

June 25, 1940.

R. J. WISE

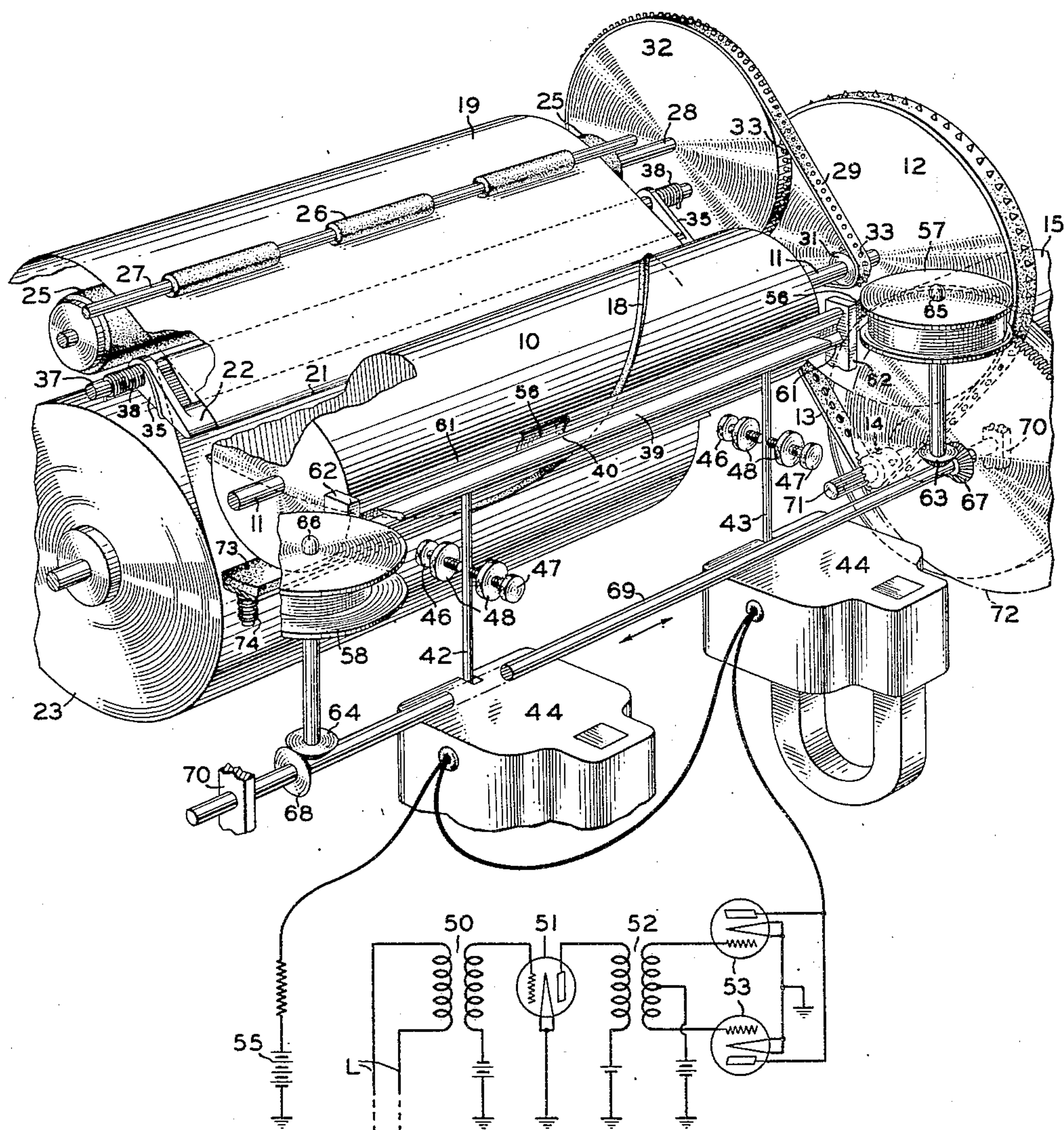
2,205,450

METHOD OF AND APPARATUS FOR RECORDING SIGNALS ELECTRICALLY

Filed June 29, 1938

4 Sheets-Sheet 1

