

Nov. 23, 1937.

W. T. REA

2,099,771

PRINTING TELEGRAPH SYSTEM

Filed April 11, 1936

4 Sheets-Sheet 1

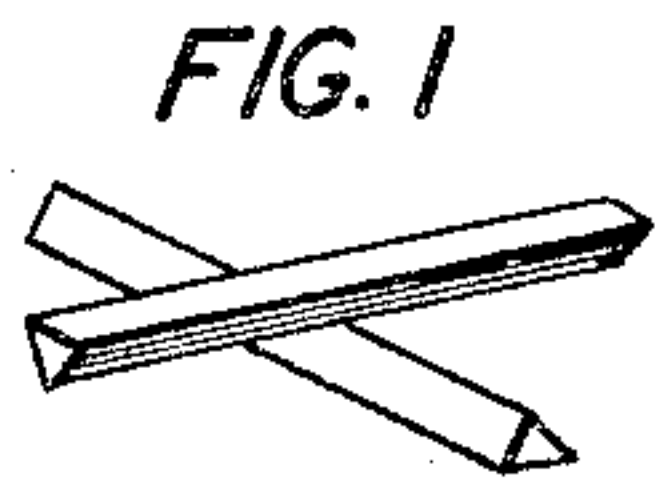


FIG. 4

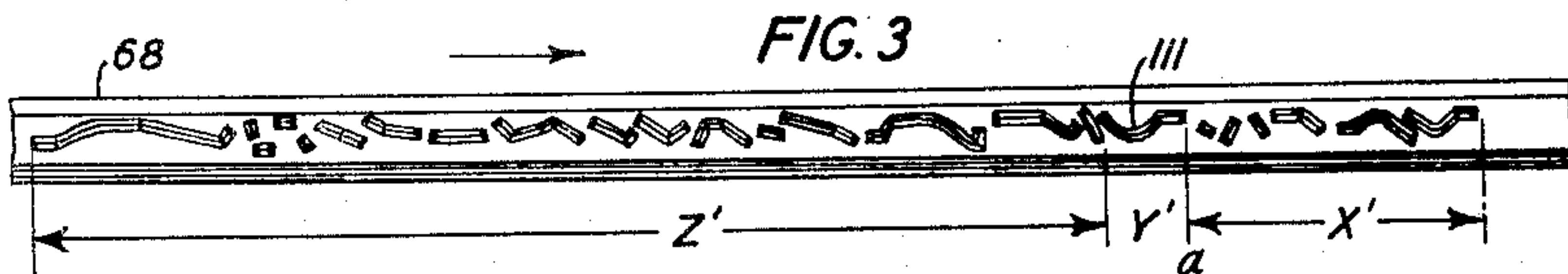
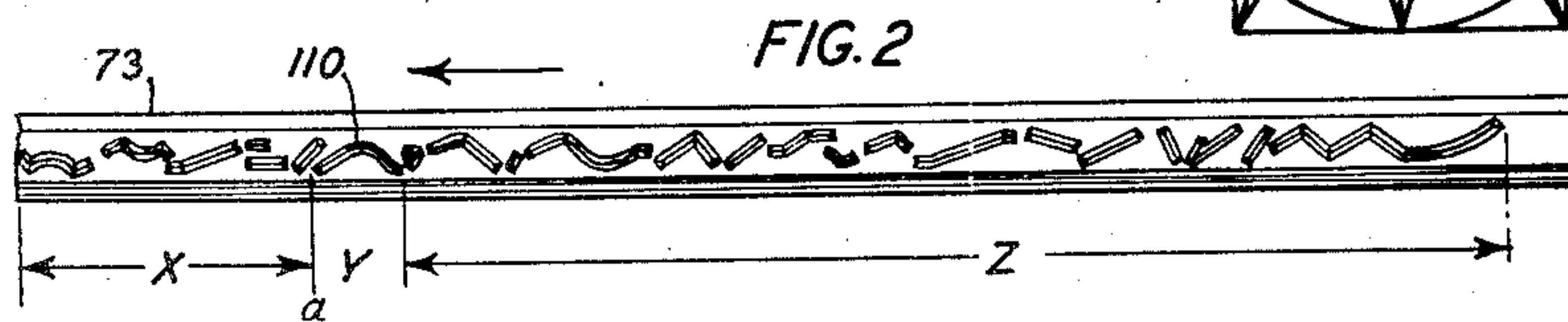
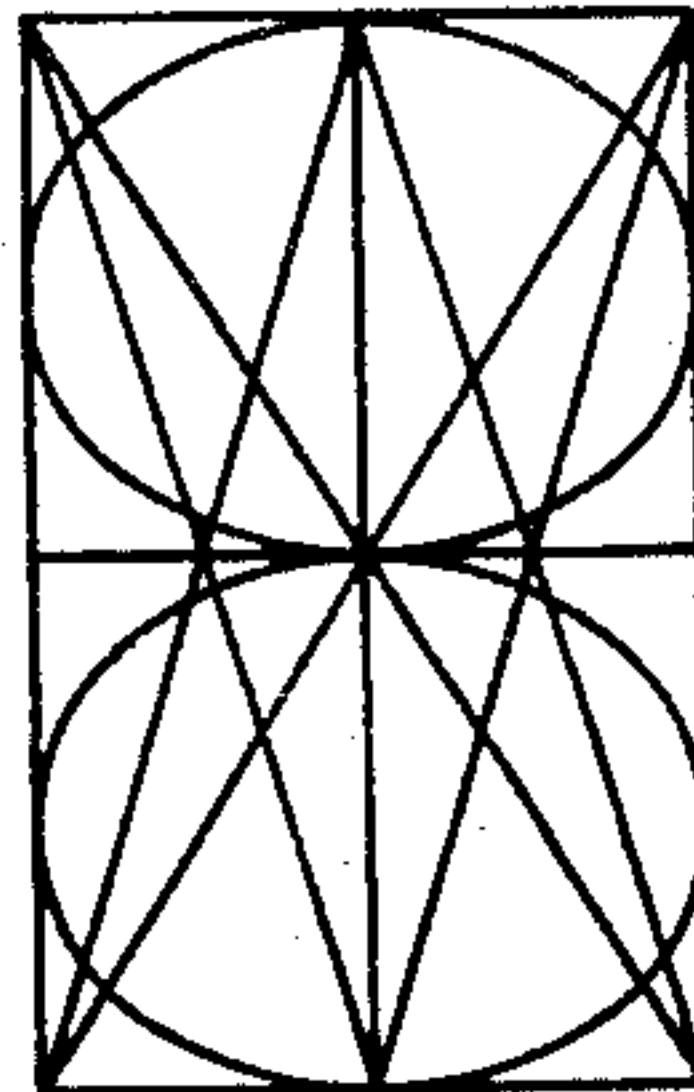


