

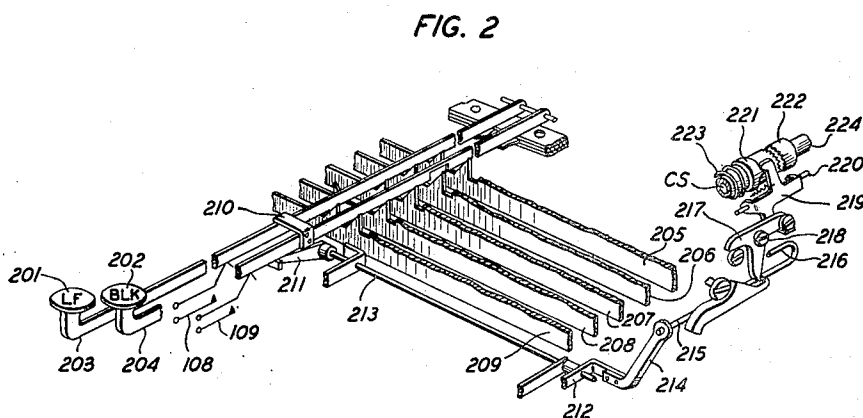
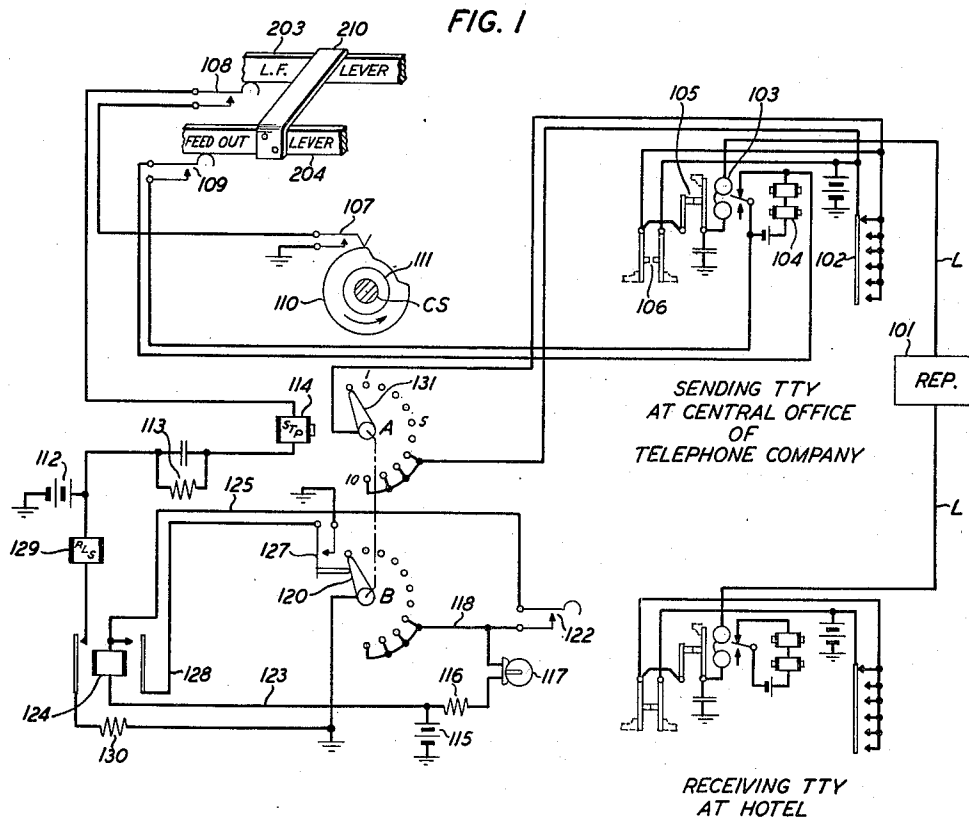
March 16, 1954

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TELETYPEWRITER LINE FEED TRANSMITTING
AND COUNTING APPARATUS

2,672,508

Filed Oct. 4, 1950

2 Sheets-Sheet 1



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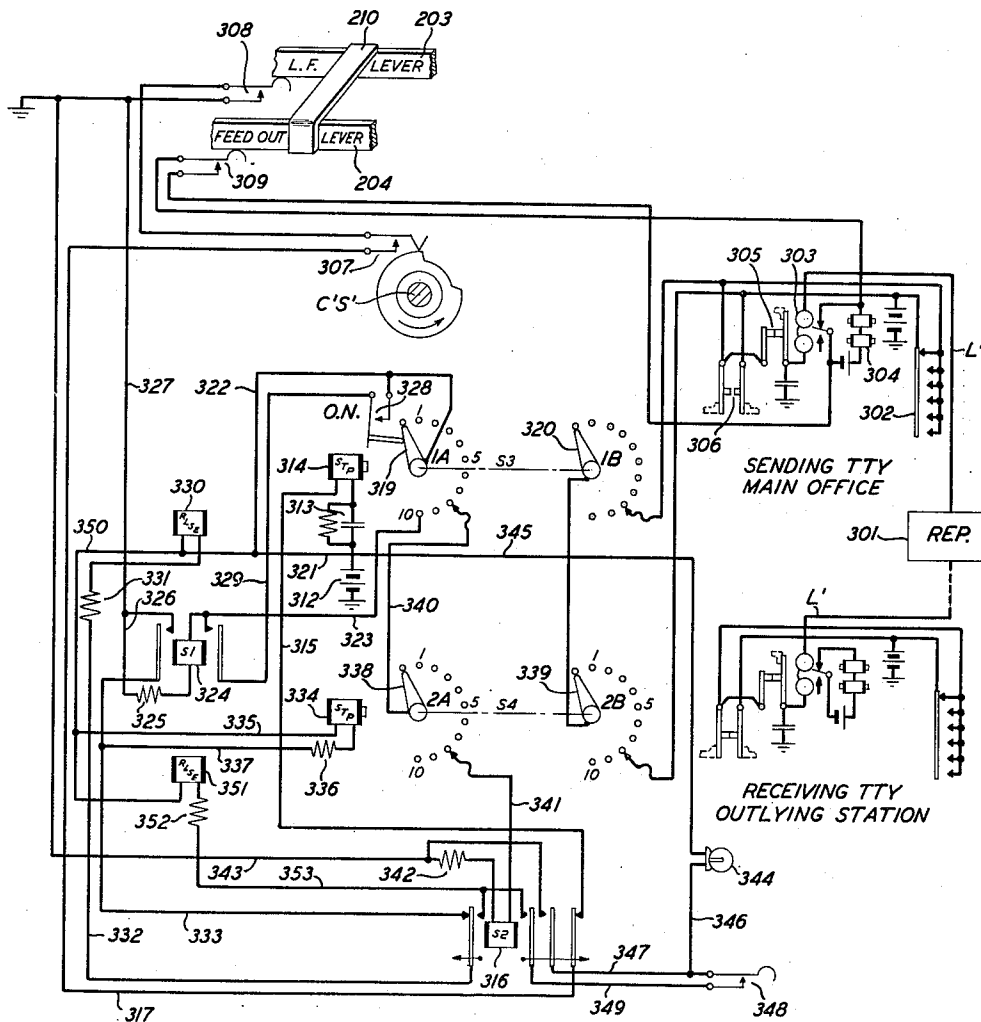
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FIG. 3



