Feb. 23, 1943. R. J. WISE ET AL 2,311,803

RECIPROCATING FACSIMILE APPARATUS

Filed Nov. 15, 1940 3 Sheets-Sheet 1

FIG. 1

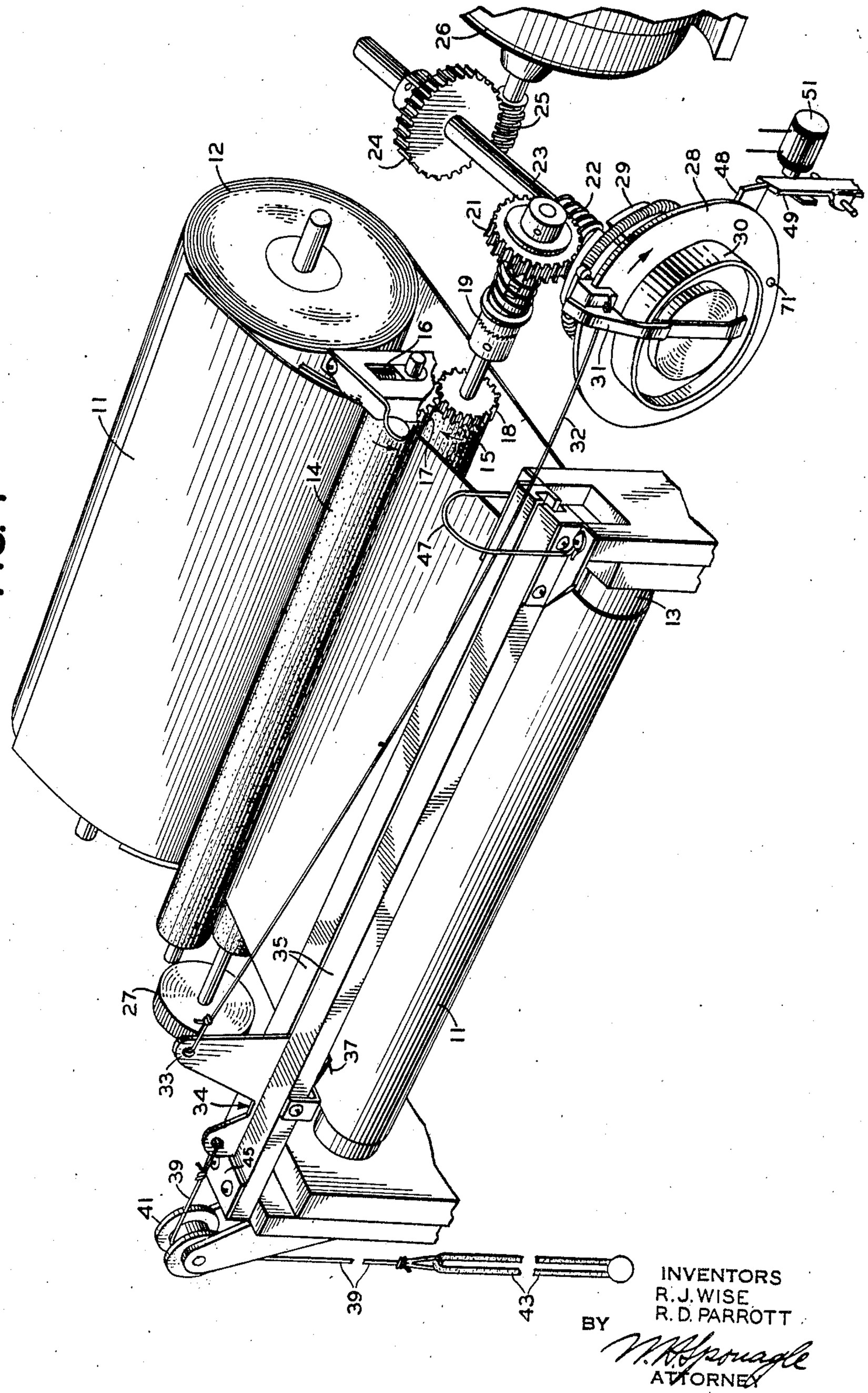

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FIG. 2

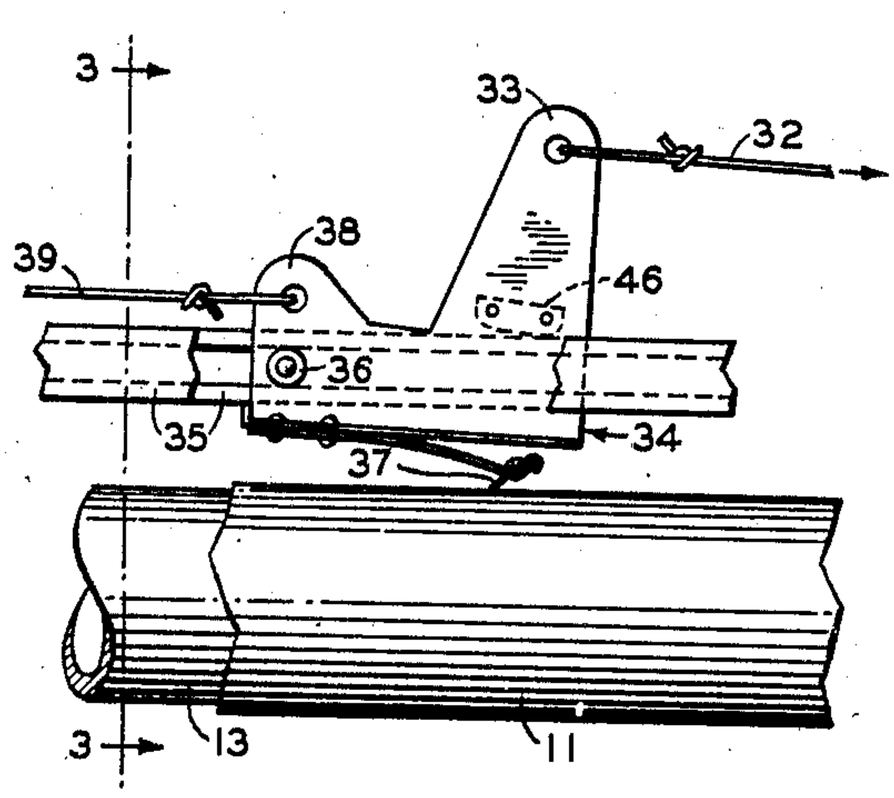

FIG. 3

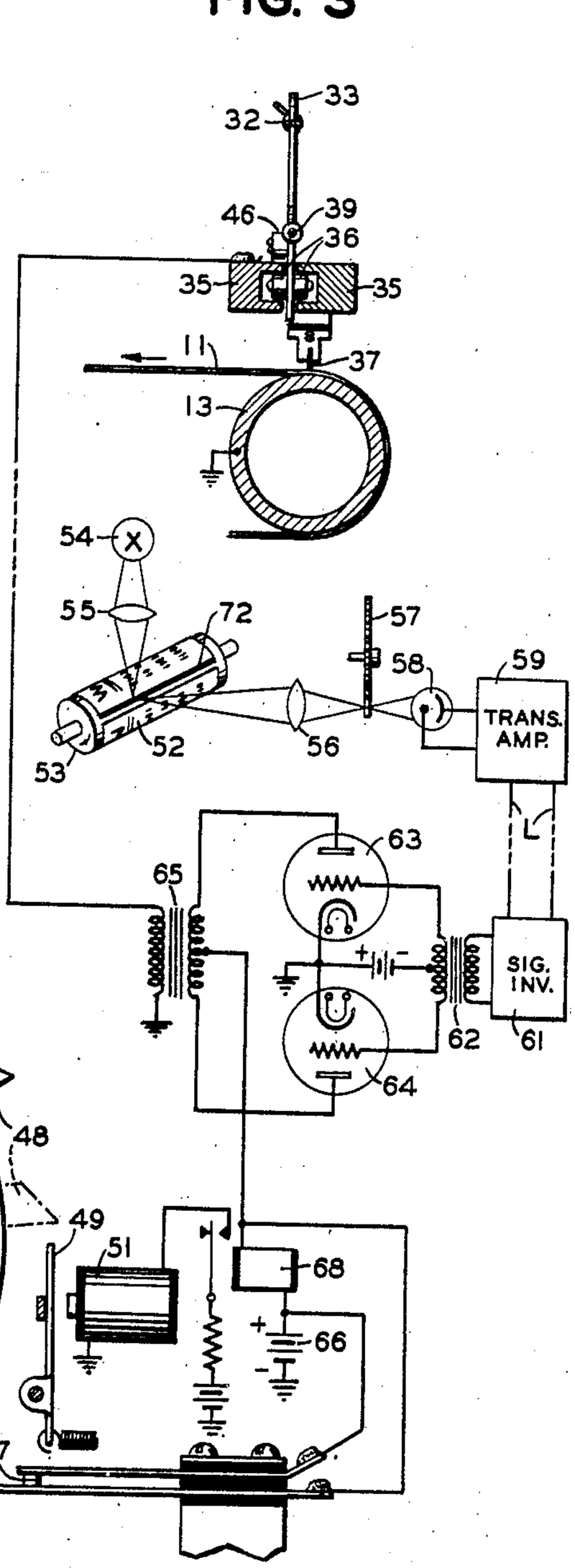

FIG. 4

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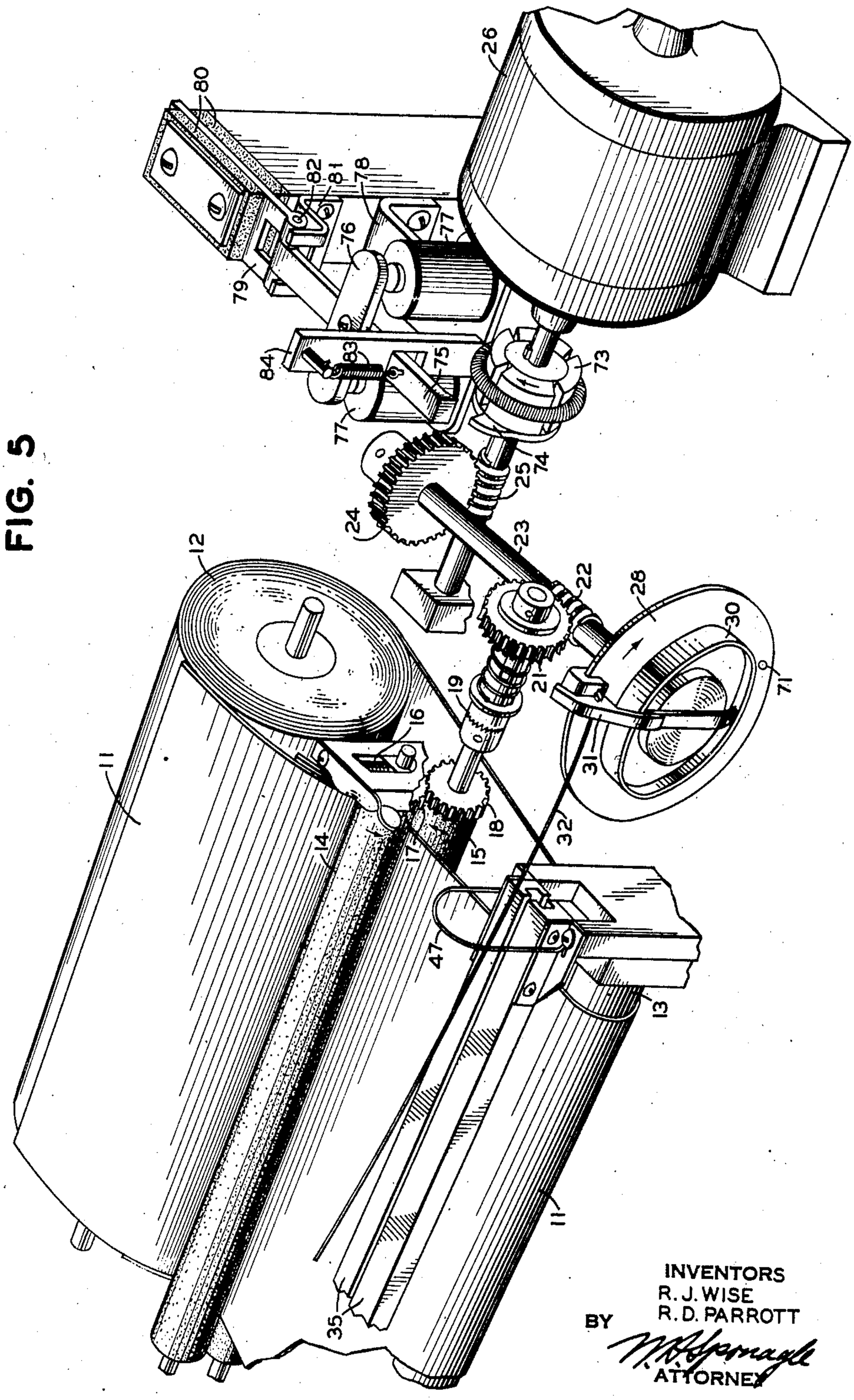
FIG. 5



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UNITED STATES PATENT OFFICE

2,311,803

RECIPROCATING FACSIMILE APPARATUS

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Application November 15, 1940, Serial No. 365,772

12 Claims. (Cl. 178—6.6)

This invention relates to facsimile apparatus and more particularly to receiving apparatus for recording subject matter on a continuous web.

Some of the novel features of the invention pertain to recording mechanisms operating on the start-stop principle of synchronization, while other of the novel features pertain to recording mechanisms employing reciprocating scanning elements irrespective of the type of synchronization employed. The invention constitutes improvements on continuous sheet recorders utilizing reciprocating scanning elements, of which numerous examples may be found in the prior art. These prior art devices have certain limitations which the present invention seeks to obviate or, at least, to minimize. One of the objectionable features of most prior art recorders of this type is the mass of the movable scanning member. One of the desirable attributes of the movable scanning member is that it can be returned to its starting position in the shortest possible time. It is evident, therefore, that the lighter the movable member, the more nearly the achievement of this result is approached. Also, the means by which some of the prior art recorders effect the movement of the movable scanning member from the end of its scanning stroke to the beginning of the succeeding stroke do not lend themselves to high speed operation. In one type of prior art recorder the movable scanning member is drawn from one edge of the recording surface to the other by means of a cord which is wound upon a drum. At the completion of the scanning stroke the drum is rotated in the opposite direction, permitting the cord to be unwound and thereby to return the scanning member to its starting position. Here again the mass of the drum in unwinding the cord appreciably retards the operation of the recorder.

