

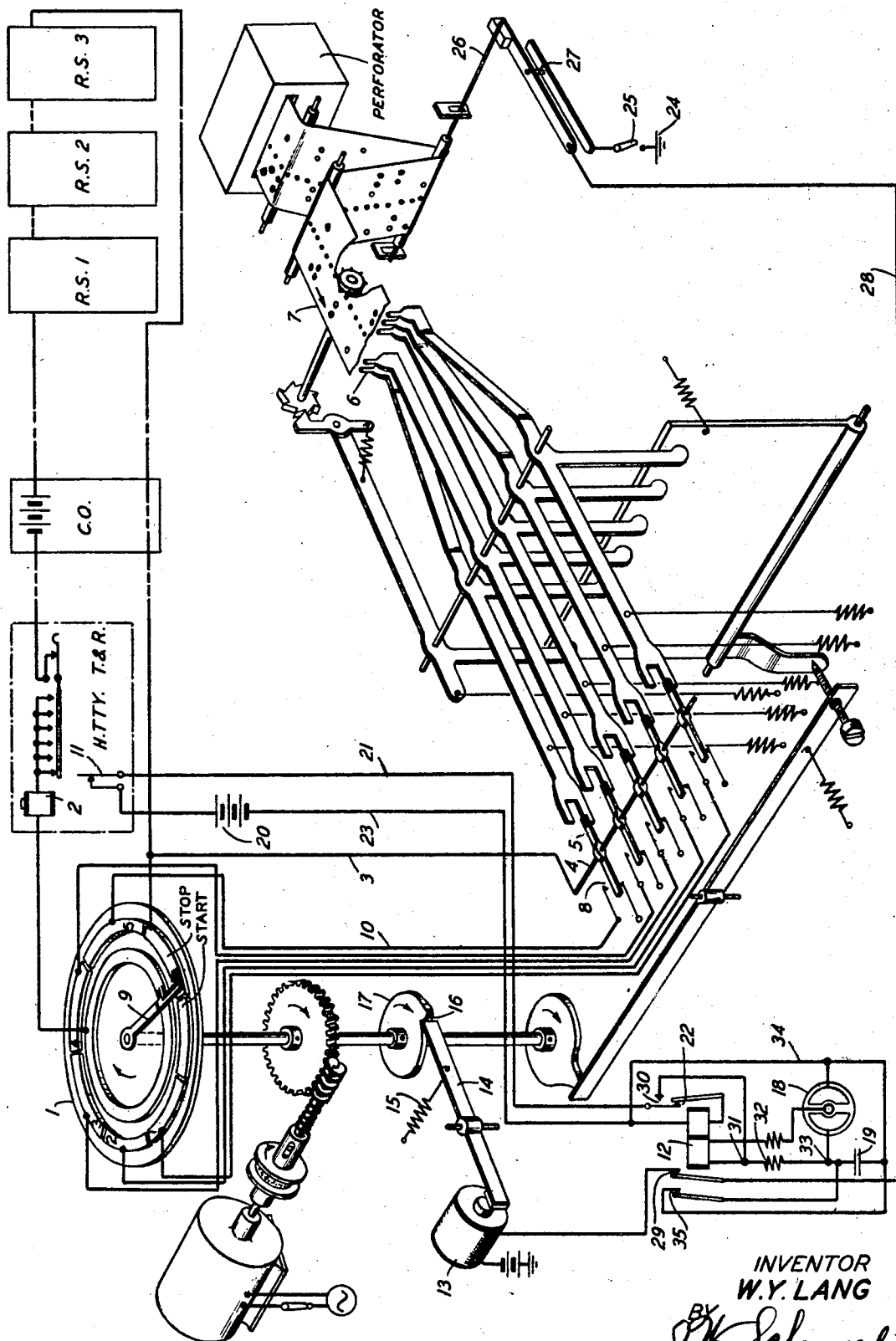
Nov. 11, 1941.