FIG. 5

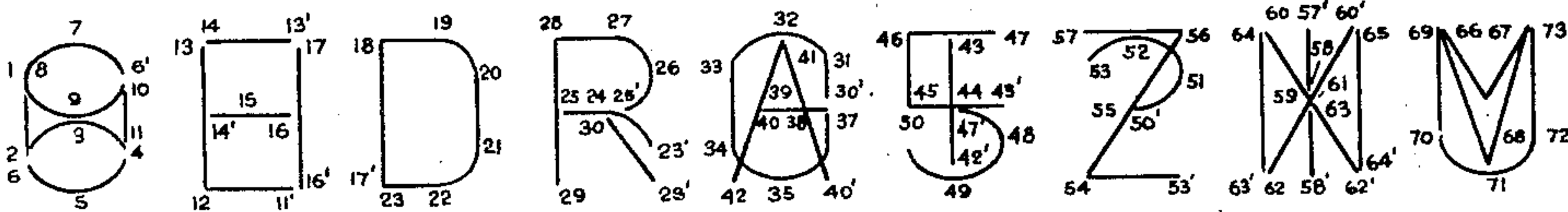
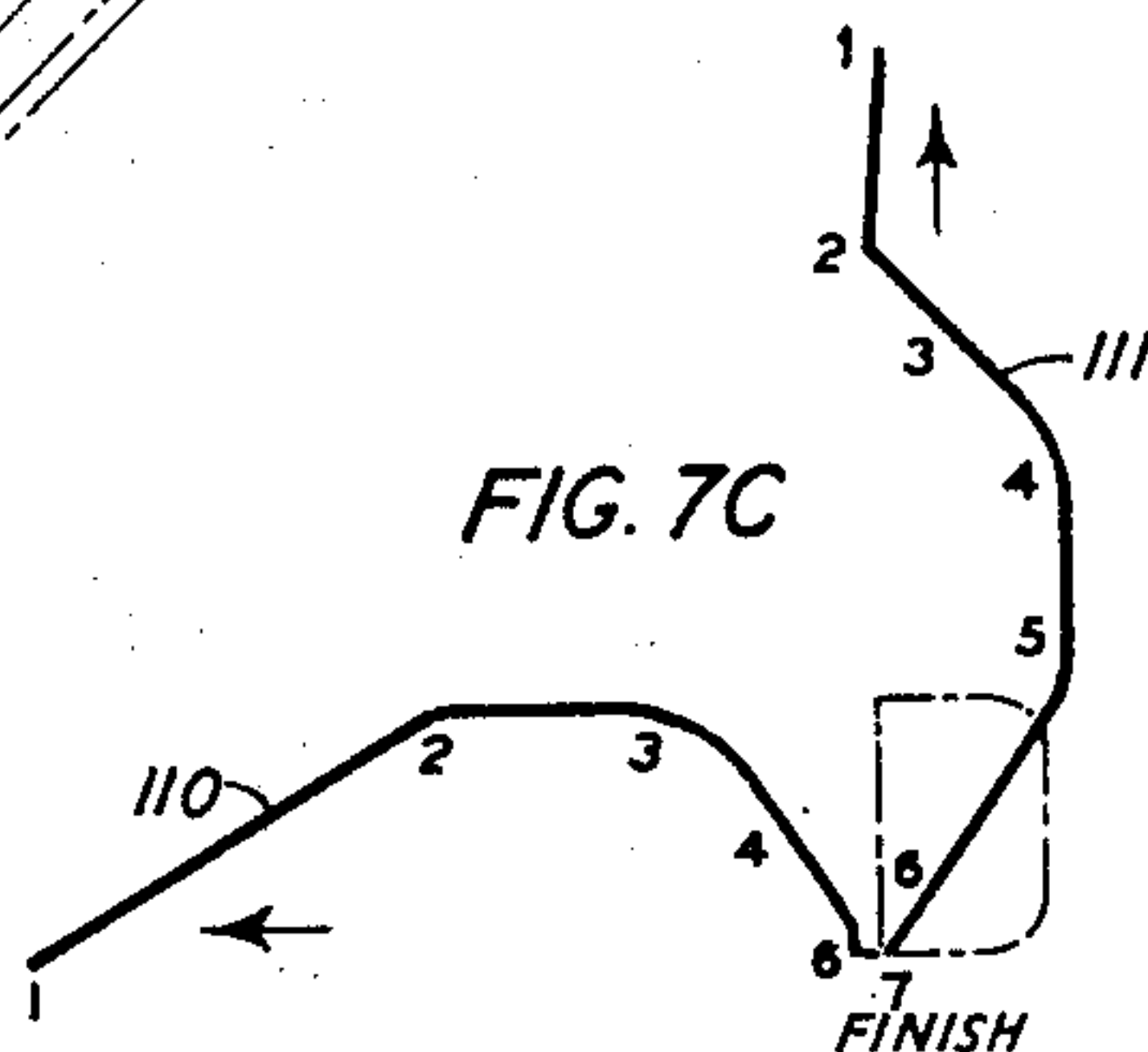
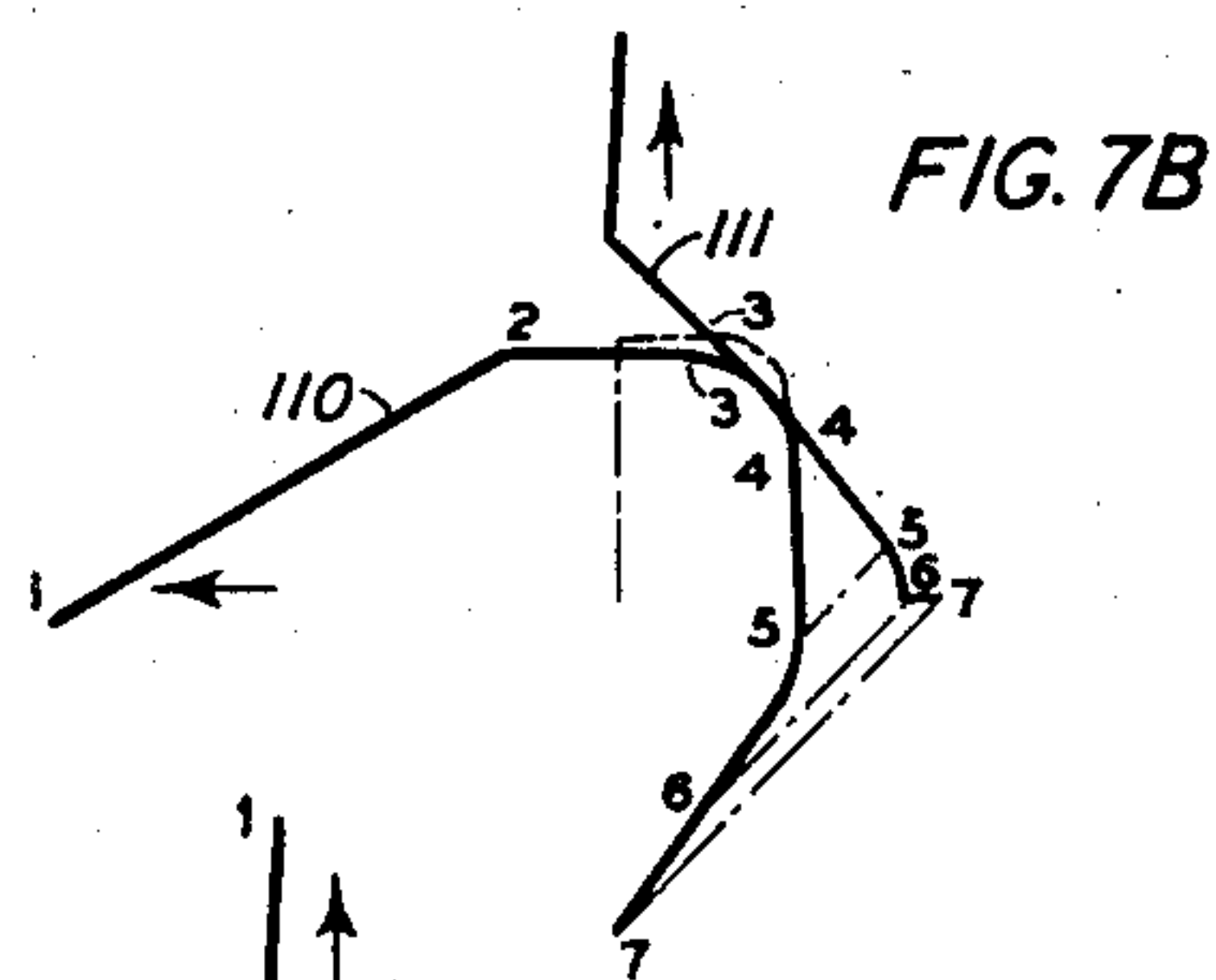
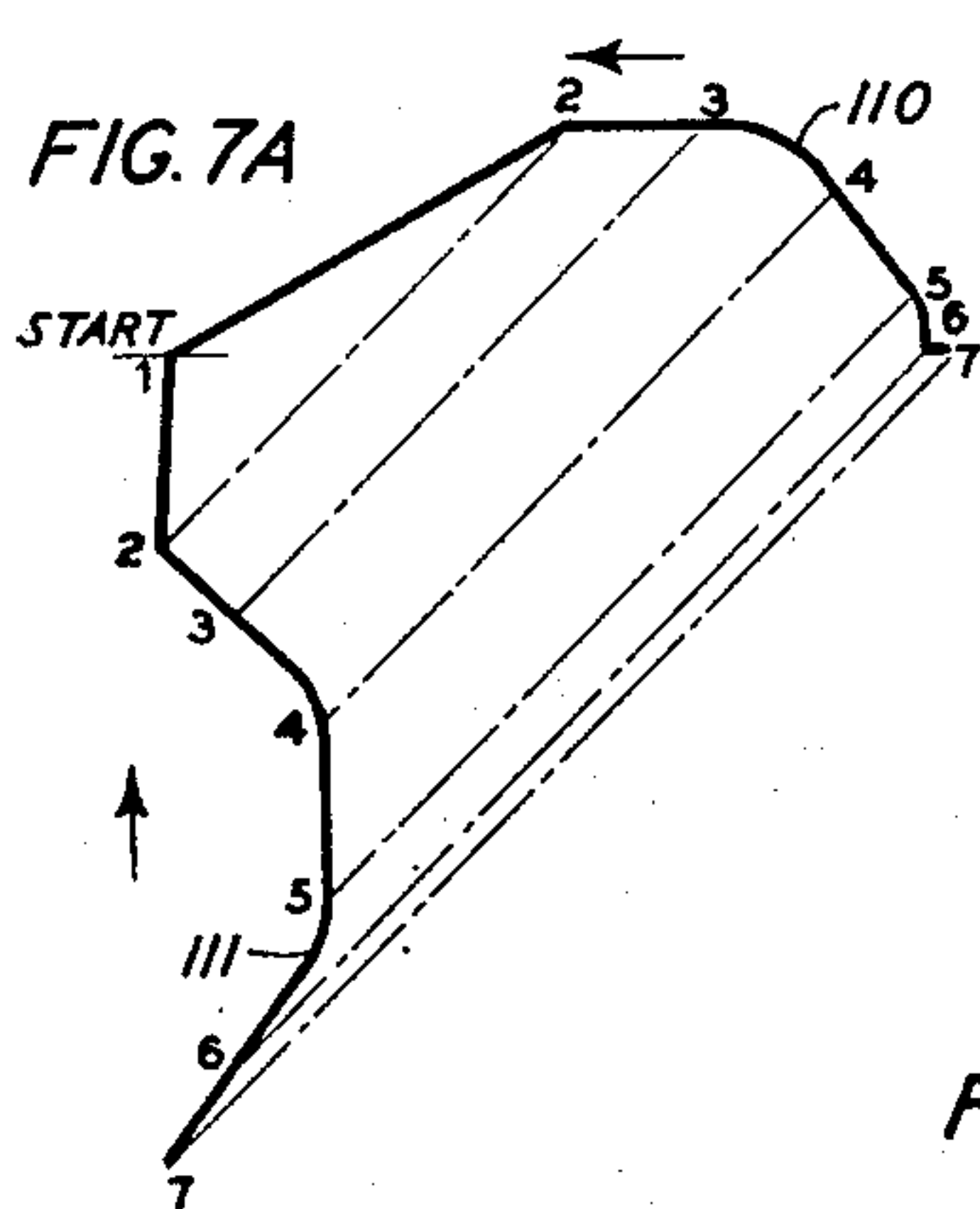