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TELETYPEWRITER LINE FEED TRANSMITTING AND COUNTING APPARATUS

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This invention relates to printing telegraph systems and more particularly to page type printers equipped with sprocket feed mechanisms for feeding through the printers form stationery, sheet stationery, superfolded stationery, roll stationery, and the like.

An object of the invention is to automatically advance stationery through a page printer a predetermined number of line spaces in response to a certain signal.

Another object is to provide a mechanism for the automatic feed-out of stationery forms or sheets at teletypewriters located at both ends of a teletypewriter circuit or at a teletypewriter located at the receiving end only, as desired, which mechanism requires modification of the sending teletypewriter only.

Heretofore after the material was typed on a sheet the line feed key was operated repeatedly in order to feed the next sheet to the proper typing position. The number of line feed signals transmitted must be correct in order to type at the proper point on the next sheet. This requires close attention on the part of the attendant and if the sheet is advanced too far, manually turning back the printer platen at each station is required, if the sheet is not to be wasted.

According to the present invention a form feeding-out mechanism is provided for use with the page type sending and receiving teletypewriter. The form feeding-out mechanism automatically feeds the form out of the printer and feeds in the next form until the desired line on the next form is in the proper recording position. The number of line spaces through which the form is advanced is determined by means of rotary selector switches, the switches being arranged to advance individual steps corresponding in number to the lines of material recorded on the form, and then in response to a special signal, to automatically advance to predetermined corresponding contacts on their respective banks whereby a circuit is closed for lighting a lamp indicating that a reset key should be momentarily operated to restore the switches to normal.

A feature of the invention is the provision of means for automatically feeding out of a printer in response to a single signal combination a sheet of stationery and advancing the next sheet to the recording, or typing, position.

Another feature is the provision of means for automatically operating in response to the single operation of a teletypewriter key the mechanism of the rotary selector switches from any oper-

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ated position to a predetermined position, and other means for restoring the operating mechanism when in its predetermined position to normal.

Another feature is the provision of means operative in response to the operation of a teletypewriter key for causing stepping switch brushes to step continuously over the contacts of their respective banks to corresponding arbitrarily selected contacts on such banks whereby a circuit is closed to light a lamp in a printing telegraph system to indicate when it is required to momentarily operate a reset key for restoring the stepping switches and their associated apparatus to normal.

Another feature is the provision of means for automatically feeding out in a continuous manner the form stationery in a teletypewriter at a receiving station in response to a signal transmitted from a sending teletypewriter without advancing correspondingly the paper at the sending teletypewriter.

Another feature is the provision of means operable in response to the depression of the feed-out key for (1) performing the function of the line feed key; (2) maintaining the printer selector magnet at the sending teletypewriter operated during the time that the form stationery is automatically being advanced out of and the next form advanced into the proper recording point in the typing unit of the teletypewriter at a receiving station; and (3) for causing the clutch throw-out lever to be disengaged from the driven member of a grab clutch on the transmission cam shaft whereby continuous rotation of the cam assembly on such shaft is had.

Another feature is the provision of a rotary selector switch of the step-by-step type which operates one step in response to each operation of the line feed key until predetermined contacts, corresponding to the last line of a message being recorded on form stationery at the receiving teletypewriter, are engaged by their respectively associated stepping brushes, and continuously in response to the single operation of the paper feed-out key until the stepping brushes respectively engage contacts corresponding to the first recording line on the form stationery following that on which the message is being recorded.

Another feature is the provision of two rotary selector switches of the step-by-step type, one of which rotates each of its brushes one step in response to each line feed signal transmitted to the line circuit to count off the number of unit

digits in the number of lines in the message that is being recorded and the other of which rotates each of its brushes one step in response to each group of ten line feed signals transmitted to the line circuit to count off the number of tens digits in the number of lines in the message. The two switches cooperate with means for advancing one form stationery out of and the next form into the recording position on a receiving teletypewriter in either a step-by-step or a continuous manner in response to the operation of one or the other of two keys of the keyboard of a sending teletypewriter.

Other objects and features will be obvious from the following description and drawings, of which:

Fig. 1 shows the schematic circuit arrangement of an intercommunicating telegraph system wherein a sending page teletypewriter is equipped for automatically feeding short stationery forms out of a receiving teletypewriter. The arrangement is identified herein as the short form device;

Fig. 2 shows a fragmentary view of the keyboard of the special sending page teletypewriter, the line feed and the paper feed-out keys only being shown. These keys are shown with respect to the code selector bars. With the paper feed-out key is shown the means for withdrawing the clutch throw-out lever from the transmitting cam clutch to cause continuous rotation of the transmitting cams, not shown but fixedly mounted on the transmitting cam shaft, during the time the feed-out key is held depressed; and

Fig. 3 shows the schematic circuit arrangement of an intercommunicating telegraph system wherein the page teletypewriter at a receiving station automatically feeds out long stationery sheets, say up to eighteen inches in length, in response to the single operation of the paper feed-out key at the sending teletypewriter keyboard. The arrangement shown in Fig. 3 is identified as the long form device.

The page teletypewriter to which the present invention may be applied is of the type disclosed in United States Patent 1,904,164 granted to S. Morton et al. on April 18, 1933, and the means for withdrawing the throw-out lever from the transmitting cam clutch in response to the operation of the feed-out key is similar to the means provided for responding to the operation of the tabulator key shown in Fig. 4 of United States Patent 2,220,364 granted to C. W. Burcky on November 5, 1940. The disclosures of both of these patents are hereby made a part of the present specification as if fully set forth herein.