W. Y. LANG

2,262,014

TELETYPEWRITER TRANSMITTING AND RECEIVING SYSTEM

Filed May 3, 1940



INVENTOR
W. Y. LANG

BY *J. K. Schmed*
ATTORNEY

UNITED STATES PATENT OFFICE

2,262,014

TELETYPEWRITER TRANSMITTING AND
RECEIVING SYSTEMWilmarth Y. Lang, Towaco, N. J., assignor to Bell
Telephone Laboratories, Incorporated, New
York, N. Y., a corporation of New York

Application May 3, 1940, Serial No. 333,062

19 Claims. (Cl. 178—4)

This invention relates to teletypewriter systems and more particularly to an improvement in such systems to compensate for differences in the speed of operation of different receiving teletypewriter motors in situations wherein more than one teletypewriter receiver is connected to a single transmitter from which the receivers are receiving signals simultaneously. As is well known one of the difficulties encountered in such operation is caused by the variations in speed between the different machines caused by differences in speed of their driving motors and by variations in clutch grip time and clutch slippage.

An object of this invention is the improvement in the operation of teletypewriter systems wherein a single transmitting device transmits simultaneously to a group of teletypewriter receiving devices.

A more particular object of this invention is the improvement of a teletypewriter system wherein a single transmitter operates with a group of receivers so that the machines may be maintained in proper synchronism.

A feature of the invention herein is a means for compensating for variations in the speeds of teletypewriter machines.

A further feature of the invention is means for stopping the transmission of signals from a teletypewriter transmitter, in cases where the lengths of time required for the performance of a particular function is different for the different receiving machines until all of the receiving machines have performed the function and transmission may be safely resumed.

A further feature of the invention is an improved transmitter-distributor start-stop drive circuit, including an improved delay circuit controlled by a function lever in a home teletypewriter receiver connected to the transmitting device.

These and other objects and features will become apparent from the following detailed description when read with reference to the associated drawing.

The single figure of the drawing shows a tape controlled transmitter-distributor transmitting to a home teletypewriter receiver and three remote receivers. The starting and stopping of the distributor is governed by a special control circuit including a delay circuit responsive to a contact under control of a function lever in the home teletypewriter receiver.

The invention herein is shown incorporated into the teletypewriter system disclosed in Patent 2,055,567 to E. F. Watson, September 29, 1936 and

the disclosure of Patent 2,055,567 is hereby made a part of the disclosure of the invention herein, in so far as it is necessary to an understanding thereof.

5 In Patent 2,055,567 as in the patent herein, a perforator is shown at the right of the drawing. In the perforator a tape is perforated in accordance with a code. The tape is fed over a number of pins to actuate a system of levers which in turn controls a group of tongues. The tongues
10 open or close five circuit paths connecting one side of a telegraph loop with another through segments of a transmitting distributor. As the transmitting distributor shaft is rotated by its motor through a clutch, worm and gear, a brush arm is rotated and metallic portions wiped over the distributor rings to connect successive segments on one ring to the solid ring. If a hole
15 has been punched to admit a pin into the tape, the corresponding tongue is actuated so that the circuit path is closed across the loop, over a path from one side of the loop through the tongue, its corresponding contact and segment and the solid ring to the opposite side of the loop. If a hole is not punched in the tape opposite a particular pin,
20 the pin is not admitted. The corresponding tongue is not actuated. The tongue remains in engagement with its lower or spacing contact. The loop remains open as the brush rotates across the corresponding segment and a spacing signal is transmitted.

The transmitter-distributor shaft is driven by a motor coupled through a clutch to a worm which drives a gear. The rotation of the shaft
25 is controlled by means of a stop arm which may be operated to engage with or disengage from a peripheral shoulder on a stop cam located just below the worm and gear on the main transmitter shaft under the influence of a magnet. The circuit of the magnet is provided with a number
30 of controls. There are a manual switch and an electrical contact controlled by a stop lever. The stop lever is raised when the tape becomes taut to open the contact and release the magnet which in turn releases the stop arm to engage the peripheral shoulder on the stop cam to stop the rotation of the transmitter-distributor arm.

The tape is advanced from the perforator to the tape pins by means of the feed wheel which
35 engages a continuous row of holes lengthwise of the tape. The feed wheel is rotated through a ratchet wheel by a feed pawl mounted on one arm of a feed lever, shown to the left of the five contact levers. The feed levers are operated by a
40 bail, under the influence of an operating lever

controlled in turn by the tape feed operating cam mounted on the bottom of the vertical main shaft of the transmitting distributor.