FIG. 1



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4 Sheets-Sheet 2

FIG. 2

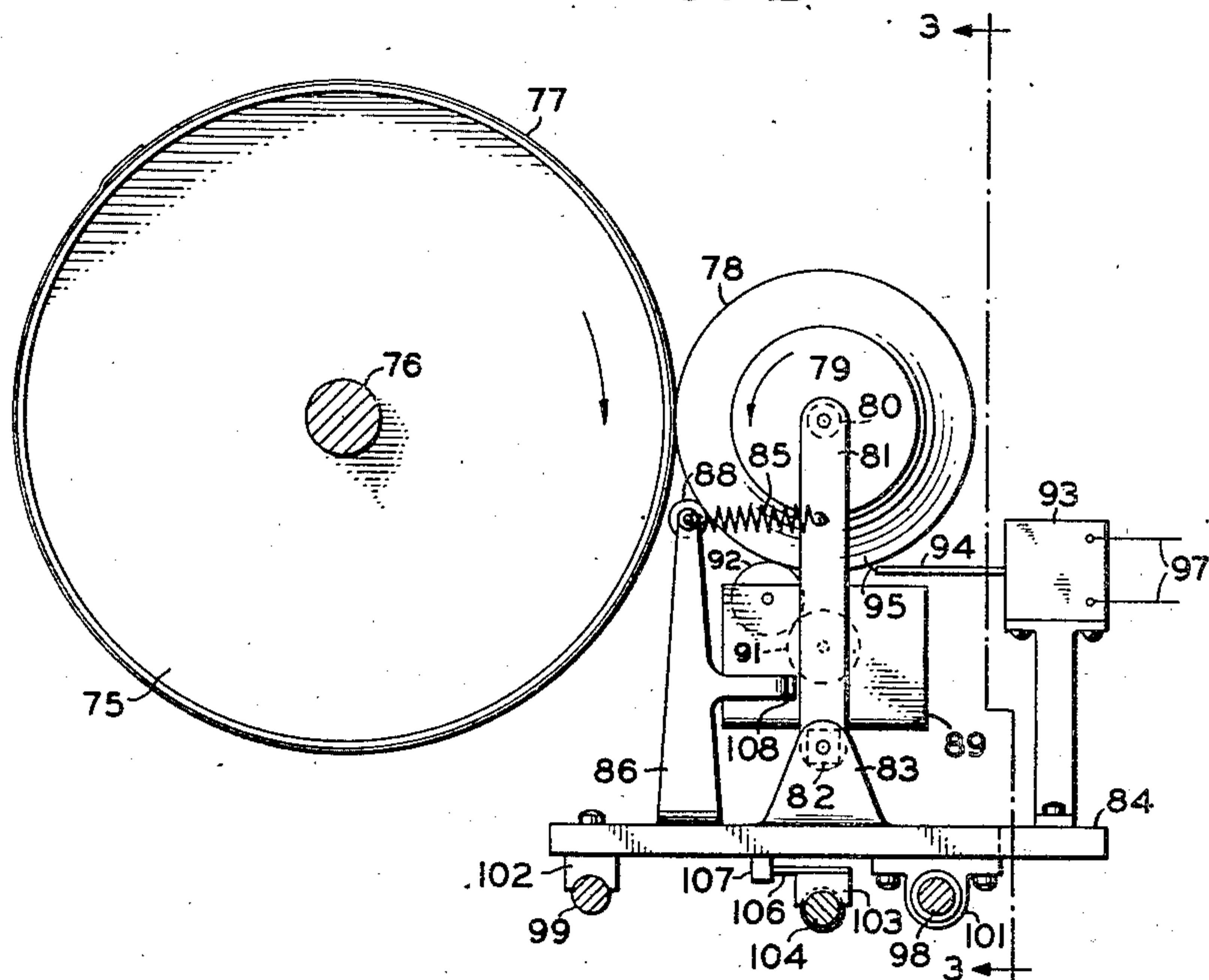
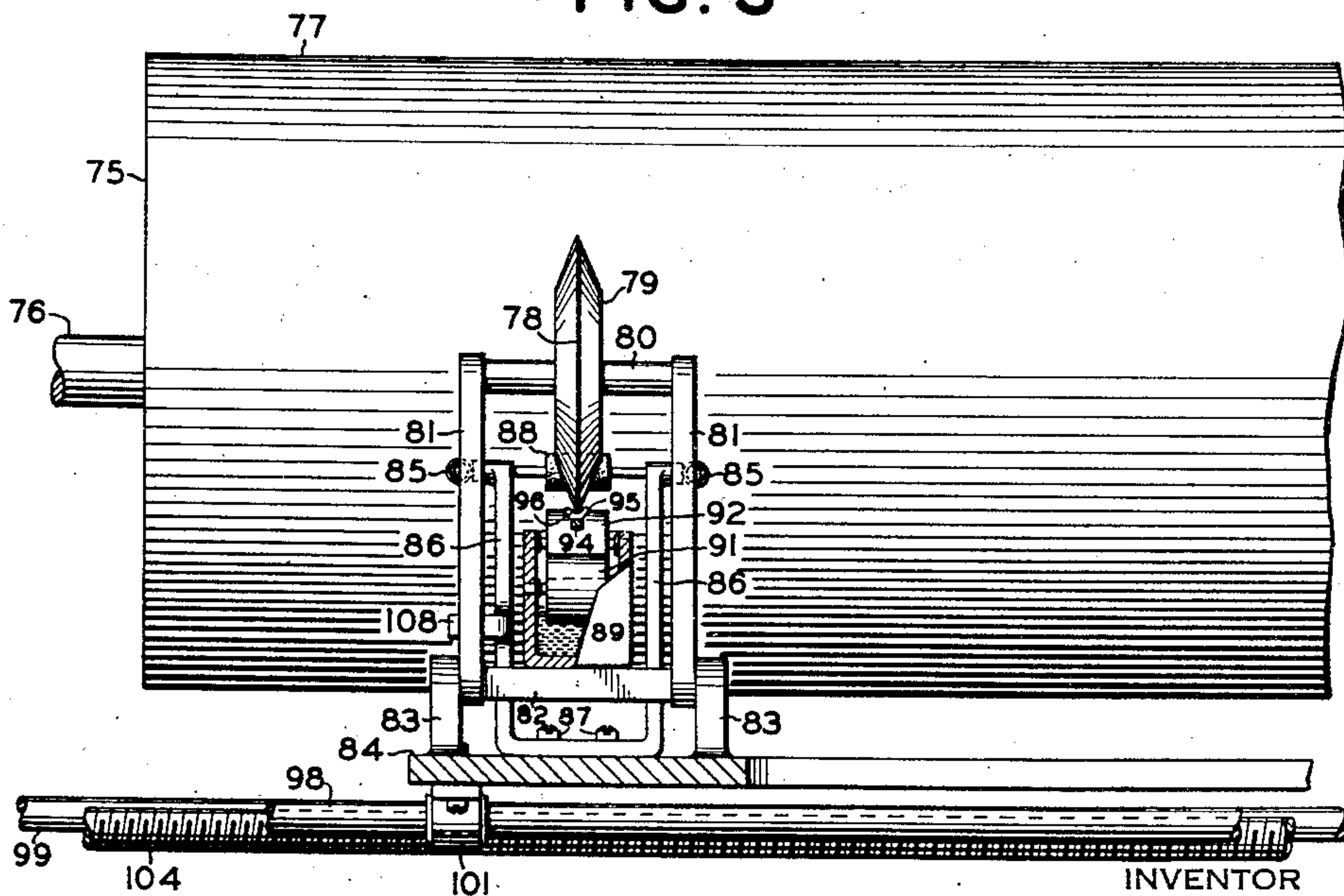