The arrangement shown in Fig. 1 is particularly adapted for use in connection with page teletypewriters installed in a telephone central office to furnish telephone call billing service to hotels usually located in the area of the central office. It provides a simple form feed-out device for recording telephone calls and charges therefor on short forms at receiving teletypewriters located in the offices of the hotels or other such premises of subscribers. Short forms according to the arrangement shown in Fig. 1 provide for a maximum of nine lines of information.

The arrangement shown in Fig. 3, also adapted for use in connection with page teletypewriters, provides means for feeding out long stationery sheets or forms having lengths up to and including eighteen inches or one-hundred and eight line feed spaces where the recording is on a basis of six lines for each inch. The operating circuit is somewhat similar to that shown in Fig. 1 ex-

cept that it includes two instead of one rotary selector switch of the step-by-step type. One switch counts the units digits and the other counts the tens digits of the number of line spaces required to advance the paper out of and the next sheet into its proper recording position in the teletypewriter at the receiving station.

Arrangement shown in Fig. 1

In Fig. 1 a line circuit L including a repeater 101 is shown extending from a teletypewriter located at a central office in a telephone system to a teletypewriter located at a subscriber station such as a hotel which receives its telephone service from such central office and supplies such service to its patrons through its switchboard. The teletypewriter shown in the central office is referred to herein as the sending machine and that at the hotel, as the receiving machine, although the latter machine may also be arranged for both sending and receiving. The equipment shown at both ends of the line circuit corresponds, in part, to that of the schematic circuits respectively shown in Figs. 29 and 30 of S. Morton et al. Patent 1,904,164, supra, the automatic tape transmitters being omitted in the schematic circuits used herein. The schematic circuit of the sending machine comprises keyboard transmitting cam contacts 102, line relay 103 for controlling the operation of the printer selector magnet 104, and contacts 105 and 106 which respectively correspond to contacts 416 and 417 of the "send-receive-break" mechanism described in S. Morton et al. Patent 1,904,164. Contact 105 is located in the line circuit and is used as a "break" contact. Contact 106, when closed, serves as a shunt around transmitting cam contacts 102 thereby rendering the transmitting cam contacts inoperative when the sending machine is in its "receive" condition.

Arrangement shown in Fig. 2

In Fig. 2 two keys of the teletypewriter keyboard are shown, key 201 representing that used for sending line feed signals and key 202 usually identified as the "blank" key for sending "blank" signal code combinations but used herein for transmitting paper feed-out signals. Key levers 203 and 204 to which keys 201 and 202 are respectively attached are shown in engageable relation with five code selector bars 205 to 209, inclusive. The code selector bars are provided along their upper edges with saw-tooth shaped notches arranged according to the requirements of the signaling code. These bars rest on rollers (not shown) and are guided at each end so that they may be easily moved lengthwise. When a key is depressed, a key lever strikes the slanting sides of these notches on certain of the code bars 205 to 209 moving one or more of these bars either to the left or to the right depending upon whether the corresponding pulses of the signal code combination are marking or spacing, as described in United States Patent Re. 20,330 granted to S. Morton on April 13, 1947. In response to the operation of the line feed key 201, key lever 203 causes code selector bars 205, 207, 208 and 209 to be moved in a lengthwise direction toward the right, if they are not already so positioned, and code selector bar 206 to be moved in a lengthwise direction toward the left if it is not already so positioned. In response to the operation of feed-out key 202, key lever 204 would ordinarily cause all the code selector bars to be moved lengthwise in a right-hand direction if

they are not already so positioned. However, it will be noted that the underside of the key lever 204 is slotted directly above the code selector bar 206 which permits code selector bar 206 to be moved toward the left when line feed key 201 is operated and remain in such position without any interference from key lever 204, especially, should feed-out key 203 be the next to be operated. Line feed key 201 when operated, actuates key lever 203 independently of key lever 204 but when feed-out key 202 is operated it actuates not only key lever 204 but also key lever 203 because arm 210 which is affixed to key lever 204 overlaps key lever 203.

Operation of arrangement shown in Fig. 1

Referring to Fig. 1 cam pulsing contact 107 is controlled by cam 110 which is one of the transmitting cams on cam sleeve 111 on the transmitting cam shaft CS, and is arranged to close when the transmitting cam shaft begins to rotate through one revolution to transmit each signal. Contact 107 is normally open, as shown, but as soon as cam shaft CS begins to rotate it closes as the cam follower drops into a cam indent and remains closed until the cam lifts the follower out of the indent at which time contact 107 again opens to await the transmission of the next signal. Contacts 108 and 109 also are normally open and are closed only when key levers 203 and 204, respectively, are depressed by the operation of the keys 201 and 202. For the short form stationery arrangement, one rotary selector switch is provided comprising contact banks A and B. Each bank is equipped with ten contacts arranged in a path for engagement by its respective rotatable brush.

It is assumed herein that a form of a supply roll or a stack of superfolded short form stationery is in its proper position on the platen of the hotel teletypewriter, that is, at the point for the first line of recording, but it is not known at the central office what part of the cycle the operating mechanism of the rotary selector switch has been left. The operator at the central office first operates the send-receive break key (Fig. 2 of S. Morton et al. Patent 1,904,164) to the received position to close contact 106 whereby no signals can be transmitted to the receiving machine of the hotel and then operates and holds operated the form feed-out key 202. Key 202 upon being operated depresses key lever 204 and arm 210 fixed to lever 204 depresses line feed key lever 203. Key lever 204, upon being depressed, closes contacts 109 to close a shunt path around the armature and marking, or upper, contact of printer selector magnet 104 so that magnet 104 cannot respond to transmitted signals, although none at this time can be transmitted to the line circuit because closed contact 106 establishes a shunt path around transmitting cam contacts 102. It is well to note at this time that the sending machine receives line feed signals for advancing its stationery during message transmission only when its send-receive-break key is in a sending position, but when feed-out key 202 is operated and printer selector magnet 104 is maintained operated the stationery is not advanced. However, when the send-receive-break key is in its receive position, the stationery in neither the sending nor the receiving machine can be advanced. In this way the sending machine at the central office is prevented or restrained from advancing its stationery. During the time when key lever 204 is maintained

