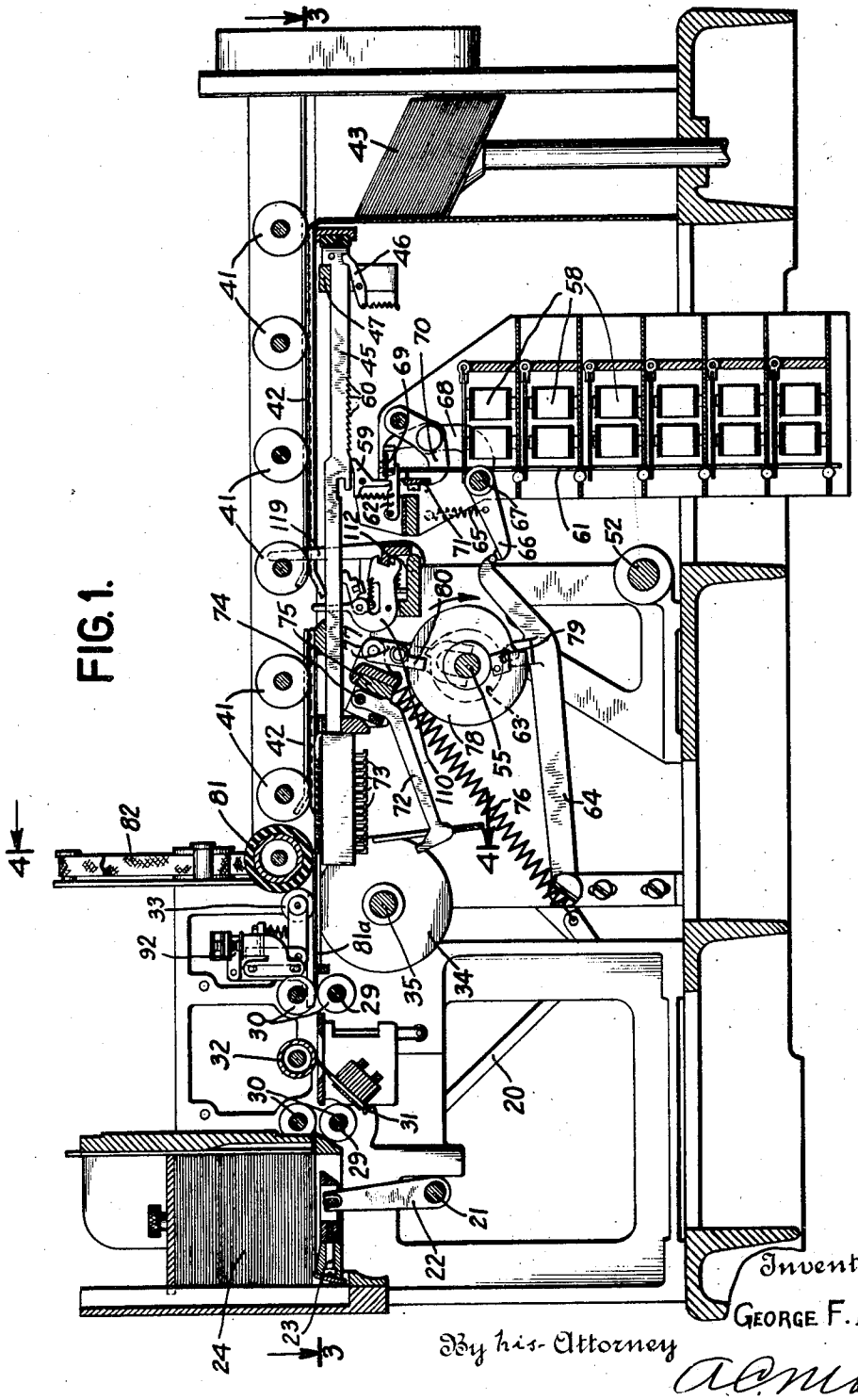
Feb. 13, 1934. G. F. DALY 1,946,900

ELECTRIC INTERPRETER

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FIG. 1.