All of this is described in complete detail in Patent 2,055,567 to which reference has been made above.

In Patent 2,055,567 the tape controlled transmitting distributor is disclosed in a system in which it transmits from a home station, over a telegraph loop circuit connecting the home station with a central office through the central office, over a connecting telegraph loop circuit to a single teletypewriter receiver located at a connected local station. In the arrangement of the invention herein there are a plurality of teletypewriter receivers located at separate local stations connected by means of a telegraph loop circuit through the central office to the single transmitter. For convenience these receiving stations, indicated R. S. 1, R. S. 2 and R. S. 3, are shown connected by means of a single loop circuit extending through the three receiving stations in series. It is to be understood that the receiving stations will ordinarily be connected to the central office in parallel, by means of separate loops. The series arrangement, however, will illustrate the invention equally well and requires less space on the drawing.

In addition to the three receiving stations connected at the distant end of the line, there is also connected to the tape controlled transmitting distributor a home teletypewriter transmitter and receiver designated H, Tty, T, and R. This is located in the same office with the tape controlled transmitter and adjacent the transmitter.

In the operation of the system of the invention herein, the tape controlled transmitter-distributor transmits through the central office to the three distant teletypewriter receiving stations simultaneously. It is to be understood that the number of receiving stations is not limited to three. As it transmits, a record of the transmitted message is made by the home receiver. This is performed by means of the operation of the selector magnet 2 of the home receiver, which is indicated as being connected in series with the loop connecting the transmitter-distributor through the central station to the distant receiving stations.

The loop circuit may be traced from the right-hand side of the battery at the central office C. O. over the top conductor, through the receiving teletypewriter at receiving stations 1, 2 and 3 in series, through the central office to the transmitting office by means of the bottom loop conductor, through conductor 3 and conducting shaft 4 to the tongues, such as 5, arranged in parallel. If, in accordance with the code, no hole has been punched in the tape 7 to admit the pin 6, the tongue 5 will be in position shown and the particular shunt across the loop, corresponding to the tongue 5, will be open at the contact 8. A spacing signal will be transmitted when arm 9 sweeps across the segment corresponding to tongue 5.

If a hole has been punched in the tape 7 opposite the pin 6, the pin will be admitted through the hole and the corresponding lever will be actuated in a counter-clockwise direction actuating tongue 5 so as to close the contact 8. This extends that particular shunt path through the conductor 10 to the segment on the segmented ring to which conductor 10 is connected. When the arm 9 sweeps across that particular segment, the loop will be closed by the brushes on arm 9,

bridging the gap between the segment and the solid ring to which the top loop conductor is connected. The loop is completed over the top conductor, through the selector magnet 2 and the teletypewriter transmitting contacts and break key of the home station to the left-hand side of the central battery.

A total of five shunt paths, corresponding to that traced through contact 8, interconnect the top and bottom loop conductors. These may be open or closed depending on whether or not a corresponding hole has been punched in tape 7 to control the tongue contact such as 8. As each shunt takes its position in turn across the loop conductors, when the transmitter-distributor arm sweeps across the corresponding segment, the loop will be open or closed to transmit a marking or a spacing signal element. The loop is always closed when the arm is on the stop segment, as the bottom loop conductor is connected to that segment directly, and the gap between the stop segment and the solid inner ring of the distributor, to which the top loop conductor is directly connected, is bridged by the arm brushes when the brush is on the stop segment. The start signal element is always an open or spacing signal element, because the bottom conductor is not connected in any manner to the start segment and as the brush arm sweeps across the start segment the loop circuit will be open.

