

March 31, 1936.

E. BUHLER

2,036,016

PRINTING MECHANISM

Filed Feb. 23, 1934

5 Sheets-Sheet 1

FIG. 1.

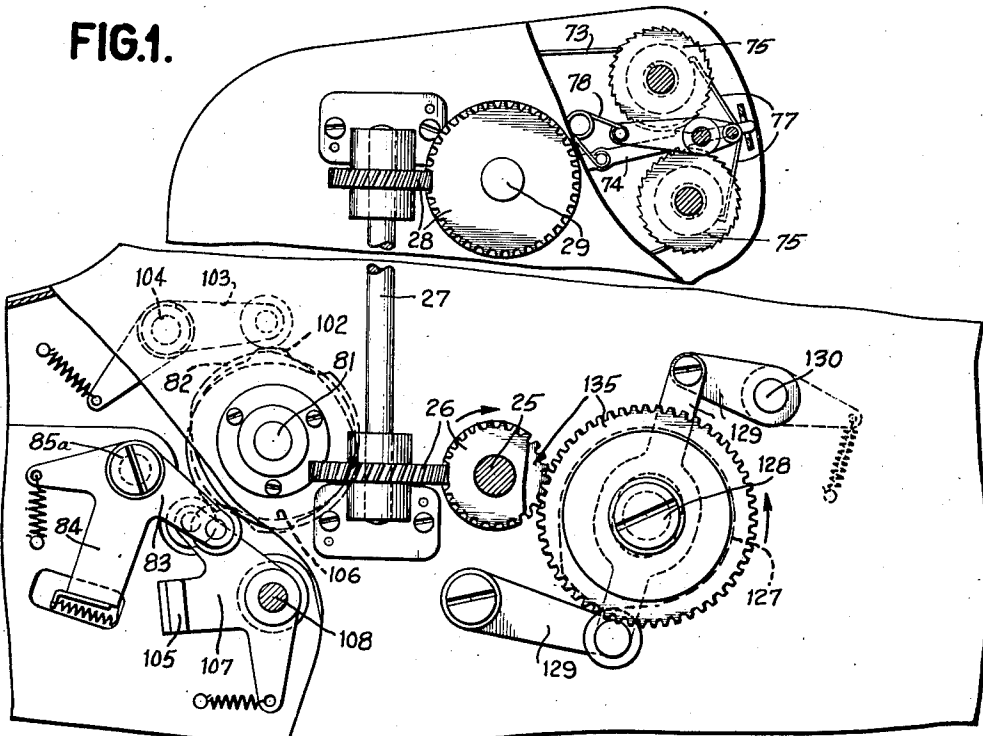
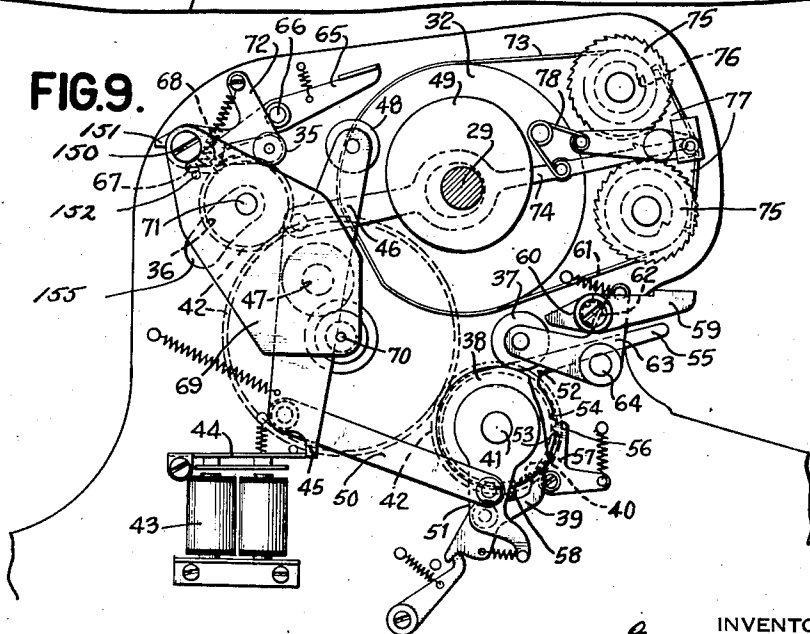


FIG. 9.