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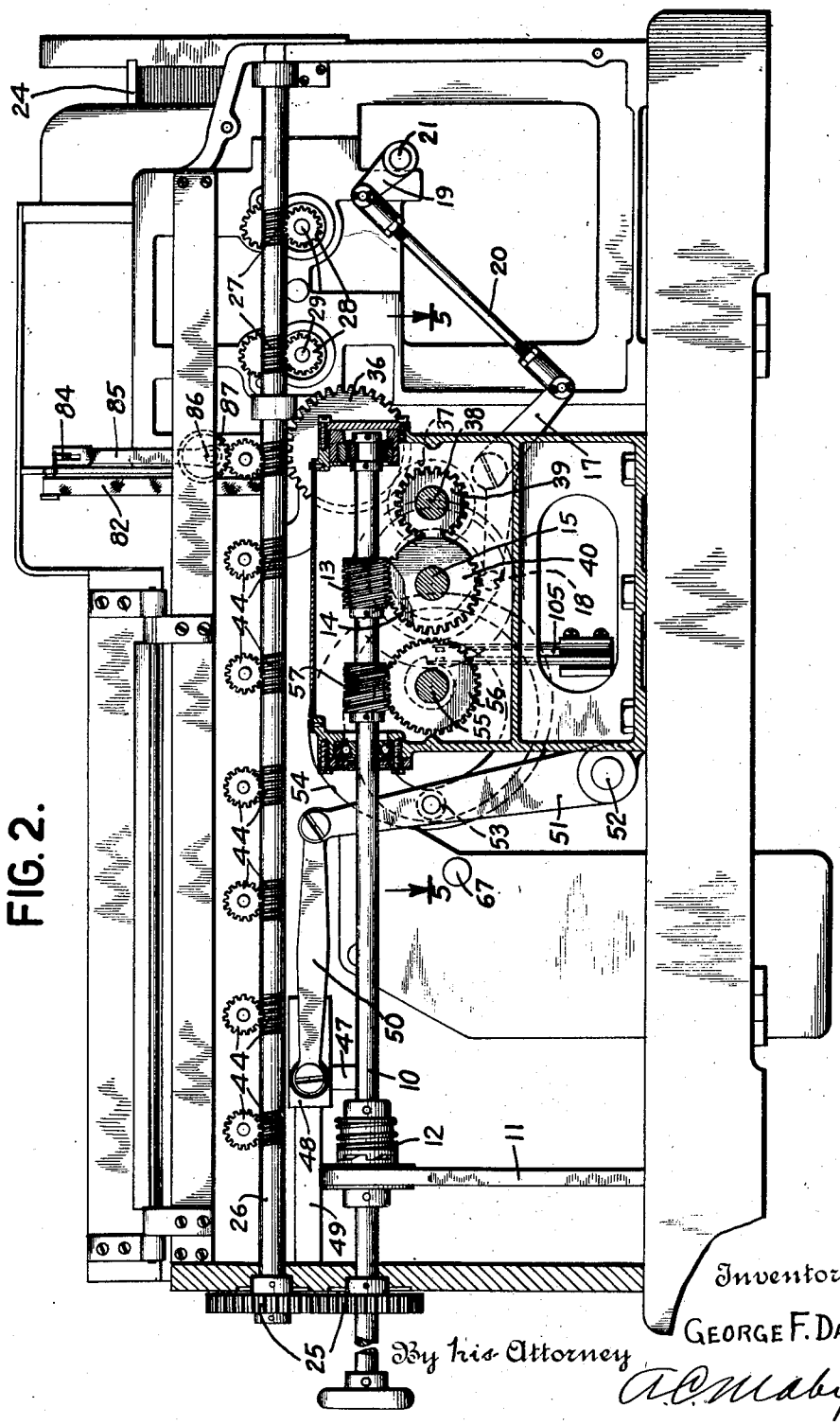


FIG. 2.

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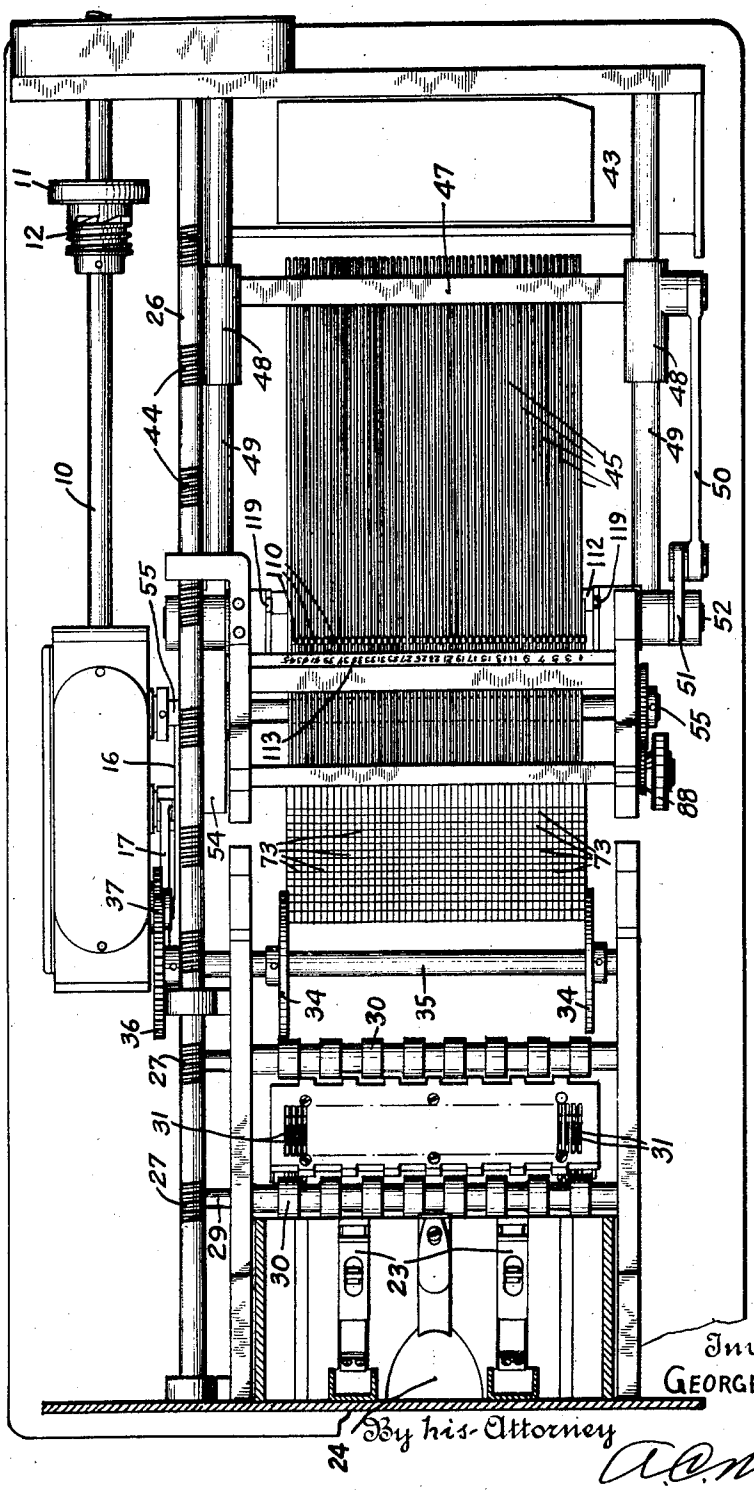


FIG. 3.

