Jan. 4, 1938. C. J. YOUNG 2,104,109

APPARATUS FOR FACSIMILE RECORDING

Filed July 17, 1934

Fig. 1.

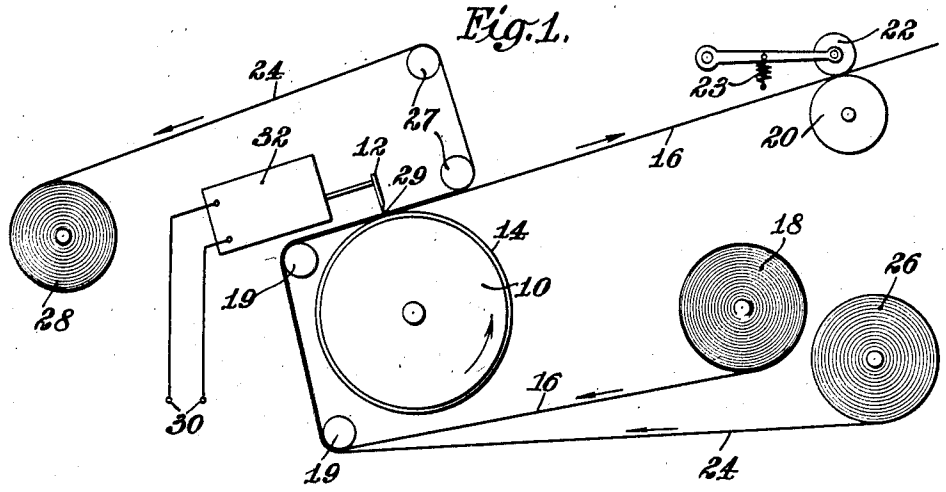

Fig. 2.

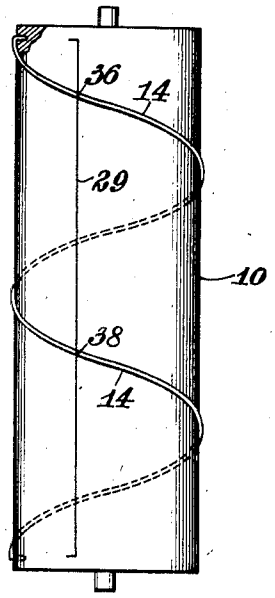

Fig. 3.

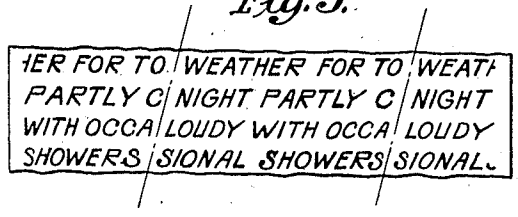

Fig. 4.

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APPARATUS FOR FACSIMILE RECORDING

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2 Claims. (Cl. 178—14)

My invention relates to improvements in apparatus for facsimile recording.

In the various methods and apparatus proposed heretofore for facsimile work an important requirement is that operating action of the scanning device at the receiver be maintained in synchronism with operating action of the scanning device at the transmitter. Otherwise, some of the text or other subject matter being transmitted is lost, the amount lost increasing with the "drift" or the amount by which the receiving scanner and the transmitting scanner are operating out of synchronism with respect to each other. In this connection, various methods and systems have been proposed for maintaining the two scanning devices in synchronism and in frame, but these have necessarily been rather complicated, critical in adjustment, expensive, and sometimes unreliable.

With the foregoing in mind, it is one of the objects of my invention to provide an apparatus for facsimile recording whereby it is possible to obtain a satisfactory record of all the text or other subject matter being transmitted, although the receiving scanner might be operating out of synchronism with the transmitting scanner by an amount which would mean loss of a substantial amount of the subject matter being transmitted if the various apparatus proposed heretofore were being used.

Another object of my invention is to provide an apparatus for facsimile recording whereby it is possible to obtain a satisfactory record of the subject matter being transmitted by using synchronizing means which, although relatively crude and inexpensive, is reliable and entirely satisfactory for the purpose.