depressed and transmitting cam shaft CS continuously rotates, arms 211 and 212 fixed to opposite ends of rock shaft 213 are also depressed. Member 214 affixed to one end of arm 212 and fastened at the other end to rod 215 is rotated in a counter-clockwise direction with rock shaft 213 to cause rod 215 to move lengthwise toward the left. Rod 215 has a horizontally extending reverse portion 216 which is normally in alignment and engageable relation with the downwardly extending portion of T-shaped member 217 and when rod 215 is moved toward the left it rotates member 217 in a clockwise direction around pivotal screw 218. The rotation of member 217 causes clutch throw-out member 219 affixed to pivotal rod 220 to rotate out of engagement with the driven clutch member 221 of transmitting cam shaft CS. The driven clutch member 221 is then permitted to engage driving clutch member 222 under the influence of the compression present in coil spring 223. Driving clutch 222 is fixed to shaft 224 which in turn is driven through a pinion and gear from the continuously rotating main shaft shown in Fig. 11 of S. Morton et al. Patent 1,904,164. During each revolution of transmitting cam shaft CS contact 107 closes and inasmuch as the operation of feed-out key lever 204 also operates line feed key lever 203, a circuit is closed traceable from grounded positive battery 112, condenser of condenser-resistance network 113, through the winding of stepping magnet 114 of the rotary selector switch, closed contacts 108 and 107, to ground. Magnet 114 operates and rotates each of the switch brushes on contact banks A and B one step. Magnet 114 operates at relatively high speed because of the condenser in the condenser-resistance network 213. At the end of the indent on cam 110, contact 107 opens to release stepping magnet 114 but inasmuch as the transmitting cam shaft CS continues to rotate, contact 107 is again closed to reoperate magnet 114 to step each of the switch brushes a second step. This operation is repeated in a continuous manner until the brushes reach predetermined contacts on their respective banks A and B.

The brush of bank B upon reaching the predetermined contact of that bank, closes a circuit traceable from positive battery 115, resistor 116, lamp 117, conductor 118, the predetermined contact, say contact No. 7, brush 120, to ground, and lamp 117 lights. Brush 131 of bank A upon stepping to its contact No. 7, closes a shunt path around transmitting cam contacts 102 for preventing transmission of signals to the hotel machine. Lamp 117 upon lighting, furnishes an indication to restore the rotary switch to normal and the operator accordingly operates reset key 122. Reset key 122 upon being operated, closes a circuit extending from grounded positive battery 115, conductor 123, through the winding of relay 124, conductor 125, reset key 122 in closed condition, conductor 118, contact No. 7 and brush 120 of bank B, to ground. Relay 124 operates and then locks at its right-hand armature and contact in a circuit traceable over conductor 128, off-normal contact 127 (now closed) of the rotary selector switch bank B, to ground. Relay 124 upon operating, closes at its left-hand armature and contact an obvious operating circuit for release magnet 129 which operates to restore the brushes 120 and 131 to their respective normal positions. The locked condition of relay 124 is maintained until the off-normal contact 127 is restored to its normally open condition and in

this way assures complete restoration to normal of brushes 120 and 131. The arrangement shown in Fig. 1 is now set in condition to furnish billing service on a telephone call by operating the send-receive-break key (not shown) to its send position. The central office machine is now ready for operation inasmuch as it was hereinbefore assumed that the form at the hotel receiving machine was in its proper position for the first line of typing. It is important that the platen of the receiving machine at the hotel is not disturbed except to correct the positioning of the copy or form in case of trouble.

The central office apparatus is now assumed to be in its desired sending condition. The operator types the pertinent matter to be transmitted to the hotel machine (one or more lines) in the usual manner. At the end of each line of information, a line feed signal is transmitted and the line feed function levers at both the central office and hotel machines are operated to cause each of the platens of such teletypewriters to rotate one step as described under the caption "Line Feed" in the specification of S. Morton et al. 1,904,164. It is assumed that the information simultaneously recorded on the copy at the central office machine and transmitted over the line circuit for recordation on the form stationery at the hotel machine requires three lines. After each line of information, the operation of the line feed key 201 depresses key lever 203 to close contact 108 and operates the universal bar to start the transmitting cam shaft CS rotating through one revolution whereby contact 107 on cam 110 is also closed to complete a circuit for operating stepping magnet 114 as hereinbefore traced. Accordingly, stepping magnet 114 is operated each time the line feed key is operated. The magnet is released when contact 107 opens at the end of the cam indent. Therefore, for each operation of the line feed key the brushes on banks A and B advance one step.

When the required number of line feed signals have been transmitted, which is assumed herein to be three, and it is desired to feed out the form stationery at the hotel machine to the starting point of the succeeding form, feed-out key 202 is operated, and held operated thereby depressing key lever 204 to close contact 109. Key lever 204 upon being depressed, rotates arms 211 and 212 which, upon rotating, causes clutch throw-out member 219 to be withdrawn from driven clutch member 221 as hereinbefore described and the transmitting cam shaft CS is permitted to rotate continuously until the end of a revolution immediately following the release of feed-out key 202. The sustained closure of feed-out contact 109 short-circuits the armature and marking, or upper, contact of line relay 103, thereby holding the printer selector magnet 104 in its marking condition, so that the succession of line feed signals transmitted as a result of the operation of feed-out lever 204 does not cause corresponding advancement of the paper in the central office teletypewriter. The reason for this is that there is no occasion to allocate each item of telephone call charging or billing data to a separate form in the central office, as there is in the subscriber's office, the hotel, because these forms are used in the billing of the patrons of the hotel, who have been the recipients of the telephone service. The reset key is then depressed and the circuit again made operative; the operation of the reset key restoring brushes 120 and 131 to their normal positions.

Arrangement shown in Fig. 3

Referring to Fig. 3, the schematic circuit arrangement provides for feeding-out, from a page machine at the receiving end of a line circuit, of stationery in forms up to eighteen inches in length by the operation of either the line feed key to effect the feed-out in individual steps or the feed-out key to effect the feed-out in a continuous manner automatically. The keyboard arrangement shown in Fig. 2 is adapted for use with Fig. 3 in the same manner as hereinbefore described except as set forth below. Line circuit L' includes repeater 301 and extends from a teletypewriter located at a main office in an intercommunicating system to a teletypewriter located at an outlying station. The teletypewriter at the main office is referred to herein as the sending machine and that at the outlying station as the receiving machine although both machines may be arranged for both sending and receiving. These equipments shown at both ends of line circuit L', like those shown at both ends of line circuit L in Fig. 1, correspond, in part, to those in the station circuits respectively shown in Figs. 29 and 30 of S. Morton et al. Patent 1,906,164, supra. The station circuit at the sending machine comprises transmitting cam contacts 302, line relay 303 for controlling the operation of the printer selector magnet 304 and contacts 305 and 306 which respectively correspond to contacts 416 and 417 of the send-receive-break mechanism described in S. Morton et al. Patent 1,906,164. Contact 305 is located in line circuit L' and serves as a "break" contact. Contact 306, when closed, serves as a shunt around transmitting cam contacts 302 which are thereby rendered inoperative as will be hereinafter described.