FIG. 3



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FIG. 4

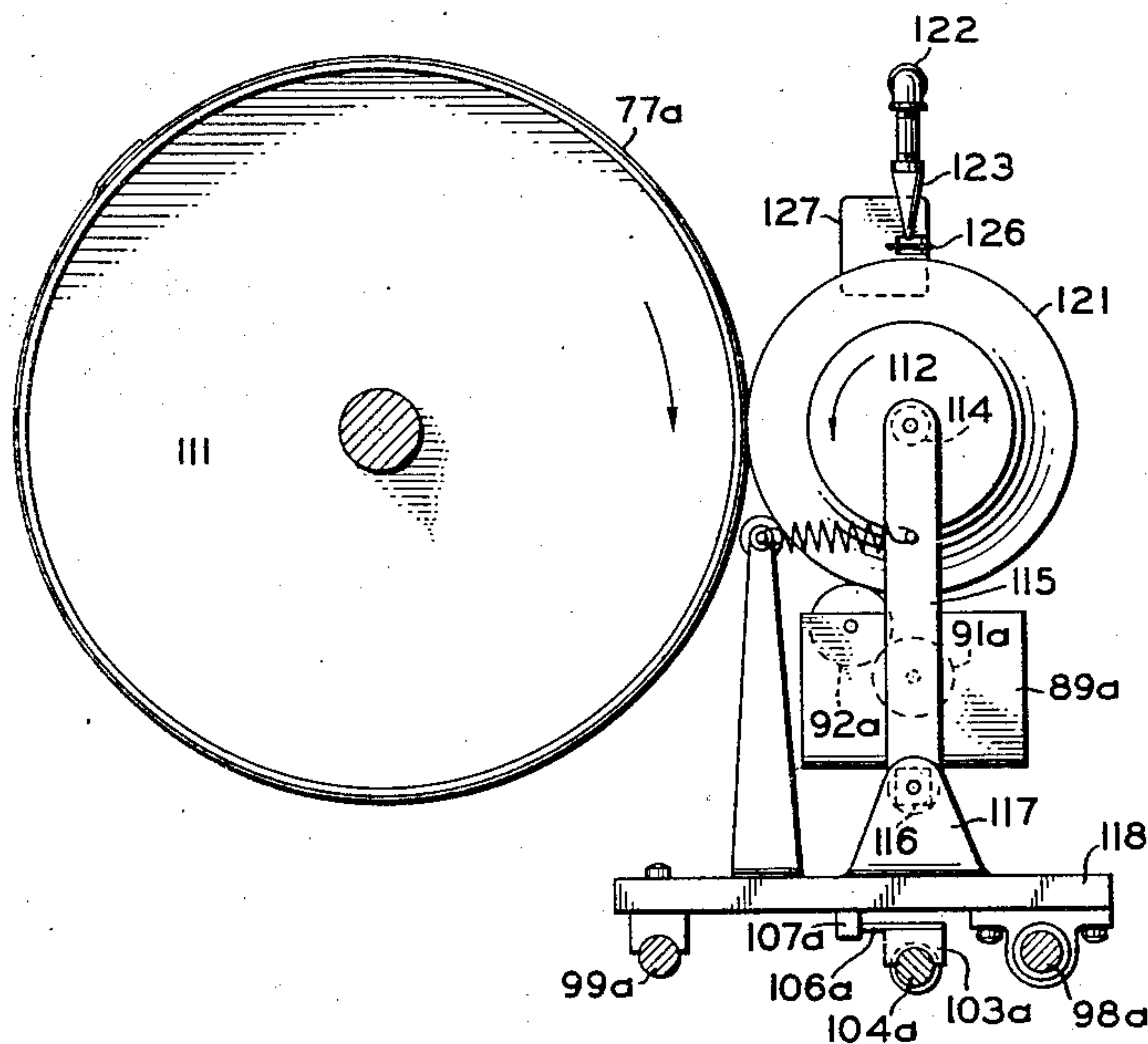
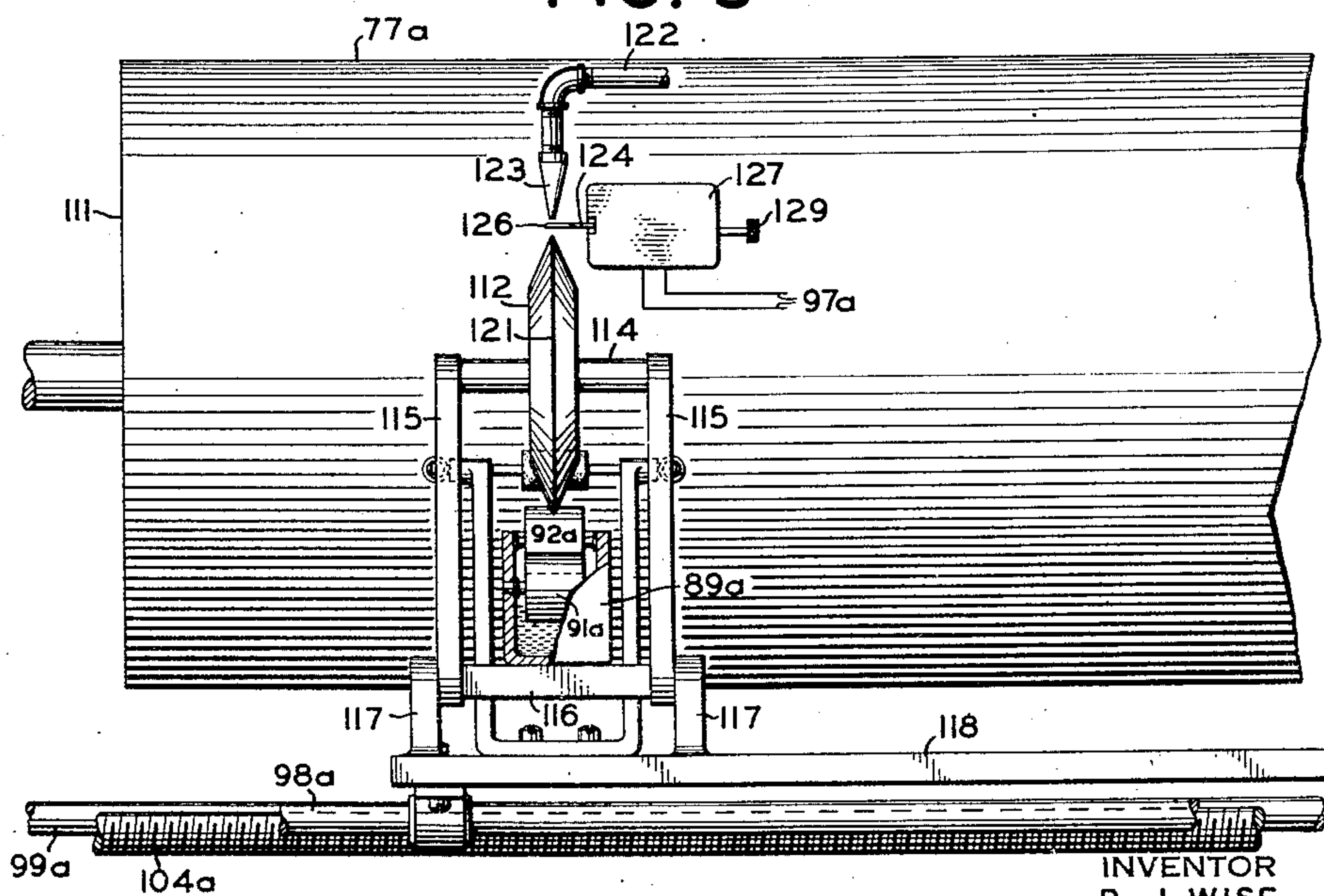


