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ELECTROLYTIC FACSIMILE SYSTEM

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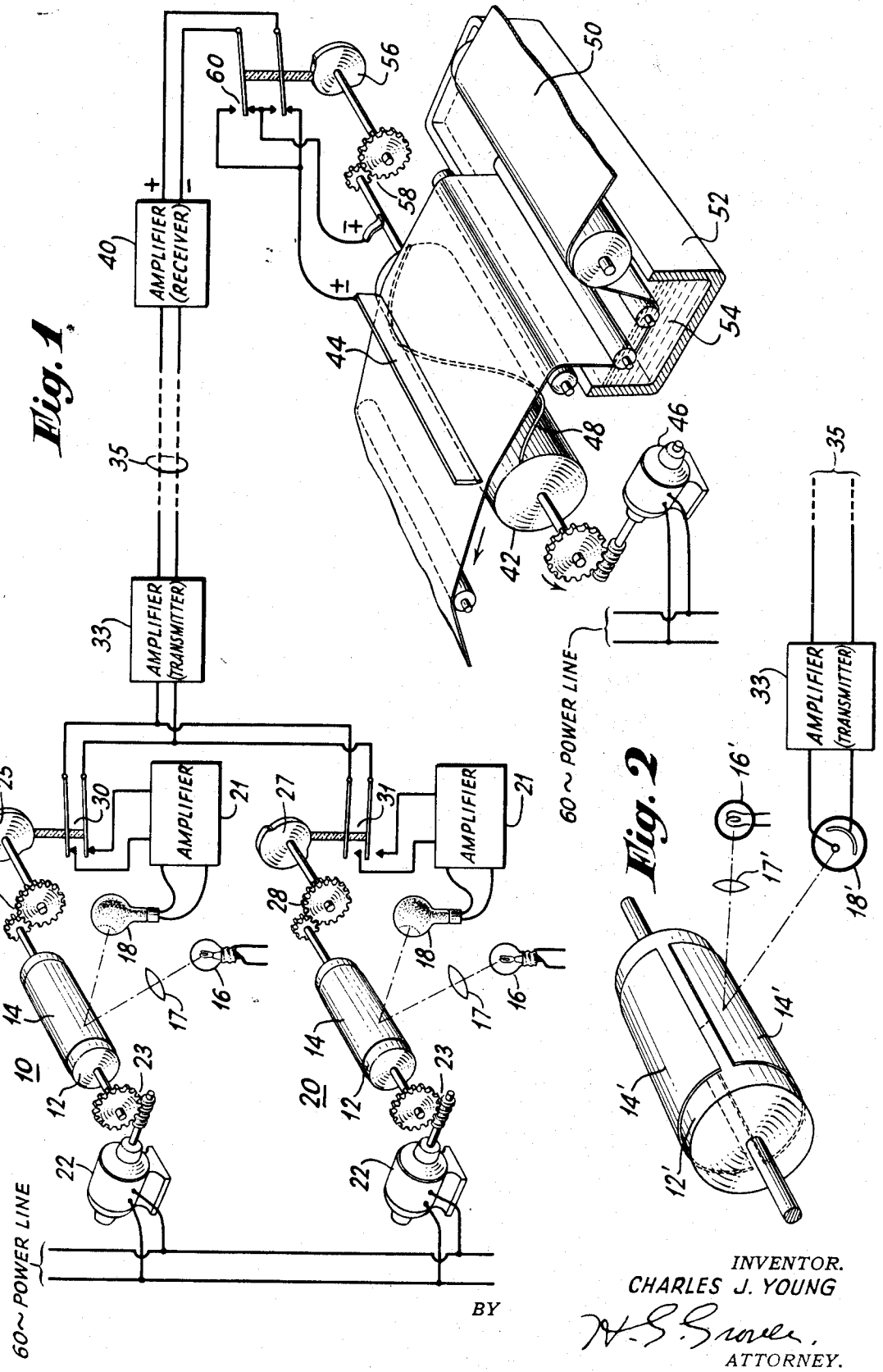


Fig. 1

Fig. 2

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ELECTROLYTIC FACSIMILE SYSTEM

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9 Claims. (Cl. 178—11)

This invention relates to a facsimile transmitting and receiving system, and more particularly to systems wherein the recording at the receiving station is accomplished electrolytically by means of varying degrees of current which are applied to the electrodes of the recording device.

