, 82, thence over resistance 143, through the winding of RR, and thence over HR—16, 15 and conductor 144 to contact points 4, 7, 14, 17, 21, 25 which are the release points and each one of which is associated with the pre-release point mentioned above, which has the consecutive lower number. Therefore, relay RR is energized as soon as the wiper arm 126 reaches any one of the contact points of level VI above mentioned, provided only that relay HR has already been operated. A locking circuit for relay RR extends over its own contacts RR—8, 7 and thence over contacts 53*b*, 53*a* operated by armature 55 of transmitter lock magnet TL to ground. Therefore, relay RR is released together with relay PR upon the complete unlocking of the transmitter.

Line circuits of the rotary switch

The wiper arms of levels I, II, III, IV and V of the rotary switch designated respectively 145, 146, 147, 148 and 149 are connected respectively to the selector segments 34*b*, 34*c*, 34*d*, 34*e* and 34*f* of the distributor. The contacts of the levels I, II, III, IV and V are so wired as to send out the required signal combinations through the distributor segments. Thus when the wipers stand on their respective No. 1 contact points, only level IV has a contact connected to the common battery lead which lead extends from line battery 88 through resistance 91 and over conductor 150,

contacts HR—18, 17, conductor 151 to all the switch contacts of the levels I, II, III, IV and V which are utilized in the transmission of signals. Thus when the switch stands at the No. 1 position, that is with the wipers on the No. 1 contact points of their respective levels, a No. 4 marking impulse only is transmitted to the line, this being the page printer code signal for carriage return. When the wipers rest on contact points 2 of levels I through V only in level II is there a contact point which is connected to the common battery lead 151. Consequently at this time a signal having a second impulse marking is transmitted, this being the page printer code for line feed. Other combinations transmitted when the switch wipers rest on other contact points may be traced from the diagram and it will be clear that the sequence of signals transmitted is in accordance with the conversion or interpolation required by the code variations and is under control of the signals appearing in the perforated tape. It should be noted that since the rotary switch always stops on a release point there is no connection between distributor segments when the switch is idle.

Operation

Before explaining in detail the mode of operating in connection with an illustrative example thereof, there is given in the following a general outline of the various operations.

Preliminary

When current is first supplied to the device the only circuit completed is that to the distributor magnet DM which immediately operates and permits the shaft 20 to rotate. Rotation of shaft 20 causes pin 40*f* to rise (it being assumed that there is no tape in the transmitter) and thereby causes energization of relay SR5 and locking of the relay in its operative position. The operation of this relay opens the energizing circuit to magnet DM bringing the shaft 20 to rest at the end of the revolution. This is the normal state of rest of the system.

Normal operation

During the greater part of the transmission no translations are made and no signals interpolated. This may be termed normal operation. After placing a tape in the transmitter the operator presses the start key 101 (Fig. 2). This breaks the holding circuit of relay SR5, releasing it and causing energization of DM. Magnet DM again frees the shaft 20 which commences to rotate, operating the transmitter and distributor brushes. Pins 40*a* to 40*e* rise through holes in the tape causing energization of their respective PS relays. The PS relays in turn connect signaling battery 90 to segments 34*b* through 34*f* and as the brush 31 sweeps over the segments in turn the desired characters are sent to the line and cause operation of both the monitor and distant printers.

Translation

When a character requiring translation is presented to pins 40 the appropriate PS relays are energized setting up the correct circuit for energization of SR1 or SR2, or both. Closure of contacts 51*f*, 51*e* completes the circuit energizing one or both of the relays SR1 and SR2. Energization of either of these relays breaks the connection to the line battery 90 (Fig. 4) and prevents any signal being sent to line during this revolution of the distributor shaft 20. Also when either relay is operated the circuit to DM is opened (Fig. 3) thereby causing shaft 20 to stop upon the completion of its revolution. In addition the operated SR relay prepares an energizing circuit for relay HR by connecting the winding of that relay to the appropriate pickup point on the control level VI of the rotary switch (Fig. 3). The determination of this pickup point is likewise under the control of relay SH as has been explained. The SR relay also prepares a locking circuit for relay HR and in addition completes a circuit for energizing the rotary switch magnet RS through its self-interrupting contacts. RS then repeatedly operates and releases in rapid succession stepping the wipers of the various levels of the switch from contact point to contact point until the wiper of the control level IV arrives at the particular pickup point to which the winding of relay HR is then connected.

At this time relay HR operates and locks. This relay performs the following functions:

(1) Breaks the self-interrupting circuit to RS, stopping the hunting of the rotary switch;

(2) Connects the winding of RS to cam contacts 50*d*, 50*c* (Fig. 3) and at the same time connects the winding of DM to break contacts RS—1, 2, thus interlocking the rotary switch and the distributor shaft so that they control each other;

(3) Connects signaling battery to the wire 151 leading to the contact points of selector levels I through IV of the rotary switch;

(4) Energizes magnet TL, thereby locking the transmitter to prevent feeding of the tape;

(5) Connects the winding of RR to the release points and sets up a connection between the winding of PR and the pre-release points, which connection will be completed at the proper time by closure of cam contacts 51*c*, 51*d*.

Magnet DM, energized over contacts RS—1, 2 allows the distributor shaft to rotate sending to line the character present in the selector levels I through V at the particular pickup point selected. The rotation of the shaft closes contacts 50*d*, 50*c*, thereby energizing rotary switch magnet RS. The operation of RS releases DM causing the shaft 20 to stop at the end of the revolution.

Near the end of the revolution contacts 50*d*, 50*c* again open, releasing RS and causing the stepping of the switch to the next following contact points. Release of RS also re-energizes DM, causing the shaft to rotate and the brush to send out the character present at the next point of levels I through V of a switch. This alternate operation of RS and DM continues until the pre-release point is reached and the brush 31 commences to send out the last character from the switch. As the shaft rotates at this time contacts 51*c*, 51*d* close, thereby energizing pre-release relay PR.

