United States Patent

[11] **3,611,425**

[72] Inventor **Milton Alden**
Needham, Mass.

[21] Appl. No. **806,801**
[22] Filed **Mar. 13, 1969**
[45] Patented **Oct. 5, 1971**
[73] Assignee **Alden Research Foundation**
Brockton, Mass.

[54] **RECORDER**
6 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **346/101,**
346/74 CH, 346/136
[51] **Int. Cl.** **G01d 15/28**
[50] **Field of Search** 346/101,
139, 74 E, 74 CH, 74 S, 74 SB, 74 SC, 136, 74;
226/179, 180

[56] **References Cited**

UNITED STATES PATENTS

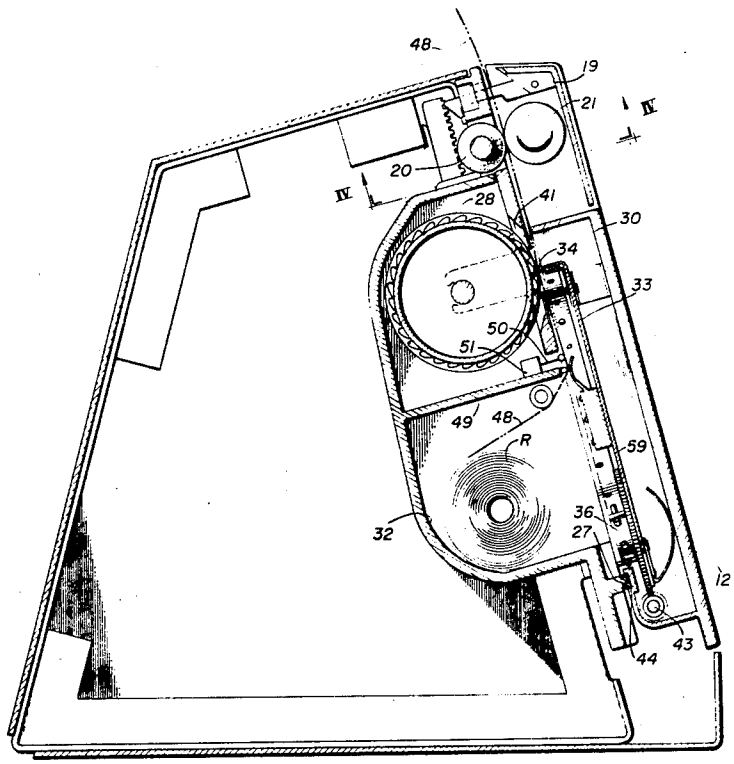
2,461,376	2/1949	Feldmeier	226/180
2,671,710	3/1954	Bowditch	346/136 X
2,819,941	1/1958	Hell	346/101
2,888,310	5/1959	Perry	346/136
2,911,634	11/1959	Ferguson	346/136 X
3,270,350	8/1966	Brandt et al.	346/136

FOREIGN PATENTS

736,428	9/1955	Great Britain	346/74

Primary Examiner—Joseph W. Hartary
Attorney—Norman S. Blodgett

ABSTRACT: A recorder arranged to receive electrical signals and to convert them to visible indicia on a chemically treated web, wherein the web passes from a storage roll through a restricted passage and is pulled by means of rollers operating on its opposite edges both forwardly and laterally to produce tautness in the web at a marking means.



