RECORD ERROR CORRECTION SYSTEM

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This invention relates to error detection and correction systems and more particularly to a system for controlling the operation of pull-back tape transmitters and overpunching reperforators.

In modern day telegraphic communications it is often desirable to transmit large blocks of numeric information. Since errors in numeric information are not as apparent as in alphabetic information it is desirable to employ error detection and correction systems in conjunction with numeric transmission equipment in order to assure the reliability of the information transmitted. Unfortunately the high cost of most error detection and correction systems has limited their use in commercial telegraph installations.

Accordingly, a principal object of this invention is to lower the cost of error detection and correction systems.

Another object of the invention is to simplify and facilitate the implementation of error detection systems with particular reference being had to FIG. 1, there will be seen a transmitting station 9 including a tape transmitter 10 which operates in conjunction with a distributor 11 to read a punched paper tape and to serialize the message contained therein onto a message telegraph line 12. The transmitter 10 is of the pullback type in that it is capable of pulling back a portion of a punched paper tape previously read and re-transmitting a previously transmitted portion of a message in response to the receipt of a signal over an error line 13. A transmitter of this type is shown in J. L. De Boo Patent No. 3,016,092, granted Dec. 19, 1961. This patent discloses a transmitter in which the feed mechanism may be operated in either a forward or a reverse direction. It should be understood, however, that the invention is also applicable to transmitters in which an independent tape pull-back mechanism is used to cause the tape to move in a direction opposite to the normal direction of tape through the transmitter. The distributor 11 may be of any of the well known types, for example, it may be of the commutator and brush type.

Attached to the feed wheel shaft 14 of the transmitter 10 (this shift corresponds to the feed wheel shaft 34 of the above-identified De Boo patent) is a pin wheel 20 which carries a plurality of contact actuating pins 21. Each of the pins 21 has a non-operative or dormant position (the majority of the pins in FIG. 1 are shown in this position) and an operative position (one pin is shown in this position). A pin setting magnet 23 is provided for actuation upon receipt by the transmitter of signals over the error line 13, and, upon actuation its armature 24 is rocked about a pivot 25 and thereby actuates each of the pins 21 to move them from their non-operative position in the pin wheel 20 into the position illustrated by the pin 21'. The pin wheel 20 is of a suitable dimension so that for each incremental movement of the feed wheel shaft 14 (a different individual one of the pins 21 will come into alignment with an arm of the armature 24 and will thereupon be positioned to be moved to its operative position by the magnet 23.

As is indicated by the arrow 30 the pin wheel 20 can move in a forward and in a reverse direction. When the wheel moves in a reverse direction any of the pins 21 which are in the operative position, as illustrated by the pin 21', will, upon being advanced a predetermined number of steps by the feed wheel shaft 14, engage a contact arm 31 and will cause a normally closed contact pair 32 to open. Upon being moved in the forward direction as indicated by the arrow 30, the pins 21 will move past a reset member 33 which serves to cause any of the pins 21 which are in the operative position back into the dormant position.

Referring now to FIG. 2, there is shown a message receiving and correcting station 39 including a reperforator 40 which is connected by the message line 12 and the error line 13 to the transmitter 10 and the distributor 11. The reperforator 40 serves to receive signals from the transmitter and to record these signals by punching permutation combinations of holes into a paper tape. It should be understood that the reperforator 40 will normally be located at a point remote from the transmitting transmitter 10 and that the transmitter and the reperforator may be used to transmit messages over long distances. Although any of the well known types of reperforators may be employed, it is contemplated that the reperforator shown in Patent No. 2,951,902, granted to R. E. Arko et al. on Sept. 6, 1960, will be employed.

Mounted on top of the reperforator 40 is an error detection circuit 41. This circuit may be of any of the well known types but preferably is of the type shown in Patent No. 2,152,038, granted to L. M. Potts on June 20, 1950. Error detection circuits of this general type sense the operation of some part of the punching mechanism, for example, the interposers or the punch pins, and give an error signal if an incorrect combination of these members is actuated. Alternatively, a tape reader may be employed.
to read the tape perforated by the reperforator 40 and the circuit shown in the Potts patent may be employed in conjunction with such a reader. In any event when the error detection circuit 41 detects that an erroneous character has been punched by the reperforator 40 an error signal is transmitted by the circuit over the error line 13 to the transmitter 10.