In present and known facsimile systems, it is possible to transmit only one record at a time, the record being reproduced upon one side of the recording paper at the receiving station in the form of printed matter, sketches, photographs or the like depending upon the subject matter transmitted. Such a system results in the use of an excessive amount of recording paper at the receiving station, and does not utilize both sides of the recording paper.

In the present invention, it is, therefore, one of the objects to provide a system wherein two separate facsimile transmissions may be carried out simultaneously, each being separately recorded on the two sides of the recording paper. At the transmitting station, two facsimile transmitting devices each of which is substantially similar to known facsimile transmitting devices, may be used, the signals from each of the transmitting devices being combined and transmitted over a common channel. At the receiving device, these signals are utilized to produce separate facsimile recordings on each side of the recording paper of an electrolytic facsimile recording device, both the transmitters and the receiver being operated in synchronism and in phase.

Inasmuch as the signals from each of the transmitters cannot be combined and impressed upon the single pair of recording electrodes of the facsimile receiver simultaneously, these signals must be kept separate and as a result it is another purpose of the present invention to provide means whereby the signals from the two scanners are transmitted alternately with the further provision of means whereby these alternately transmitted signals may be separated at the receiver and each utilized to create the corresponding facsimile reproduction.

Through the use of such a system, it is therefore possible to utilize both sides of the recording paper, and this is particularly desirable in home facsimile systems where news items and matters of current interest are transmitted and received during the early morning hours, the produced facsimile record forming a source of information which may be read at leisure at some subsequent time. When the present system is used, both sides of the recording paper, therefore, carry news items or transmitted facsimile images, so that a minimum bulk of paper is utilized for a maximum amount of transmitted information.

A further advantage of the present invention resides in the fact that, although two messages are transmitted simultaneously by alternate line scanning and recording, only one receiver and printer amplifier is necessary and only one transmitting channel need be used.

It is also possible to accomplish the same results by using only a single transmitter which is of such a size and which is operated at such a speed that alternate line scanning signals representative of two separate records may be transmitted.

Other advantages of the present invention will become more apparent to those skilled in the art from a reading of the following specification and claims, particularly when considered with the drawing wherein like reference characters represent like parts and wherein:

Figure 1 shows one form of the present invention, and

Figure 2 shows a modification of a portion of Figure 1.

Referring now to the drawing, a pair of facsimile transmitting devices 10 and 20 are shown, each of which comprises a rotating cylinder 12 about which is positioned the copy 14 which is to be transmitted by facsimile. The two copies 14 which are placed about the cylinder 12 and which are to be transmitted by facsimile are, of course, of different subject matter. Directed upon the cylinder which carries the copy is a beam of light which originates at light source 16, the light being focused into a narrow beam or spot upon the copy by means of the lens system 17. The reflected light from the copy (depending upon the light value thereof) is received by separate photo-cells 18, the outputs from which are amplified by amplifiers 21. As the cylinders 12 are rotated the copy or indicia bearing material which is positioned thereon is moved therewith, and accordingly variations in light are caused to fall upon the photocells 18. The rotation of the cylinders 12 is accomplished by means of motors 22 which may be in the form of alternating current synchronous motors, the motors being connected to a common alternating current power line. The motors are connected to the drums 12 by means of appropriate gear reduction devices 23.

Associated with each of the transmitting devices 10 and 20 is a cam 25 and 27, respectively, the cams being driven by the motor for driving the cylinder through a further reduction gearing device 28. The size of the reduction gears 28

is so chosen that the cams 25 and 27 rotate at one-half the speed of the cylinders 12 of the transmitting devices 10 and 20. Each of the cams 25 and 27 control contact devices 30 and 31, respectively, for alternately supplying an amplifier 33 with signal energy from the two separate transmitting devices 10 and 20.

If the two transmitting devices are operated simultaneously and in synchronism, signal variations will be applied to the amplifier 21 associated with each of the systems, and the output from each of these amplifiers will be supplied to the common transmitter amplifier 33 alternately, depending upon the position of the cams 25 and 27. The output from the transmitter amplifier 33 is then transmitted to the facsimile receiving device either by way of a radio link or by direct wire connection where the signals are utilized to produce the facsimile recording. This connection between the transmitter and the receiver is represented schematically by conductors 35 which are shown as dotted lines in the drawing.