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5 Sheets-Sheet 2

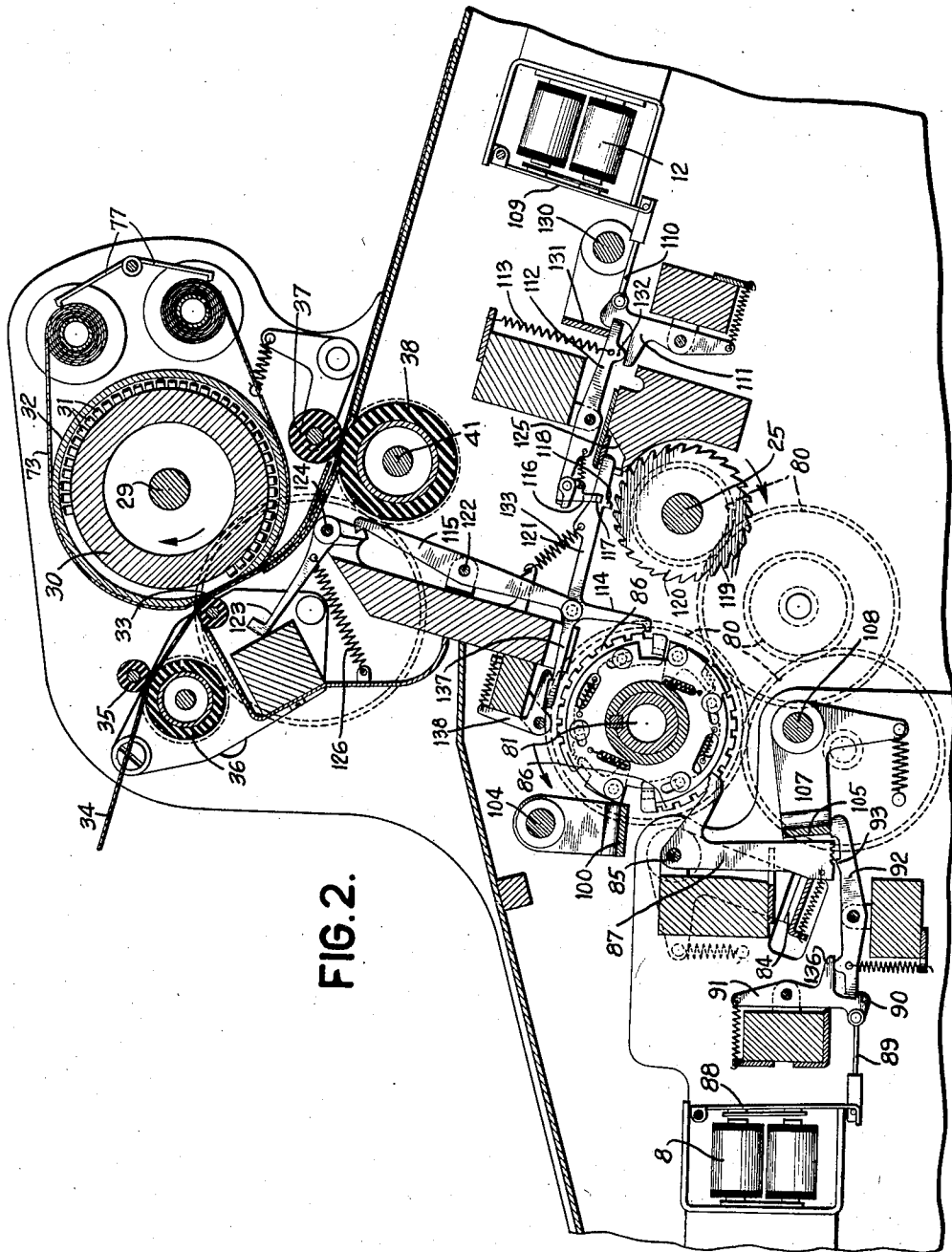


FIG. 2.

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FIG. 7.