FIG. 5



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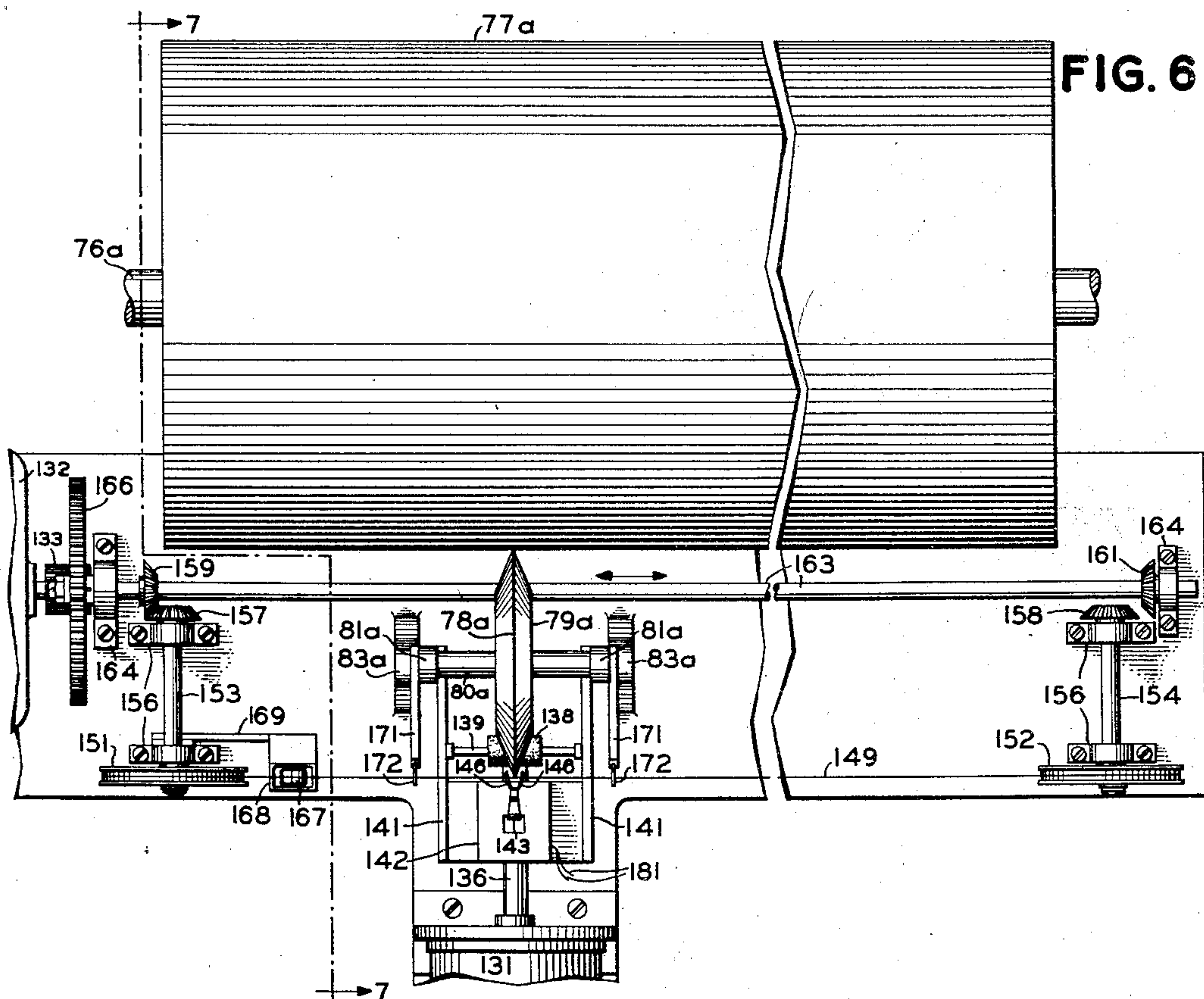