At the receiver, an amplifier 40 is provided for increasing the energy and amplitude of the received facsimile signals The facsimile receiving device includes a rotating cylinder 42 and a stationary printer bar 44. The cylinder 42 is rotated by means of a motor 46 which may be similar to motors 22 of the transmitters and which may be connected to an alternating current power line. The facsimile receiving device corresponds in considerable detail to the receiving device shown and described in the patent to C. J. Young Reissue #20,152, in which a facsimile receiver having a rotating drum is shown. Carried by the drum is a helix 48 for cooperation with the printer bar 44 and the recording paper 50 is passed between these electrodes. The receiving device shown in the drawing differs from the device shown in the above referred to patent in that the printer bar 44 is maintained in contact with the helix 48 and recording paper of the receiver with a uniform and constant pressure, whereas in the receiver shown in the Young patent, the pressure of the printer bar upon the helix and recording paper varies in accordance with the received signal energy. Furthermore, in the receiver shown, a recording paper 50 is used which is passed through a tank 52 containing an electrolyte 54 in order that the paper may be impregnated by the electrolyte. The paper, after being impregnated, is passed between the printer bar 44 and the rotating helix 48, between which varying degrees of potential are impressed in accordance with the received signal for electrolytically producing an image upon the recording paper 50. The electrolyte 54 may be any chemical solution which, when placed on a recording paper and subjected to an electrical potential, will react to form a discoloration on the surface of the paper. This discoloration does not appear on both sides of the paper, but only on one side, depending upon the polarity of the potential which is applied to the electrode which cooperates with the particular side of the recording paper. In some instances, and by using some solutions, a recording can be produce only on the side which cooperates with the particular side of the recording paper. In some instances, and by using some solutions, a recording can be produced only on the side which cooperates with the positive electrode, in which case, if the printer bar is maintained positive, an image will develop only on that side of the recording paper, the other side of the paper remaining unaffected. If, however, the polarity of the helix 48 and the printer bar 44 is reversed so that the helix becomes positive, then a facsimile record will be produced on the helix side of the paper in accordance with the received signals. Solutions which may, for example, be used in such a receiving device may correspond to those described and discussed in the U. S. patent application Serial No. 178,743 filed December 8, 1937 by Myer Solomon, or to the solution described in U. S. Patent No. 2,063,992 to Elsey.

Associated with the rotating drum or cylinder 42 of the receiver is a cam 56 which is driven at one-half cylinder speed by an appropriate gear reduction device 58. The cam operates a double-pull double-throw switching device 60, for reversing the polarity of the helix 48 and the printer bar 44 at each revolution of the cylinder 42.

It is to be understood that the cylinder 42 at the receiver is rotated at the same speed as, and in synchronism with, the cylinders 12 of each of the transmitting systems 10 and 20. This relationship of speed and phase may be maintained by operating the motors 22 and 46 from a common power supply line or the transmitters and receiver may be maintained in synchronism by the transmission of synchronizing impulses in a manner well known in the art. Since the maintaining of the receiver in synchronism with the transmitters forms no part of the present invention, no specific means other than the common power line are shown for maintaining such synchronism and phase relationship. It is also to be understood that the recording paper 50 is drawn through the recording device at a relatively slow rate, the paper being moved preferably by a direct mechanical connection to the driving motor 46. Furthermore, the longitudinal movement of the recording paper 50 corresponds to the axial movement of the scanning beam of light along the cylinders 12 in the transmitting devices.

It may be seen, therefore, that each transmitting device 10 and 20 will produce a series of signals, the signals being alternately applied to the transmitter amplifier 33 which amplifies the signals and transmits them to the facsimile receiving device. These signals are then amplified at the receiver and are impressed upon the printer bar 44 and the helix 48 between which the recording paper is drawn. During one revolution of the helix 48, one polarity is applied to the recording electrodes in order that the facsimile reproduction may be created on one side of the recording paper in accordance with the signals received from one of the transmitting devices, and during the next revolution of the cylinder 42, the cam 56 operates to reverse the polarity of the potential applied to the printer bar and helix in order that a facsimile record may be produced on the other side of the recording paper in accordance with the signals transmitted from the other facsimile transmitting device. Accordingly, at the receiver, separate images will be created on each side of the recording paper, with the result that only half the ordinarily required amount of recording paper is used and with the further result that the bulk of the facsimile copy is reduced by 50 percent.

