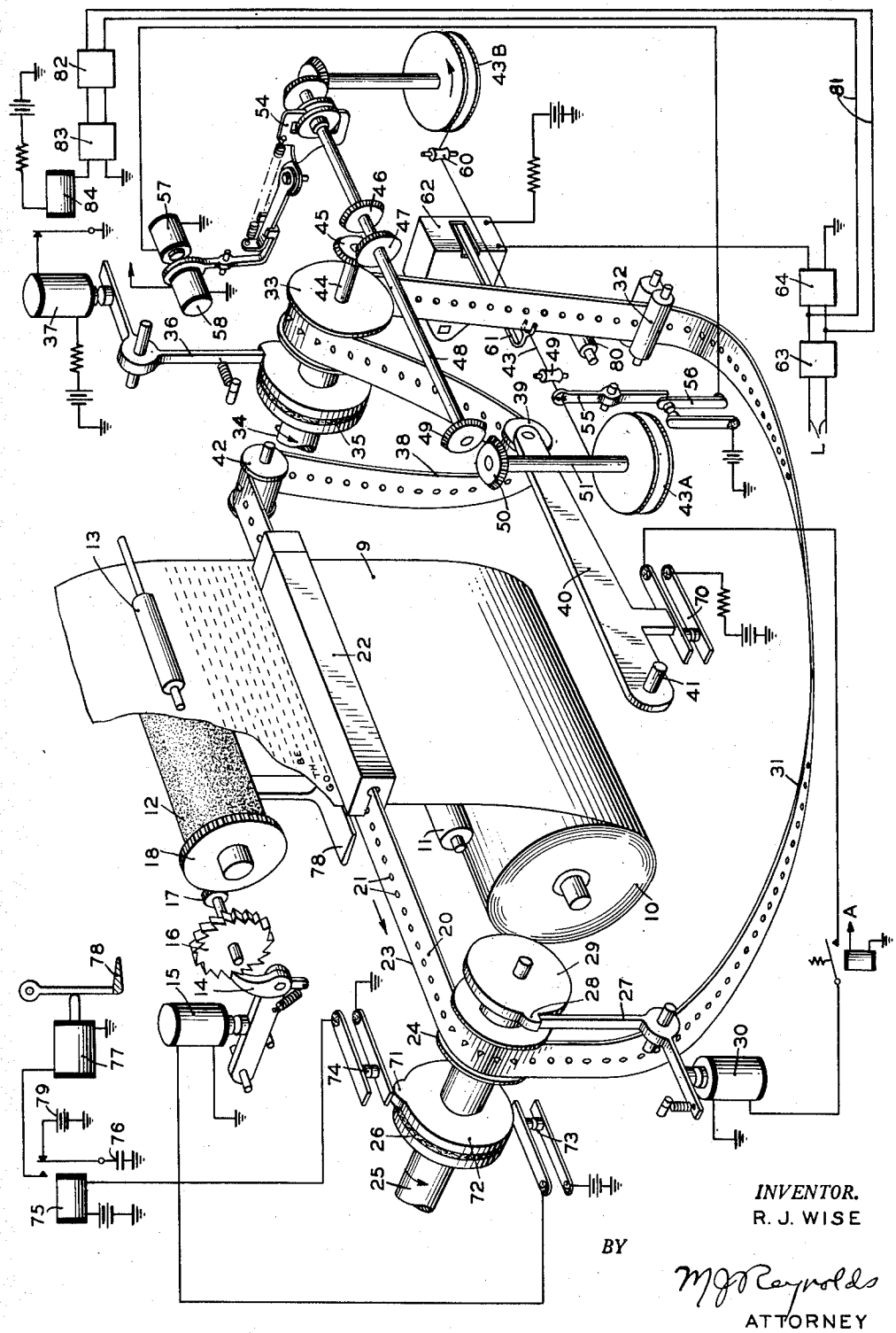
Dec. 23, 1952 R. J. WISE 2,622,957

FACSIMILE RECORDER

Filed Feb. 10, 1947



INVENTOR.
R. J. WISE

BY

M. J. Reynolds

ATTORNEY

Patented Dec. 23, 1952

2,622,957

UNITED STATES PATENT OFFICE

2,622,957

FACSIMILE RECORDER

Raleigh J. Wise, Dunellen, N. J., assignor to The Western Union Telegraph Company, New York, N. Y., a corporation of New York

Application February 10, 1947, Serial No. 727,607

9 Claims. (Cl. 346—33)

1

The present invention relates to a facsimile recorder and more particularly to novel apparatus for reproducing pictures, printed matter, writing, and the like, by selective application of a pigment, ink or other coloring matter on a suitable recording medium.

