

July 6, 1948.

R. J. WISE ET AL

2,444,484

FACSIMILE TELEGRAPH SIGNAL RECORDER

Filed Aug. 5, 1944

FIG. 1

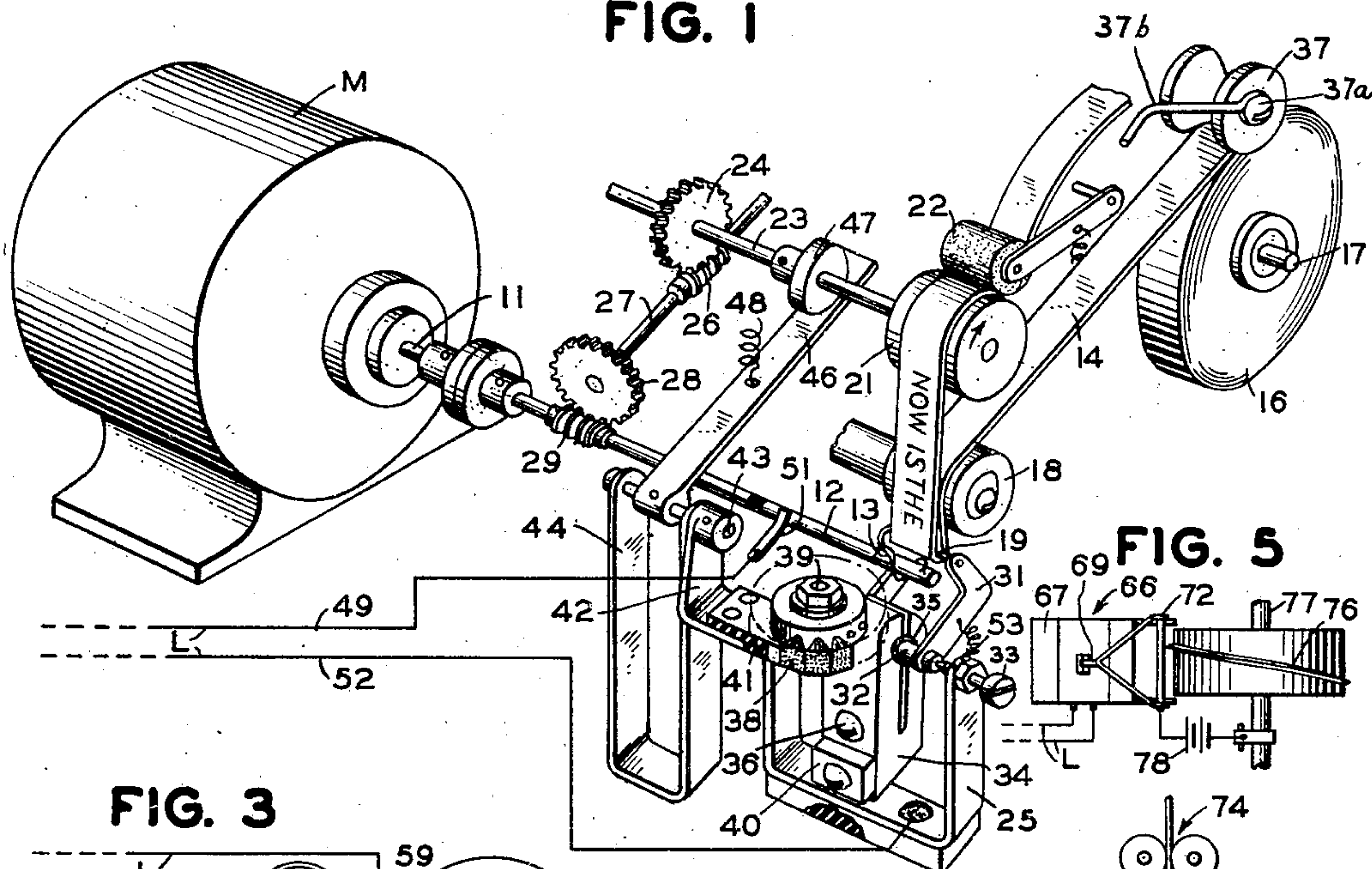


FIG. 5

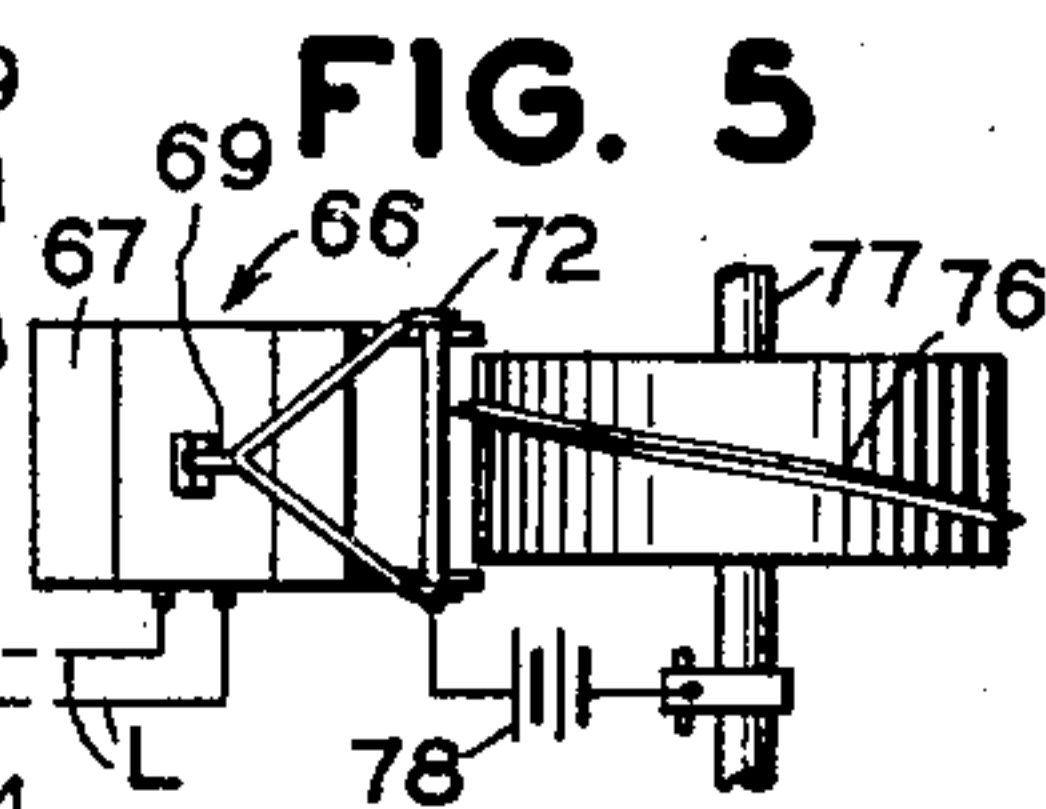


