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HIGH SPEED FACSIMILE RECORDER

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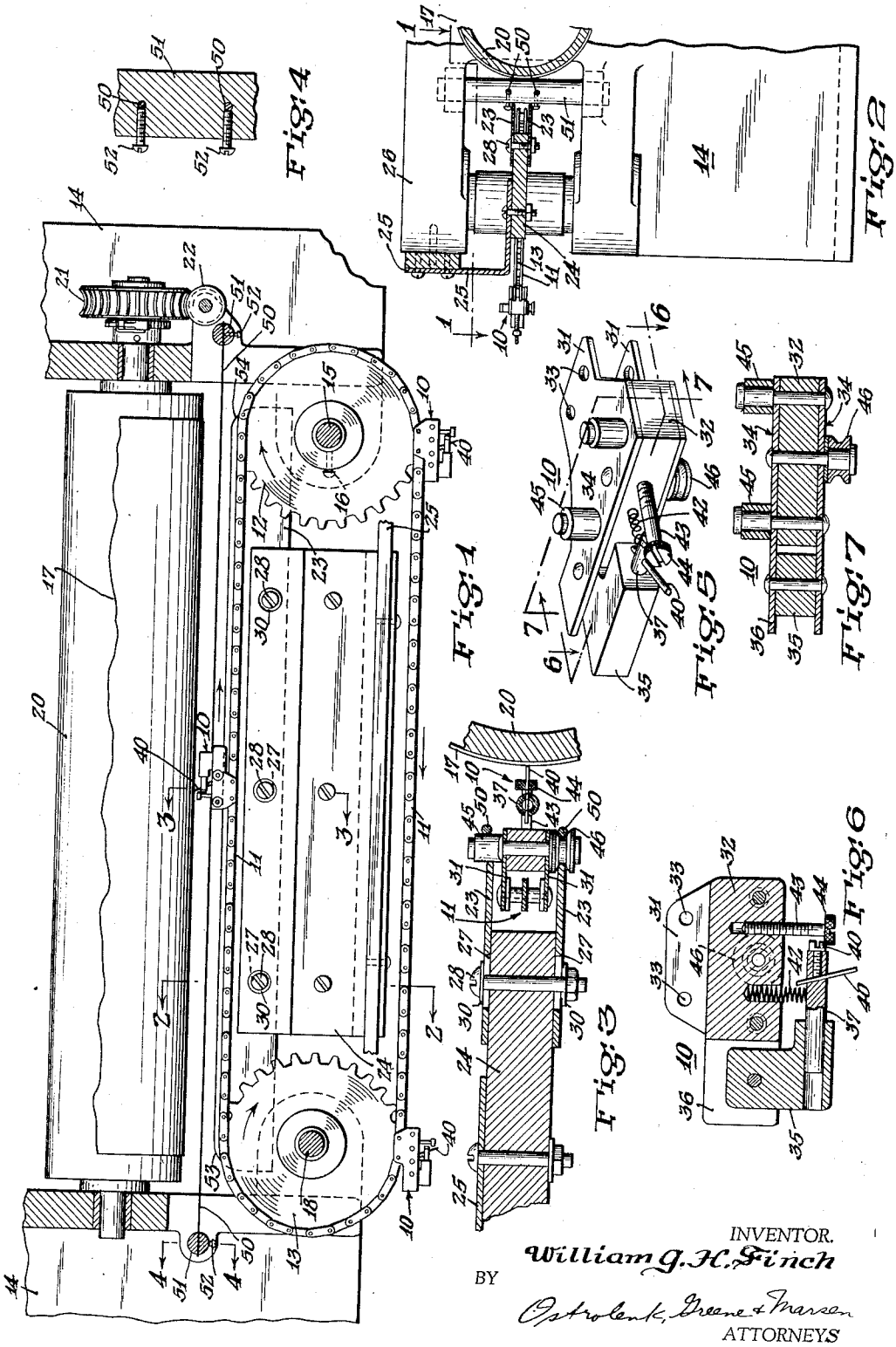


Fig. 1

Fig. 2

Fig. 4

Fig. 5

Fig. 7

Fig. 3

Fig. 6

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HIGH SPEED FACSIMILE RECORDER

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4 Claims. (Cl. 178—11)

This invention relates to facsimile systems and more particularly relates to novel apparatus for recording pictures or records at a high speed of operation. This application is a continuation-in-part of my copending application Serial No. 165,448 filed September 24, 1937, entitled "High speed portable facsimile system".