In my Patent No. 2,205,450, granted June 25, 1940, and entitled "Method of and Apparatus for Recording Signals Electrically," I have shown a facsimile recorder in which a suitable marking material is applied to a continuously rotating member selectively in accordance with received facsimile signals and transferred from such member in successive elemental areas to a paper web to build up the facsimile record thereon. The present invention embodies the transfer feature of the foresaid patent, one of the objects thereof being to apply the marking material to the recording web in successive lines, as distinguished from successive elemental areas.

Another object of the invention is to provide a facsimile recorder in which the marking material is applied to the recording medium while the latter is at rest.

A still further object is to provide a facsimile recorder of the ink transfer type in which finer definition is obtained and in which blurring of the record is eliminated.

A further object is to produce a recorder which may be operated at high speed.

Other objects and advantages will hereinafter appear.

In accordance with the present invention the transfer means comprises an endless belt upon the edge of which marking material is selectively applied in accordance with the received facsimile signals and from which the marking material is intermittently transferred to a stationary web, arranged to be intermittently fed past the transfer position. The belt is suitably driven so as to move continuously past the ink receiving position and intermittently past the ink transfer position, proper phasing of the ink receiving and transfer operations being controlled by received line signals originating at the transmitter.

The invention will be more fully understood by reference to the accompanying drawings wherein the single figure is a fragmentary perspective view showing the essential elements of a facsimile recorder embodying the present invention.

In the arrangement shown, recording is effected on a continuous web 9 drawn from a rotatably mounted supply roll 10, past a guide roller 11 by a feed roller 12 provided with suitable pressure rolls 13. The feed roller 12 is advanced intermittently in short steps of the order of magnitude of one-hundredths of an inch by a ratchet stepping mechanism comprising a pawl 14, operated by a magnet 15 and engaging a ratchet wheel 16 having on its shaft a gear 17 meshing with a gear 18 fixed to the feed roller 12.

2

The ink transfer member in the present illustration comprises an endless belt or tape 20 composed of steel, cellulose acetate, or other suitable material, having a series of equally spaced feed holes 21 therein and arranged to slide through a guide block 22 disposed across the face of the web 9 in such position as to maintain the rear edge 23 of the belt parallel to and slightly out of contact with the web 9. From the guide 22 the belt passes over a toothed drive roller 24 adapted to engage with the feed holes 21 and to pull the belt through the guide block 22 a distance of one complete scanning line on each full rotation thereof. The drive wheel 24 is driven from a continuously operating shaft 25 through a friction clutch 26 and is held against rotation by a stop arm 27 engaging with a stop 28 formed on the stop disk 29. The stop arm 27 is released for one revolution, at appropriate times, by a suitably arranged magnet 30, all as is well understood in the art.

The belt 20 passes from the feed roller 24 into an expandable loop 31 and thence between a pair of guide rollers 32 and over a second toothed feed wheel 33 driven similarly to feed wheel 24 from a continuously rotating shaft 34 through the friction clutch 35 under control of the stop arm 36 and its actuating magnet 37. The tape or belt then passes from feed wheel 33 into a second loop 38 which carries a roller 39 mounted on the end of a tape lever 40 pivoted at 41. From the loop 38 the belt passes over a guide roller 42 and thence into the guide block 22.