Cam pulsing contact 307 is controlled by cam 310, one of the transmitting cams fixedly mounted on cam sleeve 311 which is fixedly mounted on the free end of transmitting cam shaft C'S' of the sending machine and this contact is arranged to close when the transmitting cam shaft begins to rotate through a revolution in response to the transmission of each signal from the sending machine as hereinbefore described in connection with the circuit arrangement shown in Fig. 1. Contact 307 is normally open as shown, but as soon as the transmitting cam shaft C'S' begins to rotate it closes and remains closed until the end of the cam indent. Contacts 308 and 309 also are normally open and are closed only when key levers 203 and 204, respectively, are depressed by the operation of their respective keys 201 and 202.

For the long form or sheet stationery, two rotary selector switches S-3 and S-4 are provided, switch S-3 comprising contact banks 1A and 1B and switch S-4 comprising banks 2A and 2B. The contacts of each bank are arranged in a path to be engaged by a rotatably stepping brush. The contacts of banks 1A and 1B represent the "units" digit and the contacts of banks 2A and 2B represent the "tens" digit of the number of lines in a message. The wiring shown to the No. 8 contacts in each bank indicates that the circuit arrangement shown herein provides for transmitting messages having eighty-eight lines of copy although the selector switch contact banks may provide for as many as one hundred and eight lines as hereinbefore stated. When the switch brushes reach their respective No. 8 contacts, a lamp lights indicating that the brushes of selector switches S-3 and S-4 have completed

their stepping operations and that the sheet of stationery at the receiving machine has been advanced out of the machine and the next sheet has been advanced to its proper recording position. The use of contact 309 is optional and when used the transmission of the feed-out signal to the line circuit does not cause the paper at the sending machine to be advanced inasmuch as printer selector magnet 304 may be maintained operated.

Operation of the arrangement shown in Fig. 3

It is assumed herein that a sheet of stationery of a superfold stack or roll-supply of forms at the outlying station is in proper recording position but it is not known at the main office what part of the cycle the operating mechanism of the main office apparatus has been left. In order to restore the apparatus at the main office to its normal position before transmitting the message to the teletypewriter at the outlying station, the operator at the main office first operates the send-receive-break key to its receive position, whereby contact 306 is closed to prevent the transmission of signals to the outlying station, and then operates and holds operated, feed-out key 202. It is assumed for illustration purposes, although this assumption is unknown to the operator at the main office, that the brushes on contact banks 1A and 1B are on their respective No. 5 contacts and that the brushes of contact banks 2A and 2B are on their respective No. 6 contacts which positions correspond to the sixty-fifth line on the stationery.

When feed-out key 202 is operated, key lever 204 is depressed and arm 210 depresses line feed key lever 203. During the time when key lever 204 is maintained depressed, clutch throw-out member 218 is maintained out of engagement with driven member 221 of a grab clutch and transmitting cam shaft C'S' continuously rotates, but no line feed signals are transmitted because closed contact 306 shunts transmitting cam contacts 302. In a manner similar to that hereinbefore mentioned in connection with the arrangement shown in Fig. 1, the sending machine receives line feed signals for advancing its stationery during message transmission only, when its send-receive-break key is in a sending position, but when feed-out key 202 is operated and contacts 309 are used, printer selector magnet 304 is maintained operated and the stationery is restrained from advancing. However, when the send-receive-break key is in its receive position, the stationery in neither the sending nor the receiving machine can be advanced. The transmitting cam shaft C'S' has fixedly mounted thereon a cam sleeve 311 and, as hereinbefore stated, cam 310 which is one of the transmitting cams, the others of which are not shown but fixedly mounted on such sleeve, serves to close and open contact 307. Inasmuch as feed-out key lever 204 and line feed key lever 203 are simultaneously held depressed, a circuit for operating stepping magnet 314 is closed when contact 307 is closed for the interval during which the cam follower of the contact is in engagement with the cam during each revolution of the transmitting cam shaft. The circuit is traceable from grounded positive battery 312, condenser of condenser-resistance network 313, through the winding of stepping magnet 314, conductor 315, back contact and outer right-hand armature of relay 316, conductor 317, closed contacts 307 and 308, to ground. Magnet 314 operates and releases, advancing the switch brushes 319 and 320 of respective contact banks 1A and 1B one step.

Hereinbefore it was assumed that brushes 319 and 320 were on their respective No. 5 contacts and now when these brushes advance one step they move to their respective No. 6 contacts. At the end of the cam indent, contact 307 opens to release stepping magnet 314 but inasmuch as the cam shaft continues to rotate, contact 307 is again closed to reoperate magnet 314 to advance the brushes 319 and 320 a second step. This operation is repeated until brushes 319 and 320 reach their respective No. 10 contacts.

When brushes 319 and 320 reach their respective No. 10 contacts, brush 319 closes a circuit traceable from grounded positive battery 312, conductors 321 and 322, brush 319 on contact No. 10, conductor 323, through the winding of relay 324, resistor 325, conductors 326 and 327, to ground. Relay 324 operates and then locks at its right-hand armature in a circuit traceable from grounded positive battery 312, conductors 321 and 322, off-normal contact 328 now closed because of the operated condition of brush 319, conductor 329, through the right-hand armature, front contact and winding of relay 324, resistor 325, conductors 326 and 327, to ground. Relay 324 upon operating, closes at its left-hand armature and contact an operating circuit for release magnet 330, the circuit being traceable from grounded positive battery 312, conductor 321, through the winding of release magnet 330, resistor 331, conductor 332, left-hand armature and back contact of relay 316, conductor 333, left-hand armature and front contact of relay 324, conductor 327, to ground and release magnet 330 operates to restore brushes 319 and 320 to their respective normal positions. Simultaneously with the operation of release magnet 330, stepping magnet 334 also operates in a path traceable over substantially the circuit just traced, except that the path extends from grounded positive battery 312, conductors 321, 350 and 335, through the winding of stepping magnet 334, resistor 336, conductor 337, left-hand armature and front contact of relay 324, conductor 327, to ground. Stepping magnet 334 upon operating, advances brushes 338 and 339 of their respective contact banks 2A and 2B to their respective No. 7 contacts because of the assumption hereinbefore stated that the brushes were in positions corresponding to the sixty-fifth line on a long form of stationery when the send-receive-break key was operated to its receive position. Brush 319 upon being restored to its normal position, permits off-normal contact 328 to be restored to its normally open condition whereby the locking circuit for relay 324 is opened and relay 324 now releases.

