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Andree et al.

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[54] **SELF-ADJUSTING BURNING PIN WRITING SYSTEM FOR A FACSIMILE SHEET RECORDER**

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[73] Assignee: **Dr. Ing. Rudolf Hell**

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[30] **Foreign Application Priority Data**

Aug. 12, 1971 Germany 2140380

[52] **U.S. Cl.** ..... **346/74 SB,** 346/139 A

[51] **Int. Cl.** **G01d 15/06**

[58] **Field of Search** ..... 346/74 ES, 74 S, 74 SB; 178/6.6 R; 346/139 A

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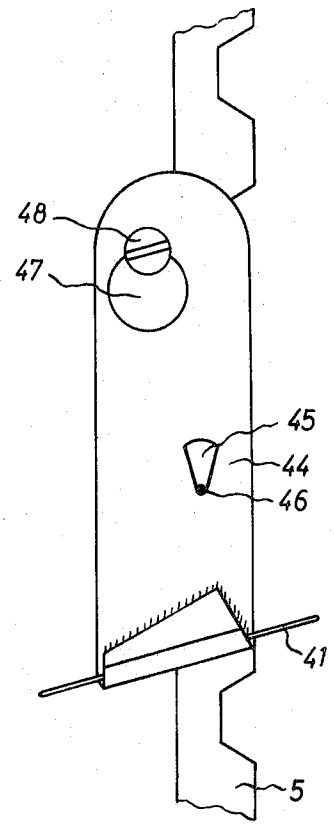
Assistant Examiner—Jay P. Lucas
Attorney, Agent, or Firm—Hill, Sherman, Meroni, Gross & Simpson

[57] **ABSTRACT**

Burning pin mounting for a facsimile sheet recorder in which at least one burning pin is carried across the face of an electro-sensitive sheet, on an endless fabric belt traveling across the paper. The burning pin is carried on the belt by a carrier member at a leading angle with respect to the electro-sensitive sheet, and is angularly adjustable relative to the belt and sheet. A guide rail for the burning pin extends between a recording run of the belt and the paper to hold the burning pin in position as it travels along the paper. A current supply rail extends along the opposite side of the recording run of the belt and supplies current to the burning pin.