FIG. 3

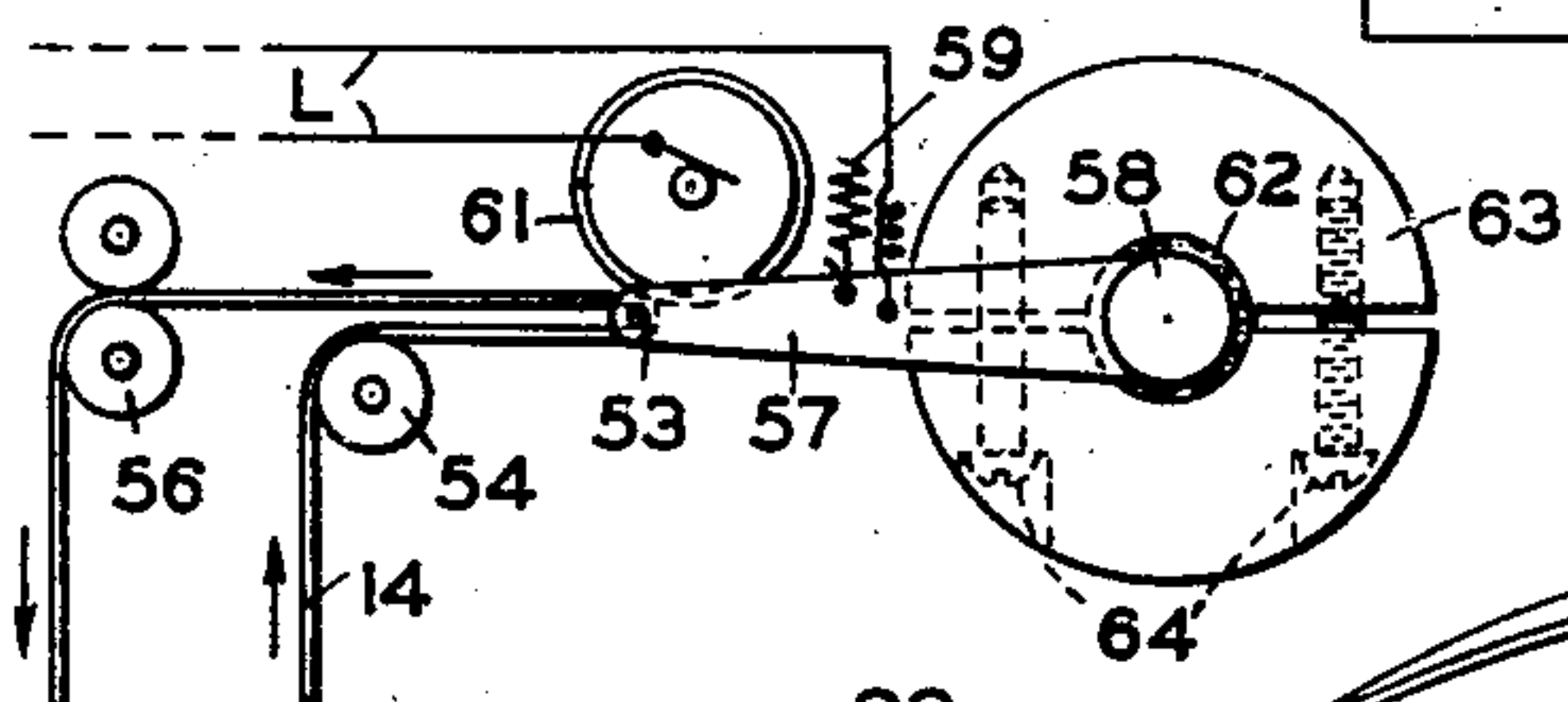


FIG. 4

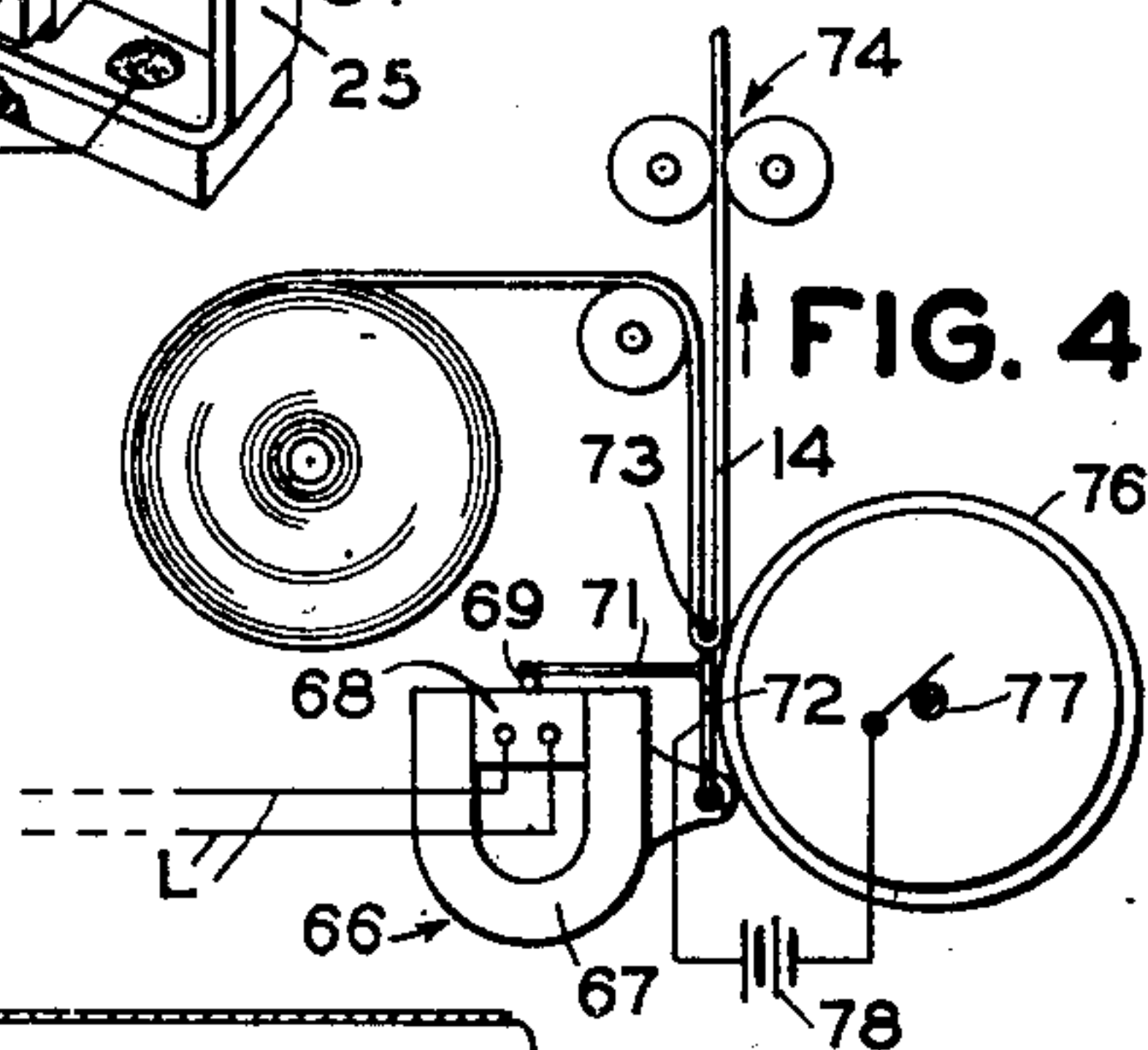