In Figure 2 is shown an alternate form of the transmitter in which a single drum or cylinder 12' is used to replace the two independent transmitters 10 and 20 shown in Figure 1. When a single cylinder is used, which may be driven by a motor and a gear reduction device as in Figure 1, both of the separate copies 14' are positioned

about the surface of the cylinder 12' as shown in the drawing. Also, the cylinder 12', by reason of appropriate gear selection, is rotated at half the speed of the drums 12 in the transmitter shown in Figure 1 and also at half the speed of the drum 42 shown at the receiving station in Figure 1. The light source 16' corresponds to the light source 16 in Figure 1, and through the use of a lens 17' a narrow beam of light is caused to impinge upon the surface of the cylinder 12' and the copy 14' carried thereby. Reflected light is collected by the photoelectric cell 18' to produce a series of signals indicative of the light values of the two copies. The two copies are so positioned on the drum that as it is rotated about its axis each copy will be alternately scanned in a line-by-line manner, the light cell and beam of light being gradually moved axially with respect to the cylinder 12' to produce bilateral scanning in a manner well known in the art. The signals which are derived from the photocell 18 are, therefore, alternate line signals of the two copies and these signals are applied to the amplifier 33 and are subsequently impressed upon the transmitting channel 35.

It may be seen that this transmitter may readily replace the two transmitters which are shown in Figure 1 and when this is done, the two switching devices 25 and 27, together with the double pole single throw switches 30 and 31 of Figure 1 may be dispensed with since the signals from the two copies are sent alternately by reason of the fact that the cylinder is of twice the circumference and rotates at half the speed of the cylinder at the receiving station. The switching device at the receiving station is still used in order that the potentials as applied to the recording electrode may be reversed in synchronism with each half rotation of the cylinder 12' at the receiving station. The two separate copies which are placed at the surface of the cylinder 12' may then be reproduced on the front and back side of the recording paper 50 at the receiving station.

If it is desirable to use two separate transmitters such as are shown in Figure 1, it is to be understood that these two transmitters may be connected together mechanically thereby obviating the necessity of using separate driving motors and reduction gears. Furthermore, a single cam wheel may be used, the single cam wheel operating to manipulate both of the switching devices 30 and 31 shown in Figure 1.

Although an electrolytic facsimile receiving device is shown and described in this application, it is to be understood that any other type of recording mediums or methods may be used provided these methods will permit the making of separate recordings on each side of the recording paper in accordance with the polarity of the potentials applied to the electrodes of the facsimile receiver.

Furthermore, although the receiver shown in Figure 1 is of the printer bar and helix type, it is to be understood that receivers of the reciprocating type may as conveniently be used, in which case alternate movements of the reciprocating head would produce recordings on opposite sides of the recording paper if the polarity of the potentials applied between the reciprocating printer head and the stationary bar were reversed.

Various other modifications or alterations in the present invention may be made without departing from the spirit and scope thereof, and it is to be understood that any and all modifications be considered as within the purview of the present invention except as limited by the hereinafter appended claims.

I claim:

1. A facsimile system comprising a pair of synchronously operating transmitters for converting light values into electrical signals, a receiver, means for alternately transmitting two unrelated series of signals from the transmitters to the receiver, a record medium at the receiver adapted to respond to varying degrees of potential to produce markings on the one or the other side thereof according to the polarity of the potential applied thereto, a pair of electrodes cooperating with the record medium, and means for applying the received signals to the electrodes and for changing the polarity of the applied signals in synchronism with the alternate transmission of the signals from the transmitters.

2. A facsimile system comprising a pair of synchronously operating scanning devices for converting light values into electrical signals, a receiver, means for alternately transmitting two unrelated series of signals from the devices to the receiver in synchronism with the scanning action, a record medium at the receiver adapted to respond to varying degrees of potential to produce markings on the one or the other side thereof according to the polarity of the potential applied thereto, and means including a pair of recording electrodes for applying the received signal potentials to opposite sides of the record medium and for changing the polarity of the applied signals in synchronism with the alternate transmission of the signals from the scanning devices.