FIG. 6 A B C D E F G H I J K L M N O P Q
R S T U V W X Y Z 1 2 3 4 5 6 7 8 9 0



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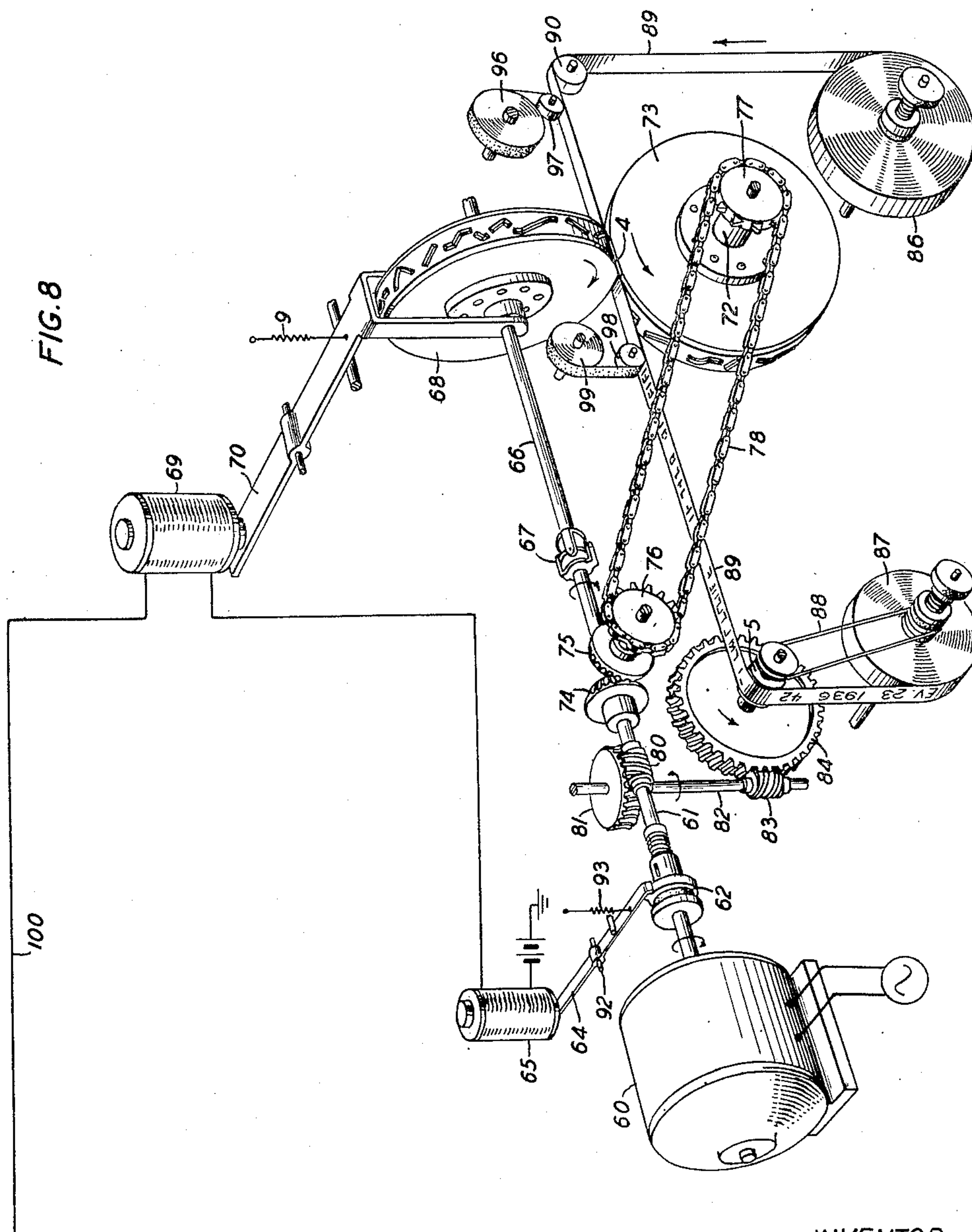
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PRINTING TELEGRAPH SYSTEM