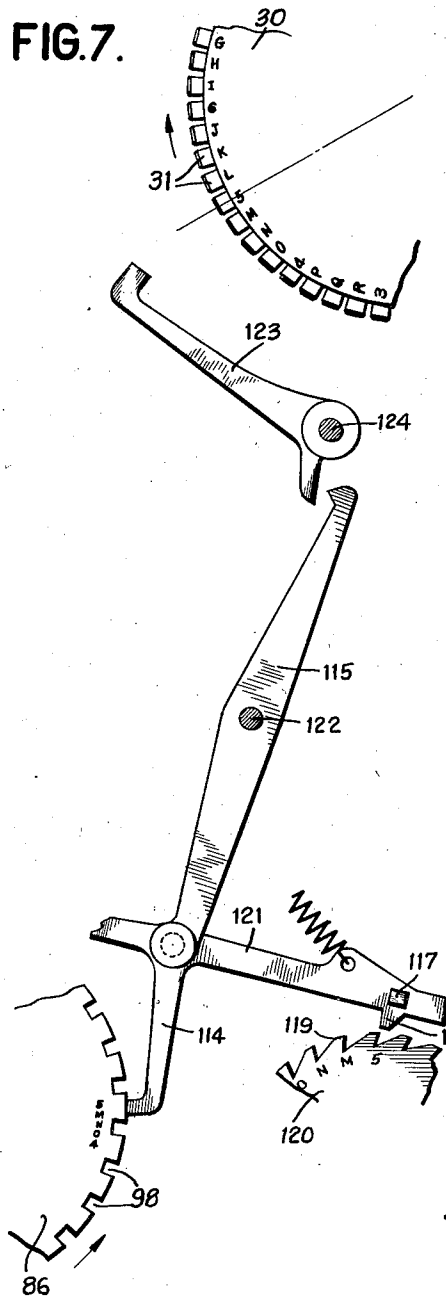
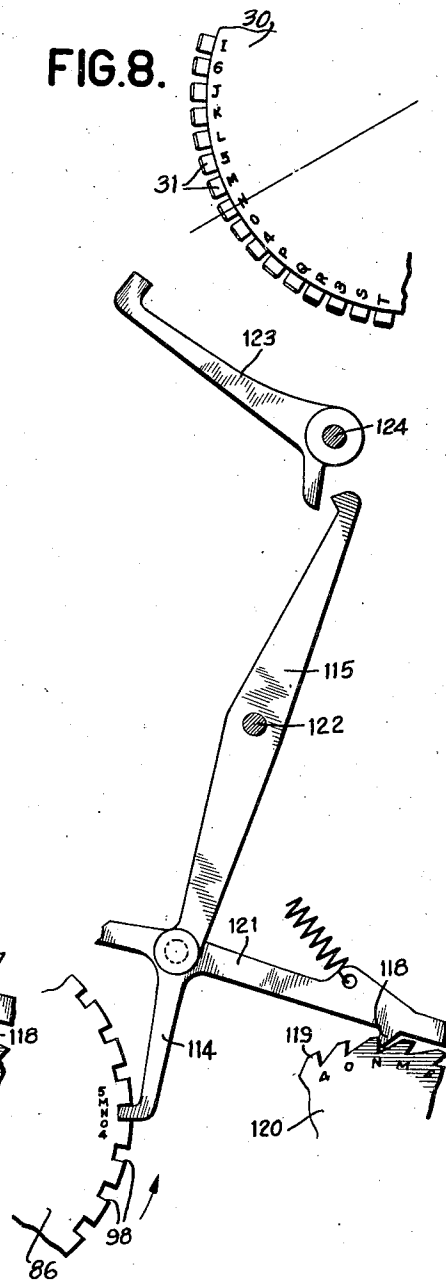


FIG. 8.



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2,036,016

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FIG.11.

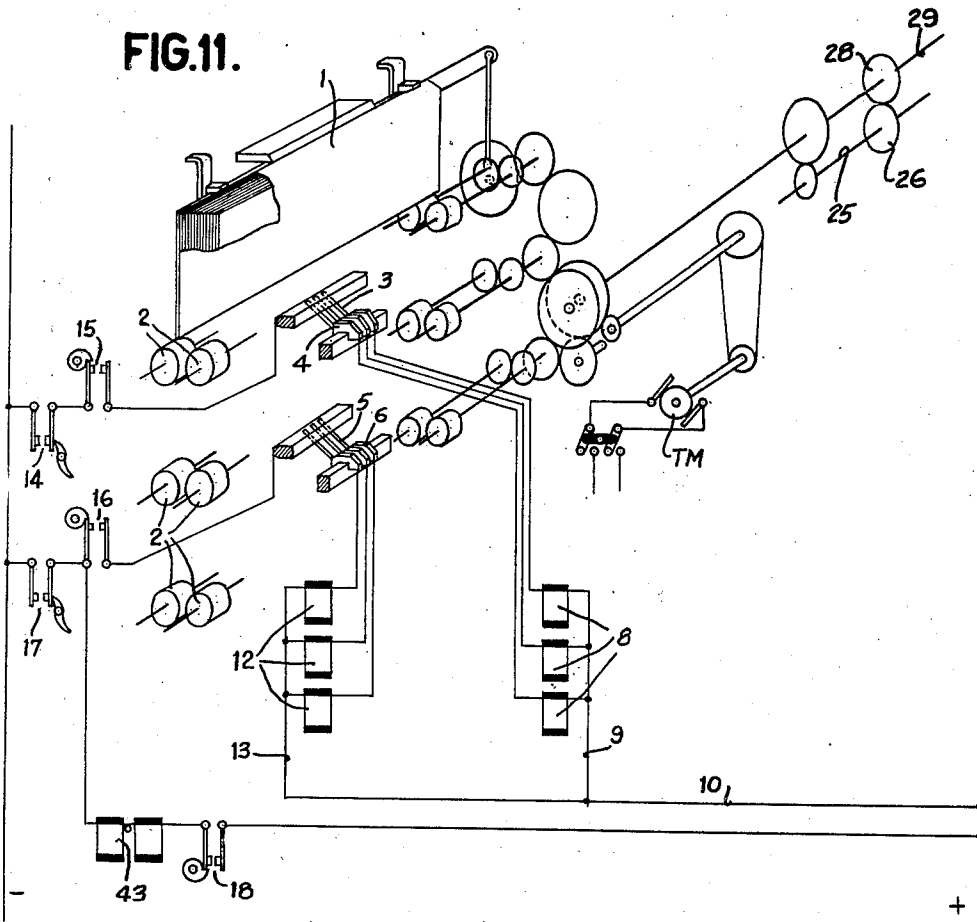
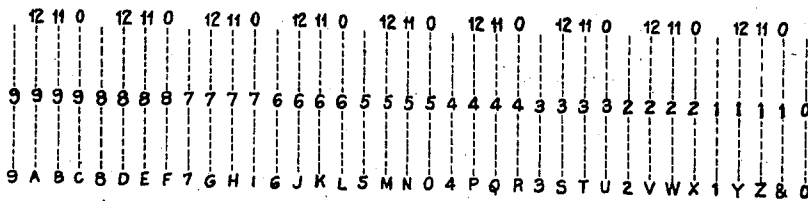


FIG.10.