Expanded from the side of the reperforator 40 is a feed wheel shaft 44 (corresponding to the feed wheel shaft 42 of the above-idented Arko patent) upon which a pin wheel 50 is mounted. This pin wheel is virtually identical to the pin wheel 20 which is attached to the feed wheel shaft 14 of the transmitter 10. The pin wheel 50 carries a plurality of pins 51 each of which has a dormant arm in an operative position and each of which may be moved from its dormant to its operative position by an arm 57 of an armature 54 which is rocked about a pivot 55 against the action of a spring 56 by a pin setting magnet 53. Like the pin wheel 20, the pin wheel 50 is of suitable dimensions so that for each incremental advancement of the tape advancing mechanism of the reperforator 40 the pin wheel 50 is advanced one step, that is, an amount sufficient to bring the next individual one of the pins 51 into alignment with the arm 57. As is indicated by the arrow 60, the tape advancing mechanism in the transmitter 10 moves in only one direction. When a pin 51 has been moved to the operative position it eventually will engage a contact arm 61 similar to the contact arm 31 and will, upon such engagement, open a normally closed contact pair 62. Upon further movement a pin in the operative position will snap out of contact with the arm 61, will come into engagement with a resetting member 63 and will be cammed back into the dormant position by the member 63.

In addition to the components associated with the transmitter 10 there is associated with the pin wheel 50 a cancelling member 64 which is moved by a solenoid 65 into engagement with the pin wheel 50 and which serves to drive any of the pins 51 which is in the operative position, and which is positioned between the arm 57 of the armature 54 and the contact arm 61, back into the dormant position.

Associated with the reperforator 40 is an overpunching mechanism 70 which serves, upon actuation, to erase or cancel characters previously recorded by the reperforator 40 by overpunching or obliterating these characters. The overpunching mechanism 70 is comprised of a punch block 71 in which are sladly mounted a plurality of punch pins equal in number to the total possible number of perforations in a tape which is being punched by the reperforator 40. These punch pins operate simultaneously by a punch operating member 72 which is eccentrically mounted on an overpunch drive shaft 73. The shaft 73 is driven by a pulley 74 which is in turn operated through a belt 75 by a pulley 76. Pulley 76 is attached to the punch operating mechanism of the reperforator 40 and is revolved through one revolution each time a character is recorded by the reperforator. If the reperforator shown in the above-idented Arko et al. patent is used, the pulley may be attached to and driven by the cam sleeve 29.

The pulley 76, the belt 75 and the pulley 74 are operated through one cycle of operation each time a character is recorded by the reperforator 40. The overpunching or obliterating of the previously recorded tape is, however, effected only when a single-revolution clutch 80 mounted on the shaft 73 is released. The clutch 80 is released by a clutch release magnet 81, which upon energization, rocks its armature 82 about a pivot 83 against the operation of a spring 84. When the armature 82 is so moved it cuts off the field of the clutch and a clutch stop member 85 on the clutch 80 thereby engages the clutch. This connects the punch operating arm 72 to the pulley 74 so that the overpunch 70 obliterates or erases one character for each one punched by the reperforator 40. When the magnet 81 is deenergized the spring 84 rocks the armature 82 into the path of the stop member 85 and, after the overpunching member 70 has completed any previously started cycle of operation, the clutch 80 will become disengaged and further movement of the clutch 80 will not effect obliteration of the tape.

A feed wheel 77 is mounted adjacent the overpunching unit 70 and serves to advance tape through the overpunching unit. The feed wheel 77 is mounted on and driven by a shaft 78 which is in turn driven by a pulley 86. A belt 87 connects the pulley 86 to a pulley 89 which is mounted on the feed wheel shaft 44. This arrangement assures that the feed wheel 77 will be advanced each time the feed mechanism of the reperforator 40 is advanced and that a single amount of tape will be maintained between the reperforator and the overpunch 70.

The operation of the tape advancing mechanism of the transmitter 10 and of the overpunching unit 70 are controlled by the pin wheels 20 and 50 through the circuit schematically illustrated in FIG. 3. In that figure the error detection circuit 41 is shown attached to the error line 13 which extends over a distance illustrated by the dotted portion of the line 13 to the remote transmitting station 9 that is sending the message to the message receiving and correcting station 39. Whenever the error detection circuit 41 detects the character error the reperforator 40 is energized and the reperforator 40 applies current to the error line 13 for a period of time approximately equal to one cycle of operation of the reperforator. The application of current to the error line 13 causes a line relay 90, which is located at the transmitting station to operate.