FIG. 6

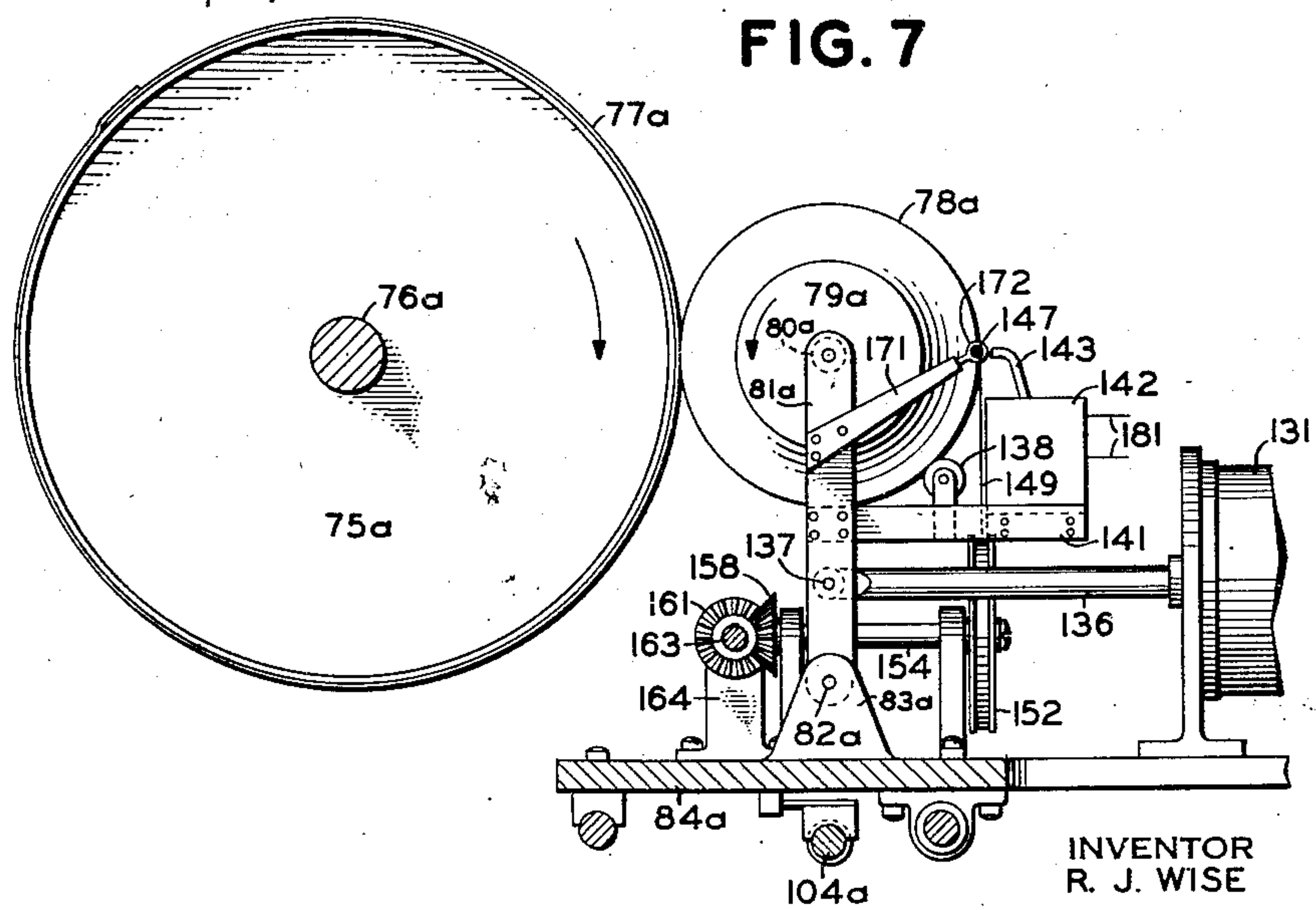


FIG. 7

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2,205,450

METHOD OF AND APPARATUS FOR RECORD-
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Western Union Telegraph Company, New York,
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Application June 29, 1938, Serial No. 216,455

18 Claims. (Cl. 178—11)

The present invention relates to the reception of pictures and other subject matter and more particularly to novel means for reproducing a facsimile of a transmitted picture or drawing.

5 In accordance with the invention a pattern of marking material representing received signals is deposited upon a transfer member and thereafter this pattern is transferred to the record sheet. Accordingly the primary object of the
10 present invention is to provide a facsimile receiver embodying means for marking a message sheet by a transfer method.

Another object of the present invention is to provide a novel paper-feeding means on a fac-
15 simile machine employing a transfer member of the helical type.

Still another object of the present invention is to obtain a pattern representing a scanned line of a picture or message for ultimate transfer to
20 a record surface.

Other and more specific objects of the invention are defined by the terms of the appended claims and will be apparent from the following description taken in connection with accom-
25 panying drawings in which:

Fig. 1 is a fragmentary view in perspective of a facsimile recorder illustrating in detail features in which the invention resides;

30 Fig. 2 is a fragmentary view in side elevation of a modification;

Fig. 3 is a sectional view in front elevation on line 3—3 of Fig. 2;

Fig. 4 is a fragmentary view in front elevation of another modification;

35 Fig. 5 is a view in side elevation of the apparatus illustrated by Fig. 4;

Fig. 6 is a top plan view of still another modification of the invention; and

40 Fig. 7 is a section on line 7—7 of Fig. 6 as viewed in the direction of the arrows.

Referring now more particularly to Fig. 1, the apparatus comprises a drum 10 or transfer wheel secured on a shaft 11 which is supported for rotation by suitable bearings (not shown) and which carries
45 a toothed pulley 12 positively driven by a perforated belt or chain 13 from a toothed pulley or sprocket 14 mounted on the armature shaft of the driving motor 15. The cylinder 10 is provided with a helical rib 18 which contacts the
50 record sheet or web 19 along the edge 21 where the web passes over the bail member or printer bar 22. The web 19 is drawn from a rotatably mounted supply reel 23 preferably at a constant rate of speed by means of a power driven friction roller 25 cooperating with the friction

rollers 26. The rollers 26 are carried by a shaft or rod 27 which is pressed downwardly by a spring means not shown so that the paper is firmly held between the roll 25 and the rollers 26. Rotary motion is imparted to the shaft 28 of
5 the roller 25 from the shaft 11 by means of a perforated belt or chain 29 in cooperation with pulleys or sprockets 31 and 32. To insure that the roller 25 will operate in step with the cylinder 10, the belt 29 may be perforated as shown
10 for engagement with the sprocket teeth 33 on both of the pulleys.

The position of the bail 22 with respect to the portion of the web 19 which extends from the bail to the feed rollers 25 and 26 is an important fea-
15 ture of the present invention. The bail 22 is provided with radial arms 35 which are swingably mounted upon a stationary rod or shaft 37. The latter is located so that it is tangent to the upper part of the paper web 19 when the edge of
20 the bail 22 is in contact with the helical transfer member 18. A pair of springs 38 engaged at their free ends beneath the arms 35 press the bail 22 upwardly so that its edge 21 presses the sharply folded web firmly against the helical
25 member 18. With the arrangement just described, the pressure of the bail against the helical member 18 is virtually independent of the paper feed tension. This insures substantially constant contact of the record sheet 19
30 with the helical member 18. This feature of the invention may be used in recorders employing electrically sensitive papers in contact with a helical recording drum.

A printer bar 39, having a relatively sharp
35 edge 40, is mounted upon the upper end of a pair of rods 42 and 43, the latter each being connected in a suitable manner to the signal responsive members of a pair of conventional loud speaker units 44 of suitable design. The
40 loud speaker units 44 are illustrated as being of the permanent magnet type, but it is to be understood that they may have separately excited field coils or that any suitable type of motor unit or units may be employed to operate the printer
45 bar 40. The movement of the swingable bar members 42 and 43 is limited by adjustable stop members 46 and 47 in the form of set screws engaged in a stationary part of the machine (not shown) and locked in the desired position by
50 means of lock nuts 48.

In the arrangement shown which forms no part of the present invention, incoming signals are fed to the motor units of the recorder from the line L by way of the transformer 50 and the
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amplifier 51. The amplifier 51 is connected by way of the transformer 52 to a rectifier comprising a pair of vacuum tubes 53, the anodes of which are connected to the motor units 44 and the anode supply battery 55.