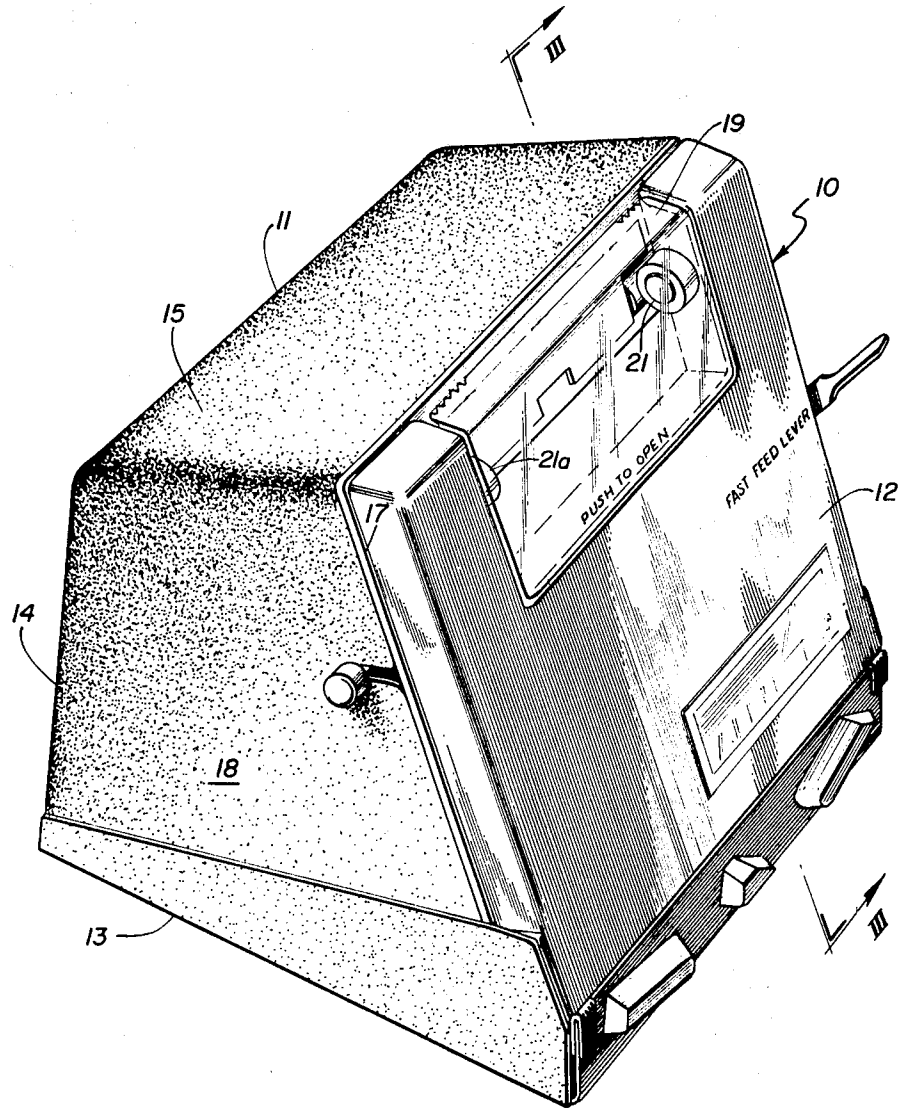


FIG. 1

MILTON ALDEN
INVENTOR.