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# UNITED STATES PATENT OFFICE

2,036,016

## PRINTING MECHANISM

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Application February 23, 1934, Serial No. 712,537

18 Claims. (Cl. 101-93)

This invention relates to record card controlled machines and more particularly to the printing mechanism of such a machine in which alphabetical printing is desired.

5 One of the objects of the present invention is to provide an improved and simplified form of printing mechanism to print either numerals or alphabetical characters. The preferred form of printing mechanism referred to is of the constantly rotating drum type and provided with a power actuated impression hammer for striking an impression from a type while the drum is in motion, and similar to the type disclosed in my copending application, Serial No. 549,881 filed 15 July 10, 1931.

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 20 of the accompanying drawings and the invention also constitutes certain new and novel features of the construction and combination of parts hereinafter set forth and claimed.

In the drawings:

25 Fig. 1 is a side elevational view of the device.  
Fig. 2 is a sectional view to show positional view of parts of the device.

Figs. 3, 4, and 5 are detailed views of parts shown in Fig. 2.

30 Fig. 6 is a diagrammatic view showing the controlling perforations which are employed on the record card.

Figs. 7 and 8 are detailed views of printing hammer mechanism shown in Fig. 2.

35 Fig. 9 is a sectional view showing the paper feed and ribbon feed mechanism.

Fig. 10 is a code of preferred combinational perforations employed in the device.

40 Fig. 11 is a wiring diagram of the machine and shows somewhat diagrammatically some of the parts of the machine.

Referring to Figs. 1 and 2, a shaft 25 is suitably geared to the main drive shaft of the device so as to rotate constantly therewith and make 45 two revolutions for each cycle of operation of the device. Driven from shaft 25 through gearing 26, shaft 27, and gearing 28 is a shaft 29, which has secured thereto a printing drum 30 provided with suitable numerical and alphabetical character types 31. The constantly rotating drum is provided by suitable gearing to make one revolution 50 for each cycle of operation of the device. A stationary circular shield or casing 32 fixedly secured to the frame of the device is disposed about the printing drum and is provided with an opening 33

through which printing is effected upon a record strip or sheet 34. The strip 34 is fed from a supply reel (not shown) by feed rollers 35, 36 and 37, 38 (Fig. 9). Rollers 36 and 38 are adapted to be rotated slightly to effect line spacing 5 by means of a pawl mechanism 39 cooperating with ratchet 40 rigidly secured to the shaft 41 of roller 38 and gearing generally designated 42. The magnet 43 is adapted to be energized after each printing cycle to attract its armature 44 10 releasing the finger 45 of member 46 pivoted at 47. Cam 49 is adapted to permit rotation of member 46 in a clockwise direction through cam follower 48 rotatably attached thereto, upon energization of magnet 43, thereby displacing 15 the link 50 attached to member 46 and arm 51 fastened to said link to the left, to cause the pawl 39 fastened to arm 51 to be stepped ahead on the ratchet 40 in a clockwise direction.

Upon restoration to its former position by 20 cam 49, the linkage described rotates the ratchet 40 and attached roll 38 in a counterclockwise direction rotating rolls 35 and 36 through gearing 42 to feed the said strip 34. Provision for single or double line spacing is made in the usual 25 manner as follows: An annular member 52 having notches 53 and 54 and an extended arm 55 is rotatably mounted on shaft 41 and held in position by detent 56 on bell crank lever 57. For single line spacing the arm 55 is maintained in 30 the upper position so that detent 56 engages the notch 53 and the protruding stud member 58 prevents the pawl 39 in its counterclockwise rotation to engage any of the teeth of ratchet 40 by causing the pawl 39 to ride over all the teeth 35 except the one adjacent the tooth previously engaged. For double line spacing the arm 55 is lowered, detent 56 engaging notch 54 to maintain that position and stud member 58 is moved to the left so that the pawl 39 in its counter- 40 clockwise rotation can engage the second tooth on ratchet 40 from the one previously engaged.