PR operates and locks and as a result holds open the energizing circuit to DM preventing re-energization of that magnet. Near the end of the revolution RS is released stepping the switch to the release point and immediately energizing release relay RR. RR releases relay SR1 or SR2 which restores the signaling battery connection to the distributor over the PS relay contacts. Also the release of either SR1 or SR2 prepares for the restoration of the normal energizing circuit to DM; breaks the self-interrupting circuit to RS which is at present broken by HR and releases HR.

HR in turn releases TL and breaks the signaling battery connection to the rotary switch RS. TL unlocks the transmitter and at the end of its release stroke releases PR and RR. PR thereupon

restores the normal energizing circuit to DM and normal transmission is resumed.

Interpolation

Normally carriage return and line feed signals will be interpolated at the first letter space after printer contacts **61** have been closed by shoe **63** (Figs. 2 and 7). Closure of contacts **61** prepares an energizing circuit for SR3. When a space character is presented to the transmitter pins **40***a* through **40***e*, PS3 alone is operated completing the circuit to SR3. If no space occurs after contact **61** is closed then the energization of SR3 is under the control of contacts **62***d* and **62***e*. From this point forward the action is similar to that described above for the energization of SR1 or SR2, carriage return and line feed signals being sent to the line from the appropriate contact points of the switch levels I through V, these signals being accompanied by a hyphen or not, as has previously been described.

Correction of errors

Before placing a tape in the transmitter the operator scans it for errors, mutilations, etc. Where any error occurs which is to be deleted from the printed copy, the operator by means of the editing punch, notches the tape before and after the error. If the system is provided with the additional transmitter control pin **40***g* which has been hereinabove described the operator may make the first notch in the forward edge and the second one in the rear edge of the tape. If not so provided both notches may be in the rear edge of the tape. When the tape is placed in the transmitter, transmission proceeds as above described either normally or with translations and interpolations until the first notch is presented either to pin **40***f* or to pin **40***g*.

If the first notch is in position to cooperate with pin **40***f* this pin rises through the notch causing closure of contacts **54***a* and **54***b* and energization of relay SR5. SR5 thereupon operates and locks, preparing an energizing circuit for relay SR4 and also opens the energizing circuit to distributor magnet DM, causing shaft **20** to stop at the end of the revolution, that is after transmission of the character in line with which the notch was placed. If any characters are to be substituted for the erroneous ones the operator types them manually on the keyboard of the monitor printer and then presses the non-print key **100**. If no characters are to be substituted the operator presses the non-print key at once.

The non-print key completes the energizing circuit to relay SR4 which operates and locks. In operating relay SR4 breaks the common energizing circuit to the PS relays, so that although tape may be passed through the transmitter no signals will be sent out to line.

If the first notch in the tape was in position to cooperate with pin **40***g* SR4 would have been directly energized by this pin rising into the notch, although this energization would have occurred upon the signal following the one in alignment with the notch this being due to the shortened horizontal arm of this pin as previously described.

No matter how operated relay SR4 completes an energizing circuit to DM, releasing the shaft **20** and allowing the transmitter to feed tape. Tape therefore passes through the transmitter but without sending out signals. Upon presentation of the second notch in the tape to pin **40***f* this pin rises and owing to the prior operation of relay SR4 causes, by means of associated contacts **54**, a completion of an energizing circuit to relay SR6. Relay SR6 then operates and locks over cam contacts **50***a*, **50***b* now closed because the shaft **20** is in motion. SR6 breaks the common energizing circuit to the PS relays which, however, is already broken by SR4, thus ensuring that the character over which the second notch was placed shall not be transmitted. Operation of relay SR6 also releases SR4 and SR5. SR4 breaks the energizing circuit to magnet DM but this circuit is immediately restored by the release of SR5. Near the end of the revolution contacts **50***a*, **50***b* open, thereby releasing SR6 and restoring the conditions to those of normal transmission.

ILLUSTRATIVE OPERATION

As an example of the operation of the device, the translation of a period from the tape printer code to the page printer code will be described in detail. In the tape printer code the period is represented by a marking impulse in the No. 4 position only and is in the lower case, that is the printer is unshifted at the time this occurs. In the page printer code the period is an upper case symbol and the code, comprises a shift signal followed by a signal composed of marking impulses in the third, fourth and fifth positions followed by an unshift signal. In the following discussion the operations are given in chronological order and are represented also by the timing diagram of Figures 10 and 11. For the purposes of this example, it will be assumed that the distributor shaft **20** is in motion, that the brush **31** has just completed transmission of a letter and has started to pass over the stop segment **34***g* and that a period, i. e. a code representation comprising a hole in the No. 4 position of the tape, is over transmitter pin **40***d*:

(1) Brush **31** passes the home position about the middle of the stop segment **34***g*,

(2) The 4th transmitter pin **40***d* rises and causes energization of relay PS4,

(3) The brush **31** passes to the start segment **34***a* opening the line and sending a start signal to the monitor page printer as well as to the distant page printer,

(4) Relay PS4 connects signaling battery **90** to the 4th selector segment **34***e*. Other segments are at this time disconnected. Also at this time PS4 sets up at its contacts PS4—5, 6 the combination for energizing relay SR1. This circuit is, however, not completed at this moment.

(5) Brush **31** reaches the beginning of the first selector segment **34***b*. At this time, as may be seen under 5 (Fig. 10) contacts **51***e*, **51***f* close under control of their cam **48** completing the energizing circuit for relay SR1 (cams **47** and **48** operate their contacts at every revolution of the shaft **20** but are effective only when the appropriate circuits are set up).

(6) SR1 disconnects, at contacts SR1—11, 12 the signaling or line battery **90** from any of the selector segments **34***b* through **34***f* that have been batteried, in this instance only segment **34***e*. SR1 also breaks the energizing circuit to magnet DM, this break occurring at contacts SR1—13, 14.