Facsimile transmitters of the prior art operated with a rotatable drum upon which the picture to be transmitted is mounted, or employed a flat record sheet continuously fed past the transmitter scanner. The facsimile recorders have hitherto corresponded to the transmitter scanners in that a rotatable drum recorder was used for a corresponding rotatable drum transmitter, and a continuous sheet or flat-bed recorder was used for a similar type transmitter.

In the transmission of facsimile records, it is most practicable to use the rotatable drum type of transmitter since the records to be transmitted usually come in relatively small lengths and are difficult to form into a continuous sheet as required for continuous sheet transmitters. On the other hand, it is more practical, particularly for layman operation of facsimile records, to receive the successive facsimile reproductions on a continuous sheet recorder. The obvious advantage of a continuous sheet recorder resides in the minimum amount of readjustment and manual operations required to obtain the successive recordings. Where the facsimile recording is performed in the home or aboard an aircraft or moving vehicle, it is most desirable to have a large roll of recording paper continuously fed past the receiving scanner to translate the signals as successive picture records on the sheet.

As described in my copending application above-referred to, I employ a novel continuous sheet facsimile recorder to translate signals originating from a revolving drum transmitter. Thus, successive news bulletins, news pictures, weather maps and the like may be mounted upon the drum of the transmitter and received in succession upon the continuous sheet recorder as though the successive transmitted records were being transmitted from a continuous sheet transmitter. The preferred transmitter I employ is of the removable drum type to enable the operator to mount the successive pictures for transmission upon a spare drum during the interval of transmission of the pictures.

An important feature of my novel high speed facsimile recorder as described in my copending application is the use of a plurality of stylii successively operated upon a record sheet to minimize the "dead period" heretofore necessary in continuous sheet recorders. My present invention is directed to an improved arrangement for mounting and carrying the plurality of stylii on a continuous chain. The stylii are individually and successively moved into contact with the record sheet to form line-by-line scanning transversely across the sheet to compose the reproduction. The stylii are electrically interconnected to the rectified facsimile signals to electrolytically or electrostatically break down the record sheet along the scanning region in accordance with the intensity of the signals.

The record sheet at the receiver is continuously advanced past the recording region during the recording intervals. Such continuous movement of the record sheet is advantageous to form a slanted line of recording along the sheet to correspond to the helical trace along the picture being transmitted from the rotatable drum. The prior continuous sheet recorders employed step-by-step line feeds which were actuated during the synchronizing interval. The facsimile recorder of my present invention is applicable equally for wet or dry type electrolytic or electrostatic recording.

In accordance with my present invention, improved means for accurately and rigidly guiding the individual stylii across the recording path of the record sheet are provided. Further means are employed for effectively adjusting the coaction of the stylii with the record sheet in a simple and efficient manner.

The facsimile recorder of my present invention is adapted to wide variations of design to meet very wide requirements in service. Thus the multi-stylii scanning system can very conveniently be employed for very high speed operation by merely increasing the number of stylii used, or may be used for very wide sheet recording, i. e., the width of a newspaper sheet, by merely lengthening the continuous chain carrier to increase the spacing between the stylii. The increased length of the carrier chain or in the number of stylii does not materially increase the weight or bulk of the apparatus beyond that necessary for accommodating the wider record sheet.

It is accordingly an object of my present invention to provide improved guiding means for a plurality of successively operated stylii in a facsimile recorder.

Another object of my present invention is to provide improved mounting means for the stylii of a multiple stylii facsimile recorder.

A further object of my present invention is to provide a novel adjustable stylus for a facsimile recorder.

These and further objects of my present invention will become apparent in the following description of a preferred embodiment of my present invention, taken in connection with the drawing in which:

Figure 1 is a partial plan view of a multi-stylii facsimile recorder embodying the principles of my present invention and corresponds to the view taken along 1—1 in Figure 2.

Figure 2 is a cross-sectional view taken along 2—2 in Figure 1 transversely of the stylii motivating mechanism.

Figure 3 is an enlarged cross-sectional illustration taken along 3—3 of Figure 1 through the stylus and guiding means therefor.

Figure 4 is an enlarged detailed view of the guiding wire anchorage as taken along 4—4 of Figure 1.

Figure 5 is an enlarged perspective illustration of a preferred form of the improved stylus device.

Figure 6 is a cross sectional view taken horizontally through the stylus along 6—6 of Figure 5.

Figure 7 is a vertical cross-sectional view through the stylus taken along 7—7 of Figure 5.