At this point brushes 319 and 320 are in their respective normal positions on banks 1A and 1B and brushes 338 and 339 are at their respective No. 7 contacts on banks 2A and 2B in preparation for counting off by brushes 319 and 320 over the contacts of banks 1A and 1B respectively the next group of ten line feed signals. The feed-out key 202 is still held operated, line feed lever 203 and feed-out lever 204 remain depressed while the next group of line feed signals are being counted off by brushes 319 and 320 inasmuch as transmitting cam shaft C'S' continues to rotate. When brush 319 counts off the next ten line feed signals and engages contact No. 10 on bank 1A, relay 324 again becomes locked operated to close at its right-hand armature and front contact parallel operating paths for release magnet 330 and stepping magnet 334. Release magnet 330 upon operating, restores brushes 319 and 320 to

their respective normal positions and opens the off-normal contact 328. Brushes 319 and 320 are now in the proper positions for the transmission of the next group of ten line feed signals. Stepping magnet 334, upon being operated, advances brushes 338 and 339 to their respective No. 8 contacts on banks 2A and 2B.

In the circuit arrangement shown in Fig. 3 contact No. 8 in each of banks 1A, 1B, 2A and 2B is arbitrarily selected to indicate the end of a long form sheet so that in response to the eighth line feed signal of the next group two special functions are performed. One of these functions is performed when brushes 320 and 339 engage their respective No. 8 contacts to close a path for shunting transmitting cam contacts 302 from the line circuit L' whereby, if contacts 306 have been open, further transmission of signals to the line circuit is prevented. The other of these functions is performed when brushes 319 and 338 engage their respective No. 8 contacts whereby a circuit is closed extending from grounded positive battery 312, conductors 321 and 322, brush 319 in engagement with its No. 8 contact, conductor 340, brush 338 in engagement with its No. 8 contact, conductor 341, through the winding of relay 316, resistor 342, conductor 343, to ground. Relay 316, upon operating, (1) opens at its outermost right-hand armature and back contact the operating circuit for stepping magnet 314, and (2) closes at its middle right-hand armature and front contact a circuit extending from grounded positive battery 312, conductor 345, lamp 344, conductors 346 and 347, middle right-hand armature and front contact of relay 316, conductor 343, to ground. Lamp 344 lights to indicate that the last line space of a long form has been reached and it is time to restore the rotary selector switches S-3 and S-4 to their normal positions. The operator upon observing lighted lamp 344, releases feed-out lever 204, thereby arresting the transmitter, and operates reset key 348 to close a circuit traceable from grounded positive battery 312, conductor 321 and then over two parallel paths one extending through the winding of release magnet 330, resistor 331, conductor 332, left-hand armature and front contact and front contact and innermost right-hand armature of relay 316, conductor 349, and the other extending over conductor 350, through the winding of release magnet 351, resistor 352, conductor 353, front contact and innermost right-hand armature of relay 316, to conductor 349 which is common to both paths, closed contacts of reset key 348, conductor 347, middle right-hand armature and front contact of relay 316, conductor 343, to ground. Release magnets 330 and 351 operate to restore brushes 319 and 320 of rotary selector switch S-3 and brushes 338 and 339 of rotary selector switch S-4, to normal. The apparatus at the main office is now in its proper condition for transmitting a message to the outlying station. Release of selector switches to normal releases relay 316 and lamp 344 is extinguished. Relay 316 is sufficiently sluggish in releasing so that it does not release until after brushes 319, 320, 338 and 339 have been restored to their respective normal positions.

The apparatus at the main office is now in its proper sending condition and the send-receive-break key of the sending machine is operated to its send position whereby contact 306 is opened and contact 305 remains closed and the printer selector magnet 334 is free to operate in response to signals transmitted from the transmitting cam

contacts 302. At the end of each line of the transmitted message, line feed key 201 is operated to transmit by means of the code selector bars 205, 206, 207, 208 and 209 and the transmitting cam contacts 302 on cam shaft C'S', a line feed signal over line circuit L' to the receiving machine at the outlying station. At the outlying station the stationery form has been placed in its proper recording position and in response to each incoming line feed signal the paper is advanced one step. The line feed signal transmitted after each line of the transmitted message operates printer selector magnet 334 to rotate the platen of the sending machine one step. At the end of the first group of ten lines, brush 319 of contact bank 1A is positioned in response to the ten transmitted line feed signals, on its No. 10 contact and as hereinbefore described, a circuit is closed from grounded positive battery 312, conductors 321 and 322, brush 319 on contact No. 10, conductor 323, through the winding of relay 324, resistor 325, conductors 326 and 327, to ground and relay 324 operates. Relay 324 upon operating, closes at its right-hand armature and front contact a locking circuit for itself extending from grounded positive battery 312, conductors 321 and 322, off-normal contact 328 now in a closed condition, conductor 329, right-hand armature, front contact and winding of relay 324, resistor 325, conductors 326 and 327, to ground. Also, relay 324 upon operating, closes at its left-hand armature and front contact a circuit extending from grounded positive battery 312, conductor 321, and then in two parallel paths one extending through the winding of release magnet 330, resistor 331, conductor 332, left-hand armature and back contact of relay 316 and common conductor 333 and the other, over conductors 350 and 335, through the winding of stepping magnet 334, resistor 336, conductor 337, to common conductor 333, and then over the left-hand armature and front contact of relay 324, to ground. Release magnet 330 and stepping magnet 334 operate. Release magnet 330 upon operating, restores brushes 319 and 320 to their normal positions, and stepping magnet 334 upon operating, moves brushes 338 and 339 of contact banks 2A and 2B to their respective No. 1 contacts.