In addition to transmitting trains of signal elements each comprising a start impulse, five signal impulses to cause the selection of a particular character by the receiving printer and a stop impulse, the modern teletypewriter transmitter and receiver must transmit and receive trains of signals to perform various functions, such as to shift from letters to numerals, etc., operate the line feed to step the receiver printer up to the next line, to return the carriage from right to left, to step the receiving printer through a succession of lines and spaces as in tabulating as well as to stop the receiver motor automatically and other functions. The manner in which this is performed by the receiver is well known and is described in detail in Patent 1,904,164 to S. Morton, April 18, 1933. In the performance of certain of these functions, when a single transmitter is transmitting to a plurality of receivers, it is important that the transmission of characters should not be resumed until all of the machines have completed the function which the transmitted signal conditions each receiver to perform. As is well understood by those skilled in the art and as is described in Patent 1,904,164 mentioned above, which is hereby made a part of this disclosure in so far as it may be necessary to an understanding of the present invention, the impulses transmitted by the transmitting distributor are impressed on a selector magnet such as 2 in the receiving printer at each of the receiving stations. This magnet corresponds to magnet 9 shown in Fig. 4 of Patent 1,904,164. The selector magnet makes a selection, either of a particular type bar which is actuated under control of the teletypewriter receiving motor to print type, or of a function lever, which is actuated under control of the receiving motor to perform a function such as suggested above.

In the performance of a number of functions, such, for instance, as in tabulating, after the selection of the particular function lever which is to perform the function, the function is completed under the control of the individual teletypewriter receiving motor at each station. In

the performance of these functions the individual teletypewriter receivers require a relatively long operating period. The motors, since each is under local control subject to variations in voltage, etc., of the local supply circuit, require intervals of different lengths to complete the designated function. Variations in clutch grip time and clutch slippage also tend to displace the receivers from uniform alignment. If the transmission of signals is resumed before all of the receivers have completed the designated function, all of the machines will not be in proper condition to record the resumed signals.

Applicant's invention is designed to obviate the difficulties ensuing from the lack of uniformity in speed of all of the receiving printers. Applicant solves this problem by identifying the transmission of each signal train from the tape controlled transmitting distributor which involves the performance of a function by a group of receivers to which the transmitter is connected, the performance of which function requires so much time that the variations in speed of the teletypewriter receiving motors will cause difficulty. The particular signal train in passing through the selector magnet of the home teletypewriter receiver operates a function lever in the home receiver. This function lever controls a contact which in turn controls the transmitter-distributor stop magnet through a relay and a delay circuit. When the particular function signal train is transmitted and registered in the home teletypewriter receiver, the transmitting distributor is stopped by the opening of the contacts such as 11, which releases a relay such as 12, which in turn releases stop magnet 13, which permits stop lever 14 to be actuated by spring 15 so as to engage the peripheral shoulder 16 of stop cam 17 and stop the rotation of the vertical shaft of the transmitting distributor 1. After the function has been completed by the home teletypewriter receiver the contact 11 is again closed. The relay 12 is not immediately reoperated as the relay circuit is then under control of a delay circuit comprising the tube 18 and condenser 19 which measures an interval before the relay is permitted to reoperate. The delay interval interposed between the reclosing of contact 11, after the completion of the function by the home teletypewriter receiver and the releasing of the transmitter-distributor shaft so that the transmission of signals may be resumed, is fixed at a period at least equal to, if not slightly greater than, the difference between the time required by the home receiver to complete its function and the time required by the slowest of the receiving printers at the station such as R. S. 1, R. S. 2 or R. S. 3 to complete the same function. By this means when the transmitter-distributor 1 resumes transmission all of the receivers will have completed the function and all will be in condition to resume receiving. The delay introduced by the delay circuit may be fixed at the interval necessary to compensate for the greatest interval required for the particular function based on the speed variations to which the various local receiving motors are subject.

The operation of the transmitting distributor start-stop control including the delay feature in the control circuit forming part of the invention herein will now be described in detail.

When the contact 11 controlled by a function lever in the teletypewriter receiver is in the normal position, contact 11 is closed. A circuit may

then be traced from the positive terminal of battery 20 through contact 11, conductor 21, contact 22 of relay 12, the right-hand winding of relay 12 and conductor 23 to the negative terminal of battery 20. This operates relay 22 which is thus normally maintained in the operated position as shown.

When the manually operated switch 25 is closed, a circuit may be traced from ground 24, through switch 25. When there is sufficient slack in the tape, the automatic stop lever 23 is lowered, closing contacts 27, and the circuit is extended over conductor 28, through closed contacts 29 of relay 12 and the winding of magnet 13 to battery. Magnet 13 is operated rotating stop lever 14 to disengage from the peripheral shoulder of stop cam 17, permitting the vertical shaft of the transmitter-distributor to rotate. Magnet 13 remains energized normally and the transmitter-distributor continues to transmit.