To facilitate feeding a new roll of paper to the device, means are provided to separate rollers 45 37 and 38 by raising roller 37 and to lower rollers 35 and 36 so as to make the paper sheet readily accessible and the possibility of its guidance, as follows, a lever 59 suitably pivoted at 60 with a fixed cam member 61 is depressed so that the camming action on surface 62 of bell crank lever 63 pivoted at 64 causes the roller 37 rotatably 50 mounted on arm of bell crank 63 to move upwardly. A pair of plate members 69, one of which is shown, are pivotally mounted at 70 and adapted to support the transverse shaft 71 which in turn 55

supports the roller 36. Depression of lever 65 pivoted at 66 raises the hooked extremity 67 to release a stop 68 attached to the said plate 69 so that the plates together with the supported shaft 71 and roller 36 are free to be lowered a distance equal to the length of the cut out portion in the frame designated 155 and permitting the said shaft to be displaced in the manner just explained. A bell crank lever 72 is rotatably attached to the free end of plate 69 so that its attached roller 35 may be displaced from the roller 36 by swinging the crank lever in a counterclockwise direction about the pivot 150. An extension 151 of lever 72 is provided to engage stop 152 to limit the movement of the said lever about its pivot. In this manner it is seen that with the roller 37 in a raised position and roller 36 in a lowered position with the roller 35 raised and displaced from roller 36 the feeding or adjusting of a roll of paper is more easily and readily accomplished.

As mentioned hereinbefore, member 46 is adapted to be rotated about 47 first in a clockwise direction upon the momentary energization of magnet 43 and then in a counterclockwise direction under control of cam 49 to be locked in the position shown by armature 44 till the end of the following printing cycle. The usual printing ribbon 73 is suitably guided between record strip 34 and type elements 31 and may be suitably advanced as follows, a clockwise rotation of member 46 imparts a motion to the right to link 74 to engage a ratchet wheel 75, and the subsequent counterclockwise rotation of member 46 causes the link 74 to advance the ratchet wheel 75 engaged to rotate slightly feeding the ribbon. To reverse the ribbon feed mechanism, a notch 76 is provided on the ratchet wheel shaft so that the spring 77 held against the ribbon supply engages the notch when the ribbon supply on the corresponding feed wheel is exhausted to cause the link 74 to engage the other ratchet wheel reversing the ribbon feed action. Link 74 is held in position by the spring arrangement designated 78.

As usual, perforated record cards 1 (Fig. 6) are fed through the machine and their index point positions 9, 8, 7, . . . successively traverse the usual analyzing brushes which serve to complete a circuit upon encountering a perforation in the card. The travel of the cards through the machine is synchronized with the constantly rotating drum 30 so that a circuit completed through any index position 9—0 will energize a magnet 12, in a manner to be traced in connection with the description of the circuit diagram, to cause the particular character to be printed corresponding to the combinational perforation analyzed.

The combinational perforations for the cards preferred is shown in Fig. 10. The one to nine index point positions (Fig. 6) represent the corresponding numerals and are adapted to be analyzed by one set of brushes. When alphabetical characters are to be read there are combinational perforations in the index point columns including the one to nine index point positions and the zero to twelve index point positions, the latter adapted to be analyzed by a separate set of brushes. The zero to twelve index point positions control the setting of the zoning or selecting mechanism, to be disclosed presently, in turn controlling the time of actuating the printing hammer.

Referring to Figs. 1, 2, and 3, shaft 25 as previously mentioned is adapted to make two revolutions

for each card cycle and through suitable gearing 80 rotates shaft 81 one-half revolution per card cycle. A cam 82 suitably mounted on shaft 81 cooperates with follower arm 83 of bail 84 pivoted on stud 85a to rock the bail in a clockwise and counterclockwise direction for every card cycle and is adapted to rock counterclockwise concurrently with the analysis of the zero, eleventh and twelfth index point positions of the record. Selecting crank lever 87 rotatably mounted on shaft 85 is adapted to engage a selecting segment 86 when rotated in a counterclockwise direction, by virtue of the motion of the bail 84 cooperating therewith, as follows: When a circuit is completed through the eleventh index position, a magnet 8 is energized to attract its armature 88 in turn moving the attached link 89 to the left to cause the hooked end 90 of lever 91 to release the spring actuated lever 92 so that the projection 93 engages the middle notch on lever 87. The rotation of lever 87 is synchronized with the travel of the cards so that when the zero position is analyzed the notch designated 0 is in a position to be engaged by projection 93 on lever 92 if the controlling magnet 8 is then energized.

Similarly while the eleventh and twelfth index point positions are analyzed the notches marked 11 and 12 are respectively in a position to be engaged by projection 93. When the projection on lever 92 engages the middle notch lever 87 as explained, the middle step 94a on arm 94 is adapted to engage stud bar 95 of one of the segments 86 of the selector 96.

The selector 96 is adapted to be set in accordance with the corresponding analysis of the zero, eleventh and twelfth index positions of the card and maintain that particular setting till the nine to one index point positions are analyzed by another set of brushes, which will be explained hereinafter, and thereby set the printing hammer mechanism in a position to be operated. After the nine to one index positions are analyzed, the zero, eleventh and twelfth index positions of the following card are analyzed by other brushes to effect a setting of the selector. From the foregoing, it is seen that the selected setting must be stored for a timed interval so as to later be able to control the operation of the printing hammer mechanism, and while the selected setting is controlling the operation of the printing hammer mechanism capable of receiving another setting to the selected and stored.