For each line of the second group of ten, a line feed signal is also transmitted to again step brush 319 from one contact to another until ten line feed signals are transmitted to the line and brush 319 reaches its No. 10 contact to again close the operating circuits for release magnet 330 and stepping magnet 334. Brush 319 is thereby restored and brush 338 is moved to its No. 2 contact. This operation is repeated for each group of ten lines of the message until the last line of the message is transmitted. If desired, immediately after typing the last line of the message, feed-out key 202 is operated to close a shunt path around the marking, or upper, contact and armature of line relay 303 and printer magnet 304 remains operated to prevent the stationery in the sending machine from being advanced during the transmission of the repeat line feed signals over the line circuit. The continuous rotation of transmitting cam shaft C'S' which effects the transmission of the repeat line feed signals to the line circuit, for the purpose of advancing the sheet stationery in a continuous manner through the receiving machine and then advancing the next sheet to a position for recording another message, also causes repeated closures of contact 307, corresponding in number to the line feed signals,

whereby brushes 319, 320, 338 and 339 are stepped over the contacts of their respective banks until the arbitrarily selected No. 8 contacts are reached. The engagement of the No. 8 contacts by their respective brushes results in performing two functions hereinbefore described. The first function is that performed by the circuit including brushes 320 and 339 on their respective No. 8 contacts whereby the transmitting cam contacts 302 are shunted from the line circuit L' to prevent further transmission thereto. The second function is that performed when brushes 319 and 338 engage their respective No. 8 contacts simultaneously to close a circuit hereinbefore traced for operating relay 316. Relay 316, upon operating, closes the operating circuit for lighting lamp 344 to indicate that the end of the stationery has been reached and that reset key 348 should be operated to restore brushes 319 and 320 on banks 1A and 1B and brushes 338 and 339 on banks 2A and 2B to their respective normal positions as hereinbefore described. The operator, upon observing lighted lamp 344, operates reset key 348 to close a circuit prepared by the operation of relay 316 for operating release magnets 330 and 351, thereby brushes 319, 320, 338 and 339 of rotary selector switches S-3 and S-4 are restored to normal.

The arrangement shown in Fig. 3 may be modified to accommodate forms eighteen inches in length, which is the equivalent of one hundred and eight line feed steps at the usual line spacing of six lines per inch, by shifting the connections of stepping switch banks 2A and 2B from the contacts No. 8 to the contacts No. 10, to provide for the counting of twenty additional lines before lamp 344 is lighted and the transmitting contacts are shunted.

What is claimed is:

1. In a signaling system, a signal sending device, a signal receiving device, a transmission channel associated with said devices, a recording medium in each of said devices, mechanisms and mechanically operated means therefor, adapted to advance said recording mediums through said devices, respectively, a predetermined distance for each operation of said means in one only of said devices, and other mechanically operated means in said one device for operating said recording medium advancing mechanism in the other only of said devices to advance in response to a single operation of said other means the recording medium through said other device, in the same direction, a variable distance to a predetermined point, and rotary stepping means electrically operable independently of said recording medium advancing mechanism for determining the variable distance through which said medium at said other device is advanced.

2. In a telegraph system, a sending teletypewriter, a receiving teletypewriter, a transmission channel interconnecting said teletypewriters, a recording paper in each of said teletypewriters, paper advancing mechanisms and mechanically operated means therefor, adapted to advance the paper through said teletypewriters, respectively, a predetermined distance for each operation of said means in one only of said teletypewriters, and other mechanically operated means in said one teletypewriter for operating said paper advancing mechanism in the other only of said teletypewriters to advance in response to a single operation of said other means the paper through said other teletypewriter, in the same direction, a variable distance to a predetermined line space of said paper for recording purposes, and a rotary

stepping means electrically operable independently of said recording medium advancing mechanism for determining the variable distance through which said medium at said other device is advanced.

3. In a telegraph system, a sending teletypewriter, a receiving teletypewriter, a transmission channel interconnecting said teletypewriters, a recording paper in each of said teletypewriters, paper advancing mechanisms and mechanically operated means therefor, adapted to advance the paper through said teletypewriters, respectively, a predetermined distance for each operation of said means in one only of said teletypewriters, stepping means responsive to the operation of said mechanically operated means for operating one step each time the paper in said teletypewriters is advanced a predetermined distance, other mechanically operated means in said one teletypewriter for operating said paper advancing mechanism in the other of said teletypewriters to advance in response to a single operation of said other means the paper through said other teletypewriter only, in the same direction, a variable distance to a predetermined line space on the paper for recording purposes, and continuously operated means controlled by the single operation of said other means for operating said stepping means through a desired number of successive steps in a continuous manner to determine the distance through which the paper must be advanced through said other teletypewriter only to bring a predetermined line space on the paper to a desired position for recording purposes.

4. In a telegraph system, a sending teletypewriter, a receiving teletypewriter, a transmission channel interconnecting said teletypewriters, a recording paper in each of said teletypewriters, paper advancing mechanisms and mechanically operated means therefor, adapted to advance the paper through said teletypewriters, respectively, a predetermined distance for each operation of said means in one only of said teletypewriters, stepping means responsive to the operation of said mechanically operated means for operating one step each time the paper in said teletypewriters is advanced one step a predetermined distance, other mechanically operated means in said one teletypewriter for operating said paper advancing mechanism in the other of said teletypewriters to advance in response to a single operation of said other means the paper through said other teletypewriter only, in the same direction, at a variable distance to a predetermined line space on the paper, automatically operated means controlled by said other mechanically operated means for operating said stepping means through a desired number of successive steps in a continuous manner to determine the distance through which the paper in said other teletypewriter must be advanced to bring the predetermined line space on the paper to a desired position for recording purposes, and restraining means responsive to the single operation of said other means for preventing the advancement of the paper through said one teletypewriter.

5. In a telegraph system, a sending teletypewriter, receiving teletypewriter, a transmission channel interconnecting said teletypewriters, a recording paper in each of said teletypewriters, paper advancing mechanisms and mechanically operated means therefor, adapted to advance the paper through said teletypewriters, respectively, a predetermined distance for each operation of

said means in one only of said teletypewriters, stepper switch means responsive to the operation of said mechanically operated means in said one teletypewriter for operating one step each time the paper in said teletypewriter is advanced one step a predetermined distance, other mechanically operated means in said one teletypewriter for operating said paper advancing mechanism in the other of said teletypewriters in response to a single operation of said other means to advance the paper through said other teletypewriter only, in the same direction, a variable distance to a predetermined line space on the paper, automatically operative means responsive to the operation of said other mechanically operated means for operating said stepper switch means to control and determine the distance through which the paper in said other teletypewriter is advanced, indicating means for furnishing a signal when said stepper switch means is automatically operated through the variable distance to a point corresponding to the predetermined line space on the paper, and manually operable means for restoring said stepper switch means to normal when the signal is operated by said indicating means.