A typewriter ribbon 56 serves as a source of marking material which is intimately transferred, under control of signals from the line L, to the record sheet 19 by the helical member 18. The typewriter ribbon 56 is carried in a conventional manner by a pair of spools 57 and 58 and is held in position before the printer bar 39 by means of a pair of vertically spaced channel-shaped members 61, the latter being fixed at each end in stationary members 62 each positioned adjacent the ends of the cylinder 10.

In order to provide a constant supply of fresh ribbon, either of the reels 57 and 58 may be driven from pinions 63 and 64 secured on the spool shafts 65 and 66 respectively which mesh selectively with pinions 67 and 68 secured for rotation on the axially movable shaft 69. The shaft 69 is slidably mounted adjacent each end in stationary bearing members 70 and is driven from the motor pinion 71, which is in mesh with a gear 72 secured to the pinion shaft. Means (not shown) is preferably provided for moving the shaft 69 axially when the ribbon 56 is completely wound on either of the spools 57 or 58. A pad 73, which is pressed upwardly against the helical member 18 as by springs 74, one of which appears in the drawings, is provided to wipe off the coloring material remaining as the member 18 transfers the pattern thereon to the web 19 and before it receives a new portion of the pattern for the next scanning line.

During operation of the picture recording apparatus just described, the interconnected motor units 44 are supplied with electrical currents from the amplifier 52 and the rectifier 53 controlled in accordance with signals received over the line L. When this current reaches a certain predetermined value, the signal actuated member in this case the printing bar 40, is moved inwardly, thus pressing the ribbon 56 against the helical ridge 18 which results in the depositing of a quantity of the pigment thereon from the ribbon 56. If the printing member 40 were held in contact with the helical member 18 during one complete revolution of the drum 10, a solid black line extending across the web 19 at its fold would be produced. The actual number of marks and their lengths produced in each scanning line is therefore determined by the number of times and the duration of each that the printing member 40 presses the ribbon 56 against the member 18 during each revolution of the scanning drum 10. It will be apparent to those skilled in the art that any suitable means may be utilized for producing synchronism between the moving parts of the apparatus by which the picture is transmitted and the moving parts of the recording apparatus described above.

A modified form of recorder is shown in Figs. 2 and 3 of the drawings which embodies the transfer feature of this invention. Reference character 75 designates a cylindrical copy holder which is mounted upon a shaft 76, the latter being supported and driven, for example, in the manner disclosed in applicant's copending application, Ser. No. 84,935, filed June 12, 1936. A message blank 77 wrapped around the copy holder 75 is secured thereon by any suitable means. The transfer means of this modification comprises the relatively sharp edge 78 of a signal

transfer wheel 79 secured to a shaft 80 which is journaled for rotation in a pair of upright members 81. The last named members are joined adjacent their lower ends by a rod 82 which is journaled in a pair of ears 83 extending upwardly from a platform member or base 84. The upright members 81 are biased toward the copy holder 75 by springs 85 connected to upstanding legs of a U-shaped bracket 86 secured to the base by fastening means 87. A pad 88 of absorbent material such as felt is carried by the bracket 86 and is pressed against sharp edged periphery 78 of the signal transfer wheel so as to cleanse it and prepare it for the reception of a fresh supply of pigment or any suitable marking material. An ink reservoir 89 is mounted between the arms 81 and is provided with one or more contacting inking rollers 91 and 92, the former of which dips into a body of marking fluid such as ink contained in the reservoir 89 so as to transfer ink from the roller 92 to the sharp edged periphery 78 of the signal transfer wheel 79.

An electromagnetic recorder unit 93 which may, if desired, be similar to one of the motor units 44 previously described, is provided with an armature 94, the upturned free end 95 of which is adapted to engage the sharp edge 78 of the signal transfer wheel. The free end 95 of the armature is preferably very thin and is notched as shown at 96 to insure good pigment scraping contact with the sharp edge 78 of the transfer wheel. The leads 97 extending from the electromagnetic recorder unit are connected so as to receive signals from the line L in the manner already and fully described in connection with Fig. 1 of the drawings.

The platform 84 is carried by a pair of guides or rods 98 and 99 upon which it slides on bearing shoes 101 and 102. The bearing member 101 embraces the rod 98 so that the platform 84 may be tilted upwardly, thus permitting a halfnut 103 which is secured to the base to be disengaged from the propelling lead screw 104. The halfnut 103 is carried on a resilient arm 106 secured at 107 to the platform 84. A stop member 108 may be provided on the bracket 86 to lift the transfer wheel 79 out of contact with the blank 77 when the halfnut is disengaged from the lead screw thus permitting the entire carriage comprising the base 84 to be moved along the blank 77.

In operation of the modified form of apparatus of Figs. 2 and 3, a message blank 77 is secured in any manner around the periphery of the cylinder 75 and the platform 84 which carries the scanning apparatus is positioned with the transfer wheel 79 in contact with the blank adjacent one edge thereof. Rotation is imparted to the cylinder 75 and the signal transfer wheel is rotated by reason of its frictional contact with the blank 77, the lead screw 104 advancing the signal transfer wheel axially of the drum 75 to provide a scanning action.

Coloring matter is applied to the sharp edged periphery 78 of the transfer wheel from the rollers 91 and 92 and if the armature 94 is normally biased away from the blank, in the absence of line signals, a continuous helical line will be traced around the blank 77 which will result in the blank 77 being covered uniformly with the pattern of lines. However, if the armature is normally biased into contact with the blank, in the absence of line signals, no mark will be produced on the blank 77. Positive or

negative signals may be used for transmission depending on the normal bias of the armature in a manner now to be described.

Assuming that facsimile signals representing a negative copy of the transmitted subject matter are being supplied from the line L to the device 93 having an armature biased to remain out of contact with the wheel during absence of signals, portions of the ink will be removed from the edge 78 of the transfer wheel when the armature moves upwardly. The remaining portions of the marking material will be left on the periphery 78 of the wheel 79 for transfer to the blank 77. In this manner a positive facsimile copy of the transmission subject matter will be reproduced.

If the transmitted signals represent a positive of the transmitted copy, the armature of the motor device 93 can be biased normally into contact with the blank so that a positive copy will be reproduced.