It is one of the major objects of the invention to obviate wherever possible or, at least, to minimize the above enumerated disadvantages of the prior art continuous sheet recorders.

Another object of the invention is to provide novel means for returning the movable scanning member of a facsimile recorder to its starting position.

Still another object of the invention is to provide, in a facsimile recorder employing a drum upon whch a cord is wound to effect a scanning stroke, novel means for disengaging the cord from the drum upon the completion of the scanning stroke whereby the scanning element may be returned to its starting position.

A further object of the invention is to provide a carriage for the movable scanning member which is light in weight and which embodies means for automatically disengaging the movable and stationary scanning members during the return stroke of the movable member.

A still further object of the invention is to provide, in a facsimile recorder operating on the start-stop system of synchronization under the control of signals sent from the transmitting apparatus, means for preserving a definite cyclic relationship between the gear teeth engaged and any particular recording position of the scanning member throughout the length of the scanning stroke in apparatus which employs reduction gearing between the driving motor and the scanning member.

Still another object of the invention is to provide, in a facsimile recorder in which the scanning member is driven by means of a relatively high speed motor through the medium of reduction gearing and operating on the start-stop system of synchronization, means for applying the start-stop synchronization to the motor shaft in response to signals sent from the transmitting apparatus.

The foregoing and other more specific objects will become apparent from the following detailed description of a facsimile recorder embodying the invention, which is taken in conjunction with the accompanying drawings, of which:

Fig. 1 is a perspective view of a facsimile recorder embodying some of the features of the invention;

Fig. 2 is a fragmentary view of the carriage supporting the movable scanning member;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary view of the drum upon which is wound the line attached to the carriage, together with a circuit diagram illustrating the operation of the scanning apparatus on the start-stop system of synchronization; and

Fig. 5 is a perspective view of a facsimile recorder illustrating the application of the start-stop synchronization at the high speed shaft of the driving motor.

Reference is made first principally to Fig. 1 which shows a continuous sheet of sensitized recording paper 11 which is supplied from a roll 12 and is passed around a metallic roll or platen 13 which preferably should be of good electrical conductivity and is passed between two feed rolls 14 and 15. The feed rolls are arranged to grip the recording sheet 11 between them with sufficient pressure to draw the paper from the

roll 12 when the feed rolls are rotated in the directions indicated by the arrows. Part of this pressure is exerted by means of a spring 16 which is arranged to press down upon the shaft of the roll 14. It will be understood that the left hand end of the feed roll 14 is provided with a similar spring so that the pressure may be exerted uniformly over the entire width of the recording sheet. The feed rolls 14 and 15 are provided with gears 17 and 18 respectively, by means of which the roll 14 is driven by the rotation of the roll 15. The latter roll is connected by means of a clutch 19 to a pinion gear 21 which is driven by a worm 22 secured to an intermediate shaft 23. Also secured to the intermediate shaft is a pinion gear 24 which is driven by means of a worm gear 25 attached to the shaft of a driving motor 26. Normally, the feed roll 15 is driven slowly by the rotation of the gear 21. However, the roll 15 is provided with a knob 27 so that it may be rotated manually at a more rapid rate in order to feed out blank paper between recordings if desired. The clutch 19 permits this type of manipulation of the paper feed mechanism to be effected independently of the motor driven paper feed mechanism.

A disc 28 is coupled by a friction clutch 29 to the intermediate shaft 23. Secured to this disc is a drum 30 and also a deflecting member 31 which is provided with a sloping surface as illustrated in the drawings. A line 32 is attached to the deflecting member 31 and also to a lug 33 which forms part of a movable carriage 34. The line 32 may comprise a stout thread or string, a cord, a light flexible wire, or the like, the only requirements being that it be light, flexible and substantially inextensible. The details of the carriage are best illustrated in Figs. 2 and 3. It is arranged for sliding movement in a pair of guide rails 35 which have forms approximating channels and are arranged with the open sides thereof facing one another. A cylindrical member 36 is attached to the carriage 34 adjacent the left hand end thereof as viewed in Fig. 2 and is arranged to move along the track provided by the guide rails 35. A stylus 37 is secured to the underpart of the carriage so that it is in a position to engage the surface of the recording sheet 11. The carriage 34 is also provided with a second lug 38 located adjacent the left hand end thereof for the attachment thereto of a retractile line 39. This line is passed around a light guide pulley 41 and is attached to one end of a resilient extensible member 43 which may be an elastic band. The other end of the extensible member 43 is secured to any convenient fixed part of the apparatus.