Other objects and advantages will hereinafter appear.

In accordance with my invention, movement at a substantially constant rate is imparted to a recording strip, and two independent recordings, by utilizing the same incoming picture signal for each, are made simultaneously on the strip.

Further, in accordance with my invention, a record strip is fed between a rotating drum and a printer bar parallel to the axis of rotation of the drum and which is actuated by the incoming picture signals, the drum being provided on its surface with a helical ridge extending around its axis of rotation through substantially more than 360°. Over a substantial range of asynchronism, therefore, the incoming picture signals produce independent recordings simultaneously on the strip so that what one record might lack due to drift, the other record supplies.

My invention resides in the apparatus of the character hereinafter described and claimed.

For the purpose of illustrating my invention, an embodiment thereof is shown in the drawing, wherein

Figure 1 is a simplified, diagrammatic, side elevational view of facsimile recording apparatus constructed and operating in accordance with my invention;

Fig. 2 is a plan view of one of the parts of the scanning device in Fig. 1;

Fig. 3 is a fragmentary view showing a section of the record strip in Fig. 1, and the manner in which the record is made thereon; and

Fig. 4 is a view similar to Fig. 3, showing a section of record strip and the manner in which the record is made thereon in a modified arrangement.

The apparatus represented in Fig. 1 is of the general type shown in my Patent No. 1,848,862, issued March 8, 1932, and comprises a drum 10 for rotation about its longitudinal axis and a printer bar 12 parallel to this axis and supported for movement toward and away from this axis. The drum 10 is provided with a helical edge or ridge 14 which may be formed by a small steel wire stretched in a helical groove formed on the periphery of the drum. The helical edge extends around the axis of rotation of the drum substantially more than 360°, or at least in the neighborhood of 600°. In Fig. 2, the helical edge is shown extending around the axis of rotation of the drum through two complete revolutions, or 720°.

The record strip 16, which is preferably relatively thin paper, is taken from a roller 18, passes around guide rods 19, then runs tangent to and engages lightly the helical ridge 14, and is then taken up by a feeder roller 20 which is power driven. An idler roller 22, pressed against the record strip by a spring 23, maintains frictional engagement of the paper with the feeder roller 20. A strip 24 of carbon paper is taken from a roller 26 and also passes around the guide rods 19, then runs tangent to the drum 10, passes around guide rods 27, and is taken up by a feeder roller 28 which is power driven.

As shown, the record strip 16 and the carbon strip 24 are fed through the apparatus between the helical edge 14 and the operating edge 29 of the printer bar 12 in a direction perpendicular to the axis of rotation of the drum 10. In operation, the drum 10 is rotated at a constant rate of four revolutions a second, for example, and in a counter-clockwise direction as indicated by the arrow. The feeder roller 20 is rotated at such a constant rate as to cause the record strip 16 to feed through the apparatus in the direction indicated by the arrows at a constant rate of about 6 inches a minute, for example. Likewise, the feeder roller 28 is rotated at such a constant rate as to cause the carbon strip 24 to be fed through the apparatus in the direction indicated by the arrows and at a constant rate somewhat

less than the rate of feed of the record strip 16.

It is proposed to drive the drum 10 and the rollers 20 and 28 from the same power shaft, as will be well understood.

Picture signals are supplied by connections 30 to electromagnetic means 32 of conventional construction to actuate the printer bar 12. The arrangement and adjustment are such that with no picture signal, the operating edge 29 of the printer bar rests only lightly against the carbon strip 24, while upon occurrence of a picture signal, the printer bar is moved down to press the strips 16 and 24 between the helical edge 14 and the edge 29 of the printer bar with varying degrees of pressure, depending upon the strength of the picture signal at the instant.