7 Claims, 9 Drawing Figures



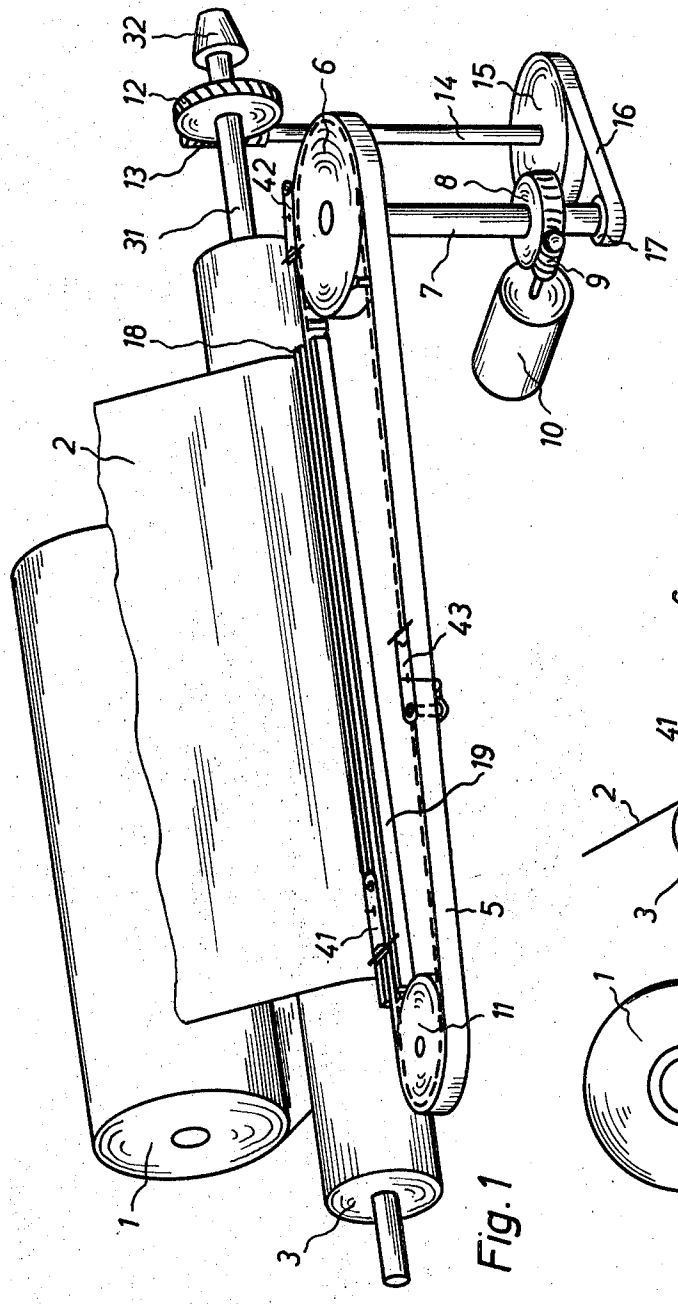


Fig. 1

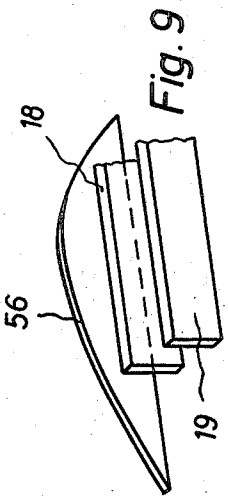


Fig. 9

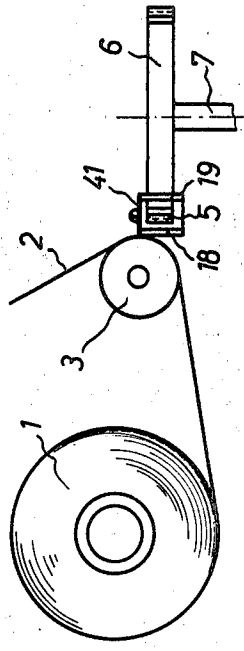


Fig. 2

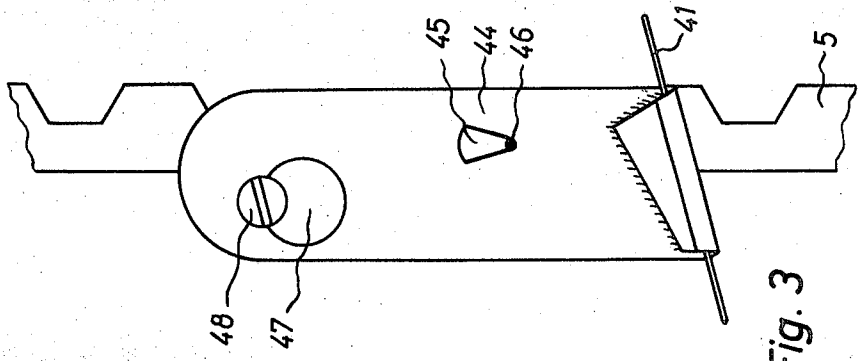


Fig. 3

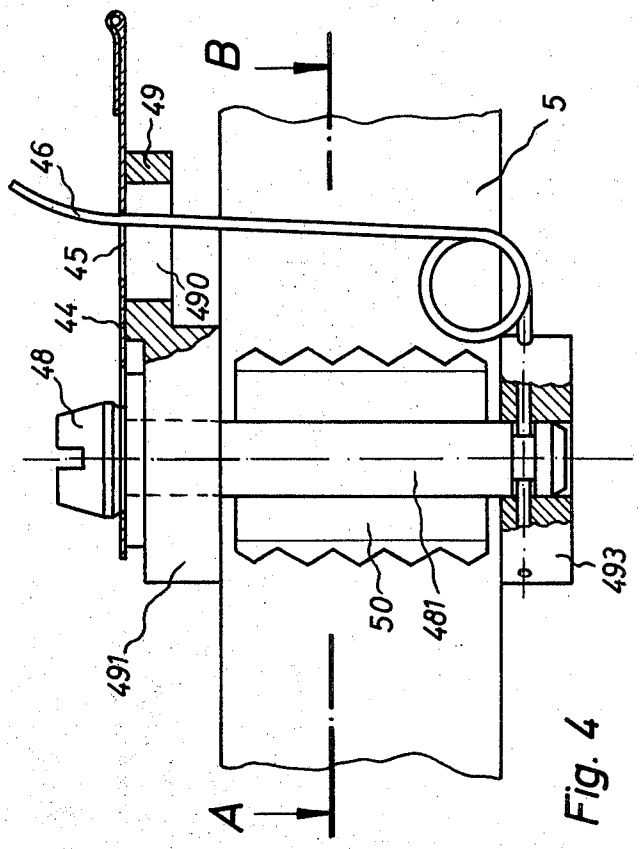


Fig. 4

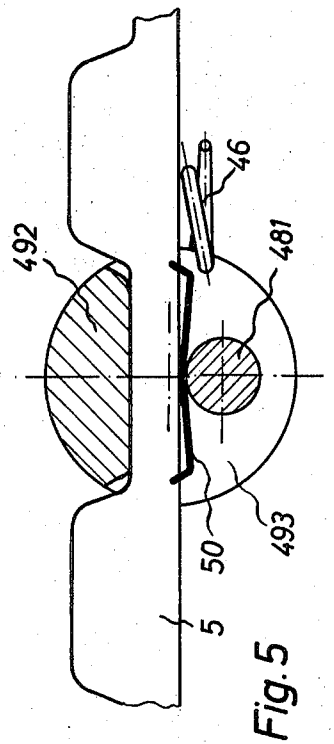


Fig. 5

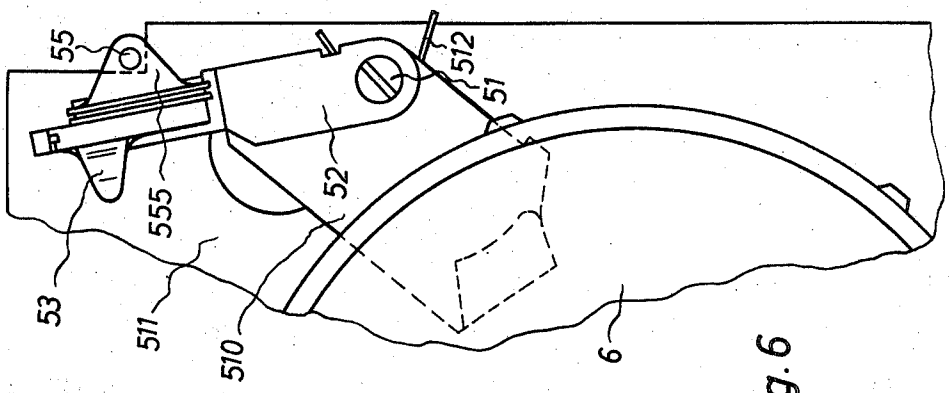


Fig. 6

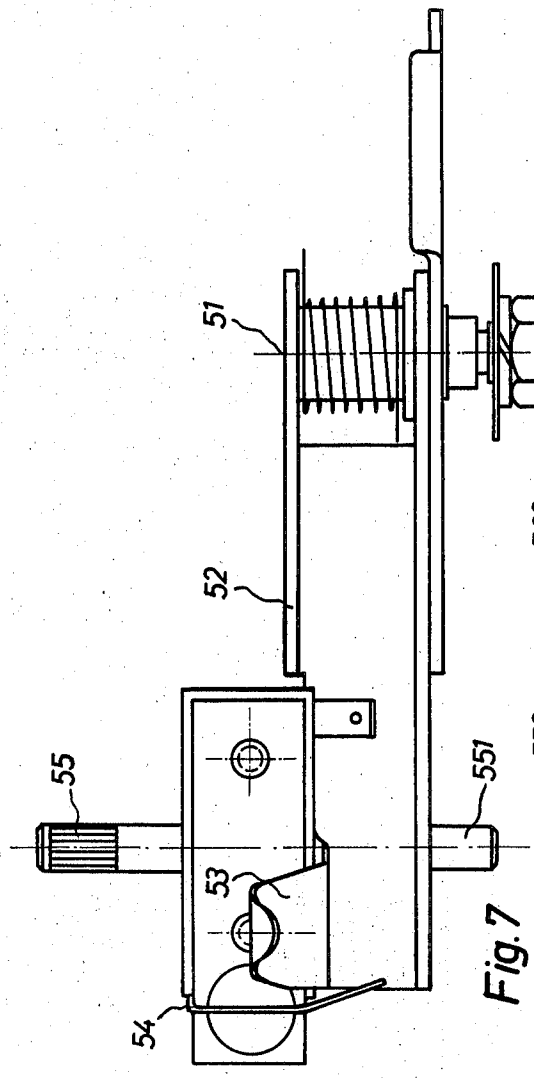


Fig. 7

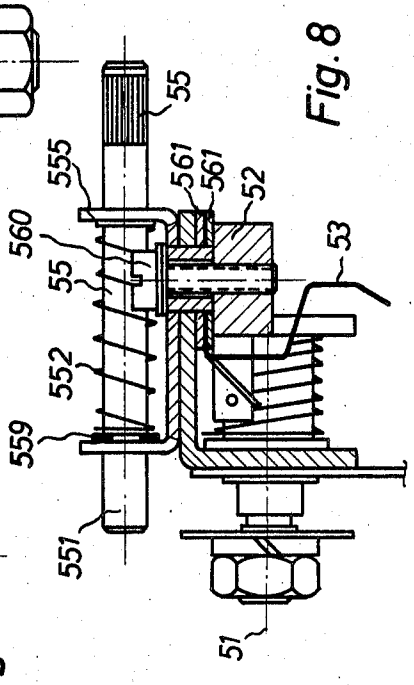


Fig. 8

SELF-ADJUSTING BURNING PIN WRITING SYSTEM FOR A FACSIMILE SHEET RECORDER

FIELD OF THE INVENTION

Burning pin recording system for a facsimile sheet recorder and adjustable mounting for the burning pin on an endless belt, together with the current conducting means for the burning pin.

PRIOR ART, SUMMARY AND OBJECTS OF INVENTION

Heretofore facsimile sheet recorders have been provided in which one or more burning pins have been mounted on an endless metal band or belt guided to travel across an electro-sensitive paper, which in turn is advanced along its length in accordance with travel of the burning pin across the paper in the line direction. While such systems effect high speed recording, the current supply for the burning pins is through the drive belt or band and the pins have been rigidly attached to the band or belt. Since the recording requires high voltage, there is always the liability that the support and driving band or belt may break and contact the housing of the recorder and cause shorting and damage to the recorder. Also, where several burning pins are carried by the belt, adjustment of the pins has been by a shifting of the drive belt, which is very inexact, since it may cause staggering between the individual lines.

An advantage of the present invention is that the burning pins are supported to travel across the paper during the writing process and are carried by the belt so they travel in an exact plane across the paper and may be exactly adjusted relative to the belt and paper.

This is attained by attaching the burning pin or pins on the belt at an acute angle with respect to the carrier for the burning pins in which the carrier for the burning pins may be adjusted about an off-center axis with respect to the belt, and supports the burning pins to extend from opposite sides of the belt to be slidably supported on a guide rail extending along the belt between the paper and the belt, at their inner ends and to be energized by a parallel rail on the opposite side of the belt from the guide rail.