Ink or other marking material is applied to the edge of the belt 20 by an inking strand, such as a silk thread 43, which extends across but is normally spaced from the edge of the belt 20. The thread 43 is moved continuously past the edge of the belt during a recording period in any suitable manner, and in the embodiment shown is drawn from one of a pair of spools 43*a* and 43*b* and is rewound on the other spool, it being understood that the spools 43*a* and 43*b* are provided with any suitable driving means arranged to reverse the direction of movement of the thread whenever the supply from either spool nears exhaustion. As shown in the drawings, the spools 43*a* and 43*b* are driven alternately from

the shaft 44 of the feed wheel 33, by the bevelled gear 45 adapted to mesh alternately with the gears 46 and 47 carried by the shaft 48. When the shaft 48 is shifted to the left, gears 45 and 46 engage, as also do gears 49 and 50, carried respectively by shaft 48 and the shaft 51 of spool 43a. When the shaft 48 is shifted to the right, gears 45, 47 and gears 52, 53 engage to rotate the spool 43b. The shifting of the shaft 48 may be controlled through any appropriate mechanism, such as a toggle lever 54 actuated by suitable mechanism controlled by a knot or other enlargement of the thread. As shown, the thread in passing from spool 43a, for instance, operates a suitable switch lever 55 to close a pair of contacts 56 which complete an operating circuit to a toggle operating magnet 57 whereby to shift the shaft 48 to the right, thereby disconnecting spool 43a from the driving shaft 44 and connecting spool 43b thereto.

Similar switch mechanism (not shown) is actuated by the thread leaving the spool 43b to operate a second toggle magnet 58 to reverse the direction of movement of the thread whenever the supply of spool 43b nears exhaustion. Obviously any other suitable reversing mechanism could be employed.

The inked thread 43 in its passage between spools 43a and 43b passes over guide rollers 59 and 60 and through the bight of a bifurcated lever 61 which forms an extension of the armature of the recording magnet 62. This magnet may, by way of example, be any suitable loud speaker unit either of the permanent magnet type or having separately excited field coils.

Incoming facsimile signals received over the line L are supplied to the recording unit 62 through an amplifier 63 and rectifying unit 64.

The operation of the apparatus is as follows. The rectified incoming signals applied to the recording magnet 62 oscillate the armature 61 to move the inking ribbon 43 against the edge of the belt 20 in response to marking signals whereby to apply thereto a spot or line of ink, the length of which depends upon the length of the marking signal. If it is assumed that the stop arm 27 of the feed wheel 24 is in position to hold this wheel at rest and that magnet 37 is energized to move the stop arm 36 from the stop disk 29, to permit the feed wheel 33 to rotate continously, and further that the loop of tape 38 between the feed wheel 33 and the guide 22 is sufficiently short so that the tape lever 40 is elevated to such a position as to permit the contacts 70 to remain open, then as the belt 31 is continuously rotated by its feed wheel 33, the incoming facsimile signals will be laid down in the form of ink or pigment spots upon the edge of the belt 20. When the loop 38 enlarges sufficiently to permit the tape lever 40 to close the contacts 70, a circuit will be completed therethrough to the release magnet 30 whereupon the stop arm 27 will be removed from the stop disk 29 to permit the feed roller 24 to make a single revolution. In doing so the tape 31 will be drawn through the guide 22 a distance equal to the width of the recording line to be printed upon the web 10. At the start of this movement, the tape loop 38 is decreased in size, opening contacts 70 and permitting the stop arm 27 to drop back so as to engage the stop disk 29 at the end of the revolution. During rotation of the feed wheel 24, a cam 71 on the cam disk 72 engages a contact 73 to complete a circuit to the line stepping magnet 15 thereby advancing the web 9 a distance equal to one scanning line which may be of the order of magnitude of one-hundredth of an inch. At the completion of the revolution of the feed wheel 24 and just as it comes to rest, the contacts 74 are closed by the cam member 71 to energize a slow-to-operate relay 75, the delay in operation of which is sufficiently long to insure that the tape 20 has completed its movement, whereupon it operates to connect the condenser 76 through the winding of a solenoid 77 to thereby operate the same and drive the bail 78 against the web 9, thereby to force the paper against the edge of the belt 20 and thus to take an ink impression from the belt. The stroke of the solenoid 77 preferably is such that the bail 78 strikes the paper by virtue of its overthrow, which together with the stationary condition of the paper produces a sharp impression thereon. The magnet 75 is shown as remaining energized during the rest period of the feed roller 24 but due to the discharge action of condenser 76, the solenoid 77 is energized only momentarily. As the feed roller 24 is released for the succeeding revolution, relay 75 releases permitting the condenser 76 to be recharged by the battery supply 79 in readiness for the next operating stroke.