The selector 96 consists of an annular disk 97 keyed to shaft 81 and shaped to receive the two selecting segments 86 which have a number of equi-distant recesses 98 corresponding in number to the numerical index point positions, namely, nine to one, and are so spaced that the circumferential distance in rotating is equivalent to the distance of four character type elements of the drum while rotating (Figs. 7 and 8).

Segments 86 are slidably attached to the disk 97 so that the stepped arm 94 when engaging the segment can set the segment in any of four positions depending on the location of the index point perforations. Pawls 99 rotatably attached to disk 97 are adapted to hold the segment in the selected position while the actuation of the printing hammer mechanism is controlled. Upon completion of printing the bail 100 is adapted through cam 102 and follower arm 103 fixed on shaft 104 to engage the camming surface 101 of the pawl to release the segment 86 to its original position. While one segment controls the operation of the

printing hammer mechanism, the other segment is selectively set by the lever 87 for the subsequent operation to control the printing hammer mechanism.

When the middle step 94a, on arm 94 is adapted to engage stud bar 95 the segment 86 is held in that position while the disk 97 continues to rotate thus displacing the position of segment 86 which setting is maintained by pawl 99. Upon completion of the setting of the segment 86 magnet 8 is deenergized and bail 105 is adapted to reset lever 92 in its locked position by extension 136 on lever 91 and a positive knock-out for armature 88 through the operation of cam 106 follower arm 107 fixed on shaft 108. Magnet 12 is adapted to be energized upon the completion of the segment setting, and through its armature 109, and link 110 will rock spring-pressed latch 111 in a clockwise direction releasing lever 112 for movement in a counterclockwise direction under the influence of its spring 113 when the extension arm 114 of T lever 121 engages a recess in the selecting segment 86, (Figs. 7 and 8). The consequent depression of by-pass 116 and its engagement with stud 117 will move the tooth 118 into engagement with a tooth 119 of actuating member 120 whereupon the lever 121 will be moved in a positive manner toward the right, rocking print operating bail 115 about its pivot 122.

The upper extremity of bail 115 is adapted to engage a depending arm of hammer 123 and rock the hammer in a clockwise direction about its pivot 124 when T lever 121 is depressed so that its tooth 118 engages a tooth 119 of actuator 120, the upwardly movement of the extremity of its arm 137 causes the latch 138 to release arm 137. As lever 121 is moved toward the right the free end thereof is adapted to engage the inclined camming surface 125 which serves to disengage tooth 118 from the actuating member 120. This disengagement will take place at approximately the time when the print bail 115 will have positively rocked the printing hammer 123 so that its striking point is just about to make contact with the record strip. The momentum of the hammer will carry it forward from this point to make actual printing contact between the record strip and a type element 31 after which it will rebound to home position where it is restrained by its spring 126.

The gearing is such that the type elements 31 pass printing position in synchronism with the passage of the index point positions of the record card past the analyzing brushes of the device and the teeth 119 in the actuator 120 are so arranged that a tooth will pass the tooth 118 during the passage of a type 31 past the printing line. The nine to one index point positions control the magnet 12 which sets the printing operating bail 115 in operative position. Depending on the combination perforation of the card, the hammer 123 will not be operated to print a character until one, two or three or four type elements 31 passed the printing line.

The operation of the hammer 123 as shown is timed by the setting of the selecting segment 86 which setting in turn is dependent on the operation of magnet 8 by the zero, eleventh or twelfth index point positions on the record. The rotation of the printing drum 30, selector 97 and actuating member 120 is adjusted so that when the selecting magnet 8 control index point positions are not perforated and when magnet 12 is energized by a numerical index point namely nine to one, to release lever 112 and depress lever 121

engaging tooth 118 with a tooth 119, a recess in one of the segments 86 is engaged directly by arm 114 of T lever 121 to actuate hammer 123 to print the corresponding numeral. The operation of the printing hammer is retarded in one, two or three timed intervals depending on the setting of arm 87 whether or not it is the 12th, 11th or zero notch respectively and in turn setting the selecting segment 86 so as to cause the retard action of the engagement of arm 114 and a recess in segment 86. A non-operative and operative position of the printing hammer mechanism is clearly indicated in Figures 7 and 8 respectively.

When all the type elements 31 have passed printing position a cam 127 mounted on shaft 128 rotated by gearing 135 to shaft 25 is adapted through spring-pressed linkage 129 to rock the shaft 130 to cause the depression of bail 131 mounted on shaft 130. Counterclockwise rocking of bail 131 will restore lever 112 to its normal position and through extension 132 will also cause positive restoration of latch 111 and its connected link 110 and armature 109. Upon release of T lever 121 from actuator 120 the arm is held upwardly and moved toward the left by spring 133. By-pass 116 is so constructed as to offer no resistance to the restoration of lever 121 if the lever 112 has not been relatched. Now when lever 112 is rocked clockwise and relatched, the by-pass 116 will snap back over stud 117 to the position of Fig. 2.