Operation of the line relay 90 closes a contact pair 94 and thereby connects a source of potential 91 to the pin setting magnet 23 of the transmitter 10 through a lead 92, normally open, now closed contact pair 94 and a lead to said magnet. This causes the pin setting magnet 23 to operate which in turn causes a pin 21 of the pin wheel 20 to be moved to the operative position. Operation of the line relay 90 also closes a contact pair 96 and thereby connects the positive source of potential 91 through the lead 92, a lead 98 and a normally open, now closed, contact pair 96 to a reverse tape feed control magnet 97. Upon such connection, the reverse feed control magnet 97 operates and upon operation locks up through a circuit including normally open, now closed contact pair 110, a lead 111, the normally closed contact pair 32 associated with the pin wheel 20, a lead 112 and the lead 98.

Operation of the reverse feed control magnet 97 operates transfer contact 115 which, upon actuation, opens a normally closed circuit including a forward feed magnet 116 and a read magnet 117 of the transmitter 10 and closes a normally open circuit from the power source 91 to a reverse feed magnet 118. These magnets correspond to forward feed magnet 106, read magnet 146 and reverse feed magnet 67 of the above-identified De Boo Patent No. 3,014,092. This operation causes the transmitter to stop feeding tape in the normal direction, to stop reading the tape and to start feeding the tape in a reverse direction.

Once started, reverse feeding of the tape continues until one of the pins 21 which has been moved to its operative position by the actuation of the pin setting magnet 23 comes into contact with the contact arm 31. At this time the holding circuit for the reverse feed control magnet 97 is broken by the opening of the contact pair 32. This allows the magnet 97 to deenergize which in turn causes the transfer contact 115 to reclose the circuit from the power source to the forward feed and read magnets 116 and 117 of the transmitter 10. This causes normal tape feed and reading operations to resume. The deenergization of the magnet 97 also causes the circuit including the reverse feed magnet 118 to be opened thereby deenergizing that magnet.