As the belt 20 passes from the feed roller 24 to the feed roller 33, the marking edge thereof is drawn past a cleaning roller 80 which serves to remove the ink previously deposited thereon and condition it to receive a fresh supply from the inking thread 43.

It will be understood that the start magnet 37 may be energized by any suitable phasing signal at the beginning of each message in a manner well understood in the art, and that it remains energized throughout the recording cycle of the message, permitting the belt to move continuously past the inking ribbon during the reception of a complete message, whereas the movement of the belt 20 past the web 9 is effected in a step-by-step movement. The manner of controlling the start magnet 37 may be effected in the manner disclosed in the patent to Wise et al., No. 2,355,868, granted September 16, 1941, for operation of the start magnet 49 of such patent. Briefly the aforesaid patent discloses a facsimile transmitter adapted to normally transmit a certain carrier frequency over the outgoing line when the transmitter is idle, different from the carrier frequency employed for the facsimile signals, the change from the idling frequency to the signaling frequency being effected at the start of transmission and at the commencement of a line of scanning. In other words, the change from one frequency to the other constituted a phasing signal. As illustrated on the present drawing, this idling frequency is conducted by a branch circuit 81 leading from the receiving amplifier 63 to a filter or tuner 82 feeding into a detector 83 the output of which passes through the winding of a relay 84. As long as the transmitter is idle the filtered and rectified idling carrier maintains the relay 84 energized and the armature thereof on its front contact. However, upon interruption of the idling carrier, at the commencement of the first line of scanning, the relay 84 releases and remains deenergized throughout the facsimile transmission. The release of relay 84 causes the stop magnet 37 to be operated to retain the stop arm 36 continuously withdrawn as long as the transmission continues, that is until completion of the message or pictured transmission. The belt 20 therefore is drawn continuously past the marking thread 43 and the complete picture or message is recorded thereon.

At the end of the message or pictured transmission the idling carrier is again applied to the line L as disclosed in the aforesaid patent, thus again energizing relay **84**, causing the start magnet **37** to release and return the arm **36** into position to stop the feed wheel **33** and the belt **20** in such position that the next message will be properly positioned on the belt relative to the web **9**.

The drawing has been made illustrative only of the principle of the invention, it being understood that the invention may be embodied in any suitable commercial structure. Therefore, I do not intend being limited to the particular construction shown but contemplate all structures and modifications coming within the scope of the appended claims.

What is claimed is:

1. In a facsimile recorder, a linear member having a sharply defined edge, means for moving said member past a recording position, means for applying a marking medium to said edge in accordance with received facsimile signals, a second record receiving member comprising a web or sheet, means for intermittently moving said first member transversely across said web or sheet, and timed means operable during the stationary intervals of said linear member for impressing against said web or sheet a marked length of said first member corresponding substantially to the width of said web or sheet which thereby receives an entire line of signal marks at each impression, and means for advancing said web or sheet after each such impression.

2. In a facsimile recorder, an endless belt having spaced feed holes therein, a feed wheel for said belt, a record impressing member disposed adjacent one edge of said belt, means responsive to received facsimile signals for initiating signals for initiating the operation of said feed wheel whereby to move said belt past said record impressing member, said latter member being responsive to received facsimile signals to deposit a marking medium on said edge in accordance with elemental areas of the facsimile record to be produced, a second feed wheel spaced from the first feed wheel, a record receiving web between said feed wheels, means controlled by said belt for intermittently actuating said second feed wheel to advance said predetermined length of said belt past said web, means operative at the completion of said advancement for transferring the marking medium from said belt to said web and means for advancing said web a distance corresponding to a single scanning line between each transfer operation.

3. A facsimile recorder comprising an endless belt having a sharply defined edge, inking means extending across said edge, means responsive to received facsimile signals for applying ink from said means to said edge in accordance with elemental areas of the record to be reproduced, means operative during a recording cycle to move said belt past said inking means in a continuous movement, means for accumulating a predetermined length of said belt upon which recording has been effected, means for intermittently advancing said accumulated length of belt into a printing position, means for supporting a flat sheet adjacent said printing position, timed means for moving the sheet against the recorded edge of the belt while the latter is in stationary printing position, whereby the signals recorded on the edge of the belt are printed on said sheet in a scanning line having the same width as the edge of the belt, and other timed means for advancing said sheet a distance equal to one scanning line after each printing operation.