(7) SR1 closes its holding circuit at contacts SR1—1, 2. Also SR1 prepares an energizing circuit for magnet RS at its contacts SR1—3, 4 this circuit to be completed later, and, in addition, SR1 connects the winding of relay HR to contact **22** of level VI of the rotary switch, that is to the pickup point associated with the transmission of a period.

(8) Brush **31** passes on to the second selector segment **34***c*.

(9) Cam 48 opens contacts 51e and 51f breaking the energizing circuit to relay SR1 but without effect since SR1 is now held operated as indicated in (7) above.

(10) Brush 31 sweeps over the remaining selector segments 34c through 34f. Since all selector segments are disconnected from battery, a blank is sent to the line, that is the unwanted No. 4 impulse is suppressed. This blank signal, comprising five intervals of line open condition, causes the monitor page printer and the distant page printer each to go through an idle cycle.

(11) Brush 31 passes to stop segment 34g closing the line.

(12) The 4th transmitter pin 40d withdraws releasing relay PS4.

(13) Cam 47 closes contacts 50e and 50f completing an energizing circuit to magnet RS over the self-interrupting contacts RS—3,4.

(14) Shaft 20 and brush 31 come to rest in the home position, that is about the center of segment 34g, stopped by the release of magnet DM, as mentioned under (6) above.

(15) Magnet RS operates, withdrawing the feed pawl of the rotary switch. In operating, magnet RS opens its own energizing circuit and, therefore, immediately releases, stepping wipers 126 and 145 through 149 ahead on the release stroke. Inasmuch as the distributor brush 31 is at rest on the stop segment 34g, no signal is sent out from the switch at this stage. The release of the armature of magnet RS recloses the energizing circuit and the alternate operation and release of magnet RS continues stepping the wipers as many steps as are necessary until

(16) Magnet RS steps the wipers 126 and 145 through 148 to the period pickup point identified by contact 22 of level VI at which time the energizing circuit to HR, which was set up as indicated in (7) above, is completed by wiper 126.

(17) HR breaks, at its contacts HR—11,12, the self-interrupting circuit to magnet RS leaving that magnet in its released position.

(18) The holding circuit for relay HR is completed over its own contacts and contacts SR1—5 and SR1—6. HR also causes energization of magnet TL due to closure of its contacts HR—7,8. Furthermore, HR prepares, at its contacts HR—13,14, an energizing circuit for PR which, however, is not yet completed. In addition, HR, at its contacts HR—15,16 connects the winding of relay RR to all release points of level VI of the rotary switch (namely points 4, 7, 14, 17, 21, 25 of this level). In addition, HR, at contacts HR—17,18 connects signaling or line battery 90 to certain contacts of the selector levels I through V of the rotary switch. Furthermore HR prepares at its contacts HR—5,6 the second energizing circuit for magnet RS which, however, is not yet completed. HR also completes the energizing circuit for distributor magnet DM, this completion occurring at contacts HR—3,4 and the circuit extending over contacts RS—1,2.

(19) Magnet DM operates releasing distributor shaft 20.

(20) Distributor shaft 20 commences to rotate.

(21) Magnet TL holds down the transmitter pins and feed pawl preventing feeding of the tape and energization of any of the PS relays. Cam 47 opens contacts 50e and 50f, cam 47 also closes contacts 50c and 50d thereby energizing magnet RS.

(22) Brush 31 passes on to the start segment 34a opening the line and sending a start signal to the distant printer as well as to the monitor page printer.

(23) Magnet RS operates releasing magnet DM and withdrawing the feed pawl of the rotary switch.

(24) Brush 31 passes over the five selector segments 34b through 34f sending to line the shift signal as set up on contacts 22 of levels I through V of the rotary switch. This shift signal is indicated in the timing diagram (Figs. 10 and 11) and comprises marking impulses transmitted during the 1st, 2nd, 4th and 5th impulse intervals of the five unit code. Following this the brush passes on to stop segment 34g (Fig. 11) closing the line.

(25) Cam 47 opens contacts 50c and 50d releasing magnet RS.

(26) Shaft 20 comes to rest with brush 31 at about the center of segment 34g, this stopping being caused by the release of magnet DM.

(27) Release of magnet RS steps the rotary switch wipers to contacts 23 of the various levels and re-energizes magnet DM.

(28) Magnet DM releases the distributor shaft.

(29) through (37) These steps are identical with (20) through (28) respectively except that at time 33 a signal comprising 3rd, 4th and 5th marking impulses is sent to the line over contacts 23 of levels I through V of the rotary switch and at time 36 the rotary switch steps its wipers to contacts 24 of the various levels.

(38) Shaft 20 commences to rotate in the same manner as was described in (20) above.

(39) Cam 47 closes contacts 50c and 50d thereby energizing the switch magnet RS.

(40) Brush 31 passes on to the start segment 34a opening the line.

(41) Magnet RS operates releasing magnet DM and withdrawing the feed pawl of the rotary switch.

(42) Brush 31 passes to the first selector segment 34b commencing transmission of the unshift signal as set up on contacts 24 of levels I through V of the rotary switch. Cam 48 closes contacts 51c and 51d energizing relay PR. (Note that the energizing circuit for this relay was prepared when relay HR operated as described in (18) above.)

(43) Contacts PR—1,2 of relay PR open the energizing circuit to magnet DM preventing re-energization of that magnet when magnet RS releases as described under (49) below.

(44) PR closes its holding circuit extending over contacts 53a and 53b of transmitter lock magnet TL.

(45) Cam 48 opens contacts 51c and 51d breaking the energizing circuit to PR which, however, is now held operated over its holding circuit.