BY
Morrow S. Blodgett

FIG. 2

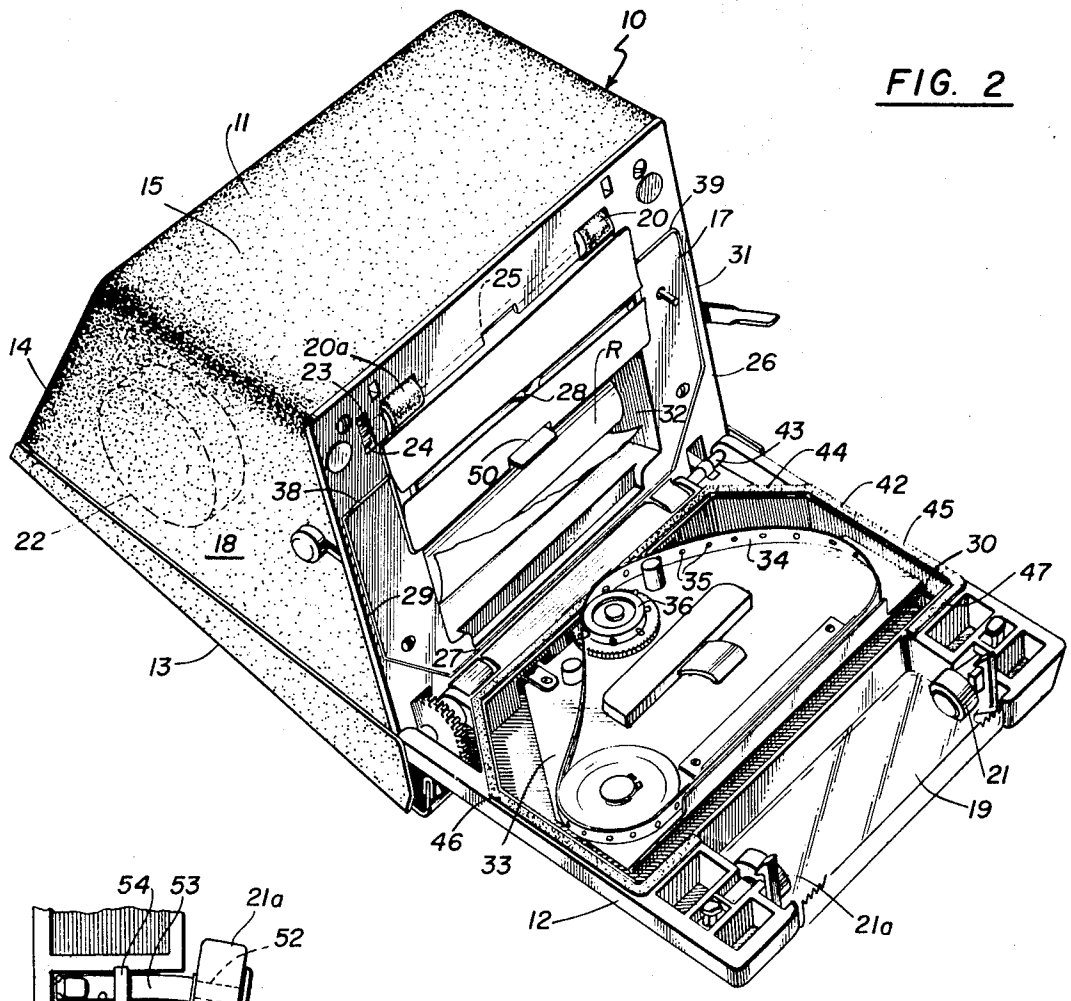


FIG. 7

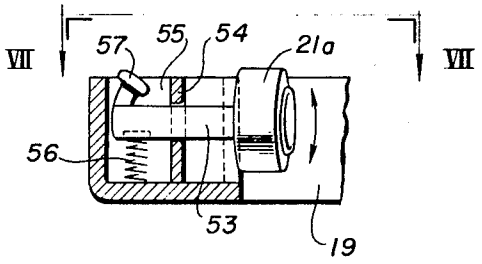
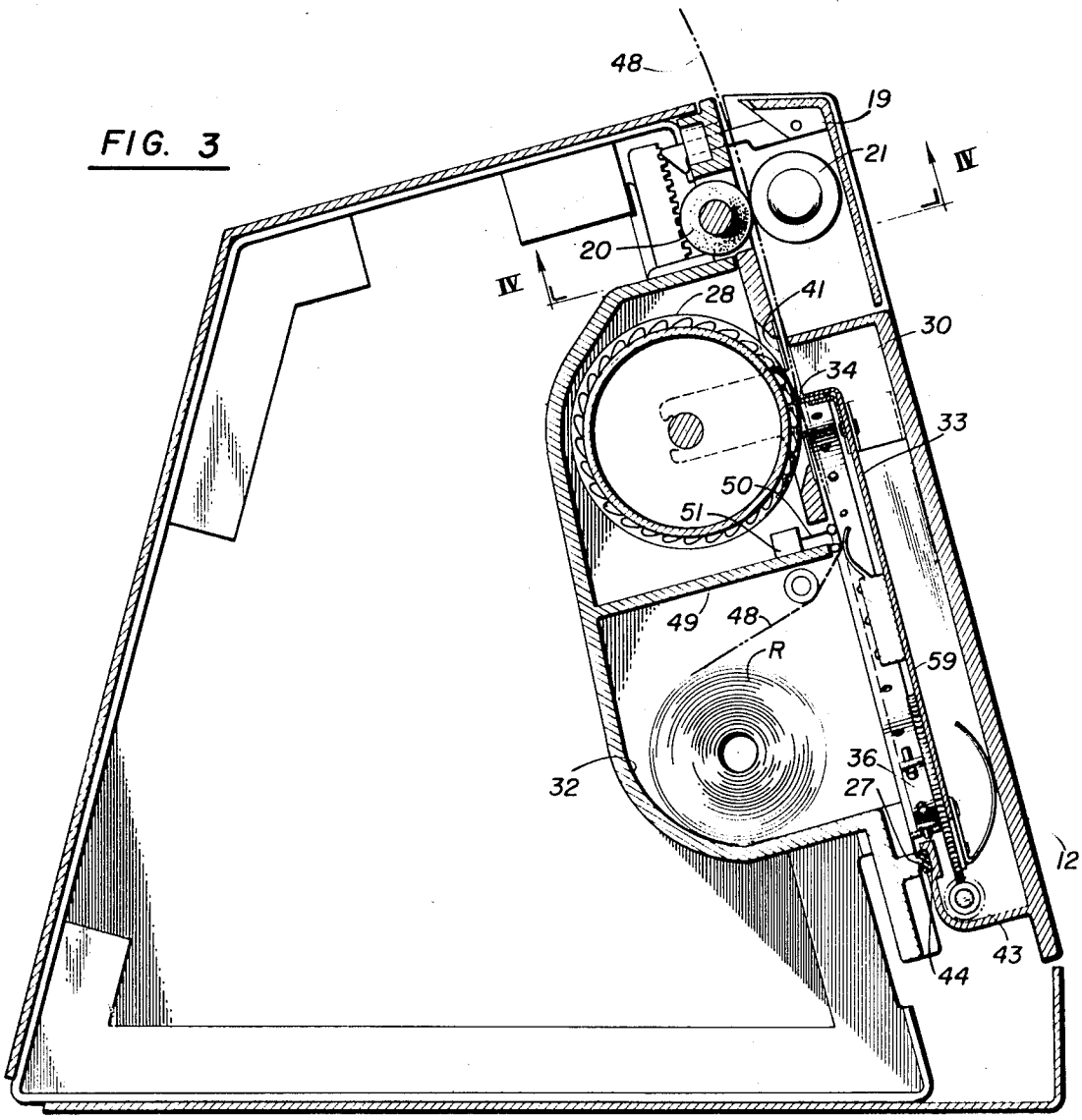