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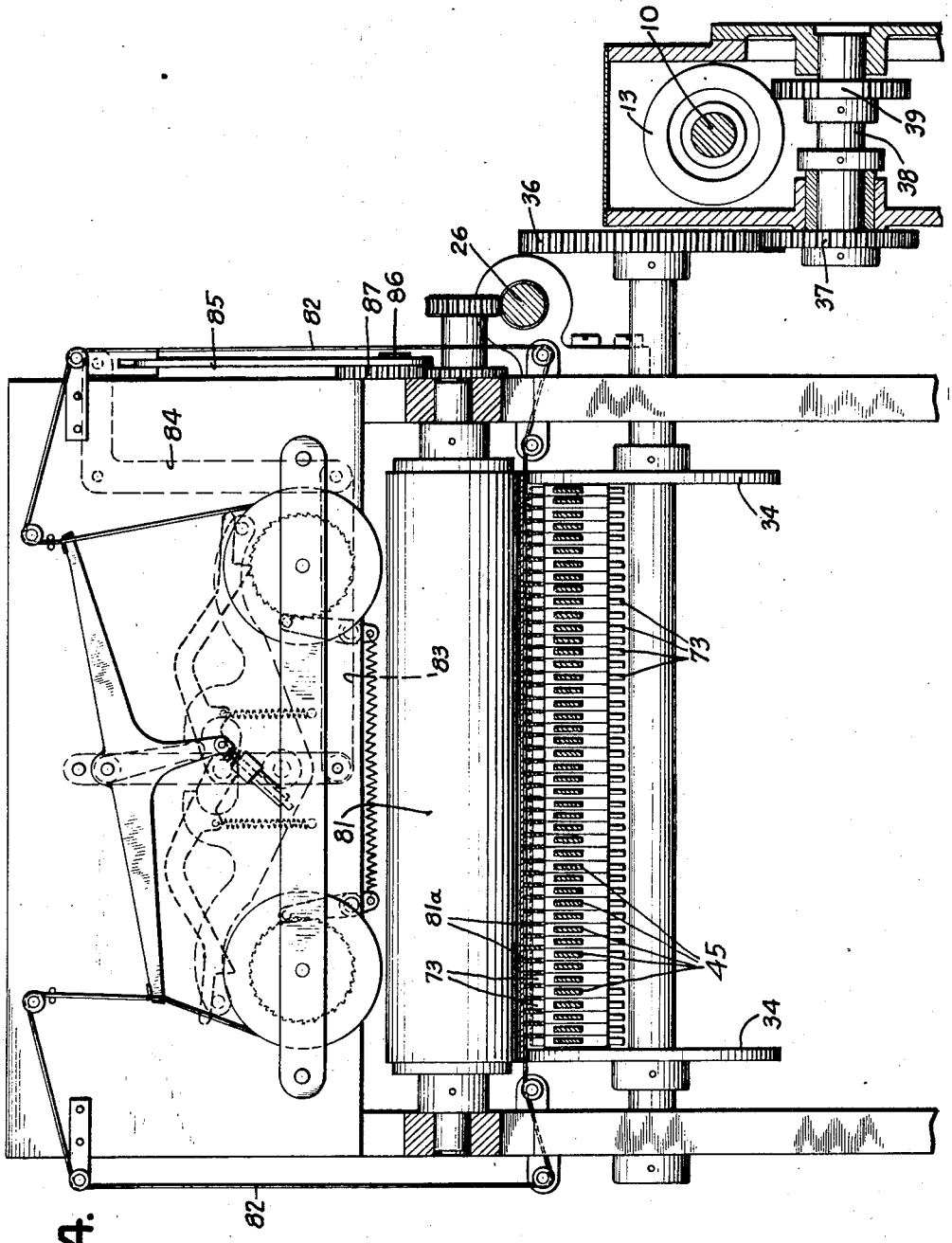


FIG. 4.