(46) Brush 31 completes the transmission of the unshift signal (indicated in Fig. 11 between time points 42 and 46 and comprising five units of marking impulses). The brush passes on to the stop segment 34g closing the line.

(47) Cam 47 opens contacts 50c and 50d releasing magnet RS.

(48) Shaft 20 comes to rest due to release of magnet DM. Brush 31 now stands at approximately the center of stop segment 34g.

(49) Release of magnet RS steps the rotary switch wipers to contacts 25 and relay RR is energized.

(50) RR at its contacts RR—3, 4 breaks the holding circuit of SR1 which is thereupon released.

(51) RR closes its holding circuit over con-

tacts 53a and 53b of magnet TL. SRI opens contacts SRI—5, 6 and thereby releases HR. Also SRI at contacts SRI—16, 17 breaks the connection between HR and the period pickup contact of level VI of the rotary switch, that is contact 22 of this level.

(52) SRI restores, at SRI—11, 12, signaling battery 90 to the selector contacts of the PS relays. SRI also restores, at SRI—13, 14, the normal branch of the energizing circuit to magnet DM although this circuit is still held open at PR—1, 2. HR at its contacts HR—17, 18 removes signaling battery from the contact points of the selector levels I through V of the rotary switch. HR at contacts HR—15, 16 breaks the energizing circuit to RR which, however, is now held operated. HR releases, at contacts HR—7, 8 the transmitter lock magnet TL. HR at contacts HR—5, 6 opens the energizing circuit of magnet RS which is already broken at contacts 50c and 50d of cam 47.

(53) The release of magnet TL frees the tape feed mechanism of the transmitter and the transmitter pins.

(54) At the end of its release stroke, magnet TL opens contacts 53a and 53b thereby breaking the holding circuits for relays PR and RR.

(55) PR de-energizes and completes, at contacts PR—1, 2 the energizing circuit to magnet DM.

(56) Magnet DM releases the distributor shaft 20.

(57) Shaft 20 commences to rotate thereby causing resumption of normal transmission from the tape through to the distant printer.

The typical example of operation described just above is varied only in that by the operation of different combinations of relays, as has been described in detail, different pickup points or pickup contacts of the rotary switch are selected and due to such selection predetermined signals are sequentially transmitted from the contact points of selector levels I through V of the rotary switch to the line after which the various relays utilized in the operation are released in the same manner as was described in connection with the transmission of the period, and normal transmission resumed.

For example, if a hyphen is to be interpolated due to the operation of the end of line contacts 62, the pickup point 8 of level VI of the rotary switch is selected and from contacts 8 of the selector levels a shift signal is first transmitted. Then the rotary switch is stepped to point 9 at which the proper signal for causing the type bar bearing a hyphen in its upper case position to operate, is transmitted. Next the rotary switch steps to point 10 and the unshift signal is transmitted. Following this, the switch again steps ahead arriving at point 11 from which point on the selector levels I through V a carriage return signal is transmitted. Upon stepping to point 12 a line feed signal is transmitted following which stepping to points 13 and 14 in order causes the pre-release relay PR and the release relay RR to operate thereby restoring normal operation in the same manner as described in connection with the transmission of the period.

While we have described a preferred embodiment of our invention and have limited the description to tape and page printer codes of particular variations and differences, it is to be understood that this description is not to limit the scope of our invention but that the limitations thereof are to be determined solely by the appended claims. Furthermore, although the illustrative example has referred solely to the use of a rotary switch as a secondary transmitter, it will be clear that other forms of secondary transmitters might be utilized, for example, a relay chain or a tape transmitter provided with a loop of tape. It will, of course, be clear that the methods for converting signals may be utilized without utilization of the methods of interpolating signals and that the reverse is likewise true. Furthermore, it will be understood that the methods for deleting the transmission of character signals when an erasure has occurred may be utilized either alone or together with the conversion and interpolation arrangements. It should also be pointed out that the arrangement described herein may be utilized in connection with a concentration board one section of which would be devoted to lines leading to receiving page printers. In this manner a relatively small number of conversion and interpolation units are capable of handling all traffic to a relatively large number of receiving page printers.

What is claimed is:

1. In a printing telegraph system having a transmitter, a distributor and a receiving printing mechanism and in which the code representation controlling the transmitter differs in certain characters from the normal operating code of the printing mechanism, means for converting the code representations of the certain characters comprising, in combination, a secondary transmitter and means to take control of the distributor from the transmitter and to place the distributor under control of said secondary transmitter to effect transmission of signals in the normal operating code of the printing mechanism.

2. In a printing telegraph system having a primary transmitter, a distributor and a receiving printing mechanism and in which the code representation controlling the primary transmitter differs in certain characters from the normal operating code of the printing mechanism, means for converting the code representations of the certain characters comprising, in combination a secondary transmitter, means operable upon the presence in the primary transmitter of any of the certain characters to condition said secondary transmitter in accordance with the code conversion indicated, means to render the primary transmitter ineffective to control the distributor, means to lock the primary transmitter against operation, means to render said secondary transmitter effective to control the distributor, and means to lock said secondary transmitter in synchronism with the operation of the distributor to send a succession of signals in a code effective to cause the receiving printing mechanism to produce the certain character.

3. In a printing telegraph system having a transmitter, a distributor and a receiving printing mechanism and in which the code representation controlling the transmitter differs in certain characters from the normal operating code of the printing mechanism, means for converting the code representations of the certain characters comprising, in combination, means operable upon the presence in the transmitter of a code representation of any of the certain characters to stop the distributor and to render the transmitter ineffective to control the distributor, a rotary switch having a plurality of signaling contact levels and a control contact level, a self-interrupting circuit for said rotary switch, means to energize said self-interrupting circuit immediate-

ly prior to the stopping of the distributor, signaling circuits from said signaling contact levels to the distributor, control circuits to contacts of the control level of said rotary switch prepared in accordance with the code representation present in the transmitter, said control circuits being completed upon the movement of the contact wipers of said switch to said contacts, means operable upon completion of any of said circuits to restart the distributor, lock the transmitter and energize said signaling circuits, means under the control of said distributor to advance said rotary switch wipers step-by-step, circuit connections to the control level of said rotary switch to determine the extent of said step-by-step advances, and means operable upon completion of said last mentioned circuit to restore control of the distributor to the transmitter and to de-energize the signaling circuits from said rotary switch to the distributor, the said signaling circuits being effective to transmit normal printer code representations of the certain character during the said step-by-step advance of the rotary switch.