FIG. 6

FIG. 3



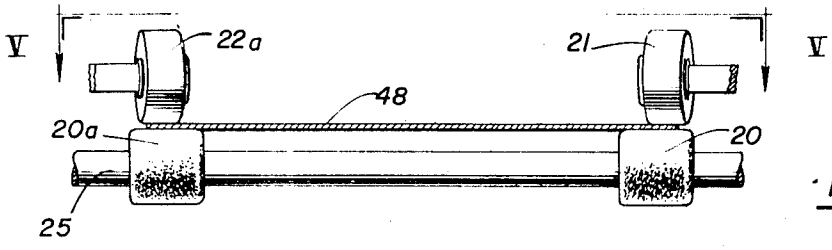


FIG. 4

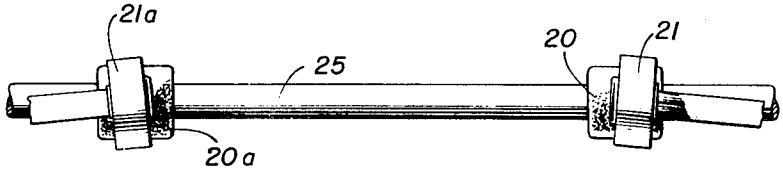


FIG. 5

RECORDER

BACKGROUND OF THE INVENTION

It is well known in the communications field to transmit visual information by use of an electrical signal whose intensity is modulated. A chemically treated web of paper is passed between scanning electrodes on which the signal is impressed. In the most practical arrangements, the chemical is in liquid form and the web is impregnated with it. One of the important factors governing the resultant visual image on the web is the tension in the web as it passes through the marking means. Not only is it important that the web be under a constant, predetermined longitudinal tension, but a lateral tension is also desirable. In the past, the web has been pulled through the recording area by driven rolls at the downstream end of the strip or web. The back pull was provided by placing the roll on a core with shafts located accurately in sockets formed in the recorder housing. Resistance to rotation about the axis provided by these shafts was provided by a friction member engaging either the shaft or the roll itself to provide a resistance to rotation of the roll. In the case of the friction member which engages the shaft, the reduction of the diameter of the roll as the paper is used produces a substantial change in the back pull on the strip and, therefore, in the tension in the web at the marking point. In the case where the friction member engages the roll itself, the usual practice was to have it engage the cylindrical surface of the roll; this resulted in the same problem of variation of tension with reduction of roll diameter. Furthermore, when the roll approached the end, it was necessary to replace it before the paper was completely used, since no back tension existed in the free end, and recording could not take place on a slack web. This resulted in a waste of paper.