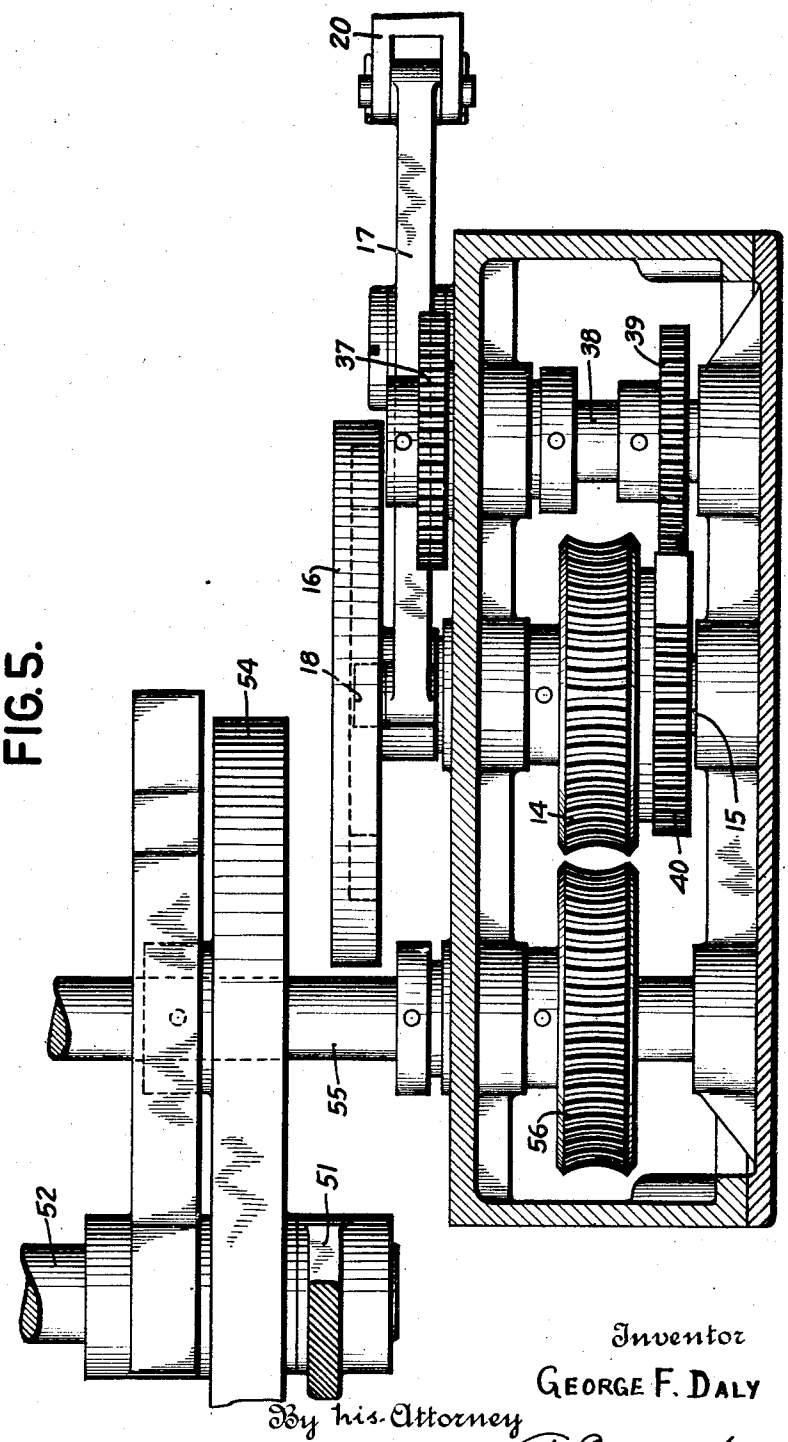
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FIG. 5.



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FIG. 6.

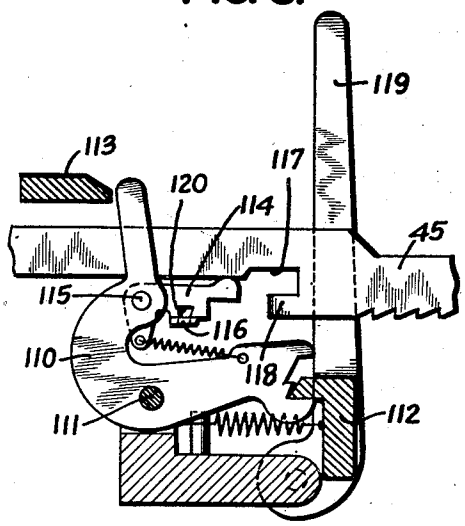


FIG. 7.

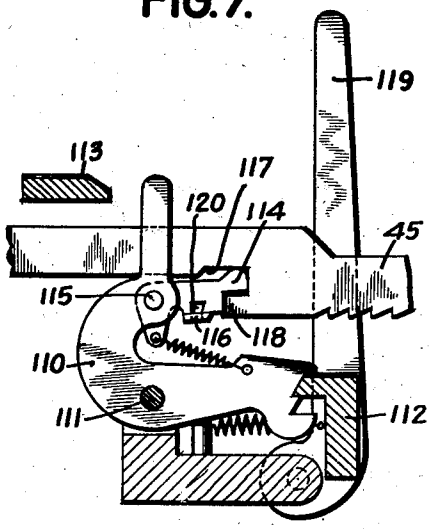


FIG. 9.

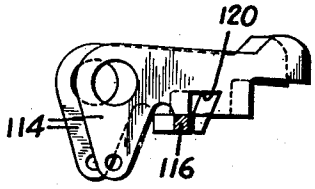


FIG. 8.

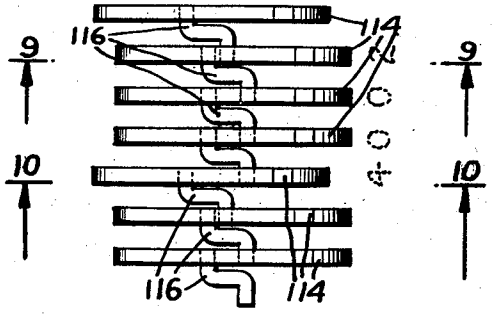
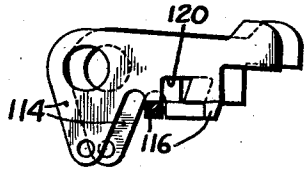


FIG. 10.



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FIG. 11.