4. In a printing telegraph system having a transmitter, a distributor and a receiving printing mechanism and in which the code representation controlling the transmitter differs in certain characters from the normal operating code of the printing mechanism, means for converting the code representations of the certain characters comprising, in combination, a plurality of pulse relays operable in accordance with the code representation present in the transmitter, the contacts of said relays normally extending battery to corresponding segments of the distributor, means operable upon the presence in the transmitter of a code representation to be converted, to break the connection from battery to said relay contacts, means to stop the distributor upon completion of the rotation during which such breaking occurs, a rotary switch having a control level and a plurality of signaling levels, means operable in accordance with the operation of said pulse relays for selecting and preparing a circuit to a particular contact of said control level, said means also energizing the stepping magnet of said rotary switch, a self-interrupting contact in the stepping magnet circuit to cause continuous step-by-step advance of the switch wipers, means operable upon the completion of said prepared circuit to break said self-interrupting circuit and to restart the distributor, cam means operated by the distributor for energizing the rotary switch stepping magnet once during each revolution of the distributor, connections from the signaling contact levels of said rotary switch to corresponding segments of the distributor, and means operable at the start of said step-by-step advance to energize said connection, said connection being arranged to cause transmission of a printer code representation upon each step of said rotary switch, the series of such representations comprising the converted signal.

5. In a printing telegraph system having a transmitter, a distributor and a receiving printing mechanism and in which the code representation controlling the transmitter differs in certain characters from the normal operating code of the printing mechanism, means for converting the code representations of the certain characters comprising, in combination, a plurality of pulse selector relays operable in combination in accordance with the code representation present in the transmitter, a shift relay controlled by said pulse relays and operable whenever a shift signal appears in the transmitter, a plurality of stop relays operated by said pulse relays upon the presence in the transmitter of a signal to be converted, means operable by said stop relays to stop said distributor and to take control thereof from the pulse relays, a rotary switch having a control contact level, a plurality of signaling contact levels and a stepping magnet, means operable jointly by said distributor and said stop relays for energizing said stepping magnet, a self-interrupting contact associated with said stepping magnet to cause the wipers of said rotary switch to advance continuously step-by-step while said circuit remains operative, a plurality of circuits prepared in accordance with the operation of said stop relays, said circuits extending to contacts of of the control level of said rotary switch, said circuits being modified when said shift relay is operated, means operable upon the completion of one of said circuits for breaking the self-interrupting circuit to said stepping magnet, said means also establishing a second circuit to said stepping magnet, said second circuit being under control of the distributor, said means additionally restarting the distributor and locking the transmitter against operation, means operable upon each rotation of the distributor to advance said rotary switch through a step of operation to send a signal to the distant printer in accordance with the code conversion required, and releasing means operable after a predetermined number of steps of said rotary switch to release said stop relay and to place the distributor under control of the pulse relays for normal operation.

6. In a printing telegraph system having a transmitter, a distributor and a receiving printing mechanism and in which the code representation controlling the transmitter differs in certain characters from the normal operating code of the printing mechanism, means for converting the code representations of the certain characters comprising, in combination, a plurality of pulse selector relays having their windings connected in circuits controlled by the contacts of the transmitter, contacts on said pulse relays normally supplying signaling battery to the segments of the distributor, a plurality of stop relays having their windings in circuits adapted to be completed by contacts of the pulse relays in accordance with the combination of said relays operated, said stop relays being energized whenever a signal requiring conversion appears on the tape in the transmitter, means under control of said stop relays for removing battery from the pulse relay contacts thereby preventing the transmitter from controlling the distributor, a rotary switch having a control contact level, a plurality of signaling contact levels, a contact wiper for each level and a stepping magnet for operating said contact wipers in unison over their respective contact levels, said control level comprising a plurality of pickup contacts, a plurality of pre-release contacts and a plurality of release contacts, means operated upon energization of any one of said stop relays for stopping the distributor in its home position, means also operable by said stop relays for preparing a circuit to one of said pick-up contacts, additional means operable by said step relays for energizing said stepping magnet through self-interrupting contacts associated therewith to cause said rotary switch wipers to continuously advance, a holding relay energized upon advance of the wiper of the control level to

the selected pickup point, means under control of said holding relay to break the said energizing circuit to the stepping magnet and to prepare a second energizing circuit therefor, means also under control of said holding relay to restart the distributor and lock the transmitter against operation, cam means operated by the distributor for closing and opening the second energizing circuit of said rotary switch once during each rotation of the distributor to cause the switch wipers to advance one step for each rotation of the distributor, circuits connecting the signaling level wipers of said rotary switch to the distributor and the contacts to battery, said latter circuit being normally incomplete, means under control of said holding relay for completing said circuit, a pre-release relay, a circuit for energizing said relay extending to the pre-release points on said control contact level, means controlled by said distributor for closing said circuit to said pre-release relay upon operation of the distributor subsequent to advance of the control level wiper to any one of the pre-release points, means under control of said pre-release relay for stopping the distributor at the end of its rotation, a release relay, a circuit for energizing said relay extending to the release points of said control level of said rotary switch, said release circuit being completed upon the advance of said control level wiper to any one of said release points, and means under control of said release relay for de-energizing operated ones of said stop relays to thereby de-energize said holding relay and restore the signaling battery to said pulse relay contacts to control the distributor, release of said holding relay also serving to restart the distributor for normal operation.