Forward feeding of the tape causes the pin 21 which had been set in the operative position to be advanced in the forward direction as indicated by the arrow 30. The
pin is stepped around past the arm 27 of the armature 24 until it contacts the reset member 33 at which time it is returned to the dormant or inoperative position. If an error is detected by the error detection circuit 41 during the retransmission of the previously pulled back portion of the message, the setting of a pin in the operative position and the initiation of reverse feeding proceeds in the manner previously described. The stopping of reverse feeding and the starting of forward feed and retransmission occurs, however, when the pin 21 which was moved to the operative position at the detection of the first error engages the contact arm 31 due to the fact that the originally set pin will not have been moved back to the inoperative position since it will not have advanced past the arm 57. Accordingly, if an error occurs during retransmission the tape is pulled back only to the point of original pull back. The pin which is set in the operative position upon the detection of the second error has no effect on the retransmission and is merely cammed back to the dormant position whenever it reaches the reset member 33. A line relay 120 similar to the line relay 90 is provided at the perforator 40 for controlling the operation of the rub-out mechanism 79. The line relay 120 may be operated in a manner identical to the operation of the relay 90 by connecting the error line 13 through the coil of the relay 120. In some situations, however, it may be desirable to operate the relay 120 by the output of a circuit 119, such as the circuit shown and described in the pending application of J. A. Rehman, Ser. No. 302,339, filed Aug. 15, 1963, which detects the absence of transmission of characters over the message line 12 by the transmitter 10. Such an absence of transmission will occur upon the detection of an error by the circuit 41 since the operation of the reverse feed magnet 97 causes the circuit to the forward feed magnet and the read magnet of the transmitter 10 to be open and thereby prevents transmission of characters by the transmitter 10. As a final alternative a suitable relay circuit may be primed by the operation of the error detection circuit 41 and may then be triggered by a circuit, such as the aforementioned Johnson circuit, which detects a long absence of a transmission from the transmitter 10. The choice of one or the other of these systems depends upon the time interval necessary to be sure that the last character transmitted by the transmitter 10 has been received by the perforator 40. Upon energization the relay 120 closes a normally open contact pair 124 and thereby connects a source of potential 121 and a line 122 to the pin setting magnet 53 and the cancelling solenoid 65, thereby operating them. The operation of the magnet 53 and the solenoid 65 causes any previously set pin 51 which lies between the arm 57 of the armature 54 and the contact arm 61 to be moved back to its dormant position by the cancelling member 64 and a new pin 51 to be moved to its operative position by the arm 57. Operation of the relay 120 also operates an overpunching magnet 127 by connecting the source of potential 121 through the lead 122, a normally open, now closed, contact pair 126 and a lead 128 to the magnet 127. Upon energization the overpunch control magnet 127 locks up and holds through a circuit including the power source 121, the lead 122, a normally open, now closed, contact pair 140, a lead 141, the contact pair 62, the contact arm 61 of the perforator 40, a lead 142 and the lead 128. Operation of the magnet 127 also operates the clutch trip magnet 60 by closing a normally open contact pair 146 which, upon closing, connects the power source 121 through the magnet 81 to ground. Operation of the magnet 81 causes the obliteration of previously recorded characters by the overpunching unit 70 until the energizing circuit for the clutch trip magnet 81 is broken. This occurs when a pin on the arm 57 in the operative position engages the contact arm 61 and thereupon opens the normally closed contact pair 62. This operation breaks the holding circuit for the magnet 127 thus allowing the contact pair 145 of the magnet 127 to reopen the circuit to the clutch trip magnet 81. This operation will disable the overpunching unit 71 after completion of a previously begun cycle. After the overpunch unit 70 has been disabled by the opening of the contact pair 62, further advancement of the tape in the perforator causes pin wheel 50 to rotate further in the direction of the arrow 60 and thus brings the pin 51 into engagement with the reset member 63 to be cammed thereby back into its dormant position. If an error is detected during retransmission the operation of the relay 120 proceeds as previously stated. The cancelling member 64 resets the previously set pin 51 back into its dormant position. The pin setting magnet 53 moves a new pin 51 into the operative position and overpunching continues until the pin 51 which was set in the operative position by the detection of the second error engages the contact arm 61. It should be noted that in all cases the same number of characters are overpunched by the overpunching mechanism 70 as are retransmitted by the perforator 10, so it is because the characters retransmitted by the transmitter is equal to the number of reverse feeding steps taken by the pin wheel 20 from the time a pin 21 is set by the magnet 23 until the contact arm 31 is engaged by a pin in the operative position plus the total number of reverse steps taken by the pin wheel 20 upon the detection of an error during retransmission. The total number of characters overpunched by the overpunching unit 70 is equal to the total number of steps necessary for the pin wheel 50 to advance a pin 51 in its operative position from the arm 57 to the contact arm 61 plus the total number of steps taken before the detection of a second error. Since the total number of steps taken before the detection of a second error is equal to the number of steps taken in the forward direction, as indicated by the arrow 30, by a pin 21 set upon the detection of a first error by the magnet 23 after opening the contact pair 32, it is thus equal to the number of characters retransmitted a second time by the transmitter 10. This construction assures that the number of characters obliterated by the overpunching 70 is equal to the number of characters retransmitted by the perforator 10. The operation of the present invention proceeds from the detection of the recording of an error by the error detection circuit 41. Upon such detection the circuit 41 operates to momentarily apply an error signal to the line 13 and thereby serves to operate the line relay 90. Operation of the line relay 90 causes the pin wheel 20 of the transmitter 10 to be moved into its operative position. Operation of the relay 90 also causes the transmitter 10 to stop feeding tape in the forward direction, stop transmitting characters and start feeding tape in the reverse direction. The reverse feeding of the tape by the transmitter 10 causes the pin on the pin wheel 20 which has been set in the operative position to count backwards until the proper length of tape to be retransmitted has been measured. At this time the pin 21 which is in the operative position opens the contact pair 32 and thereby causes retransmission of a previously transmitted portion of the tape to begin. If an error is detected during retransmission, the tape is pulled back only to the point of original pull back since the pin 21 which was set upon detection of the original error is not moved back to its dormant position until after it has passed the set pin mechanism. Detection of an error also causes operation of the line relay 120 which is similar to relay 90. Operation of the relay 120 causes a pin 51 on the pin wheel 50 to be moved to the operative position and initiates operation of the overpunching mechanism 70. The operation of the mechanism 70 erases one character for each character
recorded by the reperforator 40 until the pin 51 which is in the operative position counts a number of characters equal to the number retransmitted by the transmitter 10. After the passage of the proper amount of tape through the reperforator 40 has been measured by the pin wheel 50, the contact pair 62 is opened by the pin 51 in the operative position and the operation of the overpunch unit 70 is thereby discontinued. Should an error occur during retransmission the cancelling member 64 moves the previously set pin 51 back to the dormant position while the pin setting mechanism moves a new pin to the operative position. This assures that the same number of characters will be erased by the overpunching unit 70 as are retransmitted by the transmitter 10.