Referring now to Fig. 11, 1 designates a stack of record cards which are adapted to be handled and advanced in the usual way in succession one by one, by suitable feed rolls such as 2. Suitable card sensing means are provided comprising upper brushes 3 and contact blocks 4 and lower brushes 5 and contact blocks 6. The upper contact blocks are connected to the selector control magnets 8 to one side of the line, the brushes 3 are connected to contacts 14 and 15 and to the other side of the line. The lower brushes 5 are connected to contacts 16 and 17 to one side of the line, the contact blocks 6 are connected to control magnets 12 and to the other side of the line. The magnet 43 for controlling the ribbon and paper feed mechanism is connected from contacts 17 to the magnet coils and from contacts 18 to the line.

When cards are fed by the device to the analyzing brushes 3 and 4 by the conventional rollers 2, the card levers are operated by the cards to close contacts 14 and 17 respectively. Cam controlled contact 15 is adapted to close only when the card passing under the analyzing brushes 3 is at the zero, eleventh and twelfth index point positions, so that it is obvious that the nine to one index points will not operate the selector control magnets. The cards passing under the upper brushes 3 are in synchronism with the lever 87 (Fig. 3) so that when the 0 notch is in a position to be engaged by projection 93, the zero index position is analyzed, and if a perforation permits a circuit to be established from the line through contacts 14 and 15, brushes 3 and blocks 4 to magnets 8 and the other side of the line, the energization of magnet 8 causes lever 87 to be engaged in the zero position and in turn causing the selector to be set as disclosed hereinbefore. When the twelfth index position has been analyzed the cam control contacts 15 are adapted to open.

The lower brushes 5 analyze the nine to one index positions to control the magnets 12. The



card levers close contact 17 by the cards passing these analyzing brushes and the cam controlled contacts are adapted to be closed only when the index positions from nine to one on the card are passing the brushes. When a circuit is established from one side of the line through contacts 17 and 16, brushes 5, blocks 6 to magnets 12 and the other side of the line, the energized magnet 8 though attracting its armature 109 to release lever 112 to operate the printing hammer at the proper timed interval as described before. Cam controlled contacts 18 are adapted to close after all the type elements 31 have passed the printing line to energize magnet 43 to provide for proper line spacing and ribbon feed as explained in the above description.

While there have 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.

What is claimed is as follows:

1. In a card controlled printing machine, a plurality of type elements, a plurality of sensing stations, means for feeding cards to said stations, means for continuously moving said type elements, a printing hammer, means to impel said hammer against said elements to effect printing thereby, means controlled by one of the sensing stations to render the said impelling means operative, and means in synchronism with said moving elements and controlled by another sensing station to control the time of operation of said impelling means to effect printing while the said elements are in motion.
2. In a card controlled printing machine, a plurality of type elements, means for continuously moving said elements, a pair of sensing stations, means for feeding cards to said stations, a printing hammer, means to impel said hammer against one of said elements to effect printing thereby, and means jointly controlled by the said sensing stations to control the operation of said impelling means to effect printing while the said elements are in motion.
3. In a card controlled printing machine, a plurality of predetermined groups of type elements, means for continuously moving said type elements to traverse a given printing position, a plurality of sensing stations, means for feeding cards to said stations, a printing hammer, means to impel said hammer against one of a selected group of said type elements passing said given printing position, means controlled by one of the sensing stations to render the said impelling means operative when a selected group of a plurality of predetermined groups of type elements traverse said given printing position, and means controlled by another sensing station to control the time of operation of the said impelling means whereby one of the type elements of said selected group will print as it passes the said given printing position.
4. In a card controlled printing machine, a plurality of predetermined groups of type elements, means for continuously moving said type elements to traverse a given printing position, a plurality of sensing stations for analyzing index point positions, means for feeding cards suc-

cessively to said stations, a printing hammer, means to impel said hammer against one of a selected group of said type elements passing said given printing position, selective means controlled by one of the sensing stations adapted to be positioned in accordance with the index point positions on an analyzed card, means controlled by another sensing station to render the said impelling means operative when one of the groups of type elements corresponding to the group positioned in said selective means traverses said printing position, and means included in the said selective means adapted to be positioned in accordance with the index point positions on the successive cards analyzed while the first said positioned means controls the time of operation of said impelling means when one of the type elements of said group corresponding to the index point positions on the first said analyzed card traverses the printing position.

5. In a card controlled printing machine, a plurality of adjacent type elements, means for continuously moving said elements to successively traverse a given printing position, a plurality of sensing stations, means for feeding cards to said stations, a printing hammer, an actuator, means controlled by one of said sensing stations adapted to cooperatively associate said actuator with said hammer to impel said hammer against one of said elements, traversing the said given printing position and means cooperating with the last named means and controlled by another sensing station to time the operation of the said last named means to cause the hammer to be impelled against a different type element.