The carriage 34 is arranged so that when it is subjected solely to the influence of the retractile line 39, it is held against a stop 45 at the left hand end of the recording apparatus. Also, while it is held in this position it is arranged to pivot about the cylindrical member 36 in such a manner that the stylus 37 is lifted from the recording sheet 11. The carriage is also provided with a stop member 46 which is adapted to engage the upper surface of one of the guide rails 35 when tension is applied to the line 32 in an amount sufficient to overcome the moment produced by the elastic band 43 acting through the line 39 and to pivot the carriage in the opposite direction. This position of the carriage is best illustrated in Fig. 2 where it may be seen that the stylus 37 is brought into contact with the surface of the recording sheet 11.

During a recording operation the intermediate shaft 23 rotates at a rate equal to one revolution per scanning line. However, when the apparatus of Fig. 1 is employed in a start-stop system, the intermediate shaft continues to rotate as the scanning apparatus is periodically stopped for synchronizing purposes. Hence, in a complete recording operation the shaft will make a greater number of revolutions than there are scanning lines. The ratio of the gears 21 and 22 is such that during one revolution of the intermediate shaft 23 the feed rolls 14 and 15 are rotated sufficiently to advance the recording sheet 11 a distance equal to the separation of two adjacent scanning lines at the transmitter. At the beginning of each scanning operation the drum 30 is rotated from the position shown in Fig. 1 in the direction of the arrow, thereby drawing the carriage 34 to the right. Continued rotation of the shaft 23 causes the line 32 to be wound upon the drum 30 until the carriage 34 has been moved to its extreme right hand position. At this time the line 32 will have been wound upon the drum 30 to substantially the extent shown in Fig. 4; that is, approximately one complete turn of the cord will have been made upon the drum. The continued rotation of the disc 28 in the direction of the arrow brings the line 32 into engagement with the sloping surface of the deflecting member 31. This surface is so designed that as the disc continues to rotate, the one wrapping of the line 32 about the drum 20 will be dislodged from the drum. The carriage 34 is then influenced solely by the retractile line 39 which pivots the carriage about the cylindrical member 36 in the manner described, thereby lifting the stylus 37 from the surface of the recording sheet 11 and, substantially instantaneously, drawing the carriage to its extreme left hand starting position. The line 32 is attached to the member 31 in such a manner that it has a swivel action. A simple and convenient manner of effecting this attachment is to pass the end of the line through a suitable hole in the member 31, and to place a knot near the end of the line. There is also provided a guard 47 in the form of a wire bent as illustrated in Fig. 1 and mounted adjacent the right hand end of the guide rails 35 for the purpose of damping lateral movements of the line 32 which has a tendency to whip when it is dislodged from the drum 30 at the end of a scanning stroke.

When it is desired to maintain synchronism between the transmitting and the recording apparatus by means of the start-stop principle, a stop arm 48 is attached to the disc 28. A latch 49 is also provided and positioned so that it may be moved into or out of the path of the stop arm 48. A start magnet 51 controls the operation of the latch to withdraw it from the path of the stop arm. The stop arm 48 is positioned on the disc 28 relative to the deflecting member 31 so that it is in a position to be engaged by the latch 49 at substantially the same time that the deflecting member completes the dislodgement of the line 32 from the drum 30. Thus, further scanning is prevented until the scanning apparatus is released by energizing the start magnet 51. However, during the time that the scanning apparatus is stopped, the intermediate shaft 23 continues to rotate by reason of the frictional coupling between the disc 27 and the shaft. Hence, the feed rollers 14 and 15

continue to operate but, normally, the scanning apparatus is stopped for such a short time that the infinitesimal distance through which the recording sheet 11 is moved during the stoppage of the scanning apparatus is negligible for all practical purposes.

For the purpose of describing the operation of the start-stop synchronization feature of the recording apparatus, particular reference is made to Figs. 3 and 4. The facsimile signals may be generated in any well-known manner. For example, the subject matter to be transmitted may be applied to a sheet 52 which is wrapped around a cylinder 53. This cylinder is rotated and moved axially in any well-known manner. An optical scanning system may be employed comprising a source of light 54, the light from which is condensed by means of a lens 55 to a point impinging upon the surface of the sheet 52. Depending upon the nature of the subject matter to be transmitted, light variations will be reflected from the sheet 52 and concentrated by means of another lens 56 to a point which falls within the plane of a shutter 57 which may be any conventional light chopper such as a perforated or notched disc. The interrupted light beam is then directed to a photocell 58 by means of which alternating currents of varying amplitudes are generated and subsequently amplified by means of a transmitting amplifier 59 and transmitted over line conductors L to the receiving station.

At this point the line conductors are connected to a signal inverter 61, since in the type of scanning system described a negative copy of the transmitted subject matter would be made if the line signals were used directly. The inverted facsimile signals are impressed upon the primary of a transformer 62, the secondary winding of which is connected to excite a pair of amplifier vacuum tubes 63 and 64 arranged in push-pull connection for class C operation. The output circuits of the vacuum tubes 63 and 64 are connected to the primary of a coupling transformer 65, the secondary winding of which is connected to one of the guide rails 35 by means of which connection is made to the recording stylus 37. Plate current for the amplifier tubes 63 and 64 is supplied by a battery 66 which is connected through a contact 67 which is normally closed during a scanning operation to the mid-point of the primary winding of the transformer 65.