Although only one embodiment of the invention is shown in the drawings and described in the foregoing specification, it will be understood that the invention is not limited to the specific embodiment described, but is capable of modification and rearrangement and substitution of parts and elements without departing from the spirit of the invention.

What is claimed is:

1. A telegraphic transmission system including:
   a tape controlled transmitter having means for feeding tape in a normal and in a reverse direction;
   a reperforator for receiving messages transmitted by the transmitter and having means for erasing message portions after they are received;
   means for detecting the recording of an erroneous character by the reperforator;
   means responsive to the detection of an erroneous character by the detecting means for causing the transmitter to stop transmitting and to start refeeding tape in the reverse direction; and
   means for counting the number of characters erased by the reperforator and for signaling the setting means thereby causing them to move at least one of the switch actuating means on each.

2. A telegraphic transmission system including:
   a tape controlled transmitter having means for feeding tape-by-character in a normal and in a reverse direction for transmitting messages to remote points;
   a reperforator having means for advancing tape and for recording messages received from remote transmitters on the tape and having means for erasing message portions after they are received;
   an error detecting circuit for detecting the recording of an erroneous character by the reperforator;
   reversing means responsive to the detection of an erroneous character by the error detecting circuit for causing the transmitter to stop feeding tape in the normal direction, to stop transmitting and to start feeding tape in the reverse direction; and
   counting means operatively connected to the tape feeding mechanism of the transmitter and advanced thereby one step each time the tape is fed one character for counting the number of characters in the tape which are fed in the reverse direction by the tape feeding mechanism of the transmitter and for producing an output whenever a predetermined number of characters have been fed in the reverse direction;
   means responsive to an output from the counting means of the transmitter for disabling the reversing means and for thereby causing the transmitter to stop feeding tape in the reverse direction, to start feeding tape in the normal direction and to resume transmitting;
   means responsive to the detection of an error by the error detection circuit for causing the reperforator to erase a portion of a previously recorded message; and
   means for counting the number of characters erased by the reperforator and for stopping the erasure of characters after a number of characters equal to the number of characters fed by the transmitter in the reverse direction have been erased by the reperforator.

3. An error detection system for a telegraphic transmission system having a tape controlled transmitter with means for feeding tape in a normal and in a reverse direction and a reperforator for receiving messages transmitted by the transmitter and having means for erasing message portions after they are received, including:
   means for detecting the recording of an erroneous character by the reperforator;
   means responsive to the detection of an erroneous character by the detecting means for causing the transmitter to stop transmitting and to start feeding tape in the reverse direction;
   means for measuring the amount the tape is fed in the reverse direction and causing the transmitter to resume advancing tape in the normal direction and to resume transmitting whenever a predetermined amount of tape sufficient to assure the transmission of the errored character is fed in the reverse direction;
   means responsive to the detection of an error by the detecting means for causing the reperforator to erase an errored portion of a previously recorded message; and
   means for counting the number of characters erased by the reperforator and for stopping the erasure of characters after a number of characters equal to the number of characters retransmitted by the transmitter have been erased, thereby assuring that the errored character will be erased and retransmitted.

4. In a message transmission system having a tape controlled pull back transmitter and an overpunching reperforator, an error detection and correction system including:
   a pair of counting wheels one operatively connected to the tape advancing mechanism of the transmitter and one operatively connected to the tape advancing mechanism of the reperforator;
   a plurality of switch actuating members each normally positioned in a dormant position on one of the counting wheels and individually settable to an operative position on the counting wheel;
   setting means positioned adjacent each of the counting wheels for receiving signals and, upon receipt of such signals, for moving one of the switch actuating means on the wheel adjacent to it into the operative position;
   means for detecting an error in a message transmitted from the transmitter to the reperforator and upon such detection, for causing the transmitter to pull back a portion of previously read tape, for causing the reperforator to start overpunching a portion of the previously recorded message and for signaling the setting means thereby causing them to move at least one of the switch actuating means on each.
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of the counting wheels out of the dormant position and into the operative position;
a switch mounted adjacent the counting wheel on the transmitter for engagement by any of the switch actuating means on that counting wheel which is in the operative position and, upon engagement for causing the transmitter to stop pulling back tape and to start retransmitting a previously transmitted portion of the message and
a switch positioned adjacent the counting wheel on the reperforator for engagement by any switch actuating means on that counting wheel which is in the operative position and, upon engagement, for causing the reperforator to stop overperforating previously received characters so that the retransmitted portion of the message will not be overperforated.