FIG. 2

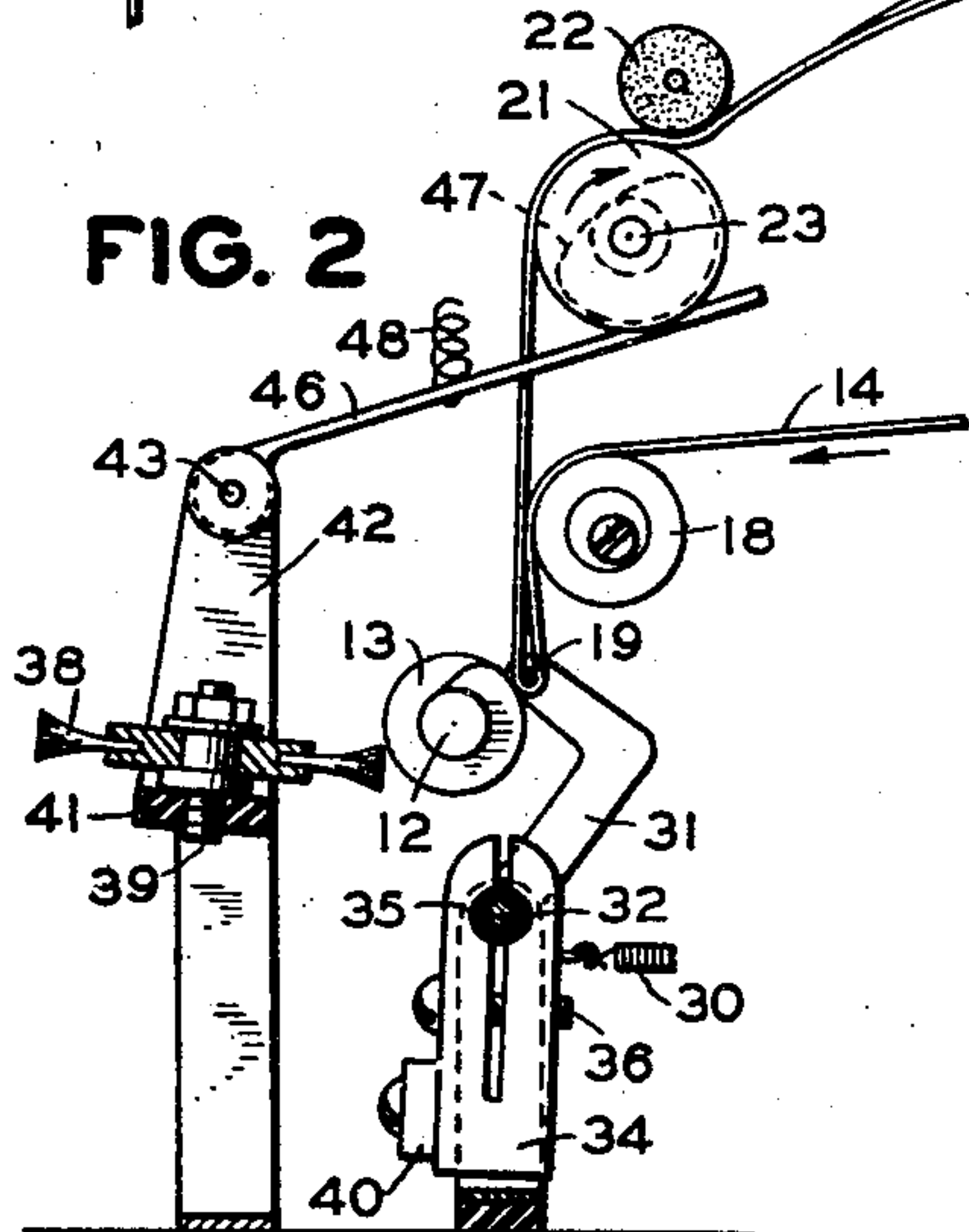
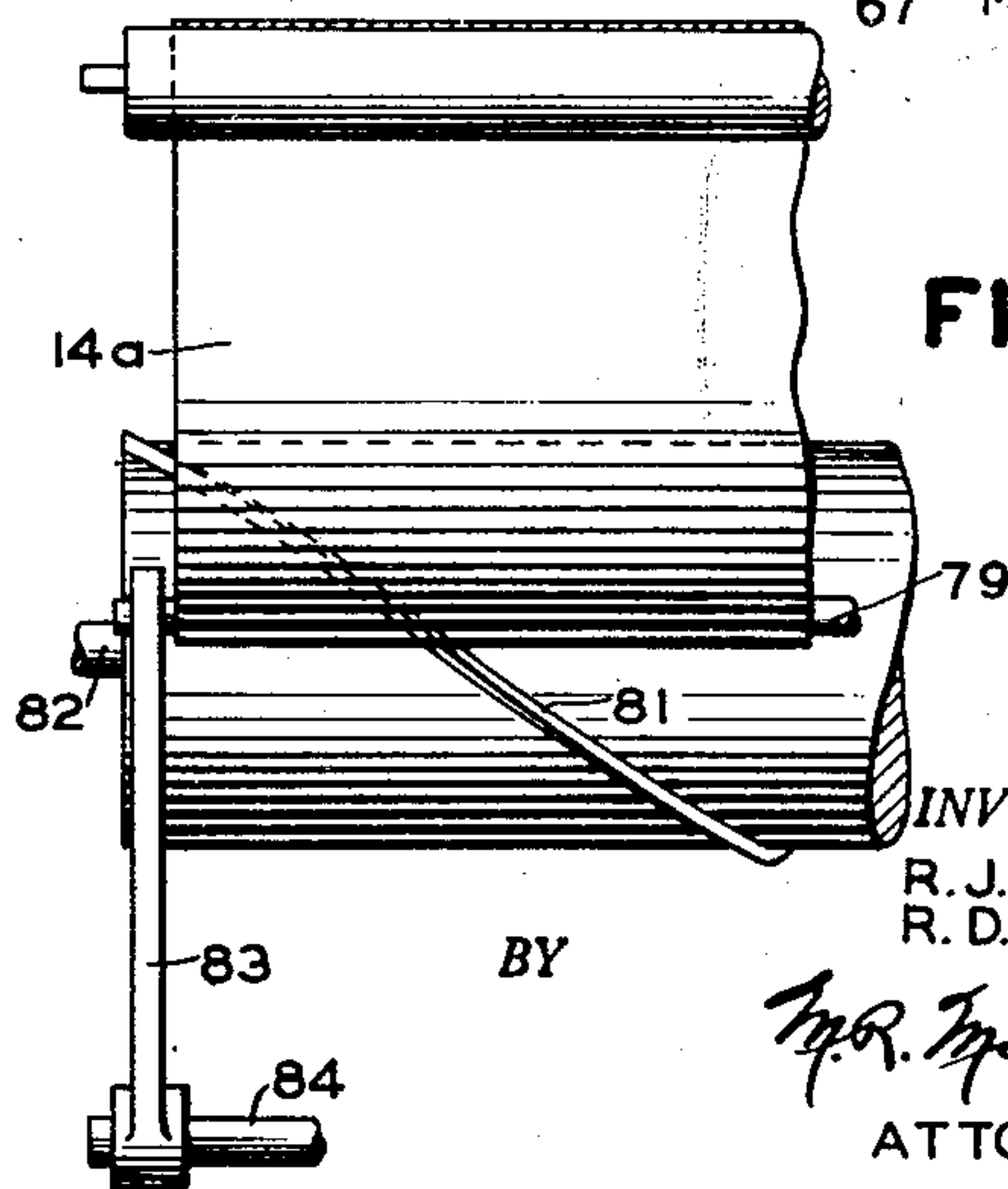