Another modification embodying the transfer feature of the invention is shown in Figs. 4 and 5 of the drawings. Referring now to these figures reference character 111 designates a cylindrical copy holder similar to the copy holder 75 of Figs. 2 and 3 which is rotated by means (not shown) known to the prior art. The cylinder 111 is provided with a recording blank 77a secured thereon in any suitable manner so that the signal transfer wheel 112 will roll against it when the cylinder 111 is rotated. The wheel 112 is mounted by a spindle 114 journaled in frame members 115, like frame members 81 of Fig. 3, which are joined together adjacent their lower ends by a member 116. The last named member is pivoted in the brackets 117 secured to the platform or base 118. This platform is mounted upon a pair of guide members 98a and 99a in the manner already described in connection with Fig. 2 of the drawings. A half nut 103a carried by a member 106a which is secured to the platform 118 at 107a engages a lead screw 104a so as to propel the wheel 112 longitudinally of the cylinder 111 to produce a scanning action.

The wheel 112 has a sharp edged periphery 121 which is continuously supplied with ink from an inking roller 92a which is in contact with a partially or wholly immersed roller 91a. The spindles of these rollers are journaled in the wall of the ink reservoir 89a in the manner described in connection with Fig. 3. A conduit 122 in communication with a convenient source of air or other fluid under pressure is provided with a nozzle 123 having a very fine opening which projects air in a stream upon the peripheral edge 121 of the wheel 112. This air stream when it impinges on the wheel 112 removes ink therefrom so that no mark is transferred to the blank 77a. To provide control of the air stream in accordance with line signals and thereby to cause the ink remaining on or, if desired, removed from the wheel 112 to represent line signals, an electromagnetically controlled valve member 124 ending in the form of a vane 126 is positioned to cover at times the nozzle 123. A signal controlled motor device 127, which may be a loud speaker unit of the type previously described, is operatively connected to the valve member 124 to withdraw the vane 126 from the opening of the nozzle 123 upon receipt of signals over the line L. It will be understood that actuation of the vane may depend on an absence of line signals in which

case a positive copy will be produced from signals representing a negative. A type of motor unit having an adjusting device indicated at 129 is preferably selected so that the normal or inoperative position of the vane 126 may be set prior to the beginning of a recording operation.

In operation of the modified recorder just described, ink is supplied to the reservoir 89a and the cylinder 111 is caused to rotate in synchronism with a more or less remote transmitter. With no signals being supplied from the line L to the motor unit 127 by way of its leads 97a, the vane 126 is moved to cover the nozzle 123 by the adjusting means 129 until no mark appears on the record sheet 77a. This is the correct adjustment for best operation of the recorder and it will be noted that this adjustment may also be obtained when a signal is supplied to the motor unit 127 in the event that picture reversal is to be had with signals being received by the motor means 127 as explained above. The vane 126 will be vibrated longitudinally in accordance with the signals which represent the transmitted subject matter and ink remaining on the periphery of the wheel 112 will be transferred to the message blank 77a in the manner already described in connection with Fig. 2 of the drawings.

A modification somewhat similar in detail to the embodiment disclosed in Figs. 2 and 3 of the drawings is illustrated in Figs. 6 and 7. In the last named figures of the drawings reference character 75a designates a cylindrical copy holder mounted upon the shaft 76a which is supported and driven in the manner already described in connection with Figs. 2 and 3. Power for driving the cylinder 75a and lead screw 104a is derived from a motor 132 which is provided with a driving pinion 133 as shown in Fig. 6 of the drawings. It will be understood that suitable gearing is provided between the motor pinion 133 and the message drum and lead screw in a manner well known to those skilled in the art. The transfer means of this modification which cooperates with a message blank 77a comprises the relatively sharp edge 78a of the signal transfer wheel 79a which is mounted upon a shaft 80a journaled in the uprights 81a. The upright members 81a are mounted on a rod 82a which is pivotally received by the upstanding apertured ears 83a. The pivoted support for the transfer wheel 79a which comprises the members 81a just described is adapted to be moved so as to withdraw the wheel 79a from contact with the message blank by a solenoid 131 having a pull rod 136 pivotally connected at or adjacent its end to the cradle member. The point of pivotal connection is indicated by the reference character 137. A pad 138 of absorbent material such as felt or the like is carried by a shaft 139 journaled at its ends in a pair of similar frame members 141.

The means for supplying the pattern of marks to the periphery 78a of the transfer wheel will now be described in detail. It comprises an electromagnetic recorder unit 142 of any of the types similarly mentioned which is secured in a suitable manner to the frame members 141. The recording unit is provided with a vibrator armature member 143 bifurcated as shown in the drawings, each arm 146 of the bifurcation being provided with an aperture 147. The marking material such as ink is applied to a strand such as a thread of silk 149. The thread is wound upon two spools 151 and 152, these latter being carried by shafts 153 and 154 journaled in bear-

ing blocks 156 in order to permit the direction of movement of the thread to be reversed when it is completely wound on either of the spools. The reel shafts may be driven from pinions 157 and 158 which mesh selectively with pinions 159 and 161 secured for rotation on the axially movable shaft 163. The shaft 163 is slidably mounted adjacent each end in stationary members 164 and is driven from the motor pinion 133 which is in mesh with a gear 166 secured to the pinion shaft 163. Means (not shown) is preferably provided for moving the shaft 163 axially when the thread 149 is completely wound on either of the reels.

Coloring material is supplied to the thread 149 from an inking pad or roller 167 dipping into an ink reservoir 168. This reservoir is supported from the base member 84a of the apparatus by a bracket 169.

In order to compensate for inclination of the thread 149 as it is wound in more or less quantity on either of the spools 151 and 152, guide members 171 are provided which are secured to the frame members 81a. The guide members 171 are provided with eyelets 172 through which the thread is passed.

In operation of the apparatus of Figs. 6 and 7 just described and assuming that blank 77a is in place on the recording cylinder, picture or message signals are supplied in a well known manner to the motor unit 142 by way of the leads 131. The thread 149 as it leaves the reel 151 is supplied with a quantity of ink from roller 167 which is applied to the periphery 78a of the transfer wheel when the armature 143 of the recorder unit moves to the left as viewed in Fig. 6 in response to a signal. It will be understood that the armature 143 vibrates in accordance with the received signals and that therefore a pattern of marks will be applied to the periphery 78a of the transfer wheel for transfer to the message blank 77a. In order to secure maximum effectiveness with the apparatus an ink roller 167 similar to that described above is preferably mounted adjacent the spool 152.