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4 Sheets-Sheet 2



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PRINTING TELEGRAPH SYSTEM

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4 Sheets-Sheet 3

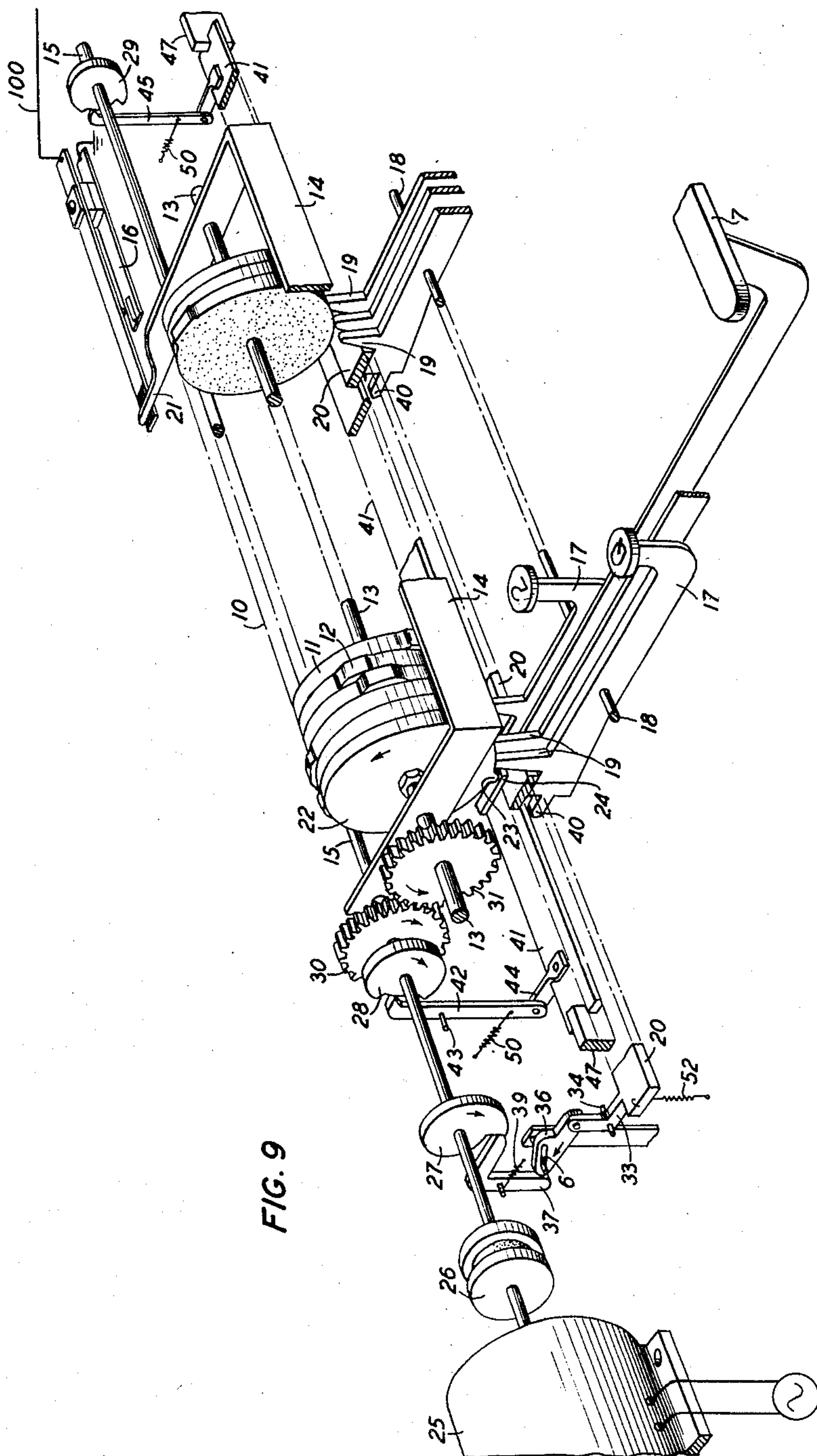


FIG. 9

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PRINTING TELEGRAPH SYSTEM

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4 Sheets-Sheet 4

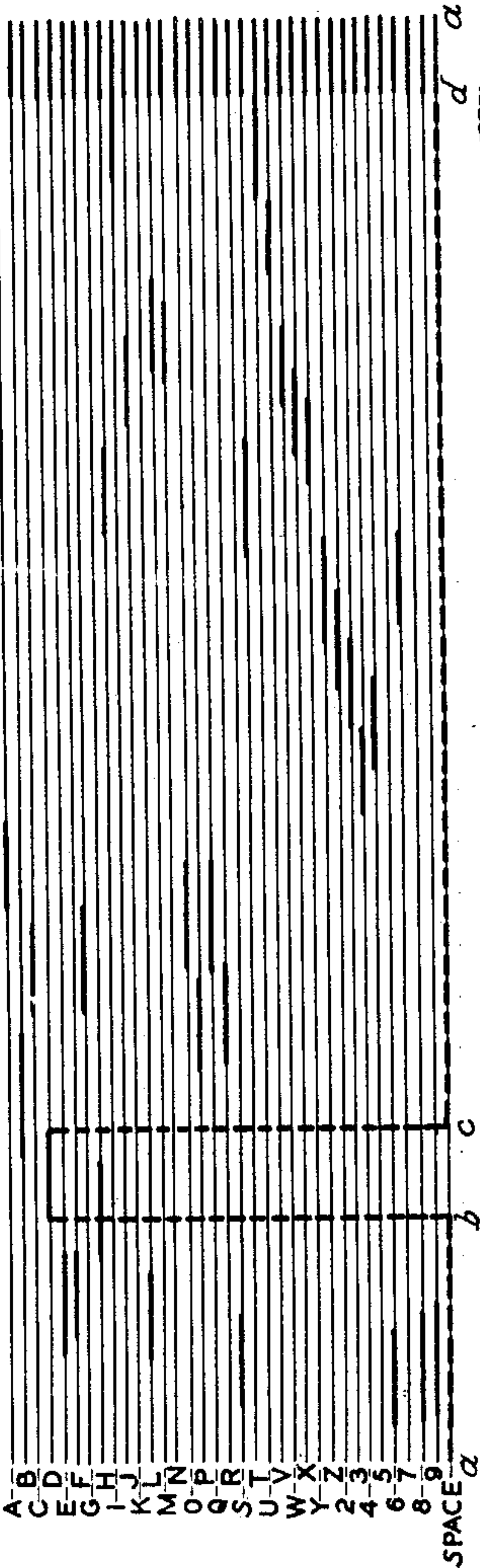


FIG. 11

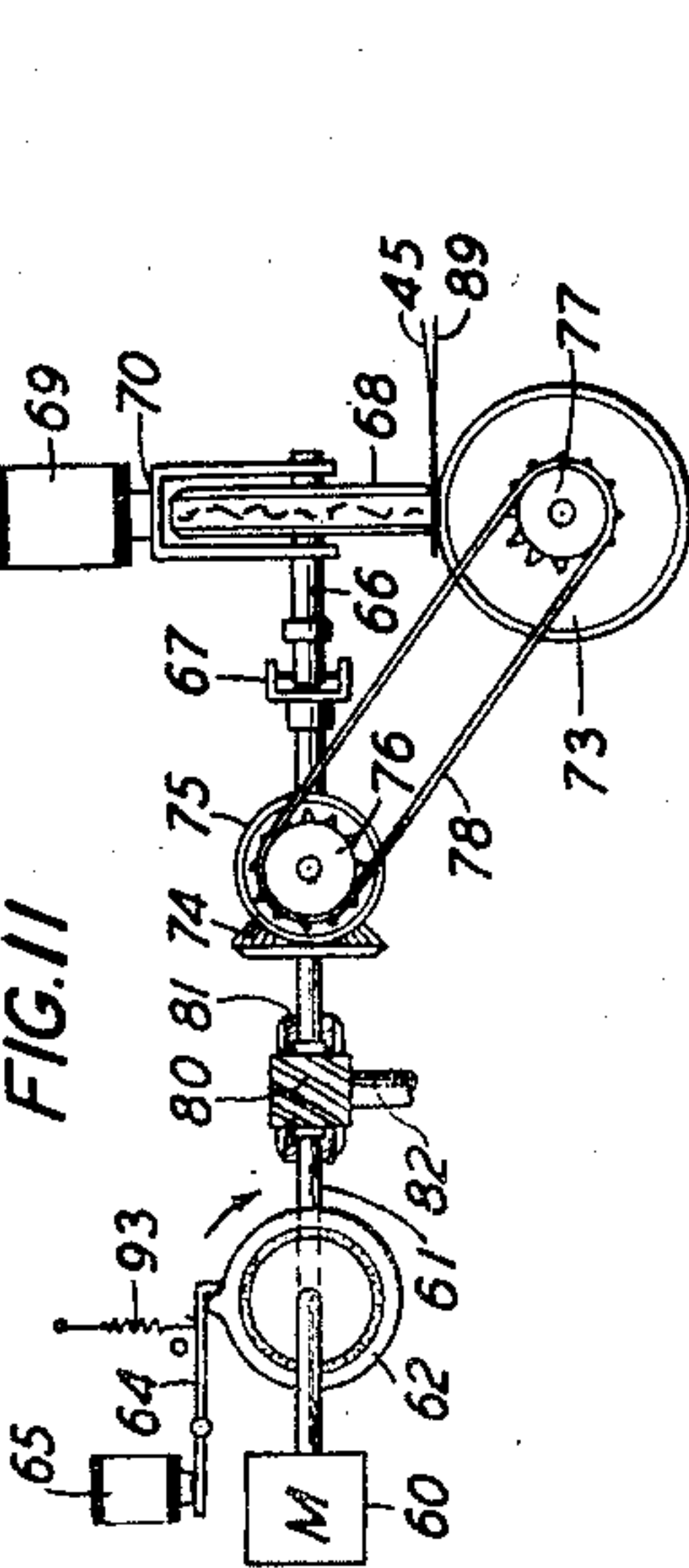


FIG. 12

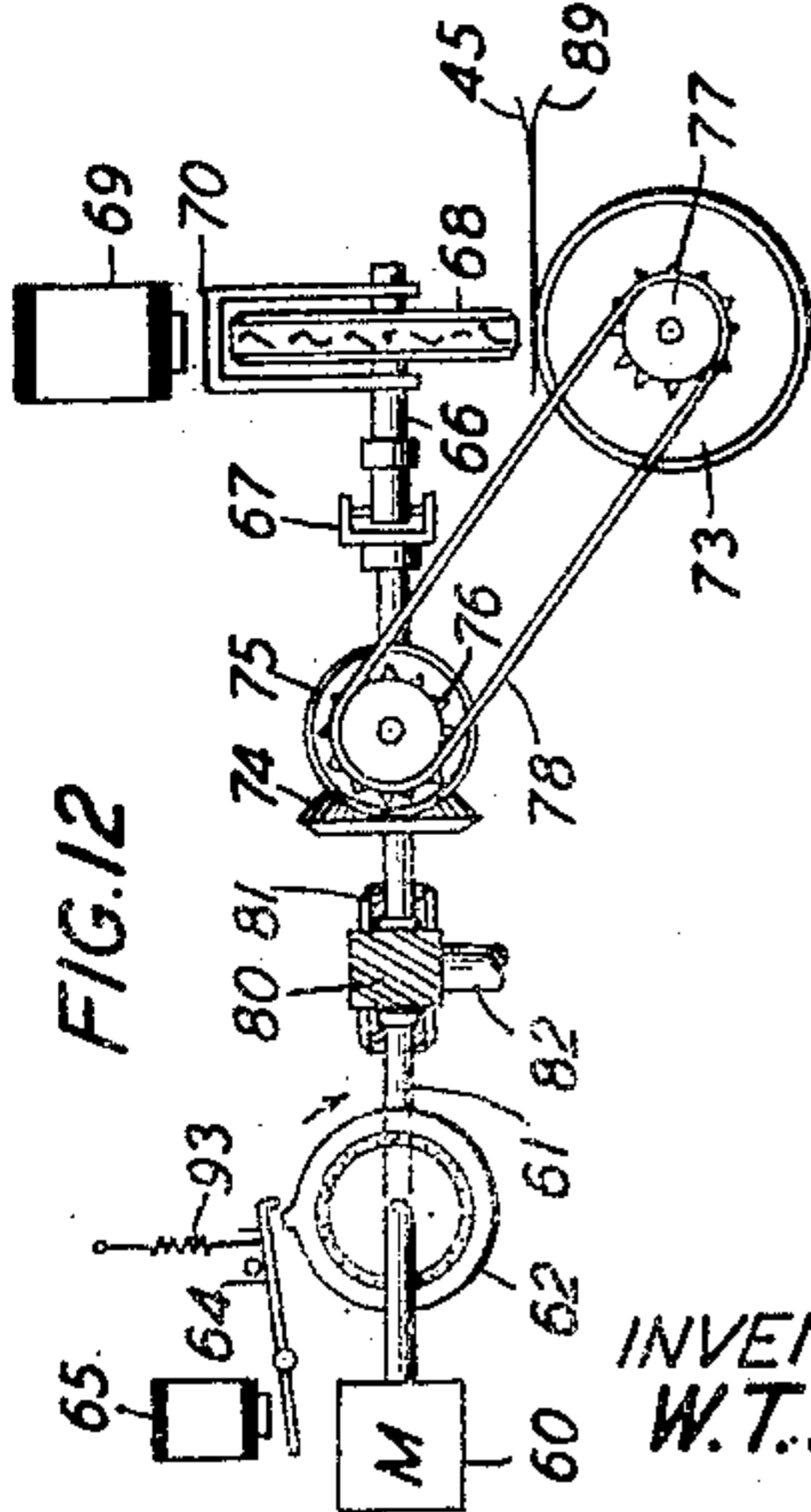


FIG. 13

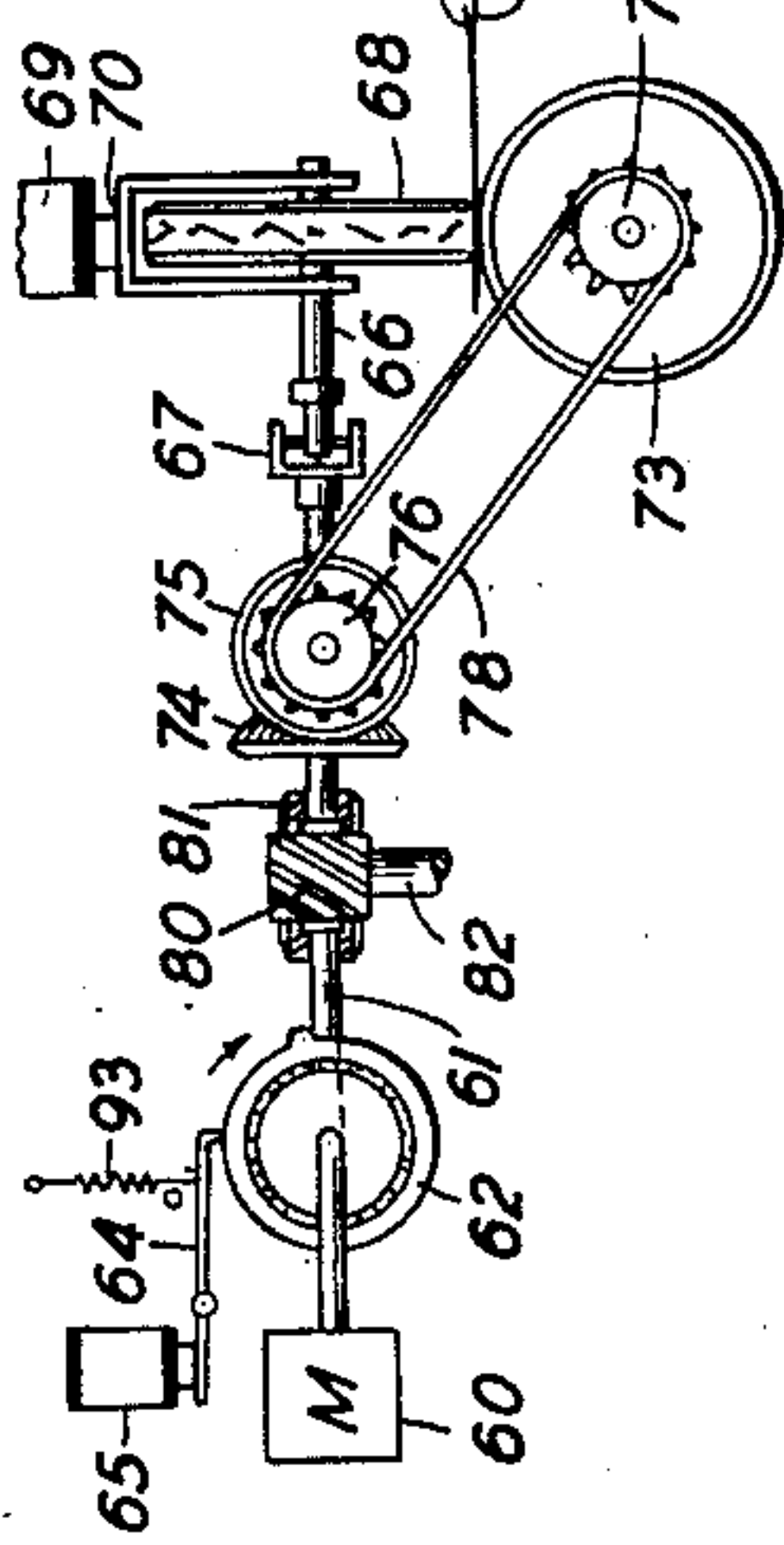


FIG. 15

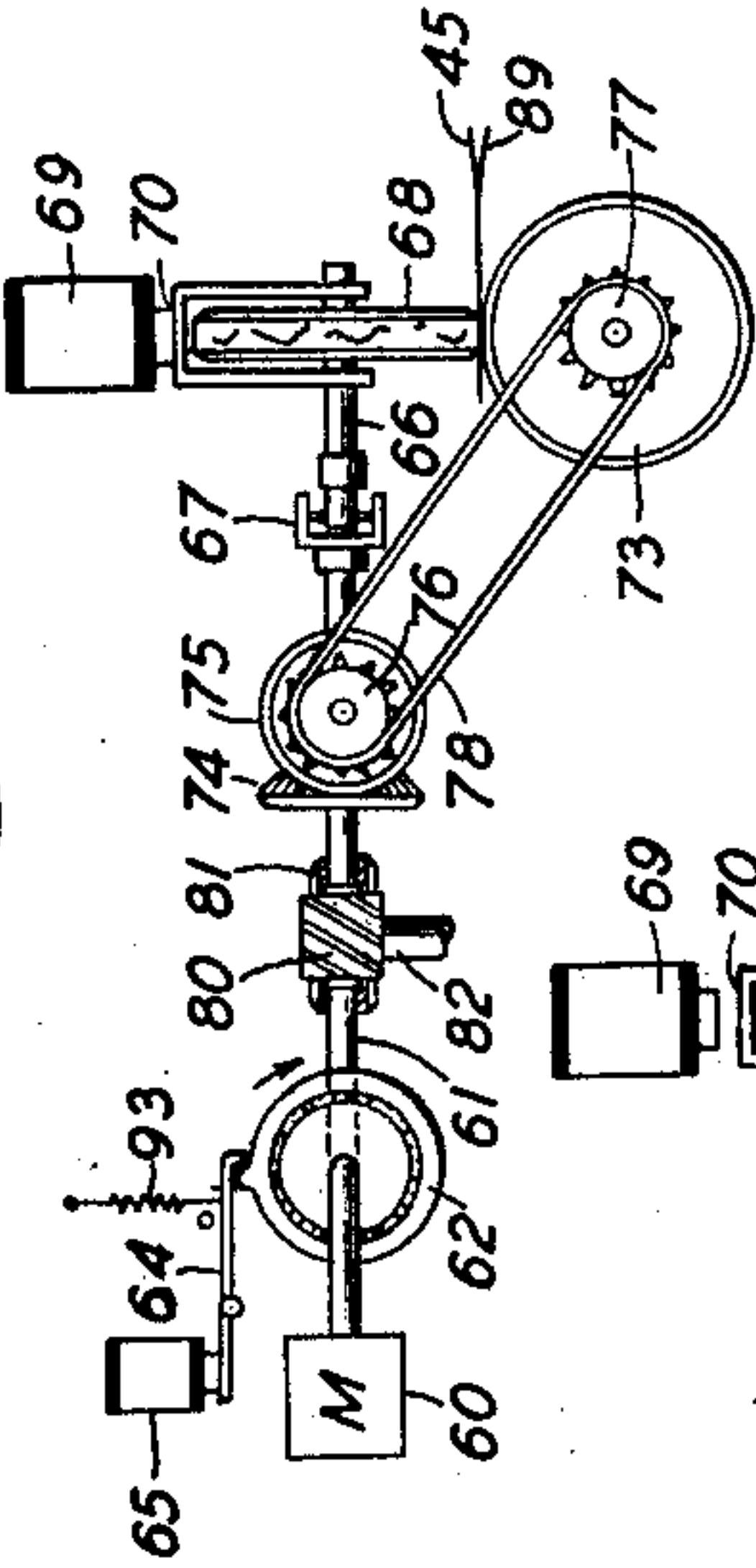