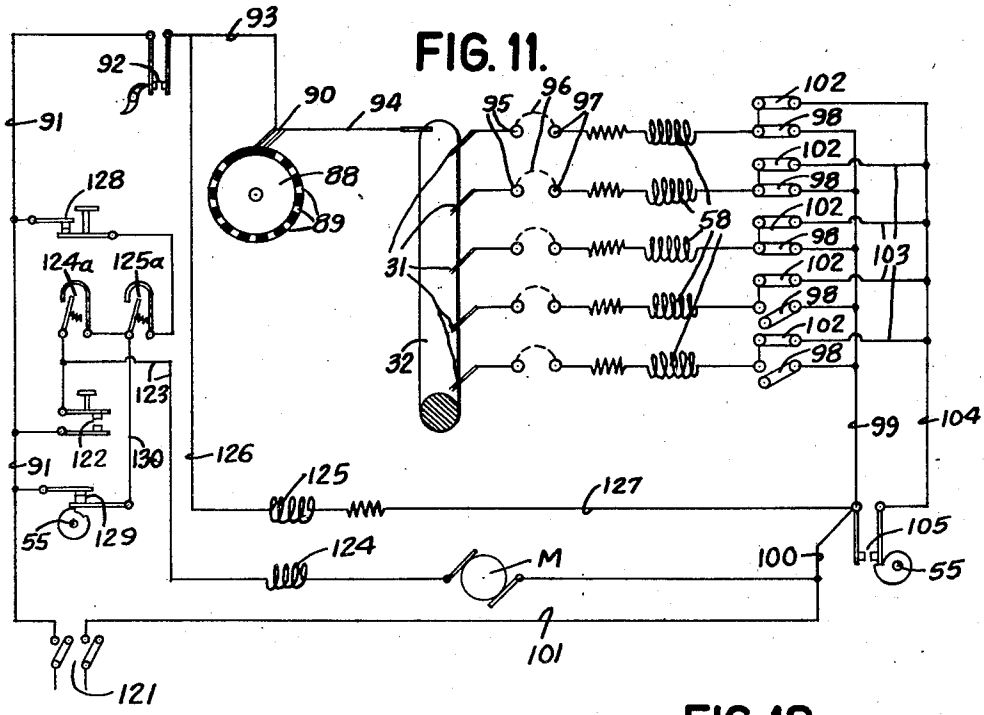


FIG. 13.

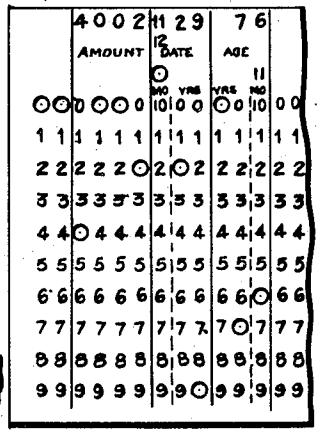
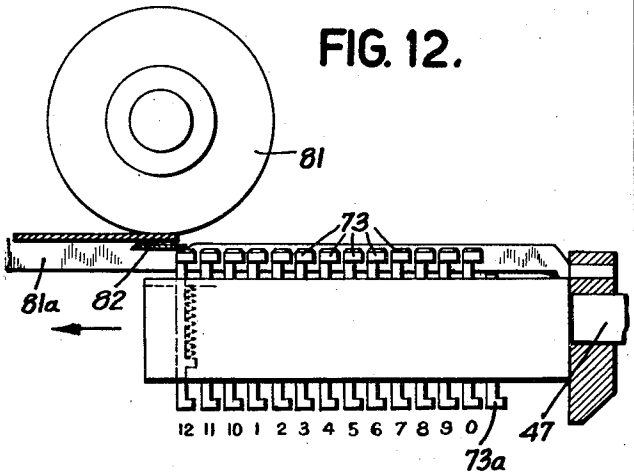


FIG. 12.



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ELECTRIC INTERPRETER

George F. Daly, Johnson City, N. Y., assignor, by mesne assignments, to International Business Machines Corporation, New York, N. Y., a corporation of New York

Application March 22, 1930. Serial No. 438,092

12 Claims. (Cl. 101—93)

In the tabulating machine art it is the common practice to perforate record cards with statistical data in the form of perforations. These record cards are afterwards utilized in connection with sorting and tabulating machines. In sorting machines the cards are separated into groups and subsequently the sorted cards may be passed through tabulating machine and data derived therefrom and accumulated or listed or both accumulated and listed. The general practice with these cards has been to perforate them in punching device wherein the location of the hole in one of a number of index positions determines the data recorded. Reading of the card, while easy for an experienced person is a matter of some difficulty for one who is not familiar with the general system.

Some efforts have been made to provide machines for perforating which in addition to perforating print a record on a card. Such machines have not come into general use since it has been difficult to effect both printing and perforating without considerable increase in the power required for operating them.

According to the present invention it is proposed to perforate the record cards in the usual manner in any suitable punching mechanism. Subsequently, if it is desired to have certain cards with printed data thereon indicative of the perforations, the cards are passed through the machine illustrated in the present application where they are successively printed with the sensed data as derived from the perforations already made in the cards. This printing may be conventionally disposed in one line at the top of the card and furthermore, if desired, the machine provides for the transition of the printing from one field of the card to another. In other words, it is not only possible to print the characters directly over the perforations in the card to which they correspond but it is also possible to offset the printing with respect to the perforations.

If desired, the machine can be arranged to print characters corresponding to certain perforated characters and omit the printing of characters corresponding to other perforations.

In some systems it is the practice to completely perforate such fields of the cards as are used. Specifically, where a six column field is perforated with a number having four places, the remaining two columns which would be the ones to the left may have zero designations punched therein. This provides a convenient checking system to insure against omissions. In the present application it is an object to suppress the printing of these extra zeros which form no part of the data and zero printing is accomplished under control of a significant column to the left. If a printing bar associated with an active column on the card is not positioned by a whole number perforation in such column it will present its zero printing element to the printing line but printing therefrom will take place only if a column to the left contained a significant figure, i. e., 1 to 9.

It is an object of the invention therefore to provide zero suppressing mechanism.

Various other objects and advantages of my invention will be obvious from the following particular description of one form of mechanism embodying the invention or from an inspection of the accompanying drawings; and the invention also constitutes certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the drawings:

Fig. 1 is a central section of the machine.

Fig. 2 is a rear view of the machine looking in the opposite direction of Fig. 1.

Fig. 3 is a plan section taken substantially on line 3—3 of Fig. 1.

Fig. 4 is a section on line 4—4 of Fig. 1 showing the ribbon mechanism and platen structure.

Fig. 5 is a section on line 5—5 of Fig. 2 showing intermittent drive gearing.

Fig. 6 is a detail of zero suppression mechanism.