7. In a printing telegraph system having a transmitter, a distributor and page type receiving printing mechanism and in which the tape controlling the transmitter lacks code representations to effectuate line feed and carriage return functions, means to interpolate line feed and carriage return signals into the train of transmitted signals comprising, in combination, a letter counting mechanism, contacts mounted thereon adapted to be operated when the counter has counted a pre-determined number of characters, a secondary transmitter, and means operable by said contacts to render the transmitter ineffective to control the distributor and to place said distributor under control of said secondary transmitter whereby line feed and carriage return signals are sent to line under control of said secondary transmitter.

8. In a printing telegraph system having a transmitter, a distributor and page type receiving printing mechanism and in which the tape controlling the transmitter lacks code representations to effectuate line feed and carriage return functions, means to interpolate line feed and carriage return signals into the train of transmitted signals comprising, in combination, a letter counting mechanism, contacts mounted thereon adapted to be operated when the counter has counted a predetermined number of characters, a secondary transmitter, means operable by said contacts to render the transmitter ineffective to control the distributor and to place said distribtuor under control of said secondary transmitter whereby line feed and carriage return signals are sent to line under control of said secondary transmitter, and means to cause control of said distributor to revert to the primary transmitter upon completion of transmission of said carriage return and line feed signals.

9. In a printing telegraph system having a transmitter, a distributor and a page-type printing telegraph receiver and in which the transmitter is controlled by a tape bearing code representations to control a tape-type printing telegraph receiver, said tape lacking code representations to effectuate line feed and carriage return functions, means to interpolate line feed and carriage return signals into the train of transmitted signals, comprising, in combination, a letter counting mechanism, contacts mounted on relatively movable parts thereof in position to be operated when said counter has counted a predetermined number of characters, means operable upon the presence in the transmitter of a code representative of a space while said contacts are operated to stop the distributor and render the transmitter ineffective to control the distributor, a secondary transmitter, means to advance said secondary transmitter to a position to effectuate the transmission of line feed and carriage return signals, means to render said secondary transmitter effective to control the distribtuor, means to restart the distributor and lock the primary transmitter against operation, and means to advance said secondary transmitter in step with the operation of the distributor to send a succession of signals to effect line feed and carriage return of the receiving page printer.

10. In a printing telegraph system having a transmitter, a distributor and a page-type printing telegraph receiver and in which the transmitter is controlled by a tape bearing code representations to control a tape-type printing telegraph receiver, said tape lacking code representations to effectuate line feed and carriage return functions, means to interpolate line feed and carriage return signals into the train of transmitted signals, comprising in combination, a letter counting mechanism, contacts mounted on relatively movable parts thereof in position to be operated when said counter has counted a predetermined number of characters, means operable upon the presence in the transmitter of a code representative of a space while said contacts are operated to stop the distributor and render the transmitter ineffective to control the distributor, a rotary switch comprising a plurality of signaling contact levels, one identified with each signaling segment of the distributor, circuits extending through the wipers of the contact levels to the distributor segments, means to complete a circuit from the source of signaling current to predetermined contacts of said levels to thereby prepare said levels for the transmission of predetermined code signals, a control contact level, means for advancing said wipers in unison to points on the control contact level to select the signals to be transmitted, and means under control of the distributor to advance the wipers step-by-step to send out the selected sequence of signals.

11. In a printing telegraph system having a transmitter, a distributor and a page-type printing telegraph receiver and in which the transmitter is controlled by a tape bearing code representations to control a tape-type printing telegraph receiver, said tape lacking code representations to effectuate line feed and carriage return functions, means to interpolate line feed and carriage return signals into the train of transmitted signals, comprising in combination,

a letter counting mechanism, contacts mounted on relatively movable parts thereof in position to be operated when said counter has counted a predetermined number of characters, means operable upon the presence in the transmitter of a code representative of a space while said contacts are operated to stop the distributor and to render the transmitter ineffective to control the distributor, a rotary switch comprising a plurality of signaling contact levels and a control contact level, a self-interrupting circuit for said rotary switch, means to energize said self-interrupting circuit immediately prior to the stopping of the distributor, circuits to the contacts of the control level prepared upon the presence in the transmitter of the space code, said circuits being completed upon movement of the control contact wiper to a selected contact point, means operable upon the completion of any of said circuits to restart the distributor and to lock the primary transmitter against operation, means under the control of the distributor to advance said rotary switch wipers step-by-step, circuit connections to contacts of the control level of said rotary switch to determine the limit of the step-by-step advance, said signaling contact levels being wired in such manner that during each advance of the said rotary switch under control of the distributor a signal is sent to the receiving mechanism, said signals controlling said printing mechanism to effect carriage return and line feed functions, and means operable upon completion of said circuit connections to contacts of the control level to restore the control of said distributor to the primary transmitter.

12. In a printing telegraph system having a transmitter, a distributor and a page-type printing telegraph receiver and in which the transmitter is controlled by a tape bearing code representations to control a tape-type printing telegraph receiver, said tape lacking code representations to effectuate line feed and carriage return functions, means to interpolate line feed and carriage return signals into the train of transmitted signals, comprising in combination, a letter counting mechanism, contacts mounted on relatively movable parts thereof in position to be operated when said counter has counted a predetermined number of characters, a plurality of pulse relays operable in accordance with the signal present in the tape transmitter, the contacts of operated ones of said relays normally extending battery to corresponding segments of the distributor, means operable upon the presence in the transmitter of the code representation of a space signal to break the connection from battery to said pulse relay contacts, means to stop the distributor upon the completion of the rotation during which such breaking of the circuit occurs, a rotary switch having a control contact level and a plurality of signaling contact levels, means operable in accordance with the operation of said pulse relays for selecting and preparing a circuit to a particular contact of said control level, means operable by said last mentioned means for energizing the stepping magnet of said rotary switch, a self-interrupting contact in the stepping circuit of said rotary switch to cause advancement of said wipers continuously step-by-step, means operable upon the completion of said prepared circuit resulting from the advancing of said switch wipers to break said self-interrupting circuit to restart the distributor and to lock the primary transmitter against operation, means operated by said distributor for energizing the stepping magnet of said rotary switch once during each revolution of the distributor, means operated by said rotary switch to start and stop said distributor once for each step of said rotary switch, circuit connections from signaling contact levels of said rotary switch to corresponding segments of the distributor, and means operable at the start of said step-by-step movement to energize said circuit connections to effectuate transmission of code representations for controlling carriage return and line feed functions of said letter counter and the distant receiving printing mechanism.