When a code symbol for a particular function is punched by the perforator, the performance of which function requires a relatively long period of time and the performance of which function requires different intervals for the different receivers, in accordance with this invention, delay is interposed between the completion of the function by the home receiver and the resumption of transmission by the transmitter-distributor, to compensate for the variations so that transmission is not resumed until the function has been completed by the slowest receiver. This is performed as described now in detail.

When the home teletypewriter selector magnet receives the signal train for the function from the transmitter-distributor, and simultaneously with the start of operation of the mechanism in the home teletypewriter receiver to perform the function, contact 11 is opened. When it opens the operating path for relay 12, traced in detail above, is opened, deenergizing relay 12 which releases. Contact 29 is thereupon opened. This breaks the energizing path of stop magnet 13. Stop arm 14 is thereupon released and rotated by spring 15 about its pivot so that its right-hand end is interposed in the path of peripheral shoulder 16 of stop cam 17 which stops the rotation of the transmitter-distributor.

The mechanism of the home teletypewriter receiver continues to operate in a well-known manner under the influence of its own local motor (not shown). Upon the completion of the function contact 11 is again closed. In tracing the path over which relay 12 was normally energized, the circuit was traced through contact 22. When the relay released, this path was broken. When contact 11 recloses, as described above, relay 12 cannot operate over its normal energizing path. The circuit now may be traced from the positive side of battery 20, through contact 11, conductor 21, contacts 30, which are closed when relay 12 is released, to junction point 31, where it divides into two branches. One branch passes through resistance 32 to junction point 33 where it connects to the top plate of condenser 19 and the left-hand element or starting anode of the three-element cold cathode type gas discharge tube or "trigger" tube as it is generally known. The second branch passes through the left-hand winding of relay 12 to the middle element or anode of tube 18. Negative battery is connected through conductors 23 and 34 to the bottom plate of con-

denser 19 and the right-hand element or cold cathode of tube 18.

Resistance 32 is intended to limit the flow of charging current to condenser 19. When the condenser 19 has been sufficiently charged, its voltage and the voltage of the control anode will be raised sufficiently to permit the tube 18 to "fire" and a flow of current will be established between the anode and cold cathode of tube 18 energizing the left-hand winding of relay 12, reoperating relay 12. The reoperation of relay 12 will reestablish the energizing circuit of magnet 13. The constants of the resistance 32 and condenser 19 are fixed so that the desired interval will elapse before tube 18 "fires" and magnet 13 is reenergized. When relay 12 is reenergized, positive battery is disconnected from the top plate of the condenser, the control anode of tube 18, the left-hand winding of relay 12 and the anode of tube 18 when contact 30 is opened. The closing of contact 35 when relay 12 is reoperated completely discharges condenser 19. The operation of relay 12 also closes contact 22 and reestablishes the path through the right-hand winding of relay 22, heretofore traced, to hold relay 22 normally operated.

Attention is called to the fact that under the system of operation described for tube 18 and relay 12, current passes through tube 18 for a very short interval only, namely, long enough to permit relay 12 to operate. Voltage is applied to the tube only during the delay interval. A shunt is maintained around the condenser at all times except during the delay interval. The condenser is therefore completely discharged at the beginning of the interval. The periods measured should therefore be of uniform duration and the period of usefulness of the tube should be a maximum.

In the arrangement shown on the drawing and described in detail above, only one function lever contact, namely contact 11, is shown. The resistance 32 and the condenser 19 are each shown as units. In actual operation, it is to be understood that as different functions require different intervals, there will be different delay intervals required. If the longest delay required for the longest function is provided in the circuit, line time will be wasted.

It is possible, of course, to reproduce the delay circuit disclosed herein in its entirety for each delay interval required but, as a practical matter, in cases where it is desirable to provide different delay intervals for different functions, a number of function lever controlled contacts such as 11 will be provided and any of a number of arrangements of the resistance and condenser will be used which will readily suggest themselves to those skilled in the art, wherein the amount of resistance 32 and capacitance 19 is varied by means of a switching operation to provide the desired delay without providing a separate tube such as 18 in each case.