3. A facsimile system comprising a pair of scanning devices for synchronously and simultaneously scanning separate subjects in a line-by-line manner to produce separate series of signals in accordance with the light values of the subjects, a receiver, means for alternately transmitting signals from the scanning devices to the receiver, a record medium at the receiver adapted to respond to varying degrees of potential to produce markings on the one or the other side of the medium according to the polarity of the potential applied thereto, a pair of electrodes cooperating with the record medium, and means for applying the received signals to the electrodes and for changing the polarity of the applied signals in synchronism with the alternate transmission of the signals from the scanning devices whereby a facsimile recording of the separate subjects may be produced on opposite sides of the record medium.

4. A facsimile system comprising a pair of synchronously operated scanning devices for simultaneously scanning separate subjects in a line-by-line manner to produce separate series of signals in accordance with the light values of the subjects; a receiver, means for transmitting the signals from the scanning devices to the receiver alternately for each line scanned, a record medium at the receiver adapted to respond to varying degrees of potential to produce markings on the one or the other side of the medium according to the polarity of the potential applied thereto, and means including a pair of recording electrodes for applying the received signal potentials to opposite sides of the record medium and for changing the polarity of the applied signals in synchronism with the alternate transmission of the signals from the scanning devices.

5. A facsimile system comprising a pair of synchronously operating scanning devices for converting light values into electrical signals, a receiver, means for alternately transmitting signals from the devices to the receiver, a recording paper at the receiver impregnated with an electrolyte whereby the recording paper may respond to varying degrees of potential to produce markings on the one or the other side of the paper according to the polarity of the potential applied thereto, a pair of electrodes cooperating with the recording paper, and means for applying the received signals to the electrodes and for changing the polarity of the applied signals in synchronism with the alternate transmission of the signals from the scanning devices whereby different facsimile recordings may be produced on opposite sides of the recording paper.

6. A facsimile system comprising a transmitter for converting light values into electrical signals, a receiver, means for transmitting signals from the transmitter to the receiver, a record medium at the receiver adapted to respond to varying degrees of potential to produce markings on the one or the other side of the medium according to the polarity of the potential applied thereto, a pair of electrodes cooperating with the record medium, and means for applying the received signals to the electrodes and for changing the polarity of the applied signals at definite intervals and in synchronism with the transmission of the signals from the transmitter.

7. A facsimile system comprising a scanning device for converting light values into electrical signals, a receiver, means for transmitting signals from the device to the receiver, a record medium at the receiver adapted to respond to varying degrees of potential to produce markings on the one or the other side of the medium according to the polarity of the potential applied thereto, and means including a pair of recording electrodes for applying the received signal potentials to opposite sides of the record medium and for changing the polarity of the applied signals at definite intervals and in synchronism with the transmission of the signals from the scanning device.

8. A facsimile system comprising a scanning device for alternately and concurrently scanning separate subjects in a line-by-line manner to produce alternate line series of signals in accordance with the light values of the subjects, a receiver, means for transmitting the signals from the scanning device to the receiver, a record medium at the receiver adapted to respond to varying degrees of potential to produce markings on the one or the other side of the medium according to the polarity of the potential applied thereto, a pair of electrodes cooperating with the record medium, and means for applying the received signals to the electrodes and for changing the polarity of the applied signals in synchronism with the alternate scanning of the separate subjects, whereby a facsimile recording of the separate subjects may be produced on opposite sides of the record medium.

9. A facsimile system comprising a scanning device for simultaneously scanning two separate subjects to produce a series of signals in accordance with the light values of the subjects, a receiver, means for transmitting the signals from the scanning device to the receiver, a record medium at the receiver adapted to respond to varying degrees of potential to produce markings on the one or the other side of the medium according to the polarity of the potential applied thereto, and means including a pair of recording electrodes for applying the received signal potentials to opposite sides of the record medium and for changing the polarity of the applied signals at definite intervals and in synchronism with the transmission of the signals from the scanning device.

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