This support thus energizes the burning pins and guides the ends of the burning pins to extend beyond the carrier member across electro-sensitive paper in the line direction.

A further advantage of the invention is that the pivotal axis of each carrier member for a burning pin is spaced from a spring biasing the carrier member and burning pin in a recording direction, and the carrier member is designed as a leaf or sheet spring resting upon a mounting device clamped to the drive belt or band.

A further advantage of the invention is that the point of pivotal movement of the carrier member is carried on an adjustable eccentric mounted on the mounting device for the carrier member.

Another advantage of the embodiment of the invention is that the mounting device for the carrier member extends along the top and bottom of the belt and comprises an upper part for supporting the carrier member, a part extending downwardly along one side of the drive belt and a lower part extending under the drive belt and is clamped to the belt by spring means to support the carrier member to extend inwardly of the other side of the belt when traveling along the recording run of the belt. The spring means is preferably a sheet spring interposed between a blot extending through the upper and lower parts and the drive belt, and biased into engagement with the belt on opposite sides of the bolt to support itself on the drive belt and bias the downwardly extending part into engagement with the inside of the belt. The bolt serves as a center and pivot for the carrier member and is secured against axial shifting by an angularly bent torsion spring having a leg extending through the lower part of the mounting device and bolt, according to further advantageous development of the invention, whereby the spring serves simultaneously for mounting and tensioning the carrier member with respect to the axis of pivotal movement thereof.

Other objects, features and advantages of the invention will be readily apparent from the following description of a preferred embodiment thereof, taken in conjunction with the accompanying drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective, generally diagrammatic view of a recording system for a facsimile sheet recorder constructed in accordance with the principles of the present invention.

FIG. 2 is a fragmentary diagrammatic end view of the recorder shown in FIG. 1, showing the supply roll and the direction changing drive roll for the paper, along with a burning pin and drive pulley for the belt.

FIG. 3 is a top plan view of a burning pin mounting and a part of the support and drive belt therefor.

FIG. 4 is a partial sectional view of the carrier member for the burning pin illustrating the mounting of the carrier member on the belt and the biasing means for the carrier member.

FIG. 5 is a partial fragmentary sectional view taken substantially along line A–B of FIG. 4.

FIG. 6 is a top plan view illustrating the adjusting device for the burning pin and showing the adjusting device positioned away from the drive puley for the belt.

FIG. 7 is a view in side elevation of the adjusting device shown in FIG. 6.

FIG. 8 is a vertical transverse sectional view taken through the adjusting device shown in FIG. 7; and

FIG. 9 is a perspective front end view of a guiding ledge for the burning pin at the beginning of the recording line.

DESCRIPTION OF PREFERRED EMBODIMENT OF INVENTION

In FIG. 1 of the drawings, we have shown an electro-sensitive paper sheet 2 trained from a supply roll 1 suitably mounted on the shaft for unwinding under tension. The electro-sensitive paper sheet is trained under a driven roll 3 and extends partially about said roll and upwardly and inwardly therefrom in a manner conventional with facsimile sheet recorders of the type described.

A toothed belt 5, which may be a fabric belt of a well-known construction, has an inner recording run traveling along the drive roll 3 and electro-sensitive paper sheet 2 in parallel spaced relation with respect thereto, and forming a support for a series of burning pins 41,42 and 43 equally spaced about said belt and projecting

therefrom toward the electrosensitive paper sheet 2 to travel along said sheet.

The belt 5 is trained about an idler pulley 11 at one side of the sheet 2, and about a drive pulley 6 at the opposite side of the sheet 2. The drive pulley 6 is shown as being mounted on the upper end of a drive shaft 7, having a worm gear 8 keyed or otherwise secured thereto, and driven from a worm 9 on the end of the drive shaft of a drive motor 10. The drive motor 10 may be an electric motor of a well-known form suitable for driving the belt 5 at a constant speed.