Another problem presented by this method of mounting the roll was that it was rather difficult for an unskilled person to change a roll. While this difficulty was of no great moment when the recorder was used in a meteorological laboratory or the like where the personnel were accustomed to handling mechanisms of some complexity, it does present a problem as the recorder becomes an accepted communications tool in a business office, where mechanically inept persons are called upon to operate the equipment. These and other difficulties experienced with the prior art devices have been obviated in a novel manner by the present invention.

It is, therefore, an outstanding object of the invention to provide a recorder in which the roll of treated paper may be easily renewed.

Another object of this invention is the provision of a recorder in which web tension at the point of recording is automatically maintained at a constant, predetermined value.

A further object of the present invention is the provision of a recorder in which web tension does not change as the diameter of the roll is reduced and the paper is maintained in a taut condition.

It is another object of the instant invention to provide a recorder in which the axis of rotation of the paper roll is not critical to web tension.

A still further object of the invention is the provision of a recorder in which lateral tension is maintained in the web to obviate wrinkles and other similar defects in the visual image.

It is a further object of the invention to provide a recorder in which the visibility of the finished image is substantially greater than in the prior art devices.

It is a still further object of the present invention to provide a recorder in which the definition of the finished image is improved, even when a high-moisture paper is used.

Another object of the invention is the provision of a recorder in which a high-moisture, tender recording paper can be used without damage to the paper.

A further object of the invention is to provide a recorder which may be used with a coreless roll of paper and in which the paper is automatically aligned.

A still further object of the invention is the provision of a recorder which is less expensive to manufacture because of the absence of support and drive means for the paper roll.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

SUMMARY OF THE INVENTION

In general, the invention has to do with a recorder for use with a roll of chemically treated paper, consisting of a housing with a cavity in which the roll is located and of a passage at one side of the cavity with a surface over which the paper passes in leaving the cavity with a resiliently biased member cooperating with the surface to produce a predetermined pressure on the paper. A marking means is provided through which the paper passes for the production of a visible image and motor-driven rollers engage the opposite surfaces of the paper to draw it from the roll, through the passage, and through the marking means at a constant tension.

BRIEF DESCRIPTION OF THE DRAWINGS

The character of the invention, however, may be best understood by reference to one of its structural forms, as illustrated by the accompanying drawings, in which:

FIG. 1 is a perspective view of a recorder embodying the principles of the present invention,

FIG. 2 is a view of the recorder with the cover open,

FIG. 3 is a vertical sectional view of the recorder taken on the line III—III of FIG. 1,

FIG. 4 is an inclined sectional view of the recorder taken on the line IV—IV of FIG. 3,

FIG. 5 is a view of the rollers taken along the line V—V of FIG. 4,

FIG. 6 is a sectional view of a portion of the recorder taken on the line VI—VI of FIG. 2, and

FIG. 7 is a view taken on the line VII—VII of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, wherein are best shown the general features of the invention, the recorder, indicated generally by the reference numeral **10**, is shown as consisting of a main housing **11** to which is fastened a cover **12**. The main body is provided with a bottom surface **13**, a vertical rear surface **14**, an upwardly and forwardly inclined top surface **15**, and an upwardly and forwardly inclined front surface **16**. It is also provided with an upwardly and rearwardly inclined front surface **17** against which the cover **12** lies and it is provided with vertical side surfaces **18**. The upper part of the cover **12** is provided with a window **19** within which can be seen rollers **21** and **21*a***. Overlying the window **19** and forming one edge thereof is a latch bar **22**.

FIG. 2 shows the recorder with the cover **12** in open, horizontal position. Located next to the side surface **18** of the main body is a recess **23** containing a drive transmission mechanism connected to a motor **22**. In the recess is a pinion gear **24** mounted on a horizontal shaft **25** on which are mounted rollers **20** and **20*a***. Underlying these rollers is a driven drum carrying a scanning electrode **28**. Located below the electrode **28** is a semicylindrical cavity **32** adapted to carry a roll R providing a web **48** of chemically treated paper. This paper is of the type used in facsimile recording and, therefore, carries chemicals which provide a visible trace when electrical current is passed through the paper from one electrode to another.

Located on the inside of the cover **12** is a recess **30** is a support plate **33** on which is mounted an electrode **34**. This electrode consists of a continuous band of metal provided with apertures **35** permitting it to be driven by a sprocket **36**. Located within the loop of the electrode **34** is a resilient pressure member **37**.