FIG. 6



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FACSIMILE TELEGRAPH SIGNAL
RECORDER

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Application August 5, 1944, Serial No. 548,194

8 Claims. (Cl. 234—68)

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This invention relates to facsimile receivers or recording mechanisms adapted to record facsimile signals on a record receiving medium.

An object of the present invention is to provide a simple, efficient and relatively cheap facsimile telegraph receiver employing a rotatable helix as the scanning member and adapted to record received facsimile signals on a record receiving strip of the type that marks or changes color on the passage of electrical current there-through.

A further object of the present invention resides in the provision of means for presenting the record receiving medium to the recording member, such as the helix, at a relatively sharp angle. This arrangement enables the successive scanned lines to be relatively close and the reproduced subject matter to have sharp and clear definition.

In facsimile recorders of the above type, variations in pressure of the record receiving medium against the recording helix may adversely affect the reproduction. If the paper presses against the helix with too much pressure, the helix is apt to scuff or mechanically injure the paper, whereas if there is not sufficient pressure to establish good electrical contact between the paper and the helix, there may be a loss of signals and the receiver fail to produce a recording. In this connection it is a further object of the present invention to provide an arrangement whereby an electrosensitive record receiving medium is held in contact with the recording helix by a substantially uniform pressure and wherein any tension on the record receiving medium employed to advance the same does not appreciably vary the pressure with which the medium engages the helix.

A further object of the invention resides in the provision of means for maintaining the record receiving medium constantly in engagement with the recording helix in such a manner as to compensate for any irregularities in the helix and to dampen movements of the record receiving medium supporting member that might be caused by irregularities in the helix which would tend to set up vibrations therein.

In facsimile recorders of the above type wherein a recording helix directly contacts the record receiving medium, a certain amount of dirt and paper dust is apt to accumulate on the edges of the helix and if permitted to remain may adversely affect the recording. In this connection, another object of the invention is to provide means whereby the recording helix is cleaned by the removal

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of any dust or dirt thereon. The cleaning of the helix in the preferred embodiment of the invention is arranged to occur during recording without affecting the same.

- 5 In facsimile machines of the type wherein the facsimile signals are applied directly to the scanning helix to cause the recording on electrosensitive record receiving paper, a relatively strong signal is required to break down the electrical resistance of the paper and cause a mark thereon. 10 In this connection, a still further object of the invention, in accordance with a modification thereof, is to provide an arrangement whereby the received facsimile signals are effective to 15 move an electrosensitive record receiving paper or medium into and out of engagement with a scanning helix which may have a uniform and steady marking potential applied thereto whereby a mark is produced on the paper only when in 20 contact with the helix. At all other times no marking of the paper is effected.

The above and further objects and advantages of the present invention will be more apparent in the following detailed description wherein reference is made to the accompanying drawings, in which:

Fig. 1 is a perspective view showing the principal components of a facsimile recording mechanism arranged in accordance with the present invention;

Fig. 2 is a side elevational view of certain of the elements of Fig. 1;

Fig. 3 is a side elevational view of a modified arrangement of a helix and record receiving medium supporting member;

Fig. 4 is a modification of the invention wherein the received facsimile signals are effective to selectively move the record receiving medium into and out of engagement with a scanning helix which may have a steady marking potential applied thereto;

Fig. 5 is an elevational view of the elements of Fig. 4; and

Fig. 6 is a view showing the principles of the invention as applied to a page recording facsimile machine.