13. In a printing telegraph system having a transmitter, a distributor and a page-type printing telegraph receiver and in which the transmitter is supplied with a tape bearing code representations to control a tape-type printing telegraph receiver, said tape lacking representations to effectuate line feed and carriage return functions of the telegraph receiver, means to interpolate line feed and carriage return signals into the train of transmitted signals, comprising in combination, a letter counting mechanism, contacts mounted on a part thereof, a contact shoe mounted on a relatively movable part thereof in position to operate said contacts when the counter has counted a predetermined number of characters, a second set of contacts likewise mounted and operable by said contact shoe when the counter has counted a second and greater predetermined number of characters, means operable upon the closure of said second contacts to stop the distributor and render the transmitter ineffective to control the distributor, a secondary transmitter, means to advance said secondary transmitter to a predetermined position representative of the printer code for hyphen, line feed and carriage return signals, means to render said secondary transmitter effective to control the distributor, means to restart the distributor and to lock the primary transmitter against operation, and means to advance said secondary transmitter in step with the operation of the distributor to send a succession of signals to effect the printing of a hyphen and line feed and carriage return movements of the receiving page printer.

14. In a printing telegraph system having a transmitter, a distributor and a page-type printing telegraph receiver and in which the transmitter is controlled by a tape bearing code representations to control a tape-type printing telegraph receiver, said tape lacking code representations to effectuate line feed and carriage return functions, means to interpolate line feed and carriage return signals into the train of transmitted signals, comprising in combination, a letter counting mechanism, contacts mounted on a part thereof, a contact shoe mounted on a relatively movable part thereof in position to operate said contacts when the counter has counted a predetermined number of characters, a second set of contacts likewise mounted and operable by said contact shoe when the counter has counted a second and greater predetermined number of characters, means operable upon the closure of said second contacts to stop the distributor and render the transmitter ineffective to control the distributor, a plurality of pulse selector relays operable in combination according to the code signal present in the tape transmitter, a shift relay controlled by said pulse relays and operable whenever a shift signal appears in the transmitter, a secondary transmitter, means normally operable upon the closure of said second set of contacts

to advance said secondary transmitter to position to effect the transmission of hyphen, line feed and carriage return signals, means operable by said shift relay to suppress the transmission of said hyphen signal and to advance said secondary transmitter to a position to effect the transmission of line feed and carriage return signals, means to render said secondary transmitter effective to control the distributor, means to restart the distributor and to lock the primary transmitter against operation, and means to advance said secondary transmitter in step with the operation of the distributor to send a succession of signals to effect line feed and carriage return functions of the receiving page printer.

15. In a printing telegraph system having a transmitter, a distributor and a page-type printing telegraph receiver and in which the transmitter is supplied with tape adapted to control a tape-type printing telegraph receiver, the tape lacking code representations for effectuating line feed and carriage return functions of the page-type telegraph receiver, means to interpolate functional signals into the sequence of transmitted signals comprising, in combination, a letter counting mechanism, contacts mounted on relatively movable parts thereof in position to be operated when said counter has counted a predetermined number of characters, a circuit prepared for closure upon the operation of said contacts, a secondary transmitter, means operable upon the transmitter sensing the code representation for a space in the tape for completing said prepared circuit, said circuit closure being effective to stop the distributor, render the transmitter ineffective to control the distributor and initiate advance of said secondary transmitter to a predetermined position, means operable upon said transmitter reaching said position to render said secondary transmitter effective to control the distributor, to restart the distributor and to lock the primary transmitter against operation, and means to advance said secondary transmitter in step with the distributor for transmitting the required signals over the distributor to the receiving printer to effectuate line feed and carriage return functions.

16. In a printing telegraph system having a transmitter, a distributor and a page-type printing telegraph receiver and in which the transmitter is supplied with tape adapted to control a tape-type printing telegraph receiver, the tape lacking code representations for effectuating line feed and carriage return functions of the page-type telegraph receiver, means to interpolate functional signals into the sequence of transmitted signals comprising, in combination, a letter counting mechanism, contacts mounted on a part thereof, a contact shoe mounted on a relatively movable part thereof in position to operate said contacts when the counter has counted a predetermined number of characters, a second set of contacts likewise mounted and operable by said contact shoe when the counter has counted a second and greater predetermined number of characters, a stop relay having an operating circuit prepared by said first set of contacts for later closure, means operable upon the transmitter sensing a space signal for completing said circuit and operating said stop relay, a second operating circuit for said stop relay completed upon operation of said second set of contacts, a secondary transmitter, means for initiating an advance of said secondary transmitter, a circuit over the contacts of said stop relay for determining the amount of advance of said secondary transmitter, means comprising contacts of said second set operable for modifying said advance controlling circuit to thereby determine a different amount of advance of said secondary transmitter, means operable upon the completion of the advance to restart the distributor, lock the primary transmitter against operation, advance the secondary transmitter in step with the distributor and render the secondary transmitter effective to control the distributor whereby signals are transmitted to the receiving printer to effectuate line feed and carriage return functions following the appearance of a space signal in the tape while said first contacts are operated and to transmit signals to effectuate shift, hyphen printing, unshift, line feed and carriage return functions when both said first and second set of contacts have operated.