4. Facsimile recording mechanism comprising a flexible record receiving tape movable lengthwise, means for recording facsimile signals on the edge of a continuously movable portion of said tape, means for moving a measured length of recorded tape intermittently across a flat record receiving sheet, and a timed device operable during the stationary intervals of said length of recorded tape for transferring a line of recording from the edge of the tape to the sheet at each operation of said device while said recording means continues to operate on a moving portion of the tape, the width of each printed line on said sheet being equal to the thickness of the edge of said tape.

5. Facsimile recording mechanism comprising two record receiving members, one of which is a tape and the other a sheet, driving means for said tape, inking means for recording facsimile signals on one edge of said tape while it is moving at uniform speed, means for holding said sheet flat opposite the recorded edge of said tape and parallel to said edge, means for holding a straight measured length of recorded tape stationary at periodic intervals in parallel printing relation to said sheet each measured length of recorded tape being equal to the length of a scanning line on said sheet, and automatic means for printing the stationary lines of recorded signals successively on said sheet while said recording means continues to operate said automatic means including mechanism for advancing said sheet after each printing operation a distance equal to one scanning line, which has a width equal to the thickness of the edge of said tape.

6. A facsimile recorder comprising a record receiving sheet, a movable tape extending across said sheet, means for recording facsimile signals on the edge of a continuously moving portion of said tape, means for intermittently holding a straight recorded length of said tape stationary in operative parallel relation to a flat portion of said sheet while said recording means continues to operate, a device for moving said flat portion of the sheet against a stationary recorded length of tape for transferring a line of signals to said sheet at each operation of said device, means for advancing said sheet a distance of one scanning line after each transfer operation to produce a line by line recording, and means controlled by said tape for automatically advancing the tape transversely of the sheet after each transfer operation.

7. In a facsimile recorder, the combination of means for supporting a record receiving sheet in flat condition, a flexible tape supported for lengthwise movement, means for continuously moving a slack section of said tape at uniform speed, a guide for holding a measured length of another section of said tape in straight rigid condition with the edge of the tape facing the flat portion of said sheet, timed means for moving said straight rigid section of the tape intermittently at periodic intervals, means for depositing marking material on the edge of the moving slack section of the tape in accordance with received facsimile signals, and means for transferring said deposited material from the edge of the straight rigid section of the tape onto said sheet during the stationary intervals of said rigid tape section

while the slack section of the tape continues to record facsimile signals.

8. In a facsimile recorder, the combination of a first driving wheel connected to be operated continuously at a uniform speed during a recording operation, a second driving wheel connected to operate intermittently at periodic intervals, a flexible record receiving tape operated jointly by said wheels, a record receiving sheet operated intermittently for line-by-line recording, means for recording facsimile signals on the edge of a continuously moving portion of said flexible tape, and automatic mechanism operated during the stationary intervals of the second driving wheel for transferring a measured line of said signals from the edge of said tape to said sheet at each operation of the transfer mechanism.

9. In a facsimile recorder, a flexible tape supported for lengthwise movement, means for operating said tape, a magnetic device for printing received facsimile signals on the edge of said tape while it is moving, and timed means for successively transferring measured lengths of said signal marks to a sheet for line-by-line recording.

RALEIGH J. WISE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
839,927	Hawkins	Jan. 1, 1907
1,045,796	Kerner	Nov. 26, 1912
1,253,305	Tulloss	Jan. 15, 1918
1,938,990	Woodward	Dec. 12, 1933
1,989,375	Meyercord	Jan. 29, 1935
2,109,109	Finch	Feb. 22, 1938
2,175,388	Gurley	Oct. 10, 1939
2,176,680	Nichols	Oct. 17, 1939
2,336,932	Fraim	Dec. 14, 1943
2,353,631	Bliss	July 18, 1944

FOREIGN PATENTS

Number	Country	Date
343,935	Germany	Nov. 11, 1921