The contact 67 is connected to short circuit the winding of a relay 68 during the scanning operations. One of the contact springs 69 is extended to a point where it may be engaged by a pin 71 projecting from the rear face of the disc 28. The pin 71 is positioned on the disc so that it engages the contact spring 69 substantially simultaneously with the engagement of the stop arm 48 with the latch 49. Thus, at the time the rotation of the disc 28 is arrested the contact 67 is opened, thereby removing the short circuit from the winding of relay 68. Hence, it is seen that the facsimile signals which are received from the line L are normally ineffective to cause operation of the relay 68.

At the transmitting station facilities are provided for transmitting a synchronizing signal after the completion of the scanning of each line. One way in which this may be accomplished is to provide a mark 72 along one edge of the sheet 52 containing the subject matter to be transmitted. Thus, once per revolution of the transmitter drum 53, the mark 72 is scanned and a facsimile signal corresponding to this mark is transmitted to the receiving station. The response to this signal produced by the amplifying tubes 63 and 64 is such that the maximum plate current is drawn from the battery 66. The time at which the synchronizing signal is received corresponds to the time at which the disc 28 is in its stopped position and the contact 67 is open. Consequently, the plate current drawn by the amplifier is employed to energize the relay 68 which effects the closure of its make contact to energize the stop magnet 51 through an obvious circuit. The latch 49 is withdrawn, thereby permitting the disc 28 to start upon another revolution, thereby actuating the movable scanning member to scan the succeeding line. As soon as the disc 28 is rotated through a small angle from the stop position, the pin 71 is disengaged from the contact spring 69, thereby permitting the contact 67 to again short circuit the winding of relay 68 so that the succeeding group of facsimile signals will not affect the relay.

The apparatus described up to this point has been found to give satisfactory results provided that certain precautions are taken, such as the ratio of the reduction gearing being properly chosen and a high degree of precision employed in cutting the necessary gears. In work of this character where an accurate reproduction of the subject matter is desired, it has been found that such results may be obtained only if an even gear ratio is chosen so that a definite cyclic relationship is maintained between each recording position of the stylus throughout the entire length of the scanning stroke and the particular gear teeth engaged at the time. That is, every time that the stylus reaches any given position the same teeth of each pair of gears are in mesh. By observing these precautions any eccentricity or other imperfections present in the driving gears do not produce a jagged reproduction.

However, when the start-stop principle of synchronization is employed, the angular position of the disc 28 and, consequently, the recording stylus 37 is constantly being shifted with respect to cooperating elements of the driving gears, since the scanning apparatus is periodically stopped while the gears continue to rotate. Thus, it is seen that the above described cyclic relationship no longer exists, and if satisfactory reproductions are to be obtained, the gears must be cut with such a high degree of precision that manufacturing costs may become too great for commercial use of the apparatus. In addition, even where high precision methods are employed in manufacturing the gears, imperfections developed through operation of the apparatus will produce the undesirable jagged reproductions.

The present invention contemplates an arrangement for obviating all of the aforementioned limitations of the apparatus described previously. Fig. 5 shows in perspective a facsimile recorder embodying this feature of the invention. The recording sheet 11 is fed through the recorder in substantially the same manner as that described in connection with the apparatus of Fig. 1. Similarly, the scanning apparatus is identical to that previously described. In this case, however, the disc 23 is rigidly attached to the intermediate shaft 23, and the worm gear 25 is coupled to the shaft of the motor 26 through a friction clutch 73. A stop arm 74 is also secured to the shaft supporting the gear 25 for the purpose of stopping the scanning and

sheet-feeding apparatus in a manner to be described.

For this purpose a latch **75** is mounted on the armature **76** of a stop magnet **77**. The supporting structure of the stop magnet includes a bracket **78** which is rigidly secured to any convenient stationary portion of the supporting structure of the recording apparatus. The latch **75** is pivotally mounted on a supporting member **79** in such a manner that the impact of the stop arm **74** with the latch **75**, when the latter is operated to intercept the stop arm, is absorbed to an appreciable extent. One way of accomplishing this result is to mount the latch supporting member **79** between two resilient members, such as the pads **80**, which may be formed of rubber or its equivalent. The latch **75** extends between the two upstanding spaced arms of a retaining bracket **81** so that the hinge or pivot **82** normally rests against the vertical arms of the bracket. In this way the latch and its supporting member **79** are free to move away from the vertical arms of the bracket **81** to absorb the shock of the stop arm **74** striking the latch. The resiliency of the rubber pads **80**, however, restores the hinge **82** to its contact with the vertical arms of the bracket **81** as soon as a state of equilibrium is reached.