The drive roll 3 is mounted on a drive shaft 31 having a gear 12 keyed or otherwise secured thereto. The gear 12 is shown as being a worm gear and meshes with a worm 13 on the upper end of a shaft 14. A pulley 15 is keyed or otherwise secured to the lower end of the shaft 14 and is driven from the shaft 7 by a belt 16, which may be a V belt trained about a drive pulley 17 keyed or otherwise secured to the lower end of the shaft 7. The electro-sensitive paper sheet is thus advanced a distance of one line as a burning pin 41,42 or 43 travels along said sheet while a line is being recorded or after it has been recorded.

The shaft 31 has a knob 32 on the outer end thereof adjacent the worm gear 12 to enable the roll 3 to be manually adjusted.

FIG. 2 of the drawings shows the training of the electrosensitive paper sheet from the roll 1 under the roll 3 and upwardly thereabout and backwardly therefrom and shows a burning pin 41 carried by the belt 5 to travel across the sheet. The burning pin 41 is shown as resting on a guide rail 18 on one side of the recording run of the belt and resting its opposite end portion on a current supply rail 19 extending along the opposite side of the recording run of the belt from the guide rail 18. With this construction, the burning pin is guided to travel exactly along a horizontal plane and due to the travel of the burning pin, along the top surface of the current supply rail 19, a continuous abrasive effect on the rails is attained which results in a self-cleaning contact for the length of the current supply rail.

FIGS. 3 and 4 show a carrier member 44 for a burning pin 41. The carrier members for the burning pins 41,42 and 43 are all of the same construction, so the carrier member 44 need only herein be described in detail. As shown in FIGS. 3 and 4, the carrier member 44 is an elongated flat plate which may be made from a spring metal and is turned over the burning pin 41 at one end of said carrier member to support said burning pin at a trailing angle with respect to the electrosensitive sheet 2 as it travels therealong. The carrier member 44 has a generally triangular apertured portion intermediate its ends extending along the top of the belt 5 for receiving a leg of a torsion spring 46 biasing the carrier member about the axis of an eccentric extending through an apertured portion 47 of the carrier member.

The leg of the torsion spring 46 extends outwardly and downwardly along the outside of the belt 5 and has an opposite leg extending at generally right angles with respect to said first-mentioned leg through a lower part 493 of a support bracket 49, and through a pin 481 securing said support bracket to the belt (FIG. 4). The bracket 49 has an upper leg 491 extending along the top of the belt and connected to the lower leg by a vertical member 492 extending in the space between two teeth of the belt, and retained into engagement therewith by a leaf spring 50 interposed between the pin 481 and the inner side of the belt 5 and having inturned serrated ends (FIGS. 4 and 5) biased into engagement with the belt, to yieldably clamp the member 492 into the space between two teeth of the belt.

The eccentric 48 extending through the apertured portion 47 forms a pivotal mounting for the carrier member 44 on the bracket 49 and is adjustable to adjust the position of the burning pin 41 against the bias of the torsion spring 46. The eccentric 48 is slotted to accommodate turning thereof by a screwdriver, and has a downward extension forming the pin or bolt 481 extending along the outside of the belt 5 and through the bottom part 493 of the bracket 49, as previously described. The bracket 49 has an opening 490 extending therethrough in alignment with the apertured portion 47 of the carrier member 44 and larger than said apertured portion, to accommodate movement of the spring 46 against the eccentric 48 to retain the carrier member 44 to said eccentric and bias the carrier member in a direction away from said eccentric. It should here be understood with reference to FIGS. 4 and 5, that the upwardly extending leg of the torsion spring 46 is spaced from the inside of the belt 5 and extends upwardly along said belt and angularly inwardly of the upper end portion of said belt to engage and extend through the apertured portion 47 and thereby exert a bias on the carrier member to retain said carrier member to the eccentric 48, and to also position the carrier member with its inner edge parallel to the recording run of the belt and to accommodate limited inward yieldable movement thereof relative to the belt about the axis of the eccentric 48.