5. In a message transmission system having a tape controlled pull back transmitter and an overperforator, an error detection and correction system including:
a pair of pin wheels one operatively connected to the tape advancing mechanism of the transmitter and one operatively connected to the tape advancing mechanism of the reperforator;
a plurality of pins mounted on the pin wheels and normally positioned in a dormant position and individually settable in an operative position;
a pair of pin setting electromagnets each for operation to set a pin on one of the pin wheels;
means for detecting an error in a message transmitted from the transmitter to the reperforator and upon such detection, for causing the transmitter to pull back a portion of previously read tape, for causing the reperforator to start overperforating a portion of the previously recorded message and for causing the pin setting electromagnets to move at least one pin on each of the pin wheels out of the dormant position and into the operative position;
means for engagement by any pin on the pin wheel connected to the transmitter which is in the operative position and, upon engagement for causing the transmitter to stop pulling back tape and to start retransmitting a previously transmitted portion of the message; and
means for engagement by any pin on the pin wheel connected to the reperforator which is in the operative position and, upon engagement, for causing the reperforator to stop overperforating previously received characters so that the retransmitted portion of the message will not be overperforated.

6. In a transmission system, apparatus for controlling the operation of a tape controlled transmitter capable of feeding tape in either a forward or a reverse direction including:
means for measuring the movement of tape through the transmitter in the reverse direction;
error indicating means for receiving signals indicating the transmission of an incorrect signal by the transmitter;
means responsive to the receipt of an error indicating signal by the error indicating means for causing the transmitter to feed tape in a reverse direction, and
means for causing the transmitter to feed tape in the forward direction after the measuring device has measured a predetermined amount of reverse movement of the tape feeding mechanism of the transmitter.

7. In a message transmission system, apparatus for controlling a tape transmitter including:
feed means for feeding tape in a step-by-step manner through the transmitter in a normal direction and in a reverse direction,
means for receiving signals indicative of an error in a message being transmitted by the transmitter and
for producing an output when such a signal is received,
means responsive to the output of the receiving means for causing the feed means to feed tape through the transmitter in the reverse direction, and
means for counting the number of steps which the feed means feeds the tape in the reverse direction and for causing the feed means to feed tape in the normal direction when a predetermined count is reached.

8. In a transmission system, apparatus for causing a tape controlled transmitter capable of feeding tape in either a forward or a reverse direction to, upon the transmission of an error, retransmit a portion of a previously transmitted message including:
a plurality of switch actuating members each having an operative and a dormant position and all mounted on a wheel which is operatively connected to the tape feeding mechanism of the transmitter and which is advanced thereby a predetermined amount for each incremental advance of the tape;
error indicating means for receiving signals indicating the transmission of an incorrect signal by the transmitter and for moving one of the switch actuating members from its dormant to its operative position;
means responsive to the receipt of an error indicating signal by the error indicating means for causing the transmitter to retract the tape in a reverse direction; and
means for actuation by any of the switch actuating members which is in its operative position and, upon actuation, for causing the transmitter to advance tape in the forward direction so that a portion of the message which was previously transmitted will be retransmitted.

9. In a transmission system, an apparatus for controlling the operation of a pull back tape transmitter including:
a pin wheel constrained to rotate with the feed wheel of the tape reader;
pin setting means for moving a pin on the pin wheel out of an inoperative position on the pin wheel and into an operative position;
means for receiving a signal indicative of an error in the message being transmitted and for operating the pin setting means on receipt of such a signal;
feed controlling means responsive to the operation of the receiving means for reversing the direction of tape feed in the tape transmitter, and
means for actuation by a pin on the pin wheel in the operative position and, upon such actuation, for disabling the feed controlling means thereby re-reversing the direction of tape feed in the tape transmitter.