Normally, during a scanning operation the latch **75** is kept out of the path of the stop arm **74** by means of a retractile spring **83**, one end of which is attached to the latch and the other end of which is attached to a stationary member **84** which is secured to the bracket **78** and is provided with an opening for the latch, the latter serving also to limit movements of the latch. The energization of the windings of the stop magnet **77** attracts the armature **76** to move the latch downward against the pull of the spring **83** so that it is in a position to intercept the stop arm **74** on the revolution thereof following the actuation of the stop magnet.

The cooperation between the scanning apparatus and the synchronizing apparatus is substantially the same as that described in connection with Fig. 1. The stop magnet **77** is connected in the synchronizing circuit in precisely the same manner as the stop magnet **51** of Fig. 4. During a scanning operation a contact similar to contact **67** renders the stop magnet **77** inoperative by short circuiting the control relay **68**. Following the scanning of each line, the contact **67** is opened, thereby placing the relay **68** under the control of the signals transmitted over the line conductors L. This occurs substantially simultaneously with the scanning at the transmitting station of the line **72** which produces at the receiving station a marking signal. The relay **68** is operated to energize the stop magnet **77** and thereby move the latch **75** into a position to intercept the stop arm **74**. It will be remembered that substantially coincidentally with the opening of the contact **67**, the movable carriage **34** bearing the stylus **73** is returned to its extreme left hand position. Consequently, when the stop magnet **77** is energized, the scanning operation of the recording apparatus is momentarily interrupted. This condition exists until the completion of the scanning of the synchronizing line **72** at the transmitting station. Before encountering the next portion of the subject matter to be transmitted the transmitting apparaus scans a blank space which produces at the receiving station a non-marking signal. Hence, the stop magnet **77** is deenergized in response to this signal, releasing the latch **75** and permitting the rotation of the stop arm **74** to initiate another scanning operation of the recording apparatus.

It will be appreciated that the above described synchronizing operation is necessary where the synchronization takes place upon a shaft which rotates at a higher speed than the shaft bearing the scanning apparatus. The latter shaft makes one revolution per scanning line, while the shaft or shafts which are employed to drive the scanning apparatus from a driving motor makes several revolutions per scanning line. Therefore, it is not possible to employ a latch which normally lies in a position to intercept the stop arm, such as in the case of the apparatus of Fig. 1. Incidentally, the arrangement of the synchronizing apparatus shown in Fig. 5 may also be employed with the recording apparatus of Fig. 1.

It should be noted that while Fig. 5 discloses the application of the start-stop synchronizing apparatus to a shaft which is arranged to be driven directly from the driving motor, it is not contemplated that the invention be limited to this specific arrangement. Obviously, where it is necessary, in order to get proper speed reduction, to employ one or more intermediate shafts between the driving motor and the scanning apparatus, the start-stop apparatus may be connected to any of the intermediate shafts. Of course, the maximum benefits to be derived from applying the start-stop synchronization to a shaft which rotates at a relatively higher speed than the scanning apparatus shaft are obtained by stopping and starting the shaft which is driven at the same speed as the driving motor shaft. However, it has been found that a large proportion of the defects introduced by gear eccentricities where the gears are allowed to rotate during the stop interval of the scanning apparatus may be eliminated by stopping one of the intermediate shafts which rotates at a speed which is higher than that of the scanning apparatus and lower than the motor shaft.

The nature of the invention may be ascertained from the foregoing description of two illustrative embodiments, it being understood that changes in the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

What is claimed is:

1. In facsimile apparatus, a recording surface, a guideway disposed transversely of said surface and substantially parallel thereto, means for moving said recording surface continuously in a direction normal to said guideway, a scanning electrode mounted for reciprocable movement along said guideway and for pivotable movement into and out of operative recording relation to said surface about an axis normal to said guideway and substantially parallel to said surface, means operable initially to move said electrode on the pivotal mounting into operative recording relation to said recording surface and subsequently to effect a relatively slow scanning movement of said electrode along said guideway in one direction, means to render said electrode moving means inoperative at the end of said scanning movement, and means effective during the inoperativeness of said electrode moving means to move said electrode on the pivotal mounting out of operative recording relation to said recording surface and subsequently to effect

a relatively fast return movement of said electrode along said guideway in the opposite direction.

2. In facsimile apparatus, the combination with a recording surface of a track disposed parallel to said recording surface, a stylus bearing carriage adapted to be moved along said track, said carriage being pivotable about an axis normal to said track and substantially parallel to said surface to move said stylus into or out of engagement with said surface, means for urging said carriage toward one end of said track and said stylus out of engagement with said surface, means operable to move said carriage to the opposite end of said track and said stylus into engagement with said surface, and means for periodically rendering said carriage moving means inoperative whereby said carriage urging means is rendered effective to return said carriage to said one end of said track with said stylus out of engagement with said surface.

3. In facsimile apparatus, the combination with a recording surface of a plurality of spaced guide rails disposed parallel to said recording surface, a movable carriage, a cylindrical member attached to said carriage and in engagement with said guide rails, a recording stylus carried by said carriage, said carriage being pivotable about the rotational center of said cylindrical member to move said stylus into or out of engagement with said recording surface, a retractile line attached to said carriage, means including said retractile line for urging said carriage toward one end of said guide rails and tending to disengage said stylus from said recording surface, an actuating line, and means including said actuating line operable to move said carriage toward the other end of said guide rails and said stylus into engagement with said recording surface.