FIGS. 6,7 and 8 show an adjusting device 52 pivotally adjustable about a pivot pin 51 mounted on a plate 510 extending under said bracket and under the pulley 6. The pin 51 in turn is mounted on a bracket plate 511 extending horizontally beyond the periphery of the pulley 6. The adjusting device 52 defines the position of said burning pin at the curcumference of the pulley 6 and belt trained thereabout, to correspond to the line at the beginning of the recording process.

The adjusting device 52 is elongated and extends beyond the plate 510 and the bracket plate 511, and has a contact 53 carried on its outer end in spaced relation with respect to the pin 51. Said contact 53 is shown as being locked in a retracted position relative to the pulley 6, by a locking pin 551 and when released towards the pulley 6 about the axis of the pin 51 it serves as a current supply for the burning pin 41. The contact 53 extends horizontally inwardly and angularly upwardly of the adjusting device 52 and then downwardly at an angle, as shown in FIGS. 7 and 8, to form a contact point engageable with respect to the burning pin 41, and is so arranged with respect to the drive pulley 6 and the toothed belt 5, that it assumes such a position as shown in FIGS. 7 and 8 during the adjusting process, as the current supply rail during the recording process. A torsion spring 512 encircles the pin 41 and has one leg hooked to the plate 511 and another leg hooked to the adjusting device, and biases the adjusting device towards the pulley 6.

The pulley 6 is engaged by a locking plate 510 during the adjusting operation forming a locking connection for the pulley, which is not further illustrated, since it is no part of the present invention. This locking plate holds the pulley 6 from rotation during the adjusting

process, and enables an exact angular position of the drive pulley 6 with respect to the adjusting device to be attained, which defines the position of the burning pin 41 at the circumference of the wheel 6, corresponding to the beginning of a line during the recording process, to assure the burning pin 41 will be in an exact position at the beginning of the line as a recording process is initiated.

This exact position is attained by a further contact 54 extending downwardly from the end of a bracket member 555 carried by and extending upwardly of the outer end portion of the adjusting device 52 and attached thereto. The burning pin 41 rests on the contact 53 on its end during the adjusting process, which end is turned away from the pulley 6, and will move along the contact 54 during adjusting and close an indicator current circuit (not shown). Adjustment is effected by placing the burning pin carrier member near the contact 54 and the burning pin is adjusted relative to said contact by turning of the eccentric 48 or by arching of the carrier 44 relative to the contact 54. The contact 53 when in position has a contact surface in the circumferential direction of the toothed belt, to provide a continuous and perfect current supply to the burning pin during the entire adjusting process.

After the adjusting process, a pin 55 having a lower end 551, is mounted intermediate the ends in the bracket 555 extending outwardly of the adjusting device to position the lower end 551 to serve as a stop for the adjusting device during the adjusting process and may be lifted and engaged with a shouldered portion of the plate, and hold the adjusting device in position shown in FIG. 6. The lower end 551 of the pin 55 will thus lockingly engage in the rest position shown in FIG. 6 to hold the adjusting device away from the pulley 6 and belt 5 and thus prevent the adjusting device from retracting during the recording operation.

In FIG. 8, the adjusting device has been shown in section to illustrate the mounting and function of the pin 55. The bracket 555 is generally U-or channel shaped and has parallel legs forming a slidable mounting for the pin 55. A compression spring 552 is seated at one end on the inside of the upper leg of the bracket and at its opposite end on a snap ring 559. The spring 552 thus biases the lower end of the pin 55 into position to engage the shouldered portion of the plate 511 and form a stop for the adjusting device to hold the device in a retracted position.