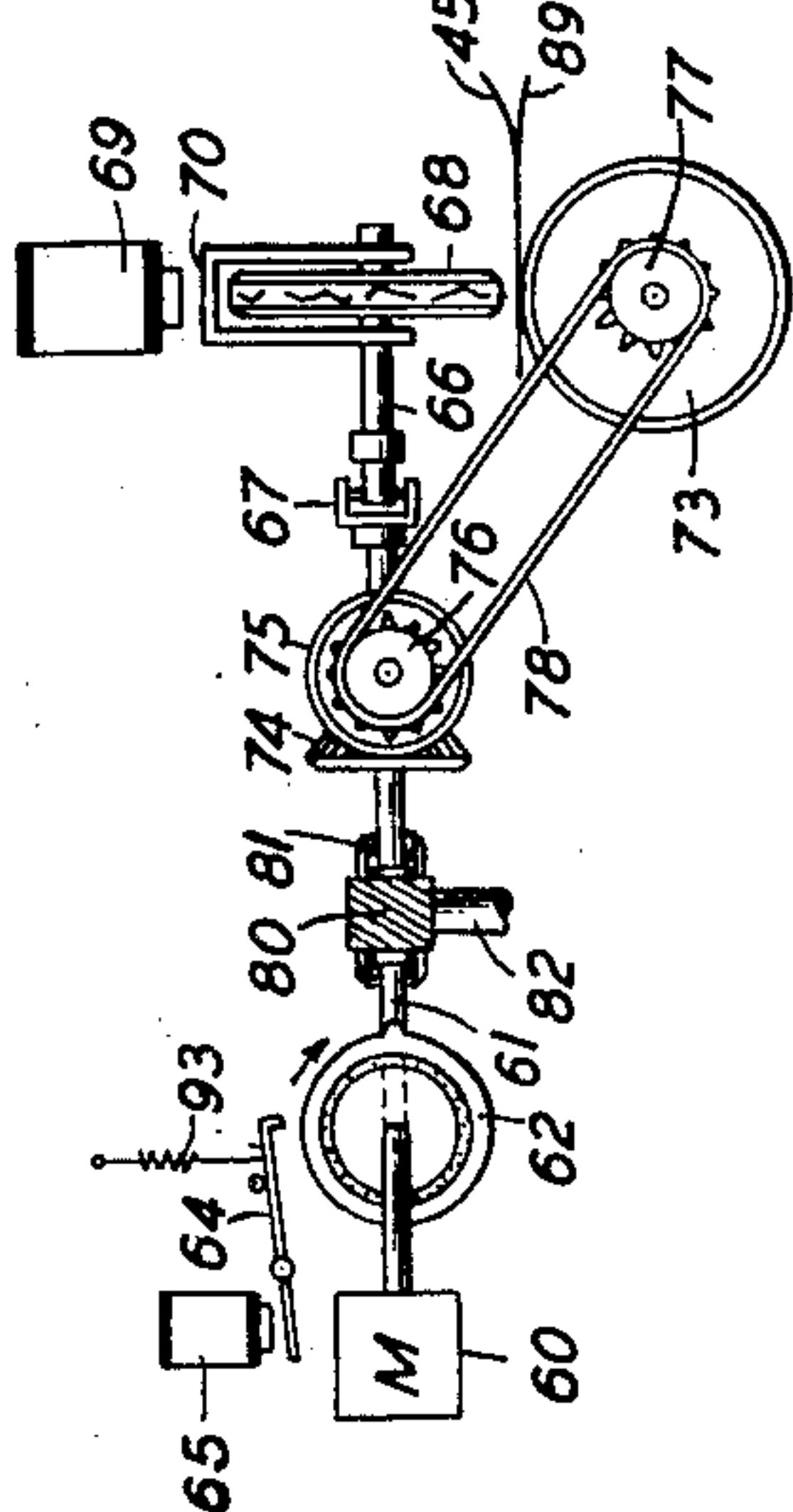


FIG. 14



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UNITED STATES PATENT OFFICE

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PRINTING TELEGRAPH SYSTEM

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a corporation of New York

Application April 11, 1936, Serial No. 73,944

10 Claims. (Cl. 178—30)

This invention relates to telegraph systems and more particularly to printing telegraph systems wherein the actuation of a keyboard type transmitter at a sending station causes the transmission of signal impulses over a line circuit which are received at a receiving station and recorded thereat on a type-wheel printer.