Referring to Fig. 1, a motor M with shaft 11 has coupled thereto a helix driving shaft 12. To the forward end of the shaft 12 is fixed a helix 13 which is adapted to be continuously rotated from the electric motor M. The motor M is assumed to rotate at such a speed that the scanning performed by the helix 13 is in synchronism with the scanning at the facsimile transmitting machine and may be effected by any

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one of a number of well-known synchronizing arrangements.

The record receiving medium or strip indicated generally by reference numeral 14 employed in conjunction with the mechanism of the present invention may be of the type disclosed in U. S. Patent No. 2,294,146, issued to R. J. Wise August 25, 1942. Such a record receiving medium or paper is adapted to mark or change color on the passage of electric current therethrough, and although the invention is shown in Fig. 1 as employing a relatively narrow strip as the record receiving medium 14, the principles of the invention can equally well be applied to a facsimile recorder employing a wide recording strip or web, or of the type that is known as a page recorder illustrated in Fig. 6.

As shown in Figs 1 and 2, the record receiving medium 14 is supplied from a roll 16 supported on a spindle 17, and as the strip advances from the roll it passes over an eccentrically or adjustably mounted roller 18. The strip in leaving the roller 18 passes downwardly around a small rod 19, hereinafter referred to as the printing member, platen or rod, and then back in the opposite direction to a feed wheel 21. The strip is held in frictional engagement with the feed wheel 21 by means of a spring-pressed roller 22 so that as the feed wheel 21 rotates the strip 14 is advanced. The feed wheel 21 is fixed to a shaft 23 which also has fixed thereto a gear 24, Fig. 1. Engaging the gear 24 is a worm gear 26 on a shaft 27 which also has a gear 28 in mesh with a second worm 29 on the shaft 12. Through the above-described gearing arrangement the feed wheel 21 is arranged to be rotated from the shaft 12 to advance the record receiving strip 14.

The printing rod 19 is carried at the free ends of a pair of arms 31 which are secured at their opposite ends to a pivot rod 32. The pivot rod 32 is supported in trunnion screws such as 33 in the upper ends of a mounting bracket 25. Adjustably secured to the pivot rod 32 over a sleeve of resilient material 35, such as rubber, by a clamping screw 36 is a counter-weight 34. The counter-weight 34 balances the arms 31 and rod 19 so that any tilting of the receiver will not vary the pressure of the record receiving strip 14 and rod 19 against the spiral 13. A light spring such as 30, however, may be attached to the weight 34 and/or the weight may be given a slight unbalance by adding thereto other small weights such as 40 at an angle to produce the light normal pressure required between the paper and the spiral. The weight 34 being mounted on the resilient sleeve 35 dampens any tendency of the printing rod 19 and arms 31 to bounce or vibrate.

In order to prevent the tension developed in the strip 14 by the feed wheel 21 from varying the pressure with which the paper bears against the helix 13, the feed wheel 21 and the guide roller 18 are so arranged that the strip, in moving to and from the printing rod 19, moves in a plane substantially common or parallel to the plane of the rod 19 and its pivot 32. With this arrangement any tension in the strip either before and/or after it passes around the printing rod 19 does not tend to increase or decrease the pressure with which the paper bears against the helix. Accordingly, the pressure of the paper against the helix may be controlled within relatively narrow limits as determined by the amount of the weight 40 and/or the spring 30.

The printing rod 19 is of relatively small diam-

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eter so that the paper engages the helix 13 at a relatively sharp angle, and this enables the scanning lines effected by the helix to be relatively close together and extremely fine. To insure that the strip 14 follows the contour of the printing rod 19, a slight drag on the strip as it unwinds from the spool 16 is created by means of the weighted roller 37, Fig. 1. The roller 37 is pivotally mounted on a screw 37a carried in the free end of a rod 37b which is pivotally supported at its other end in the frame of the machine (not shown). In addition to the drag created by the roller, the eccentrically mounted guide roller 18 may be positioned so that the strip in passing downwardly over the same engages and rubs against the strip as it moves upwardly after passing around the printing rod 19. The rubbing of the two sections of the strip 14 together also tends to remove any foreign material or dust from the under side thereof which might adversely affect the recording. Dust or other foreign material on the recording strip 14 might increase the electrical resistance of the strip and prevent the signals from being recorded.

On the opposite side of the helix 13 from the printing rod 19 is located a wire brush 38 pivotally supported on a substantially vertical pin 39. The pin 39 is in turn supported in a piece of insulating material 41 carried in the free end of an arm 42 secured at its other end to a rod 43. The rod 43 is mounted in a bracket 44 and has secured thereto an operating arm 46. The free end of the arm engages a cam 47 secured for rotation therewith to the shaft 23. As the shaft 23 rotates in addition to causing advancement of the strip 14 it, through the cam 47 thereon and in conjunction with a spring 48 attached to the lever 46, effects rocking of the rod 43 to swing the brush 38 into and out of engagement with the helix 13. Thus the brush 38 periodically engaging the helix 13 is effective to brush off any dirt or foreign material that might accumulate thereon and thereby insures that the helix is maintained in proper condition. Since the brush 38 is insulatively mounted with respect to the other elements of the machine, there is no short circuit established thereby as the same contacts the helix, and the brushing action can therefore occur during recording.