Reference is herewith made to the complete facsimile transmitter and receiver system disclosed in my copending application Serial No. 165,448 hereinabove mentioned, as a preferred system for employing the improved stylii mechanism of my present invention. The partial plan view, Figure 1, showing my improved stylii motivating mechanism for the facsimile recorder corresponds to Figure 8 of the copending application referred to. It is to be understood that the necessary motor gearing and other components of the facsimile receiver unit as a whole may well be taken bodily from the mechanism illustrated in the copending application. However, the present invention is not limited to any specific motivating means as will be evident to those skilled in the art.

The sylii 10 are spacedly mounted upon sprocket chain 11, operated by sprocket wheels 12 and 13. It is to be understood that the sprocket wheels 12 and 13, together with the chain 11 are electrically integral and are insulated with respect to the frame 14 of the facsimile unit. The sprocket wheel 12 is arranged to be driven clockwise (as indicated by the arrow) by means of the shaft 15 to which it is secured by set screw 16. The drive shaft 15 is operated at a predetermined rate by a local motor with associated gearing and synchronizing mechanism (not shown) to maintain the travel of the stylii 10 across the record sheet 17 in synchronism with the corresponding scanning operation effected at the transmitter, as will be evident to those skilled in the art. Sprocket wheel 13 is idly mounted upon shaft 18.

Sprocket chain 11 is accordingly operated at a continuous rate, carrying the stylii 10 successively into scanning position. The recording sheet 17 is motivated by metallic platen 20, in turn operated by the gearing arrangement 21—22 directly related to the gearing not shown which operates the scanner drive shaft 15. The metallic chain 11, together with the electrically related stylii 10, are connected to one terminal of the facsimile signal current; the metallic platen 20, to the other terminal.

A pair of spaced guide bars 23—23 are arranged parallel to the platen 20 and adjustably mounted a predetermined distance therefrom to accurately guide the stylii 10 into cooperation with the record sheet 17. Guide bars 23 are insulatingly supported on a composition strip 24 which may be hard rubber, ceramic, Bakelite or the like. Strip 24 is mounted between the sprocket wheels 12 and 13 by means of a bracket 25 secured to suitable sections 26 of the frame as seen in Figure 2. Elongated slots 27 are formed in the guide bars 23 whereby bolts 28 and washers 30 may coact to adjustably and securely position the rails 23 with respect to bracket 29. The elongated slots 27 in rails 23 permit accurate parallel alignment thereof, with respect to each other and with respect to the platen 20, a feature which is important for maintaining even pressure of the stylii points upon the record sheet 17.

Figures 5, 6 and 7 are enlarged detailed illustrations of a preferred embodiment for each of the stylii 10. Each stylus 10 is arranged with prongs 31 projecting from the body 32 thereof, and provided with holes 33 so that the stylus may be inserted as a unit or link in the sprocket chain 11, as shown in detail in Figure 3.

In the illustrated arrangement, the stylus 10 is composed of a metallic block 32 having two plates 34 rigidly attached to opposed sides thereof; the projecting flanges 31 for attachment to the sprocket chain 11 being integral with and extending from the opposite plates 34. A further metallic element 35 is pivotally supported by extensions 36 of the plates 34. A rod 37 is secured to element 35 by a drive fit as shown in Figure 6. The stylus point 40 fits through a small transverse hole in the rod 37 and is adjustably maintained in said rod 37 by a set screw 41. Point 40 is arranged at a trailing angle with respect to the directional movement of the stylus 10, to minimize friction and avoid scratching of the point 40 with the record sheet 17.

The diameter of the stylus point 40 is of the order of the spacing between lines of scanning, being $\frac{1}{100}$ of an inch in a particular apparatus. I prefer to use a hard metallic substance such as tungsten in view of the high electrical stresses and continued wear and use of the points 40. A spring 42, set into the body 32 of the stylus, is arranged to project therefrom and against rod 37 carrying stylus point 40. Since the stylus carrying element 35 is pivotally mounted with respect to the body of the stylus, the spring 42 acts to mechanically bias the stylus point 40 away from the body of the stylus 10. A set screw 43 extends from the body portion 32 of the stylus and contains a large flat head 44 which coacts with the end of the set screw 41 in a manner clearly illustrated. It will now be evident that the position of the stylus point 40 is minutely adjustable, by operating the set screw 43 against the supporting and biasing elements for the pin 40.

A further advantage of the spring 42 is to maintain a substantially constant stylus point pressure against the record sheet in the event of bumps or irregularities on the surface of the record sheet and prevent tearing or scratching of the record sheet, making for uniformity in the detail of the recording.