In systems of this general type it has been common practice heretofore to utilize as the printing medium at the receiving station, a character bearing member or type-wheel whose periphery is equipped with characters corresponding to the letters of the alphabet and to the digits of our system of numbers and to cause such member to be rotated to a particular position with respect to a recording tape and there actuated in such a manner as to cause to be impressed on the tape the particular character corresponding to the particular position to which the wheel has been rotated. In such systems the type-wheel must be halted between the selection and printing operations and means must be provided for moving the recording tape intermittently between the printing of successive characters. Such requisites tend to complicate the receiving mechanism and the system in general.

Due to the fact that, in previous forms of type-wheel printers, the length of the actuating signal pulse bears the same relation to the total time of rotation of the type-wheel as a single character bears to the total number of different characters transmissible, a relatively high maximum signal frequency is required which causes difficulty in transmission over the usual telegraph circuit of limited band width.

It is the object of this invention to simplify and improve telegraph printers of the type-wheel variety and to reduce the maximum signal frequency necessary for a given sending speed.

This object is attained in accordance with a feature of the invention by utilizing as the printing medium in a telegraph receiver, a pair of character bearing wheels or discs whose peripheries are furnished with a series of characteristically formed edges and causing the wheels to be rotated relative to each other in such a manner, and to come into engagement at such times, that the point of intersection of the two cooperating edges will describe, in the plane defined by the two edges, the outline of a symbol such as a letter of the alphabet or a numeral.

Another feature of the invention is embodied in the use of a letter or character pattern which renders it possible for parts of the pattern to be used in forming more than one of the characters

so that an "overlay" between characters is attained and the shortest actuating signal pulse is permitted to be long relative to the total time of rotation of the operating members. This feature causes the maximum signal frequency necessary for a given speed of sending to be reduced to approximately half the signal frequency necessary in the usual form of type-wheel printer.

A further feature of the invention resides in the use of means for effecting the synchronous operation of the two character bearing wheels and for causing to be drawn between their cooperating edges, during a printing operation, a receiving medium, such as carbon paper or an inked ribbon.

A still further feature of the invention is embodied in a suitable keyboard type telegraph transmitter which is so designed as to be capable of controlling the operation of the receiving mechanism so as to cause it to function in such a manner as to cause to be printed on a moving tape the character or characters corresponding to the key or keys utilized in transmitting a message.

In the proposed form of the invention illustrated in the drawings, two character wheels or discs are employed in the receiver, the axes of which are at right angles to each other and each in the plane of the opposing wheel, on the peripheries of which are formed a series of characteristically shaped ridges. When the wheels are rotated synchronously and their peripheries caused to make mutual contact, the point of intersection of the ridges will cause to be inscribed, on a paper tape moving between them, a symbol or character whose formation is determined by the pattern of the ridges contacting. The point at which the rotating discs or wheels are brought into engagement and the time duration of this engagement, which determine the form of the particular character traced on the tape, are themselves determined by the design of suitable cams associated with the transmitting mechanism and their location on a common transmitter cylinder with respect to the home or normal position thereof.

The invention will be readily understood from the following detailed description made with reference to the accompanying drawings, in which:

Figure 1 is a schematic representation illustrating a pair of elements whose longitudinal axes are at right angles to each other and whose edges are in contiguity at a particular point. The two elements of this figure correspond to the charac-

teristically shaped edges located on the type-wheels employed in the present invention;

Figs. 2 and 3 constitute plan views of the peripheries of the type-wheels showing the characteristically shaped ridges located thereon;

Fig. 4 illustrates a design pattern out of which may be formed all the letters of the alphabet and the numbers to nine;

Fig. 5 illustrates the nine symbols which may be produced by the character wheels of this invention. This figure is labeled by the numerals from 1 to 73 to indicate its order of formation. It will be noted that any letter or digit may be abstracted from the figure by starting and stopping at the proper places. For example, the letter "S" is formed by the lines from 3 to 9, the figure "6" is formed by the lines from 1 to 8, and the letter "X" is formed by the lines 59 to 63;

Fig. 6 shows the character wheel printer letter and digit forms as they appear when printed on a recording tape;

Figs. 7A, 7B and 7C illustrate the manner in which a particular letter, such as "D", is formed by a particular set of characteristically shaped edges on the character wheels of this invention;

Fig. 8 is a skeletonized perspective view of the operating mechanism employed in the receiving device or printer of which the particular type of character bearing wheels form a part;

Fig. 9 is a skeletonized perspective view of the transmitting mechanism which controls the operation of the receiver of Fig. 8;

Fig. 10 is a graphic illustration of the line signals corresponding to each letter and digit capable of being transmitted by the transmitting mechanism; and

Figs. 11 to 15, inclusive, illustrate five successive stages in a complete cycle of operation of the printer mechanism. Fig. 11 shows the normal condition of the printer; Fig. 12 illustrates the printer at the start of its movement; Fig. 13 shows the printer mechanism during the printing operation; Fig. 14 shows the printer mechanism immediately after the printing operation has been performed, and Fig. 15 illustrates the printer just as it is about to assume its normal condition.

The transmitter

The transmitting mechanism utilized in the system herein disclosed is illustrated in Fig. 9 and includes a cylinder 10 which is divided into thirty-four annular sections 11, each of which is provided on its periphery with a cam or elevated portion 12. The location of the cams 12 on the cylinder with respect to the home or normal position of the cylinder and their lengths have a special significance in that they determine the formation of the various characters. The cylinder 10 is suitably mounted on a shaft 13 and is cradled within the yoke piece 14 which is pivotally supported on the axis of the drive shaft 15. A pair of control springs 16 is located in such a position as to be within the line of travel of projection 21 of the yoke 14. These springs function to control the operating magnets of the receiving mechanism in a manner to be hereinafter described.

The transmitter includes a keyboard comprising thirty-four lever type keys 17, only two of which are shown complete, and a space bar 7. Twenty-six of the keys are allotted to the letters of the alphabet and eight to the numerals 2 to 9, inclusive. The keys "I" and "O" are employed in effecting the printing of the letters "I" and "O" and also the numbers 1 and 0. The key levers are pivotally mounted on a shaft 18 and are each pro-

vided with an integral projection 19 extending therefrom at right angles to the longitudinal axis of the key lever. Each of the projections 19 is in alignment with a cylinder section 11 and cooperates with the respective cylinder cams 12 in such manner as to determine the time at which the receiving mechanism starts to print a character and the time duration of such printing operation.

A cam 22 is located at one end of the cylinder 10 and is rigidly associated therewith. This cam is provided with a camming elevation 23 which, when the cylinder is in its normal or home position, rests upon a stop 24 which is rigidly fixed in any suitable manner. The engagement of elevation 23 with stop 24 when the cylinder 10 is in its normal position, causes the cylinder 10 and yoke piece 14 to be raised in such a manner as to cause the end 21 to bear upon and maintain the longer of the contact springs 16 in engagement with the shorter one. The contact springs 16 are, therefore, closed when the transmitter is in its normal position.

A continuously operating constant speed motor 25 drives the shaft 15 through a friction clutch 26. Rigidly secured to the drive shaft 15 are stop cam 27, latch cams 28, 29 and gear 30, the last meshing with gear 31 fixedly mounted on shaft 13. The purpose of this apparatus will appear from a later description.

Each key lever extends rearwardly beyond its projection 19 to form a ledge which, when a key is actuated, engages the under side of the elongated bar 20 which is common to all the keys. The actuation of a key 17 and the ensuing upward movement of bar 20 causes bell crank 33, one end of which is permanently associated with the bar 20 or may be integral therewith, to pivot about the axis 34. Pivotally associated with the bell crank 33 is a slotted cam 36 which is adapted to ride on the fixed pin 6 and to move in the direction indicated by the arrow when actuated by the bell crank. This movement of the element 36 causes pawl 37 to pivot on its axis and move out of engagement with the straight portion of stop cam 27 whereupon the drive shaft 15 is released and rotates. The upper edge of pawl 37 now rides on the camming surface of cam 27 being held in contact therewith by the action of spring 39. The cam 36 is so designed as to release the pawl 37 when the cam reaches the limit of its forward travel thereby permitting the pawl to be in a position such as to engage the cam 27 when the latter completes a revolution. The cam 27, therefore, under the influence of motor 25 rotates in the direction indicated by the arrow thereon for one complete revolution whence the straight edge thereof again is engaged by the working end of pawl 37. The cam 27 and drive shaft 15 are, therefore, arrested and held against further rotation.

As a key 17 is depressed, a lug 40 on the inner end of the key lever moves upwardly, clearing the edge of latch plate 41. As the shaft 15 rotates, cam 28 fixed thereto, acts upon the lever 42 to cause it to pivot about its axis 43 and thrust the latch plate 41 forward under the lug 40 of the actuated key 17, the lever 42 being connected to the latch plate 41 by means of element 44. A similar cam 29 and lever 45 operate in the same manner on the other end of the latch plate 41 to effect a more positive movement thereof. The plate 41 rides in notches on the ends of the strips 47.