A brush 51 bears against the shaft 12 and in conjunction with a conductor 49 establishes an electrical circuit between the helix 13 and one of the conductors of the line L. The other conductor of line L is connected by a conductor 52 to the insulatively supported bracket 25, and then by some suitable means, such as a light flexible wire 53, to one of the printing rod supporting arms 31 and the printing rod 19. Accordingly, the establishment of a potential difference between the printing rod 19 and the helix 13 causes a mark to be produced on the electrosensitive record receiving strip 14. The helix 13 during rotation thereof scans successive lines on the strip as the latter advances, and recording is effected on the strip in accordance with the received signals.

In Fig. 3 a modification of the recording elements is shown wherein the record receiving strip 14 is moved toward and away from the printing rod 53 in substantially horizontal paths. The strip is guided over a roller 54, from whence it passes to a printing rod 53 and then to the feed wheel 56. The printing rod 53 in the modification shown in Fig. 3 is supported in substantially horizontal arms such as 57 fixed to a shaft 58

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supported by suitable means (not shown). A relatively light spring 59, preferably adjustable, or other suitable resilient means is provided and urges the printing rod 53 and the paper thereon against the recording helix 61 with a light normal pressure. Secured to the shaft 58 over a sleeve of resilient material 62, such as rubber, is a split cylindrical weight 63. The weight 63 is formed in two halves and clamped together by means of clamping screws such as 64.

The weight 63, being resiliently secured by means of the resilient sleeve 62 to the shaft 58, dampens any vibratory action that may be produced at the printing rod 53 by irregularities in the helix 61 or any other means and insures good contact of the recording strip 14 with the record receiving helix at all times. The line signals received over the line L may be applied to the helix and to the printing rod 53 in the manner shown.

In Figs. 4 and 5 another modification of the invention is shown wherein the line signals received over the line L are applied to an electro-responsive device 66 including a permanent magnet 67 and an actuating coil 68. A movable armature 69 of the electro-responsive device 66 is attached by means of a link 71 to a bail 72 which carries in the upper end thereof a printing rod 73. The bail 72 is pivoted at its lower end, and the record receiving strip 14 is arranged to pass down around the printing rod 73 and up through the advancing unit 74. In this arrangement the paths of the strip 14 in moving toward and away from the printing rod 73 are in planes substantially parallel to the plane of the printing rod and the mounting point of the bail 72. Accordingly, any tension developed in the strip 14 by the advancing means 74 has little or no effect in pivoting or preventing pivoting movement of the bail 72.

In operative relation with the printing rod 73 is a helix 76 mounted on a shaft 77 and arranged to rotate in synchronism with the received signals under the control of synchronizing arrangements well known in the art. One polarity of potential is applied through suitable electrical connections to the helix from a battery 78 and another to the printing rod supporting bail 72 so that, when the bail is moved to press the paper thereon against the helix, the battery 78 will cause a mark to be produced on the paper. When the bail 72 moves the paper out of contact with the helix 76, no mark is produced on the paper, and thus the line signals which control the movement of the bail 73 and paper 14 into and out of contact with the helix cause recordings on the paper corresponding to received signals.

With the arrangement of Figs. 4 and 5, recordings on the paper strip 14 may be effected in response to signals received over the line L which might otherwise be of insufficient strength to break down the electrical resistance of the strip if employed in a receiving mechanism of the type disclosed in Figs. 1, 2 and 3, since less signal strength is required to operate the electro-sensitive device 66 than to break down the electrical resistance of the record receiving strip 14.

In Fig. 6 the principles of the invention are shown applied to a recording unit wherein a record receiving strip of considerable and greater width than the tape disclosed in the other figures is employed. In this arrangement the same principles of operation apply, and the record receiving medium 14a is arranged to pass over a printing rod 79 in much the same manner as disclosed

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in Figs. 2 and 4. The printing rod 79 has associated therewith a helix 81 mounted on a shaft 82 whereby the helix scans a transverse line on the record receiving web 14a for each revolution thereof. The printing rod 79 of Fig. 6 is supported by arms such as 83 pivotally supported on a rod 84, and the received signals may be applied directly to the rod 79 and helix 81 in the manner illustrated in Figs. 1 and 3, or signals may be employed to operate an electro-responsive device such as 66 of Fig. 4 to move the printing rod 79, Fig. 6, into and out of engagement with the helix 81. In the latter case, steady marking potential would be applied to the helix and the printing rod 79 in the manner illustrated in Fig. 4.

It will be obvious that various other modifications of the invention other than those shown and described herein may be made without departing from the spirit or essential attributes thereof, and it is desired, therefore, that only such limitations be placed thereon as are imposed by the prior art or are specifically set forth in the appended claims.