What is claimed is:

1. In a teletypewriter switching system, a transmitter connected through an operable telegraph path to a receiver, electromechanical means for starting and stopping said transmitter responsive to a control circuit and electric circuit delay means in said control circuit responsive to the transmission of certain signals from said transmitter for stopping said transmitter for a measured interval.

2. In a teletypewriter transmitting and receiving system, a teletypewriter transmitting device

connected to a teletypewriter receiving device and means, connected to said transmitter, responsive to the transmission of specific signals from said transmitter for stopping the transmission of signals from said transmitter for a measured interval after said receiver has completed performing its function in response to said signals.

3. In a teletypewriter transmitting system, a teletypewriter signal transmitter, means connected to said transmitter for starting said transmitter and automatic means connected to said transmitter for stopping said transmitter, in response to the transmission of specific signals from said transmitter, for a definite measured interval longer than that required to record said signals.

4. In a teletypewriter transmitting system, a tape perforator for perforating code signals in a tape, means for delivering tape from said perforator directly to transmitting means for transmitting signals in accordance with said perforations and transmitting control means connected to said transmitter responsive to the perforation of a particular code in said tape for stopping said transmitter for a measured interval after said code has been recorded.

5. A system in accordance with claim 4 including means for automatically restarting said transmitting means after said measured interval.

6. A system in accordance with claim 4 in which said control means comprises an electric potential controlled discharge device.

7. A system in accordance with claim 4 in which said control means comprises a function lever in a teletypewriter receive and an electrical delay circuit responsive to said lever.

8. In a teletypewriter transmitting system, a tape perforator for perforating code signals in a tape, means for delivering said tape from said perforator directly to transmitting means for transmitting signals in accordance with said perforations, transmitting control means connected to said transmitter responsive to the perforations of a particular code in said tape for stopping said transmitter for a measured interval, said control means comprising a delay circuit.

9. In a teletypewriter transmitting system, a tape perforator for perforating code signals in a tape, means for delivering said tape from said perforator directly to transmitting means for transmitting signals in accordance with said perforations, transmitting control means connected to said transmitter responsive to the perforations of a particular code in said tape for stopping said transmitter for a measured interval, said control means comprising a teletypewriter receiver and a delay circuit responsive to said teletypewriter receiver.

10. In a teletypewriter transmitting and receiving system, a transmitting device connected to a plurality of receiving devices, means in said transmitting device for conditioning said transmitting device to transmit signals of a particular character to said receivers requiring relatively long intervals for recording by said receivers, individual recording apparatus connected to each of said receivers requiring intervals of different lengths for the performance of said recording on the different receiving devices and a synchronizing device connected to said transmitting device to compensate for the variations in the required recording time.

11. A system in accordance with claim 10 in which the synchronizing device comprises a teletypewriter receiver.

12. A system in accordance with claim 10 in which the synchronizing device comprises a delay circuit.

13. A system in accordance with claim 10 in which the synchronizing device comprises a teletypewriter receiver and a delay circuit.

14. A system in accordance with claim 10 in which the synchronizing device comprises a means for stopping the transmitter momentarily.

15. In a teletypewriter a single transmitter operably connected to a plurality of receivers, means for transmitting signals of a first general character from said transmitter, means in said receivers for printing typed characters in response to said signals, means for transmitting signals of a second general character from said transmitter, means for adjusting the printed record in each machine in response to signals of said second character, individual mechanisms associated with each receiver responsive to signals of said second character, said mechanisms re-

quiring intervals of different lengths for said adjustment, and means in said transmitter operating in response to the transmission of signals of said second character only to compensate for said required intervals of different length.

16. A system in accordance with claim 15 in which said compensating means comprises a teletypewriter receiver.

17. A system in accordance with claim 15 in which said compensating means comprises a delay circuit.

18. A system in accordance with claim 15 in which said compensating means comprises a teletypewriter receiver controlling a delay circuit.

19. A system in accordance with claim 15 in which said compensating means comprises a teletypewriter receiver controlling a delay circuit, which delay circuit in turn controls said transmitter.

WILMARTH Y. LANG.