The cover **12** and its associated equipment is hingedly attached to the main body **11** by means of a horizontal hinge shaft **43**. The sprocket **36** and, therefore, the electrode **34** is driven through this hinge shaft by gearing. As is evident in FIGS. **2** and **3**, the paper-tension pressure member **37** extends

at a substantial angle to the plate 33, but is attached thereto in such a way as to have a resilient action relative to the plate. The plate 33 is provided with a movable plate 59 (see FIG. 3) which carries the sprocket 36 and provides for adjustment.

Extending around the front surface 17 of the main body 11 is a ridge 26 formed integrally with the body; it consists of a lower portion 27 underlying the cavity 32, a side portion 29 extending upwardly from one end of the lower portion, and a side portion 31 extending upwardly from the other end of the lower portion. Extending inwardly from the upper end of the side portion 29 is a portion 38. A similarly inwardly extending portion 39 is associated with the upper end of the side portion 31. A flexible seal 41 extends between the inner ends of the portions 38 and 39. The lower portion 27, the side portions 29 and 31, the inwardly extending portions 38 and 39, and the flexible seal 41 form a rectangular figure within which lies the cavity 32 and the scanning electrode 28.

Associated with the inner surface of the cover 12 is a seal 42 consisting of a strip of elastomer material, such as Teflon, which engages the ridge 26 when the cover is closed. It is provided with a lower portion 44 which is approximately the same length as the lower portion 27 of the ridge 26 and is the same distance from the axis of the hinge shaft 43, so that the ridge embeds itself in the elastomer strip when the cover is closed. The seal 42 has a side portion 45 which engages the side portion 31 of the ridge; it also has a side portion 46 which contacts the side portion 29. Finally, the seal 42 has an upper portion 47 which extends across the inner surface of the cover 12 from the side portion 45 to the side portion 46 on a narrow dividing wall between the window 19 and the recess 30 in which the support plate 33 lies. Generally speaking, the seal 42 is rectangular and extends around the edge of the recess 30.

The cavity 32 is of a generally semicircular cross section and has a smooth surface. Neither the end surfaces or the curved intermediate surfaces have protrusions or edges that would inhibit free rotation of the roll R and the advance of the web 48. The rollers 20 and 20*a* are made of an elastomer material and are driven by the gear 24 and the shaft 25 and are of cylindrical shape. The rolls 21 and 21*a* are similarly shaped and made of an elastomer material, but are mounted for free rotation on shafts whose axes are angularly related to the axis of the shaft 25. The shaft angles are selected such that the surfaces cooperate not only to pull the web longitudinally but also feed it laterally to stretch it tightly. A toeing out of the nondriven rollers 21 and 21*a* produces this effect. The wall of the housing between the cavity 32 and the recess in which the recording drum lies is provided with a flat upper surface 49, and on this surface is fastened a bar 50 having an outwardly directed convex surface against which a similarly shaped surface of the pressure member 37 would rest if the web 48 were not interposed. Fastened to the wall in the drum recess is a limit switch 51. This switch has a sensitive, low-pressure actuating finger which contacts the undersurface of the web. In the absence of the web, the switch is in such a mode that the recorder is inhibited from operation.

The operation of the apparatus will now be readily understood in view of the above description. In setting up the recorder, the roll R of sensitized paper is placed in the recess 32 (see FIG. 3). The web 48 is laid between the bar 50 and the pressure member 37, over the scanning electrode 28, through the rollers, and over the back surface 15 of the main body 11. The cover 12 is then closed, the fingers associated with the latch 22 snapping into recesses in the main body to hold it in place. When the motor 22 is energized, the electrodes 28 and 34 and the rollers 20 and 20*a* are driven. The flow of electricity from the electrode 28 to the electrode 34 produces a visible message or diagram on the surface of the paper. Eventually, the paper is moved upwardly by the action of the rollers 20 and 20*a* cooperating with the rollers 21 and 21*a* in the cover, so that the message is exposed in the window 19.

The web 48 leaves the cavity 32 and passes between the electrodes 28 and 34 for recording. Back tension is produced because of the constant-value friction of the bar 50 and the pressure member 37. The pressure member 37 operates on the web between the roll R and the electrodes. The web passes between the upper portion 47 of the seal 42 on the cover and the resilient seal 41 on the main body as it passes from the electrodes to the rollers.