It will be apparent from the foregoing descrip-

tion that the latch plate 41 when actuated, moves between the lug 40 of an actuated key lever and the corresponding lugs of all other key levers thereby locking the actuated lever in its operated position and preventing the actuation of all other levers.

Due to the engagement of gears 30 and 31 and when the cam 27 is released, the cylinder 10 starts to rotate in the direction indicated by the arrow on cam 22. The elevation 23 of cam 22 accordingly rides off the stop 24 permitting the cylinder 10 and its associated yoke piece 14 to fall, so that the periphery of the cylinder section 11 corresponding to the actuated key 17 engages the projection 19 thereof. This movement of yoke 14 causes its end 21 to raise whereupon the contact springs are opened for a purpose which will appear from a later description. As the cylinder 10 rotates, the spring contacts 16 remain open until the elevated portion or cam 12 reaches the projection 19 of the actuated key lever whereupon the cylinder 10 and yoke piece 14 are again raised and the contact springs 16 again actuated to effect a circuit closure. The duration of this circuit closure depends upon the peripheral length of the cam 12. When the cam 12 rides off the projection 19 due to the continued rotation of cylinder 10, the latter and its yoke piece 14 are again lowered to cause the contact springs 16 to be opened and they remain open until the raised portion 23 of cam 22 again rides upon the stop 24, when the cylinder 10 and its yoke 14 are raised to effect a circuit closure by way of the contact springs 16. The cylinder 10 is then in its home or normal position.

Just prior to the cylinder 10 reaching its home position, the latch cams 28 and 29 act upon the levers 42 and 45, respectively, permitting their upper ends to fall into the cam notches under the action of springs 50. This movement of the levers 42 and 45 causes the latch plate 41 to be withdrawn from its latching position whereupon the actuated key 17 is restored to normal by the action of a suitable restoring means, not shown. As the latch plate 41 is withdrawn and the key lever restored to normal position, the bar 20 is returned to its normal position under the action of spring 52. The bell crank 33 accordingly pivots on its axis 34 causing the notched cam 36 to move in a direction opposite to that indicated by the arrow and assume a position such that it will arrest any further pivotal movement of pawl 37 when the latter is engaged by the straight portion of cam 27. The transmitter mechanism is accordingly restored to normal position of rest and the rotational energy generated by the motor 25 is dissipated in the friction clutch 26.

The receiver

Referring now to the receiving mechanism shown in Fig. 8, there is disclosed a continuously operating constant speed motor 60 which drives shaft section 61 through a friction clutch 62. Normally, that is, when the transmitter shown in Fig. 9 is not functioning, that portion of the friction clutch 62 associated with shaft section 61 abuts against the latching armature 64 of the electromagnet 65 so that the shaft section 61 is normally at rest. The drive shaft comprises the section 61 and section 66 connected together by the flexible coupling 67 so that the section 66 may be moved angularly with respect to the section 61. On the extreme end of shaft section 66 there is rigidly fixed a character bearing wheel or disc 68. An electromagnet 69 is provided with an arma-

ture 70 which terminates in a depending yoke-like portion which supports the outer end of shaft section 66. As will appear from a general description of the operation of the system to be made hereinafter, the magnets 65 and 69 are normally operated so that the armature of the former is in such a position as to effectively prevent rotation of the shaft sections 61 and 66 and the armature of the latter is in such a position that the shaft portion 66 and the type-wheel 68 are in their lowermost position.

With its axis at right angles to the axis of wheel 68 there is mounted on a suitable shaft 72 a type-wheel or disc 73 which is adapted to be driven by shaft section 61 through gears 74, 75, sprocket wheels 76 and 77, and drive chain 78.

The shaft section 61 has rigidly fixed thereon a worm 80 which meshes with the worm wheel 81 mounted on shaft 82 which carries a fixed worm 83 at its lower end. The worm 83 meshes with worm gear 84 so that the latter is driven by the shaft section 61 also. Mounted on suitable shafts are a paper tape supply reel 86 and a paper take-up reel 87, the latter being driven from the shaft of worm gear 84 by means of belt 88. The paper tape passes from the supply reel 86 over a pulley 90, between the two type-wheels 73 and 68, over a driving pulley 5 mounted on the shaft of worm gear 84 and thence on the paper take-up reel 87. The supply and take-up reels 86 and 87 are permitted to slip relative to their respective shafts in order to insure a uniform movement of the tape between the type-wheels 68 and 73 when the diameters of the reels vary as the tape is transferred from one to the other. The rate of movement of the tape 89 bears a predetermined relation to the rate of movement of the peripheries of the character wheels. A carbon or inked ribbon is fed from the reel 96 over pulley 97, passed between the tape 89 and type-wheel 68, over pulley 98 to the take-up reel 99. It is to be understood that the shaft upon which reel 99 is mounted may be driven at a constant speed in any suitable manner from the shaft 61.

It will be apparent from the foregoing description that when magnet 65 is deenergized, the armature pivots about its axis 92 under the action of spring 93 and moves out of engagement with the stop portion of friction clutch 62. The shaft sections 61 and 66 thereupon rotate causing the type-wheels 68 and 73 to be driven synchronously and the tape 89 to be drawn between the two co-operating peripheries thereof under the influence of pulley 5.

A general description of the operation of the system will now be had, specific reference being made to Figs. 10 to 15, inclusive.

Fig. 10 may be considered to correspond to the periphery of the cylinder 10, the heavy horizontal lines thereof representing the cam surfaces 12 of the cylinder. As hereinbefore stated, the length of a cam surface 12 and its position on the cylinder relative to the start or home position of the cylinder determines the character which will be printed at the receiving end. In the present description it will be assumed that it is desirable to transmit to the receiver the letter "D".

Prior to the transmission of a character signal, the magnets 65 and 69 are in their normal energized condition due to the closure of contact springs 16 which cause ground to be connected to conductor 100 to complete an energizing circuit for the magnets of the receiver. This condition is illustrated by Fig. 11. In this position of the receiver, the character wheels are, as shown in Fig. 75

8, in such position that they do not bear on the recording tape due to each wheel being furnished with a flat space on the periphery thereof. The flat space on wheel 73 is clearly indicated at 4.

5 To transmit the letter "D" or rather to cause the letter "D" to be printed at the receiving station, an operator would depress a key identified by the letter "D" causing the release of stop cam 27 in a manner hereinbefore described. The transmitter shaft and cylinder 10 would accordingly start to rotate. As the elevation 23 of cam 22 rides off the stop 24, the cylinder 10 and its yoke piece 14 are lowered causing contact springs 16 to be separated and the magnets 65 and 69 to be deenergized. The deenergization of these magnets occurs substantially simultaneously with the start of rotation of cylinder 10. Magnet 65, deenergized, releases its armature causing it to move out of engagement with the stop element 20 of friction clutch 62 whereupon drive shaft 61 and associated mechanism begin to function under the action of motor 60. The thirty-five superimposed short lines shown at the extreme right of Fig. 10 correspond to the raised portion 23 of cam 22, it being understood that the cam 22 functions for the entire cylinder when the latter is in its home position. As the cylinder continues to rotate the projection 19 of the actuated key 17 rides on the periphery of the annular portion in alignment therewith until it meets a cam 12. The peripheral portion of the cylinder traversed by the projection 19 up to this time corresponds to the selection period and is indicated by the broken line *a-b* of Fig. 10, it being understood that the selection period begins at *a*, that is, when the cam 23 rides off the stop 24.

During this period of selection the type-wheel 68 is in its raised position due to the deenergization of magnet 69 so that the paper tape 89 and inked ribbon 95 pass freely between the two type-wheels, that is, no impression is made on the tape, due to the separation of the type-wheels. This condition or stage is represented by Fig. 12.

45 When the projection 19 of a depressed key 17 engages the cylinder cam 12 in alignment therewith, the printing operation starts and continues until the cam 12 passes beyond the influence of the projection 19. During this period, magnets 50 65 and 69 are energized, the latter causing the type-wheels 68 and 73 to come into engagement. During the period that projection 19 is riding on a cam surface 12, which period is termed the printing period and corresponds to the distance 55 *b-c* shown in Fig. 10, certain portions of the characteristically formed peripheries of the type-wheels are pressed together with only the traveling tape 89 and inked ribbon 95 intervening, with the result that the letter "D" is traced upon the 60 tape, it being understood that during the selection period the type-wheels have advanced until a particular set of characteristically formed edges on the peripheries thereof have been positioned opposite to one another and which edges cooperate to form the letter "D" as the tape is drawn between the cooperating edges. The printing period is shown in Fig. 13.

As the key lever projection 19 moves off the cam portion 12 of the cylinder 10, the cylinder and its yoke piece 14 are again lowered causing the deenergization of the magnets 65 and 69. The deenergization of magnet 69 at this time causes the type wheel 68 to be drawn upwardly away from the type-wheel 73 allowing the paper tape 75 to be drawn freely therebetween without any im-

pression being made thereon. This condition is illustrated by Fig. 14 and persists until the latch cams 28 and 29 of the transmitter function to release the actuated key and permit the restoration to normal of bar 20 under the action of spring 52. 5 The release of the bar 20 causes the bell crank 33, notched cam 36 and pawl 37 to cofunction in such a manner that the pawl 37 is in a position to engage the straight portion of stop cam 27 which results in the arrest of the transmitter. 10 This condition is illustrated at Fig. 15 and the peripheral distance traversed during this time (after printing) by the key projection 19 is indicated by the broken line *c-d* of Fig. 10.

Just as the transmitter is coming to rest, or 15 approaching its home position, the raised portion 23 of cam 22 rides upon the stop 24 causing cylinder 10 and its yoke piece 14 to be raised with the result that the contact springs 16 are again closed. The closure of the springs 16 at this 20 time causes magnets 65 and 69 to be energized with the result that the armature stop of the former is moved into such a position as to engage the stop portion of friction clutch 62 whereupon the receiving mechanism is brought to rest 25 and the equipment is restored to its normal condition.