An important feature of my present invention resides in the means for accurately and rigidly guiding the respective stylii 10 into proper scanning position. The aforementioned parallel rails 23—23 coact with each stylus 10 by means of the two rollers 45 mounted on one side of the stylus and a grooved or V-roller 46 mounted on the other side thereof, as shown in Figures 5

and 7. The respective rollers 45 and 46 are secured by a running fit on corresponding studs projecting from the body of the stylus. Figure 3 clearly shows the coaction of the rollers 45 and 46 with the edges of the parallel rails 23. The body of the stylus is accordingly properly guided at a predetermined distance from the record sheet 17.

To avoid fluttering of the stylus proper, I further provide two wire guides 50 maintained taut in a fixed position parallel to the platen 20. The steel wires 50 extend from posts 51 set in the frame of the facsimile unit as shown in Figures 1 and 2. Figure 4 is an enlarged cross-sectional view showing the manner in which the wires are maintained taut by means of set screws 52 operating directly against the wires 50 which reside in circular borings within posts 51.

Figure 3 illustrates the coaction of the wires 50 against the rollers 45 and 46 of the stylus 10. The wires 50 bias the body of the stylus against the guiding rails 23—23' and prevent fluttering or misplacement of the stylus in its course along the record sheet 17.

The leading and trailing edges 53 and 54 of rails 23 are arcuate as seen in Figure 1, whereby the rollers 45 and 46 of the stylus are gradually guided into position on the rails and against the taut spring wires 50. The coaction of the wires 50 and the rails 23 serve as an adjustable flexible smooth and rigid guiding means for the body of the stylus with respect to the platen 20.

Besides the rigid guidance of the main body of the stylus 10 at the rollers 45 and 46 thereof, the pressure of the stylus point 40 is made independently adjustable with respect to the recording sheet 17 by means of the set-screws 41 and 43 and spring 42 hereinabove described in connection with Figures 5 and 6. The trailing angle of the point 40 avoids any possible scratching or abrasion of the sheet 17, and the compliant mounting thereof serves to maintain the adjusted pressure of the needle 40 on the record sheet 17 in spite of slight creases or bumps which may exist at particular sections of the sheet during recording, effecting a smooth and continuous recording operation.

In the illustrated embodiment I have shown three equi-spaced stylii 10 mounted on the sprocket chain 11, spaced by a distance equal to the length of the recording area. The stylii are successively and independently brought into coaction with the rails 23 and wires 50 during their respective scanning excursions across the record sheet 15 in the line-by-line scanning of the sheet 17. It is to be understood that the record sheet 17 is advanced either continually step by step with respect to the individual stylii which scan across the sheet to effect a facsimile reproduction by successive adjacent line-by-line scanning operation.

It will now be evident that my present invention readily lends itself to wide variations in design to accommodate a wide range in widths for the recording sheet as well as to a wide range in the speed of scanning. Thus the recording sheet may be the width of a newspaper, requiring only the corresponding distance between the sprocket wheels 12 and 13 carrying the sprocket chain 11 and the stylii 10 arranged on the chain. Increased speed of recording is effected by increasing the number of stylii.

Having described a preferred embodiment carrying out the objects and principles of my present invention, it is to be understood that variations and modifications are feasible within the broader spirit and scope thereof and accordingly I do not intend to be limited except as set forth in the following claims.

I claim:

1. A multi-stylus facsimile recorder comprising two spaced rails parallel to the record sheet for successively guiding each stylus in the recording path, each stylus having a body portion with roller means secured to one side of said body portion arranged to roll against one of said rails, and a roller secured to another side of said body portion for coaction with the other of said rails, whereby a rigid guiding arrangement is effected for each stylus on successive engagement with the rails during the recording excursion, a pair of wires stretched parallel to the rails and arranged to press the rollers against said rails to prevent fluttering thereof during the recording excursion.

2. A multi-stylus facsimile recorder comprising two flat spaced rails with longitudinal edges parallel to the record sheet for successively guiding each stylus in the recording path, each stylus having a body portion with two spaced rollers secured to one side of said body portion arranged to roll against said longitudinal edge of one of said rails, and a roller secured to the opposite side of said body portion having an annular groove for coaction with the other of said rails, whereby a rigid guiding arrangement is effected for each stylus on successive engagement with the rails during the recording excursion, a pair of wires stretched parallel to the rails and arranged to press the rollers against said rails with one of the wires fitting into said roller annular groove to prevent fluttering thereof during the recording excursion.

3. A facsimile recorder according to claim 1 further characterized by the leading edges of said rails being arcuate for gradually guiding said rollers against said wires and each stylus correspondingly into recording position.

4. A facsimile recorder according to claim 2 further characterized by the leading and trailing edges of said rails being arcuate for gradually guiding said rollers against and away from said wires and each stylus correspondingly into and out of recording position.

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