It can be seen that the unwinding of the roll R as the web 48 is advanced takes place with very little friction. The back pull on the web is produced almost entirely by the friction of the bar 50 and the pressure member 37; this friction remains constant irrespective of time and change of paper roll diameter. The rollers which produce the forward pull also pull sideways on the edges of the web and serve to align the web as it passes between the marking electrodes. The lateral tension also smooths out any wrinkles or looseness that might otherwise prevent the production of an image with good definition. The same back tension exists in the web even when the back end of the paper strip has left the roll, i.e., when the coreless roll has been reduced to zero or only a cardboard sleeve remains. When the rear end of the web leaves the passage between the bar 50 and the pressure member 37, the tension in the web no longer exists and the actuating finger of the switch 51 moves upwardly, changing the mode of the switch, and shutting down the recorder. Placing a new roll in the recorder in the machine is very simple, since it is only necessary to drop the new roll R into the cavity 32, pull the web out across the bar 50, the recording drum, and the rollers 20 and 20*a;* the cover 12 is then snapped shut and the recording continues. The fact that there is no need for shafts, drive gear, and the like for the roll means that the recorder can be manufactured at less cost without sacrificing quality of recording. The fact that stub shafts 21 and 21*a* are used leads to better visibility in the window 19; it is no longer necessary to pull the web out of the recorder (with consequent waste of paper) to see the image. Because the roll R can lie in the cavity loosely and in any chance aspect without affecting the feeding and alignment of the web as it passes through the recording area, the former high cost of assuring that the paper roll shaft axis and the feed roll axis are exactly parallel is removed. This tends to permit fabrication by relatively inexpensive unskilled labor, rather than toolroom technicians.

FIGS. 6 and 7 show the details of the mounting of the nondriven rollers. The roller 21*a* is rotatably mounted on a shaft 52 extending from one end of a bar 53. The central portion of the bar extends through an aperture in a wall 54 which extends across a recess 55 in the cover 12. The bar fits loosely in and is guided by the sidewalls of the recess and these walls are inclined to the axis of the drum 28, so that the roller 21*a* toes outwardly. A spring 56 maintains the bar 53 and the roller 21*a* in a position outwardly of the window 19 when the cover is open, i.e., as shown in FIG. 2. However, when the cover is closed, a finger 57 strikes the surface of the housing and presses the bar inwardly against the pressure of the spring 56, thus throwing the roller 21*a* inwardly of the window 19 and against the roller 20*a*.

It is obvious that minor changes may be made in the form and construction of the invention without departing from the material spirit thereof. It is not, however, desired to confine the invention to the exact form herein shown and described, but it is desired to include all such as properly come within the scope claimed.

The invention having been thus described, what is claimed as new and desired to secure by Letters Patent is:

1. A recorder for use with a roll of recording paper, comprising

a. a housing having a cavity in which the roll rests, the cavity being of a generally semicircular cross-sectional shape with a smooth surface so that the roll is free to lie in various degrees of alignment and to rotate freely,

b. a passage at one side of the cavity having a surface over which the paper passes in leaving the cavity and a resilient member cooperating with the surface to produce a predetermined pressure on the paper, the passage lying

between a wall on the one hand and a smooth pressure plate on the other hand, the wall having a convex cylindrical surface to engage one surface of the paper, while the plate has a curved portion for engaging the other side of the paper,

c. marking means through which the paper passes for the production of a visible image, and

d. driven rollers engaging opposite surfaces of the paper to draw it from the roll, through the passage, and through the marking means.

2. A recorder as recited in claim 1, wherein the marking means includes a drum having a helical blade engaging one surface of the paper and a blade engaging the other surface of the paper.

3. A recorder as recited in claim 1, wherein the rollers are of cylindrical form and pull on opposite edges of the strip both forwardly and laterally to produce tautness in the web at the said marking means.

4. A recorder as recited in claim 3, wherein the rollers are mounted in opposed pairs with their axes angularly related.

5. A recorder as recited in claim 1, wherein the roll of paper is provided with no positive connection to the recess for driving or rotation.

6. A recorder as recited in claim 4, wherein the rollers at the inside of the paper are keyed to a driven shaft and are concentric with each other and with the shaft, while the rollers at the outer side of the paper are rotatably mounted on independent shafts, each independent shaft being inclined at a substantial angle to the axis of the said driven shaft, wherein each independent shaft is hingedly mounted in the housing for selective movement of its roller toward and away from the driven shaft, and wherein a spring engages each independent shaft to bias it toward the driven shaft.