17. In a printing telegraph system having a transmitter, a distributor and a page-type printing telegraph receiver and in which the transmitter is supplied with tape adapted to control a tape-type printing telegraph receiver, said tape lacking code representations for effectuating line feed and carriage return functions of the page-type telegraph receiver, means to interpolate functional signals into the sequence of transmitted signals comprising, in combination, a letter counting mechanism, contacts mounted on a part thereof, a contact shoe mounted on a relatively movable part thereof in position to operate said contacts when the counter has counted a predetermined number of characters, a second set of contacts likewise mounted and operable by said contact shoe when the counter has counted a second and greater predetermined number of characters, a stop relay having an operating circuit prepared for later closure upon operation of said first set of contacts, means operable upon the transmitter sensing a space signal for completing said circuit and operating said stop relay, a second operating circuit for said stop relay completed upon operation of said second set of contacts, a secondary transmitter, means for initiating an advance of said secondary transmitter, a circuit over the contacts of said stop relay for determining the amount of advance of said secondary transmitter, means comprising contacts of said second set operable for modifying said advance controlling circuit to thereby determine a different amount of advance of said secondary transmitter, means operable upon the completion of the advance to restart the distributor, lock the primary transmitter against operation, advance the secondary transmitter in step with the distributor and render the secondary transmitter effective to control the distributor whereby signals are transmitted to the receiving printer to effectuate line feed and carriage return functions following the appearance of a space signal in the tape while said first contacts are operated and to transmit signals to effectuate shift, hyphen printing, unshift, line feed and carriage return functions when both said first and second set of contacts have operated, and to effectuate line feed and carriage return functions when both said first and second contacts are operated and a shift signal has been sensed by the transmitter without a subsequent unshift signal prior to operation of said second contacts.

18. In a printing telegraph system having a tape controlled transmitter, a distributor and a receiving printer, means to cause interpolation

of information in the train of signals comprising, in combination, a marginal notch in the tape, means operable upon the sensing of said marginal notch to stop the transmitter, manually operable means for interpolating the required information and additional manually operable means to restart said transmitter thereby resuming normal transmission.

19. In a printing telegraph system having a tape controlled transmitter, a distributor, and a receiving printer, means to enable interpolation of an intelligence into the train of transmitted signals comprising, in combination, a marginal notch in the tape at the point at which the interpolation is to be made, a relay operable by the sensing of said marginal notch, to stop said transmitter, a locking circuit for holding said relay operated, a keyboard for manually transmitting said interpolated intelligence, and manually operable means for breaking said locking circuit whereby transmission is restored to normal.

20. In a printing telegraph system having a tape controlled transmitter, a distributor and a receiving printer, means to prevent transmission of portions of the tape signals comprising in combination, a marginal notch in the tape, means operable upon the sensing of said marginal notch to stop feeding of tap through the transmitter and to render the transmitter ineffective to control the distributor, manually operable means to restart said transmitter but without restoring control of said distributor, whereby the tape is fed through the transmitter without sending signals to line, a second marginal notch in the tape, and means operable upon sensing of said second marginal notch to restore control of said distributor to said transmitter, whereby normal transmission is resumed.

21. In a printing telegraph system having a tape controlled transmitter, a distributor and a receiving printer, means to prevent transmission of portions of the tape signals comprising, in combination, a marginal notch in the tape preceding that portion the transmission of which is to be suppressed, a relay operable upon the sensing of said marginal notch to stop said transmitter, a locking circuit to hold said relay operated, a second relay, a locking circuit therefor, manually operable means for energizing said second relay when said first relay is operated and held, means under control of said second relay for rendering the transmitter ineffective to control the distributor, means also under control of said second relay for restarting said transmitter, a second marginal notch in the tape following that portion the transmission of which is to be suppressed, a third relay, means controlled by said second relay whereby said third relay may be operated upon sensing of said second marginal notch, and means operable by said third relay whereby said first and second relays may be released and normal transmission resumed.

22. In a printing telegraph system having a tape controlled transmitter, a distributor and a receiving printer, means to prevent transmission of portions of the tape signals comprising, in combination, a marginal notch in the tape preceding that portion the transmission of which is to be suppressed, a sensing mechanism cooperating therewith, a relay operable by said sensing mechanism to stop said transmitter, a locking circuit for holding said relay operated, a second relay, a locking circuit therefor, manually operable means for energizing said second relay when said first relay is operated and held, contact means operable by said second relay for rendering the transmitter ineffective to control the distributor, contact means also operable by said second relay for restarting said transmitter, whereby the tape is fed through the transmitter without sending signals to line, a second marginal notch in the tape following that portion the transmission of which is to be suppressed, said second notch also cooperating with said sensing mechanism, a third relay, contact means operable by said second relay whereby said third relay may be operated upon sensing of said second marginal notch, and contact means operable by said third relay for breaking the holding circuits to said first and second relays to resume normal transmission, said first relay being reoperated upon said sensing mechanism sensing the trailing end of the tape to stop transmission at the end of a message.

23. In a printing telegraph system having a tape controlled transmitter, a distributor and a receiving printer, means to prevent transmission of portions of the tape signals comprising, in combination, a first sensing mechanism, a second sensing mechanism, a first opening in the tape adapted to be presented to said first sensing mechanism, a second opening in the tape adapted to be presented to said second sensing mechanism, means operable upon sensing of said first opening by said first sensing mechanism to prevent signaling battery from reaching the selector segments of said distributor whereby no signals are sent to line though tape is fed through the transmitter, and means operable upon sensing of said second opening by said second sensing mechanism to restore signaling battery to said selector segments whereby normal transmission is resumed.

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