6. In a telegraph system, a sending teletypewriter, a receiving teletypewriter, a transmission channel interconnecting said teletypewriters, a recording paper in each of said teletypewriters, paper advancing mechanisms and mechanically operated means therefor, adapted to advance the paper through said teletypewriters, respectively, a predetermined distance for each operation of said means in one only of said teletypewriters, stepping means responsive to the operation of said mechanically operated means for operating one step each time the paper in said teletypewriters is advanced one step a predetermined distance, other mechanically operated means in said one teletypewriter for operating said paper advancing mechanism in the other of said teletypewriters in response to a single operation of said other means to advance the paper through said other teletypewriter only, in the same direction, a variable distance to a predetermined line space on the paper, automatically operated means responsive to the operation of said other mechanically operated means for operating said stepping means through a desired number of successive steps in a continuous manner to determine the distance through which the paper in said other teletypewriter must be advanced to bring the predetermined line space on the paper to a desired position for recording purposes, switching means in said teletypewriters for changing said teletypewriters from a receiving condition to a sending condition or vice versa, and restraining means in said automatically operated means and said other mechanically operated means for preventing the operation of said paper advancing means in said teletypewriters when said sending teletypewriter is changed to its receiving condition by said switching means.

7. In a telegraph system, a sending teletypewriter, a receiving teletypewriter, a transmission channel interconnecting said teletypewriters, a recording paper in each of said teletypewriters, paper advancing mechanisms and mechanically operated means therefor, adapted to advance the paper through said teletypewriters, respectively, a predetermined distance for each operation of said means in one only of said teletypewriters, stepping means responsive to the operation of said mechanically operated means in said one

teletypewriter for operating one step each time the paper in said teletypewriters is advanced one step a predetermined distance, other mechanically operated means in said one teletypewriter for operating said paper advancing mechanisms in the other of said teletypewriters in response to a single operation of said other means to advance the paper through said other teletypewriter only, in the same direction, a variable distance to a predetermined line space on the paper, automatically operated means responsive to the operation of said other mechanically operated means for operating said stepping means through a distance corresponding to the variable distance through which the paper in said other teletypewriter is advanced, indicating means for furnishing a signal when said stepping means is automatically advanced through the variable distance to the predetermined line space on the paper, switching means in said teletypewriters for changing said teletypewriters from a receiving condition to a sending condition or vice versa, restraining means in said automatically operated means and said other mechanically operated means for preventing the operation of said paper advancing means in said teletypewriters when said sending teletypewriter is changed to its receiving condition by said switching means, and other means responsive when said automatically operated means are operated to operate said stepping means in said one teletypewriter from any position to which said stepping means were last operated to a position whereat said indicating means furnishes a signal without operating the paper advancing mechanism in either of said teletypewriters.

8. In a printing telegraph system, a transmitter, counting means for registering cumulatively the occurrences of transmission of a particular signal by said transmitter, transmitter controlling means operable by said counting means upon counting a predetermined number of said signals for totally suppressing signal transmission by said transmitter, means for initiating automatic repetitive transmission of said particular signal, local and remote teletypewriter printers receptively associated with said transmitter, and means effective during repetitive transmission of said particular signal for suppressing receptive operation of the local printer.

9. In a printing telegraph system, a line circuit, a transmitter for transmitting signals over said line circuit, recording means local to said transmitter for making a local copy of the message signals transmitted over said line circuit, counting means for registering cumulatively the occurrence of transmission of a particular signal from said transmitter, means for initiating automatic transmission of said particular signal a plurality of times successively, means operable during a time when the particular signal is being transmitted from said transmitter to the line circuit a plurality of times successively, for preventing the operation of said local recording means, and other means operable immediately following the transmission of the particular signal a plurality of times successively, for totally suppressing signal transmission from said transmitter to said line circuit and for conditioning said counting means for restoration to normal.

10. In a printing telegraph system, a line circuit, a transmitter for transmitting signals over said line circuit, counting means for registering cumulatively the occurrence of transmission of a particular signal from said transmitter, means

for initiating the automatic repetitive transmission of said particular signal, local and remote teletypewriter printers receptively associated with said transmitter, means operable during the time when the automatic repetitive transmission of said particular signal is taking place for preventing the reception of said particular signal at said local teletypewriter printer, and other means operable immediately following the automatic repetitive transmission of said particular signal for totally suppressing signal transmission from said transmitter to said line circuit and for conditioning said counting means for restoration to normal.

11. In a signalling system, a signal sending device, a signal receiving device, a transmission channel associated with said devices, a recording medium with each of said devices, mechanisms and mechanically operated means therefor, adapted to advance said recording mediums through said devices, respectively, a predetermined distance for each operation of said means in one only of said devices, and other mechanically operated means of said one device for operating said recording medium advancing mechanism of the other only of said devices to advance in response to a single operation of said other means the recording medium through said other device, in the same direction, a variable distance to a predetermined point, and means electrically operable independently of said recording medium for determining the variable distance through which said medium in said other device is advanced.

12. In a telegraph system at least two teletypewriter printers, a transmission channel interconnecting said printers, a transmitter associated with at least one of said teletypewriter printers, and an attachment for said transmitter comprising means for cumulatively registering the occurrences of transmission of a predetermined signal, means for causing repetitious transmission of said predetermined signal, and means controlled by said registering means for disabling said transmitter upon registering a predeter-

mined number of transmissions of said predetermined signal.

13. In a telegraph system at least two teletypewriter printers, a transmission channel interconnecting said printers, a transmitter associated with at least one of said teletypewriter printers, and an attachment for said transmitter comprising means for cumulatively registering the occurrences of transmission of a predetermined signal, means for causing repetitious transmission of said predetermined signal, means for precluding response of the teletypewriter printer having said transmitter and attachment associated therewith to said repetitious transmissions of said predetermined signal, and means controlled by said registering means for disabling said transmitter upon registering a predetermined number of transmissions of said predetermined signal.

14. In a signaling system, a signal sending device, at least two signal receiving devices connected to be controllable by said sending device, a recording medium in each of said receiving devices, signal responsive feed mechanism in each of said receiving devices adapted to advance the respective recording medium a predetermined distance for each operation of the feed mechanism, means for causing said sending device to transmit repetitiously in varying number the signal to which said feed mechanisms are coded to respond, and means controlled by said last-mentioned means for precluding response of one of said receiving devices to said repetitiously transmitted signal.

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