What is claimed is:

1. In a facsimile recording apparatus, means for supporting an electrosensitive record receiving medium, a record receiving medium advancing means, a rotatable member with a helical ridge extending around the axis of rotation thereof, a rod supported on an axis substantially parallel to the axis of rotation of said helical ridge carrying member and movable toward and away from said ridge in a path substantially radially with respect thereto at said ridge, said record receiving medium being arranged to pass between said rod and said helical ridge in moving from the source of supply thereof to said advancing means, means including said rod for pressing the record receiving medium into contact with said helical ridge whereby successive lines thereon are scanned and marked in accordance with received facsimile signals by said ridge as the same rotates and said medium is advanced, and means for guiding said medium to and from said rod, the rod and the axis of support thereof and said guiding means being in substantial alignment, said rod being between the axis of support therefor and said guiding means whereby the tension produced in the direction of the length in said medium by said advancing means has substantially no effect in varying the pressure of said medium against said ridge.

2. In a facsimile recording apparatus, means for supporting an electrosensitive record receiving medium, a record receiving medium advancing means, a rotatable member with a helix extending around the axis of rotation thereof, a rod substantially parallel to the axis of rotation of said helix carrying member, said rod being supported on an axis remote therefrom and movable toward and away from said ridge in a path substantially radially with respect thereto at said ridge, said record receiving medium being arranged to pass between said rod and helix in moving from the source of supply thereof to said advancing means, an electro-responsive means operative in response to received facsimile signals to move said rod and press a section of the record receiving medium in contact therewith against said helix, whereby as said helix rotates and said medium advances successive parallel lines on said medium are scanned by said helix, means including a source of potential between said rod and said helix to mark said medium at the time the latter is in contact with said helix,

means for guiding said medium to and from said rod, said guiding means and said rod and the axis of support thereof being in substantial alignment, said rod being between the axis of support therefor and said guiding means whereby tension produced in said medium by said advancing means has substantially no effect on the movement of said rod and medium toward and away from said helix as controlled by said facsimile signal operated electroresponsive means.

3. In a facsimile recorder, means for supporting an electrosensitive record receiving strip, a rotatable member having a spiral ridge thereon, a printing rod for holding said strip in operative relation with said ridge whereby successive lines thereon are scanned as said ridge rotates and said strip advances, a shaft having fixed thereto and rotatable therewith supporting means for said rod whereby said rod is movable about the axis of said shaft, an eccentric weight adjustably secured to said shaft and means including the adjustment of said weight on said shaft relative to the printing rod supporting means for balancing said printing rod and said supporting means therefor.

4. In a facsimile recorder, means for supporting an electrosensitive record receiving strip, a rotatable member having a spiral ridge thereon, a printing rod for holding said strip in operative relation with said ridge whereby successive lines thereon are scanned as said ridge rotates and said strip advances, a shaft having fixed thereto supporting means for said rod whereby said rod is movable about the axis of said shaft, an inertia member on said shaft and resiliently secured thereto for limited rotative movement relative thereto and means including said inertia member for damping vibrations of said shaft and rod produced by movement of said printing rod.

5. In a facsimile recorder, a rotatable member having a spiral ridge thereon and a co-operating printing rod movable about an axis substantially parallel to the axis of rotation of said rotatable member, means for supporting an electrosensitive record receiving medium, means for advancing said medium between said spiral ridge and said printing rod, an adjustable weight movable with said rod, means including said adjustable weight for resiliently pressing said rod and said record receiving medium against said spiral ridge, and means for guiding said record receiving medium to and from said rod in planes such that the resolution of the tension forces in said medium produce substantially a zero component in a direction to vary pressure of said spiral ridge and said printing rod on said medium.

6. In a facsimile recording mechanism, means for supporting a record receiving web, a fixed record receiving web advancing means, a member with a spiral scanning ridge thereon rotat-

able about a fixed axis, a printing member movable about an axis remote from and substantially parallel to the axis of rotation of said spiral ridge for holding said web in point contact with said spiral ridge, said web being looped around said printing member and moving in substantially opposite directions in approaching and leaving said printing member, an adjustable member for guiding said web and located between said printing member and said advancing means, and means including said adjustable member for varying at least one of the paths of movement of said web toward and away from said printing member whereby tension produced in said web by said advancing means has substantially no effect on the pressure of said printing member and web against said spiral ridge.

7. In a facsimile recording mechanism, means for supporting an electrosensitive record receiving web, a rotatable member with a spiral scanning ridge thereon, a pressure rod for pressing said web against said spiral whereby the advancement of said web and rotation of said spiral effects line-by-line scanning of said web, a source of facsimile signals applied to said pressure rod and said spiral ridge for effecting recording on said web as said scanning proceeds, a spiral cleaning member for removing accumulations of foreign material therefrom and means for automatically moving said cleaning member into and out of operative relation with said spiral during the scanning of and recording on said web.

8. In a facsimile recording mechanism, means for supporting an electrosensitive record receiving web, a rotatable member with a spiral scanning ridge thereon, a pressure rod for pressing said web against said spiral whereby the advancement of said web and rotation of said spiral effects line-by-line scanning of said web, a source of facsimile signals applied to said pressure rod and said spiral ridge for effecting recording on said web as said scanning proceeds, an insulatively supported brush member, means for periodically moving said brush member into engagement with said spiral, and means including said brush member for removing foreign material from said spiral that may accumulate thereon incident to and during scanning of said web thereby.

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REFERENCES CITED

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

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