4. In facsimile apparatus, a carriage supporting a scanning member and movable between two extreme positions, means for constantly urging said carriage toward one of said positions, a line attached to said carriage, means operable invariably in the same direction for winding said line to draw said carriage toward the other of said positions, and means controlled by said winding means for periodically releasing the wound line from the winding means.

5. In facsimile apparatus, a carriage supporting a scanning member and movable between two extreme positions, means for constantly urging said carriage toward one of said positions, a rotating drum, a line attached at one end to said carriage, means for causing said line to be wrapped around said drum to effect a movement of said carriage toward the other of said positions, and means rotatable with said drum for dislodging the line from said drum concurrently with the arrival of said carriage at said other position.

6. In facsimile apparatus, a reciprocable scanning element, a linear track along which said scanning element is adapted to be moved, a rotating member carrying a drum, a line attached at one end to said scanning element and at the other end to said rotating member, said drum being disposed to cause said line to be wrapped around the drum, thereby producing a forward linear movement of said scanning element, a deflecting member attached to said rotating member and having a surface inclined to the rotational plane of said drum, said deflecting member being disposed to cause the inclined surface thereof to divert the line sufficiently to dislodge the wrapped portion from the drum, and a retractile line attached at one end to said scanning element to produce a backward linear movement of said scanning element upon the dislodgement of said first named line.

7. In a facsimile telegraph system employing a transmitter of facsimile signals and a recorder of said facsimile signals having scanning apparatus adapted to effect one complete scanning cycle for a plurality of complete cycles of a member employed to drive said scanning apparatus, the method of synchronizing said recorder with said transmitter which comprises, periodically transmitting a plurality of successive synchronizing signals, stopping said driving member in response to one of said synchronizing signals, and starting said driving member in response to a succeeding one of said synchronizing signals.

8. In a facsimile telegraph system employing a continuously operating transmitter of facsimile signals and a recorder of said facsimile signals having a scanning electrode adapted to make one scanning traverse of a recording surface for a plurality of revolutions of its rotary driving member, the method of synchronizing said recorder with said transmitter which comprises, transmitting after each scanning traverse of the subject matter being transmitted two successive signals having substantially opposite characteristics, stopping said driving member in response to the first of said successive signals, and starting said driving member in response to the second of said successive signals.

9. In start-stop facsimile apparatus, scanning apparatus including a recording electrode, a constantly running driving motor, speed reducing mechanism coupling said motor and said scanning apparatus, whereby said electrode is operated at a relatively low speed by said relatively high speed motor, means for effecting an invariable cyclic relation between cooperating elements of said speed reducing mechanism and successive recording positions of said electrode during a scanning movement, means for transmitting in succession a start signal and a stop signal, and means responsive to said signals for stopping and starting said scanning apparatus without altering said cyclic relation.

10. In start-stop facsimile apparatus, a scanning member, a constantly running driving motor, speed reducing mechanism comprising, a plurality of shafts, gears attached to said shafts and serving to drive one shaft from another at different rates of speed, said scanning member being actuated from a relatively low speed shaft and said motor being connected to drive a relatively high speed shaft, a clutch comprising a driving member and a driven member and having the driven member secured to said relatively high speed shaft, a stop arm attached to said relatively high speed shaft, a latch operable to engage said stop arm, means for transmitting a group of synchronizing signals, means responsive to one of said synchronizing signals, and means controlled by said low speed shaft coacting with said signal responsive means to operate said latch to its stop engaging position.

11. In a start-stop facsimile system, a recorder having a retractile scanning member, means operable at a relatively low speed to effect a scanning movement of said scanning member against a retractive force, said low speed means embodying mechanism for disabling the low speed means at the end of a scanning movement whereby said scanning member is returned by said retractive force, means operable at a relatively high speed

for driving said low speed means, means operable in response to a first synchronizing signal to stop said high speed means substantially concurrently with the disabling of said low speed means, and means controlled by a second synchronizing signal and said low speed means to restart said high speed means.

12. In a start-stop facsimile system, a recorder having a retractile scanning member, a relatively low speed shaft, a relatively high speed shaft, a winding drum attached to said low speed shaft, a cord attached at one end to said scanning member and at the other end to said drum whereby rotation of said drum causes the cord to be wound thereon and to effect a scanning movement of said scanning member against a retractive force, said drum having means for dislodging said wound cord at the end of a scanning movement whereby said scanning member is returned by said retractive force, a stop member attached to said relatively high speed shaft, a latch operable in response to a first synchronizing signal to engage said stop member substantially concurrently with the dislodgement of said cord, and a release mechanism controlled by a second synchronizing signal and said stopped drum to disengage said latch from said stop member.

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