In this form of the invention a separate inking roller in contact with the periphery of the transfer wheel may be used in which case the thread will remove ink from the periphery of the wheel in response to signals in a manner similar to that described in connection with the armature 94 of Figs. 2 and 3. From the foregoing it will be seen that this invention provides recorders which operate in accordance with novel principles and which are cheap to manufacture and can be used on ordinary paper or any other material which presents a surface of any color capable of receiving ink.

While the invention has been described and explained in detail in connection with four illustrative embodiments thereof, it is to be understood that the invention may be embodied in other forms and, therefore, the invention is not limited except as indicated by the terms and scope of the appended claims.

What is claimed is:

1. The combination of a scanner for the reception of facsimile signals including transfer means and means to support a recording surface in engagement with said transfer means, means to cause said transfer means to scan said recording surface and means to provide said transfer means with marking material in accordance with received facsimile signals for transfer to said recording surface.

2. In a facsimile recorder, means to hold a record sheet, a marking device and means to support the same for contact with said sheet, means to cause said marking device to scan said record sheet and means to provide said marking device with a pattern of marking material, said pattern of marks representing line signals.

3. The combination of scanning means including a rotatable spiral member and a cooperating printer member arranged to be moved substantially radially with respect to said spiral member, means interposed between said printer member and said spiral member to apply marking material to the latter upon radial movement of the printer member, and means arranged to support and move a record receiving sheet in continuous contact with said spiral member at a point spaced circumferentially from said printer member.

4. The combination of claim 3 wherein said means interposed between said printer member and said spiral member is a typewriter ribbon, means to support and guide said ribbon, and means for feeding and receiving said ribbon whereby it is moved longitudinally.

5. The combination of a scanner including a rotatable transfer member and means to support a record receiving surface in contact with said transfer member, means to cause said transfer member to scan said record receiving surface and inking means to provide said transfer member with marking material in accordance with signals for transfer to said recording surface.

6. In a facsimile recorder, means to hold a record sheet, a marking wheel and means to support the same in contact with said sheet, means to cause said marking wheel to scan said record sheet and means to provide said marking wheel with a pattern of marking material, said pattern of marks representing line signals.

7. The combination of scanning means including a rotatable spiral member and a cooperating printer member arranged to be moved radially with respect to said spiral member, means interposed between said printer member and said spiral member to apply marking material to the latter upon radial movement of the printer member, and means comprising a pivotally mounted bail arranged to support and move a record receiving sheet in continuous contact with said member at a point spaced circumferentially from said bar.

8. In a facsimile recorder, scanning means including a transfer member, means to apply marking material to said member in accordance with signals, means to support and move a record sheet comprising cooperating feed rollers at least one of which is power driven, a bail member and means to swingably mount said bail member for engagement with said transfer member, and guide means located substantially at the axis of movement of said bail member to guide said record sheet whereby the contact pressure of said bail member on said transfer member is unaffected by the tension applied to the sheet by said feed rollers.

9. A recorder comprising transfer means, electrically operated means to apply recording material to said transfer means, means to apply tension to a record sheet to advance the same, a pressure member free to move in an arcuate path into contact with said transfer member, and a guide member located substantially at the center of the arcuate movement of said pressure member, said record sheet being looped over said pressure member and passing over said guide

member, the location of said guide member with respect to said pressure member acting to prevent the tension on said sheet from affecting the contact pressure of said pressure member on said transfer means.

10. The combination of scanning means including a rotatable spiral member, and a cooperating bar arranged to be moved radially with respect to said member, means interposed between said bar and said member to apply marking material to the latter upon radial movement of the bar, means arranged to support and move a record receiving sheet in continuous contact with said member at a point spaced circumferentially from said bar, and means to remove marking material remaining after contact with said sheet, from said member.

11. The combination of scanning means including a rotatable spiral member, means intermittently to apply a marking medium to said member including a cooperating bar arranged to be moved radially with respect to said member, and means arranged to support and move a record receiving sheet in continuous contact with said member at a point spaced circumferentially from said bar.

12. The combination of a scanner including a transfer wheel and a rotatable cylinder adapted to hold a record sheet in contact with the periphery of said transfer wheel, means to apply marking material on the periphery of said transfer wheel, means to remove portions of said material from said wheel, in accordance with signals so that only the remaining material will be transferred to said sheet continuously to form a facsimile record, and means to remove substantially all of the material remaining after contact of said wheel and said sheet.

13. A recorder adapted to be operated by picture signals comprising means to hold and advance a record sheet, a transfer member presenting a thin edge to said sheet, means to cause said member to scan said sheet, means to form a pattern of marking material on said edge in accordance with received signals and means to cause said pattern to be transferred from said edge to said sheet.

14. A recorder adapted to be operated by picture signals comprising means to hold and advance a record sheet, a transfer member presenting a thin edge to said sheet, means comprising a moving filament carrying a pigment and a signal controlled member for moving said filament into and out of contact with said edge to form a pattern of marking material on said edge in accordance with received signals, and

means to cause said pattern to be transferred from said edge to said sheet.

15. In a facsimile recorder the combination of a scanner including a rotatable transfer wheel and means movably to support a record receiving surface in contact with said transfer wheel, means to cause said wheel to scan said record receiving surface and inking means to supply ink to said transfer wheel in accordance with signals for transfer to said recording surface.

16. The combination of scanning means including a rotatable spiral member and a cooperating printer member arranged to be moved radially with respect to said spiral member, carbon bearing means supported between said printer member and said spiral member to apply marking material to the latter upon radial movement of the printer member and means to support and move a record receiving sheet in continuous contact with said spiral member, said last named means being spaced from said printer member.

17. The combination of scanning means including a rotatable spiral member and a cooperating printer member arranged to be moved substantially radially with respect to said spiral member, an ink carrying strip interposed between said printer member and said spiral member to apply marking material to the latter upon radial movement of the printer member, and means arranged to support and move a record receiving sheet in continuous contact with said spiral member at a point spaced circumferentially from said printer member.

18. In a facsimile recorder, a helical marking member, a paper strip on which recording is to be effected, means to apply tension to said strip to advance the same, a pivotally mounted elongated pressure member disposed substantially parallel to the axis of said marking member, means to cause said pressure member to bear against said marking member with substantially uniform pressure throughout its length, said strip being looped to pass over said pressure member between said pressure member and said marking member, and guide means over which both runs of said loop are drawn by said tension means, said guide member lying substantially in a plane defined by the portion of said pressure member which presses said strip against said marking member and the pivotal mounting axis of said pressure member, whereby the uniformity of contact of said strip with said marking member is independent of the tension in said strip.

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