The bracket 555 is shown as abutting and mounted on the vertical leg of an angle bracket, the horizontal leg of which in cooperation with a downwardly spaced parallel leg, forms a mounting for the pin 51. A machine screw 560 is shown as provided to clamp the angle bracket to the adjusting device 52 to form a part thereof and to clamp the contact 53 between two clamping plates 561, to thereby position the contact 53 to allow the burning pin to scan over said contact pin for a current supply.

In FIG. 9, we have shown a guide member or cam 56 carried on the inside of the guide rail 18 at the incoming end thereof and extending thereabove to lift the burning pin at the incoming ends of the rails 18 and 19 and to assure that the pin does not engage the edge of said rails at the beginning of the line, but will be lifted above the edges of said rails by the camming ledge 56 to come into position for recording at the exact beginning of the line. We claim as our invention:

1. In a recording system for a facsimile sheet recorder,
- a driven roll,
- an electro-sensitive sheet trained about said driven roll and extending upwardly therefrom,
- an endless belt having a recording run extending parallel to said driven roll and the sheet trained thereabout,
- an idler pulley forming a direction-changing member for one end of said belt and spaced from one side of the sheet,
- a drive pulley spaced from the other side of the sheet for driving said belt along the sheet,
- at least one burning pin,
- mounting means mounting said burning pin on said belt to extend at a leading angle with respect to the electrosensitive sheet as moved therealong by said belt,
- a carrier member for said burning pin extending along the top of said belt and mounted for yieldable movement relative to said belt about a vertical pivotal axis spaced to one side of said belt,
- a guide rail positioned between the recording run of the belt and the electro-sensitive sheet, and extending along said belt in the plane of travel thereof,
- a current supply rail extending parallel to said guide rail on the inside of the recording run of the belt and
- said carrier member forming a mounting for said burning pin to rest on said rails and be carried therealong by said belt and be energized by said current supply rail to effect a recording operation,
- a contact arrangement for said burning pin,
- means preadjusting said burning pin and contact arrangement to align the burning pin with a line beginning at the drive pulley and to lockingly engage the drive pulley during adjustment of said contact arrangement, said means being disengageable from the drive pulley upon adjustment thereof, to accommodate normal operation of the burning pin.

2. The recording system according to claim 1, characterized in that the contact arrangement comprises a first contact for the current supply to the burning pin, an indicator current system through the burning pin and first contact, and a second contact towards which the burning pin can be adjusted, means adjusting the burning pin towards said second contact to effect the switching on or off of the indicator current system through the burning pin and the first contact.

3. The recording system of claim 2, including a guide member at the burning pin intake at the beginning of a line, lifting the burning pin and then lowering the burning pin to come into position for recording at the exact beginning of the line.

4. The recording system of claim 2, characterized in that a locking device for the contact arrangement is provided adjacent the drive pulley for locking the drive pulley in position during an adjusting operation.

5. The recording system of claim 4, wherein the means preadjusting the contact arrangement and burning pin comprises an adjusting device, a pivot pin pivotally mounting said adjusting device for movement about a vertical axis spaced outside of and parallel to the axis of rotation of the drive pulley, said adjusting device defining the position of said burning pin at the circumference of the drive pulley and belt trained

about, to correspond to a line at the beginning of the recording process.

6. The recording system of claim 5, wherein the adjusting device is elongated and extends away from the drive pulley, wherein the first contact is carried on the outer end of said adjusting device in spaced relation with respect to its inner end, wherein means are provided for locking said adjusting device away from the drive pulley and other means bias the adjusting towards the drive pulley.

7. The recording system of claim 6, wherein a locking plate is provided formimg a mounting for said pivot device for said adjusting device and wherein the locking connection is provided between said locking plate locking the drive pulley from rotation during the adjusting process to enable an exact angular position of the drive pulley with respect to the adjusting device to be attained which defines the position of the burning pin at the circumference of the drive pulley corresponding to the beginning of a line during the recording process, to assure that the burning pin will be in exact position at the beginning of a line as a recording process is initiated.

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