Fig. 7 is a position view of parts in Fig. 6.

Fig. 8 is a plan detail of parts in Fig. 6 enlarged.

Fig. 9 is a section on line 9—9 of Fig. 8.

Fig. 10 is a section on line 10—10 of Fig. 8.

Fig. 11 is a diagram of the electric circuit of the machine.

Fig. 12 is a detail of a type bar shown in relation to the printing platen.

Fig. 13 is a fragment of a card.

Card feeding mechanism

In more detail 10 represents the main drive shaft of the machine. This may be driven in any suitable manner as by an electric motor through belt 11 (Fig. 2) and uni-directional coupling 12. From shaft 10 a worm 13 drives worm wheel 14 secured to a shaft 15 (see also Fig. 5) to which is also secured a box cam 16. A pivoted cam follower arm 17 has a roller 18 at one end riding in the cam groove and at the other has connection to an arm 19 through adjustable rod 20.

Arm 19 is secured to a shaft 21 having arms 22 (see Fig. 1) in pin and slot engagement with pickers 23 mounted for reciprocation in the frame of the machine. This reciprocating picker mechanism is adapted to advance one record card at a time from the supply stack or magazine 24.

Through gears 25 in Fig. 2 shaft 10 drives a parallel shaft 26 which has threaded sections 27 meshing with worm gears 28 on roller shafts

29 to drive feed rollers 30 constantly. The card which is advanced by the picker passes into the bite of the first pair of feed rollers 30 to the left in Fig. 1 and is subsequently guided to the analyzing or perforation reading devices which comprise brushes 31 and contact roller 32. These brushes and contact roller are of conventional structure such as is commonly used in electrically controlled tabulating machines.

After passing the analyzing brushes 31 the cards pass to the second pair of feed rollers 30 which advance each card to a pair of intermittently driven rollers comprising an upper spring pressed roller 33 and a lower roller 34 which engages the edge of the card (see also Fig. 4). These rollers 33 and 34 advance the card to printing position where they momentarily pause in their rotation to permit printing on the card in accordance with the preceding analysis.

This interruption in the advance of the card is accomplished as follows: Rollers 34 are secured to a shaft 35 (Figs. 1, 2, 3 and 4) journalled in the frame of the machine and having attached at one end a gear 36 meshing with a gear 37 on shaft 38 on which shaft is also a gear 39 adapted to be driven by a mutilated gear 40 on continually running shaft 15 (see also Fig. 5). Thus during the rotation of shaft 15 the gear 40 will pick up gear 39 to advance the card to printing position upon reaching which the toothless portion of gear 40 moves into locking engagement with gear 39 as in Fig. 2. After printing has been effected gear 39 is again engaged for rotation and the card is fed forward to a conveyor (Fig. 1) comprising rollers 41 and tracks 42 which convey the card to a suitable stacker 43 where they are collected. The shafts upon which rollers 41 are secured are adapted to be continually driven by reason of the gear connections 44 to the shaft 26 as in Fig. 2. It is the frictional engagement of rollers 41 with the upper surface of the card which causes the card to be advanced along the tracks 42.

Printing mechanism

For effecting the printing on the record cards as they successively pass through the machine a plurality of type bars 45 are provided. These bars are all mounted for reciprocation in the frame of the machine and have connection through a spring pressed pawl 46 to a crosshead 47. Thus, in Fig. 1, upon movement of crosshead 47 to the left the pawls 46 through frictional engagement with bars 45 will move the bars concurrently in the same direction.

The bars may be arrested at any point in their travel and subsequently the pawls 46 will disengage and permit the further movement of the crosshead 47. Upon the reverse movement of crosshead 47 the projecting ends of the bars 45 will be engaged thereby to positively move the bars to restored position. For reciprocating crosshead 47 the following mechanism is provided.

In Figs. 2 and 3 the crosshead 47 is connected at its ends to blocks 48 slidable upon rods 49 and having pivoted link connections 50 to a follower arm 51 pivoted at 52. Arm 51 has a roller 53 cooperating with the cam groove of a box cam 54 mounted on a shaft 55 connected through worm gear 56 and worm 57 to constantly running shaft 10 (see also Fig. 5). The arrangement and timing of the parts is such that the type bars 45 are advanced under the influence of pawls 46 synchronously with the movement of a card past the analyzing or sensing brushes 31.

If a perforation at say the 5 position on the card is under the sensing brushes the corresponding type representing 5 will be at the printing line. The establishment of an electric circuit through the index point perforations by the brushes is adapted to energize a magnet 58. There are a number of these magnets 58 corresponding to the different columns in the card, each magnet being related to a corresponding type bar 45. The energization of any magnet is adapted to release a pawl device 59 through a wire 61 and latch 62 and allow it to engage one of the ratchet teeth 60 on the bar 45. After pawl 59 has engaged the teeth 60 further movement of the type bar 45 to the left in Fig. 1 is prevented. The type bars 45 are positioned during a passage of a card past the brushes. Subsequently these type bars are held during the period that a card passes from the analyzing station to printing position and during the printing operation. After the printing operations pawls 59 and latches 62 are positively restored in the following manner.

Secured to shaft 55 is a cam 63 having in engagement therewith the roller of an arm 64 pressed upwardly by a spring 65 acting through an arm 66 on shaft 67. The shaft 67 has an arm 68 to which is secured a restoring plate 69 and through connection to a pivoted arm 70 also actuates a restoring plate 71. In this manner cam 63 is adapted to move plate 69 to the left to restore pawls 59 and plate 71 is moved upwardly to restore latches 62 and their connected wires 61.