10. In a transmission system, an apparatus for controlling the operation of a pull back transmitter which reads tape and which transmits messages contained there-in including:
a pin wheel constrained to rotate with the feed wheel of the tape reader;
a pin setting electromagnet for moving a pin on the pin wheel out of an inoperative position and into an operative position;
a normally open energizing circuit for the pin setting electromagnet;
a line relay for receiving a signal indicative of an error in the message being transmitted and for closing the energizing circuit for the pin setting electromagnet on receipt of such a signal so that the magnet is operated and a pin on the pin wheel is set into the operative position;
feed controlling means responsive to the operation of the line relay for reversing the direction of tape feed in the tape transmitter and for interrupting the transmission of the message; and
means for actuation by a pin on the pin wheel in the
operative position and upon such actuation for disabling the feed controlling means thereby re-reversing the direction of operation of the reperforator and which is advanced thereby a predetermined amount for each incremental advance of the tape;

means responsive to the output of the receiving means to set a pin on the pin wheel; and

means for engagement by a set pin on the pin wheel and for causing, upon such engagement, the feed wheel to stop feeding tape in the reverse direction and to resume feeding tape in the normal direction.

12. In a transmission system, apparatus for controlling the operation of a reperforator capable of obliterating a portion of a message previously punched including:

measuring means for measuring the amount of tape which passes through the reperforator;

error detection means for detecting the punching of an incorrect character by the reperforator;

means responsive to the detection of a failure by the error detection means for causing the reperforator to obliterate a portion of a message previously punched and for causing the measuring means to start measuring the passage of tape through the reperforator; and

means for stopping the overpunching of characters after the measuring device has measured the passage of a predetermined amount of tape through the reperforator.

13. In a message transmission system, apparatus for controlling a message recorder including:

erasing means for cyclic operation to obliterate individual characters previously recorded by the recorder;

error detection means for detecting the recording of an erroneous character by the recorder and for producing an output when such a detection is made;

transmission means responsive to the output of the detection means for operatively connecting the erasing means to the drive mechanism of the recorder so that the erasing means obliterate one character for each character recorded by the recorder; and

means operatively connected to the recorder for counting the number of characters recorded by the recorder after the detection of an error by the error detecting means and for disabling the transmission means after a predetermined count is reached thereby disconnecting the erasing means from the recorder and stopping the obliteration of characters.

14. In a transmission system, apparatus for controlling the operation of a reperforator capable of deleting a portion of a message previously punched including:

a plurality of switch actuating members each having an operative and a dormant position;

a supporting element for said switch actuating members operatively connected to the tape advancing mechanism of the reperforator and which is advanced thereby a predetermined amount for each incremental advance of the tape;

error detection means for monitoring the operation of the reperforator and for detecting the punching of an incorrect character by the reperforator;

means responsive to the detection of an error by the error detecting means to move one of the switch actuating members out of its dormant position and into its operative position;

means responsive to the detection of an error by the error detection means for causing the reperforator to delete a portion of a message previously punched; and

means for actuation by any of the switch actuating members which is in its operative position and, upon such actuation, for stopping the deletion of characters and for resuming the normal recording of the message.

15. In a transmission system, an apparatus for controlling the operation of an overpunching reperforator including:

a pin wheel constrained to rotate with the feed wheel of the reperforator and having a plurality of pins on it;

pin setting means for moving a pin on the pin wheel out of an inoperative position on the pin wheel and into an operative position;

means for detecting the receipt of an erroneous character by the reperforator and for operating the pin setting means upon such detection;

overpunching means responsive to the operation of the error detecting means for obliterating a portion of the message punched by the reperforator; and

means for actuation by a pin on the pin wheel in the operative position and, upon such actuation, for disabling the overpunching means so that no further characters are obliterated.

16. In a transmission system, an apparatus for controlling the operation of an overpunching reperforator including:

a pin wheel constrained to rotate with the feed wheel of the reperforator and having a plurality of settable pins on it;

a pin setting electromagnet for moving a pin on the pin wheel out of an inoperative position on the pin wheel and into an operative position;

a normally open energizing circuit for the pin setting electromagnet;

means for detecting the punching of an erroneous character by the reperforator and for closing the energizing circuit for the pin setting electromagnet upon such detection;

an overpunch for cyclic operation to erase individual characters previously recorded by the reperforator whenever the detecting means detects the punching of an erroneous character by the reperforator;

means for operatively connecting the overpunch to the reperforator so that the overpunch operates through one complete cycle for each cycle of operation of the reperforator; and

means for actuation by a pin on the pin wheel in the operative position and, upon such actuation, for disabling the overpunch so that no further characters are obliterated.

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