6. In a card controlled printing machine, a plurality of adjacent type elements, means for continuously moving said elements to successively traverse a given printing position, a plurality of sensing stations, means for feeding cards to said stations, a printing hammer, an actuator, means controlled by one of said sensing stations adapted to cooperatively associate said actuator with said hammer to impel said hammer against one of said elements, and means cooperating with the last named means and controlled by another sensing station to time the operation of said last named means to cause the hammer to be impelled against a type element adjacent to the element traversing said given printing position when said actuator cooperates with said hammer.

7. In a card controlled printing machine, a plurality of type elements, means for sensing a card while in motion, a printing hammer, means for impelling said printing hammer against said elements, selecting means to control the time of operation of said impelling means, and means under control of said sensing means to impel said hammer against said elements while said card is in motion.

8. In a printing mechanism, in combination, a type element, means for moving said element, a printing hammer, means for impelling said hammer against said element, a selecting device, means for moving said device in synchronism with said element, to effect printing thereby, means cooperating with said impelling means to initiate the operation of said impelling means, and means cooperating with said selecting device to complete the operation of said impelling means to effect printing.

9. In a card controlled printing machine, a plurality of printing elements, means for moving said elements, sensing means, means for moving cards to said sensing means to analyze com-

binational perforations on said cards, a printing hammer, means for impelling said hammer against said elements, to effect printing thereby, means controlled by one of said combinational perforations to render the said impelling means operative, a selector, means for operating said selector in synchronism with said moving elements, and means included in said selector controlled by another of said combinational perforations to control the timing of operation of said impelling means to effect printing while said elements are in motion.

10. In a printing machine, adjacent type elements, means for moving said elements to traverse a given printing position, a printing hammer, selecting means in synchronism with said elements, an actuator, means cooperating with said selecting means and said actuator to impel said hammer against said elements, means to render said impelling means operative when one of said elements traverses said given printing position, and means cooperating with said selecting means to delay the operation of said impelling means to impel said hammer against the element adjacent to the element traversing the said given printing position when said impelling means is rendered operative.

11. In a printing machine, a plurality of type elements, means for moving said elements to traverse a given printing position, a printing hammer, selecting means in synchronism with said elements, an actuator, means cooperating with said selecting means and said actuator to impel said hammer against said elements, means to render said impelling means operative when one of said elements traverses said given printing position, and means cooperating with said selecting means to delay operation of said impelling means to impel said hammer against a different type element.

12. In a record controlled printing mechanism including sensing means for analyzing index points in records, a plurality of type elements, means for moving said type elements, a printing hammer, means for impelling said hammer against said elements, selecting means adapted to operate in synchronism with said moving elements, and means cooperating with said selecting means and adapted to be positioned in accordance with said index points to control the impelling of said hammer against said moving elements.

13. In a card controlled printing machine, a plurality of type elements, a plurality of sensing stations, means for feeding cards to said stations, means for continuously moving said type elements, a printing hammer, means to impel said hammer against said elements to effect printing thereby, electromagnetic means controlled by one of the sensing stations adapted to render said impelling means operative, and means in synchronism with said moving elements and controlled by another sensing station to control the time of operation of said impelling means to effect printing while the said elements are in motion.

14. In a card controlled printing machine, a plurality of type elements, means for continuously moving said elements, a pair of sensing stations, means for feeding cards to said stations, a printing hammer, a power drive, an actuator for connecting said drive to said hammer to impel said hammer against said moving elements, and means jointly controlled by the said sensing stations to control the operation of impelling said hammer against said moving elements.

15. In a printing mechanism for record controlled machines comprising a plurality of predetermined groups of type elements, record analyzing means for analyzing a portion of a record, a selector device including a settable segment, means controlled by said analyzing means adapted to set the segment of said device to control the selection of a particular type from one of said groups, and additional record analyzing means for analyzing another portion of the record and means controlled thereby for selecting the groups to permit selection of the particular type only.

16. In a printing mechanism for record controlled machines, means for feeding records with groups of index point positions to the machine, a plurality of sensing means for analyzing a record, a selector segment with a plurality of positions, a position for each index point position in one of said groups, a selector disk associated with said segment, means controlled by the index point positions for adjusting the selector segment with respect to the said disk and printing means controlled through said segment and disk.

17. In a record controlled printing machine, comprising a rotatable drum including a plurality of type elements, a plurality of sensing means for successively analyzing records with groups of index point positions, a printing hammer, an actuator, electromagnetic means controlled by one of said sensing means analyzing a group of index point positions and adapted to cooperatively associate said actuator with said hammer to impel said hammer against said elements, a selector segment with a plurality of positions, one for each index point position in another group, a selector disk associated with said segment, electro-magnetic means controlled by other sensing means analyzing last named index point positions to adjust the selector segment with respect to the said disk and means controlled by said segment to control the hammer impelling against said type elements.

18. In a printing mechanism for record controlled machines comprising a rotatable drum including a plurality of type elements, a plurality of record analyzing devices, means controlled by one of said analyzing devices capable of maintaining a plurality of type element selecting settings simultaneously, and means controlled by another of said analyzing devices for rendering the first named means effective so as to select a type element in accordance with one of said settings.