For each type bar 45 there is an individual hammer 72 which is adapted to strike the particular type 73 on the type bar which is at the printing line. The hammers are pivotally mounted on a rod 74 carried by a bar 75 and depend for their actuation upon movement of said bar. The bar 75 is pivoted on the frame of the machine by means of pintles co-axial with rod 74 and has springs 76 biasing the bar in a clockwise direction in Fig. 1. To the middle of bar 75 is pivoted a cam follower arm 77 bifurcated to straddle shaft 55 and having a roller in cooperation with a cam 78. Fixed to one face of the cam 78 is a cam member 79 which cooperates with a projection 80 of the cam follower arm 77.

As the cam 78 revolves, by virtue of the shaft 55 being driven in the manner previously described, it cooperates with the arm 77 through its follower roller, gradually retracting the hammers 72 in a counterclockwise direction against the tension of springs 76. As the roller leaves the high point of the cam, member 79 engages the projection 80 and upon continued rotation of the cam the projection 80 drops from the member 79 and the springs 76 thus released turn the common bar 75 in a clockwise direction to swing the hammers 72 against elements 73 thus effecting printing.

Referring to Figs. 1 and 4, 81 designates a printing platen journalled in the frame of the machine and adapted to be turned by frictional engagement with the passing card to prevent excessive wear at any one place. The inking ribbon devices are of conventional form and require no detailed description.

The ribbon 82 is guided along the platen 81 as in Fig. 4 where a series of plates 81*a* (see also Figs. 1 and 12), are shown located between each of the columns of printing elements 73. The upper edges of the plates serve to guide the card

and keep it out of contact with ribbon 82 and elements 81*a*.

In Figs. 2 and 4 the ribbon feeding mechanism is shown as being adapted to be operated through a link 83, bell crank 84 and eccentric strap 85 one end of which has connection to a pin 86 mounted eccentrically in gear 87 meshing through an idler gear with a threaded section of shaft 26.

Circuit diagram

In devices of this sort it is also necessary that the circuits through the index point perforations in the card to magnets 58 be interrupted before the brushes leave the perforations in order to prevent arcing at the brushes. To this end a commutator 88 is provided in Figs. 3 and 11 with gear connection to shaft 55 and having insert segments 89 therein.

These segments 89 are adapted to bridge in succession a pair of brushes 90 just after the card brush makes contact and hold such bridge until the brush has left the perforation. The circuit through the hole in the card follows:

From line 91 through card lever 92, wire 93, brushes 90 and segments 89, wire 94 to common contact roll 32, brushes 31, plugs 95, plug wires 96, plug 97, magnets 58, switches 98, wire 99, wire 100 to other side of line 101.

A set of switches 102 is provided which when switches 98 are opened conduct the above circuit from magnets 58 through switches 102, wires 103, wire 104, cam contact 105, wire 100 to line 101. Cam contact 105 is controlled by shaft 55 and is timed to open just before the zero index point on the card arrives at the sensing brushes and to close just after this index point has passed the brushes so that the occurrence of a perforation in zero position would not be analyzed to control magnet 58 in the columns in which switches 98 were opened.

Referring to Fig. 13 it will be noted that the zero index position of the card is also used in certain cases to represent the number 10, as when a date is recorded. The elements 73 in Fig. 12 are arranged to successively present themselves in printing position, in the order indicated, synchronously with the passage of the corresponding index points on the card past the sensing brushes. It is quite obvious therefore that if a perforation in zero position were permitted to control type bar magnet 58 the numeral 10 would be printed. Hence in the columns other than those in which 10 is represented the switches 98 will be moved to open position and magnets 58 associated therewith will not interrupt their respective type bars. Such bars, unless otherwise interrupted in their advance as hereinafter set forth will present a dummy element 73*a* in printing position. This element 73*a* has the usual type element spring structure of elements 73. It is obvious that the cam contact 105 may be timed so as to open during the passage of any other index point position by the analyzing brushes. The timing may also be altered to prolong the period of opening of contact 105 i. e. during the passage of more than one index point by the brushes.

Printing of zeros will be effected under control of a significant figure in a predetermined column as follows.

Zero suppression

In Figs. 1, 6 and 7 a series of members 110, one for each column, are pivoted on a rod 111 and held in normal, zero suppressing position as in Fig. 7 by a spring pressed latching bar 112. Cooperating with the members 110 is an indexed strip 113 (see Fig. 3). When any member 110 is rocked counterclockwise as in Fig. 6, it advances a spring pressed lever 114 pivoted thereon at 115. The lever 114 has an arm 116 projecting under the lever of next lower order as in Fig. 8. If the free ends of lever 114 rise into a recess or slot 117 in the type bars 45 when in the position of Fig. 7, these bars will move to a point where the dummy element 73*a* of Fig. 12 is presented to the printing position, but should the levers 114 be held out so that the ends do not pass into the recesses 117, their free end will be in the path of stops 118 and the bars 45 will move to a point where the "0" element 73 is presented to the printing position. Bar 112 is provided with side arms 119 to permit release of members 110 for setting thereof.

With all the members 110 in the position of Fig 7, zeros are adapted to be printed across the machine to the left of any significant figure. The rocking of any member 110 will interrupt the repetition of zeros at such point. The functioning of the various parts may best be explained in connection with a specific example.

For instance in Fig. 13, in all columns except the one containing the month designation of the date, the corresponding switches 98 in Fig. 11 will be in open position. This, as we have already seen, will prevent the reading by the sensing brushes of perforations in zero index point position of such columns. Considering now the field of the card headed "Amount", the members 110 associated with the first column to the left in this field and the first column following the field to the right, namely the "Mo." column will be moved to the position of Fig. 6 (see also Fig. 8). This adjustment will prevent the carrying of zeros into the "Amount" field from the left and will interrupt passage of zeros to the field adjoining it on the left.