As just described and as illustrated by the broken line *a-b-c-d-a* of Fig. 10, there are 30 three active phases in the cycle of operations required in the printing of a character. First, the selection period, which in the case described, extends between the points *a* and *b* on the broken line of Fig. 10. The extent of this selection period varies in accordance with the location of the 35 camming element 12 on the periphery of the cylinder 10 with respect to the cylinder's home position or starting point. The second is the printing period extending between the points *b* and *c* on the broken line of Fig. 10. The length 40 of this period varies with the length of the cam 12 employed, and the last, is the period after printing, represented by that portion of the heavy line in Fig. 10 between the points *c* and *d*.

With further reference to Figs. 2 and 3, it will 45 be noted that the particular characteristically formed ridges labeled 110 and 111 on the peripheries of type wheels 68 and 73, respectively, are those which, when brought together, cooperate in forming the letter "D." This is apparent from 50 the enlarged representations illustrated in Figs. 7A, 7B and 7C. The peripheral lengths "X" and "X'" indicate those portions of the type-wheel peripheries which will have passed each other before the projection 19 of the actuated key lever 55 17 comes into engagement with the elevated portion or cam 12 on the section of cylinder 10 which is in alignment with the actuated key. This is known as the selection period of the cycle and corresponds to the portion of the broken line in 60 Fig. 10 extending between the points *a* and *b*. The peripheral lengths "Y" and "Y'" indicate those portions of the type-wheel peripheries which are in contact during the printing period due to the operation of magnet 69 which is effected by the 65 engagement of the key lever projection 19 with a cam surface 12 and the consequent closure of the contact springs 16. The interval of time during which the projection 19 and a cam 12 are in contact depends upon the length of time during 70 which the contact springs 16 are maintained closed which in turn depends upon the length of the cam surface 12.

The peripheral lengths "Z" and "Z'" indicate those portions of the type-wheel peripheries 75

which freely pass each other after the printing of a character has been accomplished and correspond to the period of the cycle represented by the portion *c—d* of the broken line in Fig. 10.

5 During this period, the key lever projection 19 is in contact with the deeper portion of the cylinder section 11 intermediate the cam 12 and the point corresponding to the home position of the cylinder 10, the contacts 16 separated and magnet 69 deenergized.

To more clearly illustrate the actual printing of a character, the sketches 7A, 7B and 7C are submitted, which combine to disclose the manner in which the characteristically formed ridges 110 and 111 (Figs. 2 and 3) cooperate in tracing the letter "D". The point indicated "Start" in Fig. 7A corresponds to the points *a* of Figs. 2 and 3 at which the characteristically formed ridges 110 and 111 of the type-wheels 68 and 73, respectively, come into contact with each other. As the type-wheels advance, the edges defined by the characteristically formed ridges 110 and 111 wipe over each other causing to be traced on the paper tape moving between the two wheels, the character "D". Fig. 7A illustrates the start of the wiping engagement. Fig. 7B that portion of the letter "D" which is completed after the two edges have partially passed each other and Fig. 7C, the end of the printing cycle when the tracing of the character is completed. The small numerals shown on the patterns 110 and 111 of Figs. 7A, 7B and 7C, serve to define those portions of the edges which cooperate in tracing the particular elements of which the letter "D" is composed. The edge portions between the numerals 1 and 2 cooperate in tracing the upward vertical line of the letter "D"; the portions located between the numerals 2 and 3 effect the tracing of the upper horizontal line of the letter; the portions defined by the numerals 3 and 4 trace the upper curve in the letter; the portions between the numerals 4 and 5 cooperate in tracing the vertical line extending downwardly from the upper curved portion of the letter; the portions located between the numerals 5 and 6 effect the tracing of the lower curve and the portions 6 to 7 trace the lower horizontal line of the letter "D". It will be noted that the symbol forming pattern progresses from right to left as the wheels rotate in order to compensate for the motion of the tape during the rotation of the wheels.

It is to be understood that the connection between the transmitting contacts and receiving magnets may be any well-known form of transmission circuit, such as telegraph, telephone or radio.

The device herein described, though resembling in some respects a type-wheel printer, has the advantage thereof, that a simple operation of the receiving magnet during the rotation of the receiving mechanism causes a letter or character to be formed. In other words, it is not necessary to halt the character-bearing member or members during the printing operation, nor is it necessary that means be provided for moving the tape intermittently between characters. This results in a simplification of the mechanism. A further important feature of the device of this invention, as hereinbefore mentioned, provides for a lower maximum signal frequency for a given sending speed.

Though the invention has been disclosed in a particular embodiment, it is conceivable that it may assume other forms. For example, two

hollow cylinders having their axes at an angle to each other and in the same relation to each other as the character wheels referred to above may be employed. Around each cylinder wall characteristically shaped slits or apertures may be provided. Positioned within the first cylinder a stationary light source and a lens system would be provided for directing a beam of light through the apertures in the cylinder. Within the second cylinder a light sensitive medium, such as a strip of photographic paper, may be caused to move parallel to the axis of the cylinder and also within this cylinder and interposed between the sensitive medium and the light source, a second lens system is provided with causes the light beam passing through the two cylinder apertures to be concentrated in a point on the sensitive medium. The two cylinders may be caused to revolve in synchronism and the light source may be controlled in any suitable manner by line impulses.

The operating principle of this arrangement is the same as the character-wheel embodiment, i. e., when the cylinders are rotated at equal velocities and the light source is illuminated, the moving point of intersection of the slits in the cylinders, which are in the range of the beam of light, will trace a symbol or character on the light-sensitive surface.

What is claimed is:

1. In a telegraph printer, a pair of continuously rotating discs having irregular peripheral edges, a moving recording tape interposed between the peripheral edges of said discs and means for causing the peripheral edges of said discs to contact said moving tape at certain intervals during the rotation of said discs whereby said tape is acted upon by the contacting portions of the peripheral edges to cause a symbol, characteristic of the contacting portions of the peripheral edges, to be traced on said tape.

2. In a telegraph printing system, a pair of continuously rotating discs having irregular peripheral edges, a moving recording tape interposed between the peripheral edges of said discs, and means for selectively positioning certain portions of the peripheral edges of said discs into cooperative association with said tape and means for actuating one of said discs to cause the selected portions of the peripheral edges of said discs to contact said tape whereby said tape is acted upon by the selected portions of the peripheral edges of said discs to cause a definite character to be traced on said tape.

3. In a telegraph printing system, the combination of a printer having a pair of rotatable discs each of whose peripheries bears a series of characteristically shaped ridges and which cooperate by mutual contact to trace on a tape moving between their peripheries symbols whose formation is determined by the peripheral points in contact and the time duration of such contact, an electromagnet adapted to effect the contacting of said discs and transmitter means for transmitting current impulses of predetermined different durations and at predetermined intervals during the rotation of said discs to cause the operation of said electromagnet accordingly.

4. In a telegraph printer, a pair of continuously rotating discs, the axis of each of said discs being in the plane of the other disc and at right angles to the axis of the other disc, a characteristically shaped ridge on the periphery of each of said discs, a recording tape moving

freely between said discs in a direction at right angles to the plane of one of said discs and means for effecting an operative association of said discs whereby the edges of the characteristically shaped ridges of said discs make mutual contact through said moving tape to cause to be traced on said tape a symbol whose form is determined by the characteristic shapes of the edges in contact.

5. In a telegraph printer, a pair of continuously rotating discs, the axis of each of said discs being in the plane of the other disc and at right angles to the axis of the other disc, a plurality of characteristically shaped ridges on the periphery of each of said discs, a recording tape moving freely between said discs and whose line of travel is parallel to the axis of one of said discs and means for moving one of said discs to cause the edge of certain of the characteristically shaped ridges thereof to contact, through said tape, the edge of certain of the characteristically shaped ridges of the other disc whereby the movement of said tape between the two contacting edges causes to be traced on said tape a symbol whose form is determined by the characteristically shaped ridges in contact.

6. In a telegraph printer a pair of continuously moving elements, a plurality of characteristically shaped ridges on each element, a symbol recording tape moving therebetween, said elements moving in such a manner that the respective ridges move in planes substantially parallel to the tape and at right angles to each other and means for bringing said elements together without interrupting their motion so that the ridges make contact with and trace a symbol on the tape in accordance with the shape of the cooperating ridges in contact therewith.

7. In a system for tracing letters or symbols, a pair of opposed characteristically shaped scribing edges, a tape or other recording medium

therebetween, means for moving the tape at a constant rate, means for moving said edges at right angles to each other and substantially parallel to said tape at a constant rate and means for simultaneously bringing said opposed edges into engagement with the tape for a predetermined interval without interrupting their parallel movement or the movement of the tape.

8. In a system for tracing letters or symbols, a pair of tracing elements in contact with each other at one point, a tape or other recording medium therebetween, means for moving said recording medium between said elements and means for synchronously moving said elements at right angles to each other without breaking the contact therebetween, said elements being so shaped that said synchronous motion causes the point of contact to shift with respect to the moving record medium, thereby tracing a legible character.

9. The method of tracing symbols on a moving tape or recording medium by means of a pair of scribing edges which comprises causing the scribing edges to be moved at right angles to each other and in planes substantially parallel to the recording medium, driving the recording medium between the scribing edges and causing said scribing edges to contact the recording medium in accordance with a predetermined pattern.

10. The method of tracing symbols on a moving tape or recording medium by means of a pair of scribing edges which comprises passing the recording medium between the scribing edges, causing the scribing edges to contact the recording medium and moving each of said scribing edges at right angles to each other over the recording medium while in contact therewith, in accordance with a predetermined pattern.

WILTON TREAT REA.