With the drum 10 in the position shown in Fig. 2, the operating edge 29 of the printer bar crosses the helical ridge 14 at the two points 36 and 38. The occurrence of a picture signal at this instant, therefore, causes two records to be made simultaneously on the record strip 16. Since the pitch of the helix is uniform, when two independent recordings are made simultaneously on the record strip they will always be spaced the same with respect to each other along the scanned lines transversely of the record strip and parallel to the axis of rotation of the drum 10. In other words, the record strip 16 is spot-scanned simultaneously at two points disposed on lines transverse of the record strip. The result of this characteristic of my improved apparatus is that the transmitted subject matter such as text, for example, will be at least partially duplicated across the record strip so that, although the drum 10 might be rotating slightly out of phase or out of synchronism with the scanner at the transmitter, none of the text is lost because of the duplication.

With the helical edge 14 extending around the axis of the drum 10 two complete revolutions, or 720°, a complete duplicate record is made on the strip 16 by each incoming picture signal. In this case at least one complete unbroken copy of the transmitted message is always available, the only limit to the permissible error in synchronism being the extent of distortion of copy which can be tolerated.

Under other operating conditions, it is proposed to manually adjust the speed of the recorder when the record begins to move out of frame due to asynchronism of scanning action at the receiver with respect to such action at the transmitter. In this case, the helical edge on the drum 10 need extend only about 600°, for example, around the drum. Two complete copies are not obtained with this construction, but there is sufficient tolerance on either side of the primary recorded message to permit the operator to make any necessary correction. In such case a larger copy of the message can be obtained with apparatus of a given size than can be obtained when two complete copies are recorded.

The respective rates of rotation of the drum 10 and the rollers 20 and 28, and the relative dimensions of the various parts, may vary over a wide range in different apparatus embodying my invention, to suit particular requirements. For example, the width of the strips 16 and 24 might be made the same as the width of "ticker" tape, the drum 10 rotated at about 60 revolutions a second, and the roller 20 rotated at a rate to feed the record tape through the apparatus at the rate of about three-quarters of an inch a second. In such case the text for transmission is taken from a tape on which it is printed in the direction along the tape. The record at the receiver would therefore appear on the record strip as shown in Fig. 4, which represents conditions when the scanning device at the receiver is operating out of synchronism with operating action at the transmitter for the condition where the helical edge extends 600°.

From the foregoing it will be seen that I have provided an apparatus for facsimile recording by which it is possible to obtain a satisfactory record, the entire subject matter being recorded although the scanning device at the receiver might be operating out of synchronism with operating action at the transmitter.

While but one embodiment of my invention has been described, it will be understood that various modifications within the conception of those skilled are possible without departing from the spirit of my invention or the scope of the claims.

I claim as my invention:

1. In facsimile recording apparatus, a rotatable member provided with a helical edge extending around its axis of rotation through an angle of the order of 600 degrees, an element provided with a substantially straight edge and supported with said straight edge substantially parallel to the axis of rotation of said member and for movement toward and away from said spiral edge, means for feeding a record strip through said apparatus and between said edges in a direction perpendicular to the axis of rotation of said member, means for rotating said member, and means for imparting operating movement to said element in accordance with incoming picture signals to produce at all times one complete record and a partial additional record of said signals.

2. In facsimile recording apparatus, a strip upon which a record is to be produced, means for feeding said strip through said apparatus at a substantially constant rate in a given direction, a transfer strip adjacent the recording strip, means for feeding the transfer strip simultaneously with the record strip through said apparatus and at a speed substantially identical to the record strip, and means for spot scanning said transfer strip to produce the record image, said scanning means operating simultaneously at two points on the transfer strip along a line transverse to the direction of motion thereof during a selected portion of a predetermined scanning time period and at a single point only on the transfer strip during another selected portion of the same predetermined scanning time interval, said scanning means comprising a member supported for rotation about an axis transverse to said direction of motion and provided with a helical ridge for engaging with the transfer strip, said ridge extending around said axis through an angle of the order of 600°, an element provided with a substantially straight edge and supported with said straight edge substantially parallel to said axis and for movement toward and away from said helical edge, means for rotating said member, and means for imparting operating movement to said element in accordance with incoming picture signals to produce at all times one complete record of the signals and a partial additional record of the signals.

CHARLES J. YOUNG.