Fig. 10 shows the relation of levers 114 of the first and second columns of the field wherein the first column lever has been moved to the left without moving out of controlling engagement with the arm 116 of the next lower order, so that if the first lever 114 is held depressed by reason of its associated type bar being stopped at a significant figure all the levers 116 to the right will be held depressed to the extent of the field. In Fig. 9 the lever 114 of the first column in the next field will be to the left as shown and its arm 116 will lie under a notch 120 in the lever 114 to its left. This relation of the parts as is readily understood prevents the depression of lever 114 to the left influencing the lever 114 on its right. In an identical manner the column to the left of the "Amount" field in Fig. 13 is prevented from exerting an influence over columns in the field.

By way of further illustration, consider a single entry in the units column of the "Amount" field and zeros punched in the three remaining columns. These three zeros not being sensed by the brushes, their associated type bars will move to present the dummy elements 73*a* to printing position, and only the units column will stop its bar to print the particular item entered therein.

Referring now to the circuit diagram (Fig. 11) certain of the mechanical parts are shown in a diagrammatic manner in this view. In this figure M is the driving motor which by belt and pulley connection drives the main drive shaft 10 of the machine. This shaft through the gearing described drives the picker devices, which advances the record cards one at a time from the stack 24 through the feed rolls and past the cooperating

brushes 31 and contact roller 32. At such times when the cards are passing the brushes the usual card lever is pressed up by the cards thus closing card lever contacts 92.

To start the machine into operation the operator first closes main line switch 121. Thereupon start key 122 is depressed which upon the closure of its contacts establishes a circuit from line 91 through start key 122, wire 123, motor relay magnet 124, motor M to other side of line 101. The energization of the motor causes the feeding of cards to close the card lever 92 and energization of card lever relay magnet 125 through a circuit from line 91, card lever contact 92, wire 126, magnet 125, wire 127, wire 100 to line 101. This closes the relay 125*a* which together with relay 124*a* establishes a holding circuit for the motor M from the line 91 through stop key contacts 128, relay armature 125*a*, relay armature 124*a*, wires 123, magnet 124, motor M, back to line 101. A cam contact 129 is provided to hold this circuit during the interval between cards when armature 125*a* will be open and the circuit follows from line 91, contacts 129, wire 130, relay armature 124*a*, wires 123, through motor M as before. Contact 129 also serves to take the arc from the relay 125*a* with which it is in parallel.

If it is desired to print in the corresponding columns in which the perforation has occurred, plug connections such as 96 may be provided connecting plug sockets 95, 97 in corresponding columns. If it is desired to offset the printing the plugging connections may be arranged from plug sockets 95 to other sockets 97 out of alignment therewith.

It will be understood that if it is desired to suppress printing entirely of the data sensed by any particular group of brushes, it is only necessary to entirely omit plug connections in which case there will be no circuit established to the magnets 58 and the associated type bars will move to blank position.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore to be limited only as indicated by the scope of the following claims:

I claim:—

1. A printing apparatus comprising means for successively feeding a series of perforated cards having index points in a column, means for successively reading the index points of a column in each passing card, means for printing corresponding printed records on each passing card indicative of the perforations therein and means for suppressing at will the printing of records from certain index point positions in a card column while printing from other index point positions in the same card column.

2. In a printing apparatus, a plurality of type elements, means for positioning a type element in zero printing position under control of a type element of higher denominational order and means for rendering such zero positioning means ineffective.

3. In a printing apparatus, a type bar, a member carrying a stop adapted to stop said type bar in zero printing position, and means operable at will to move said member and stop out of cooperation with said type bar.

4. A printing apparatus comprising means for successively feeding a series of perforated cards having index points, means for successively reading the index points in each passing card, a type carrying member with means for moving it successively into a plurality of printing positions, means controlled by said reading means for selectively arresting the movement of said member in any printing position, means to cause printing upon said passing card and means for selectively suppressing the operation of said arresting means in any index point position of a column of a card.

5. In a machine of the class described, a printing platen, type bars cooperating therewith, means for feeding a record card between said platen and type bars, and means controlled by the movement of the card to cause rotation of said platen.

6. In a machine of the class described, a printing platen, an inking ribbon therefor, means for feeding a card into printing position relative to said platen and means comprising a series of members adapted to support the card in printing position, and having recesses therein to support said inking ribbon.

7. In a record controlled machine controlled by records having index points arranged in columns, means for setting a printing device normally adjusted under control of all the index points in a particular column, and selective means whereby said printing device is adjusted under control of either all the index points or ineffective with respect to certain index points in the same column.

8. In a printing apparatus, having a plurality of type bars, means associated with each bar and controlled by the position thereof to interrupt the next adjacent type bar in zero printing position and means operable at will to selectively adjust said interrupting means to prevent control thereby of the next adjacent type bars.

9. In a machine of the class described, sensing means for reading perforations in record cards having index point positions arranged in columns, circuits completed by said sensing means under control of perforations in any index point positions in a record card and means rendering the sensing of certain index point positions ineffective to control said circuits.

10. In a machine of the class described, sensing means for reading perforations in record cards having index point positions arranged in columns, circuits completed by said sensing means under control of perforations in any index point position in a record card and means for selectively rendering the sensing of certain index point positions in a card column ineffective to control said circuits.

11. In an apparatus of the character described, the combination of a record card having index point positions in columns, an electric circuit initiated under control of a perforation in an index point position of a column, a plurality of differently timed return circuits for said initiated circuit, and means for selecting one of said return circuits to control the completion of the circuit initiated by said perforation.

12. In a card controlled device of the class described adapted to be controlled by record cards having index points in columns, means for analyzing a plurality of the index point positions in a plurality of columns and settable means for rendering said analyzing means ineffective with respect to an index point position in a column.

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