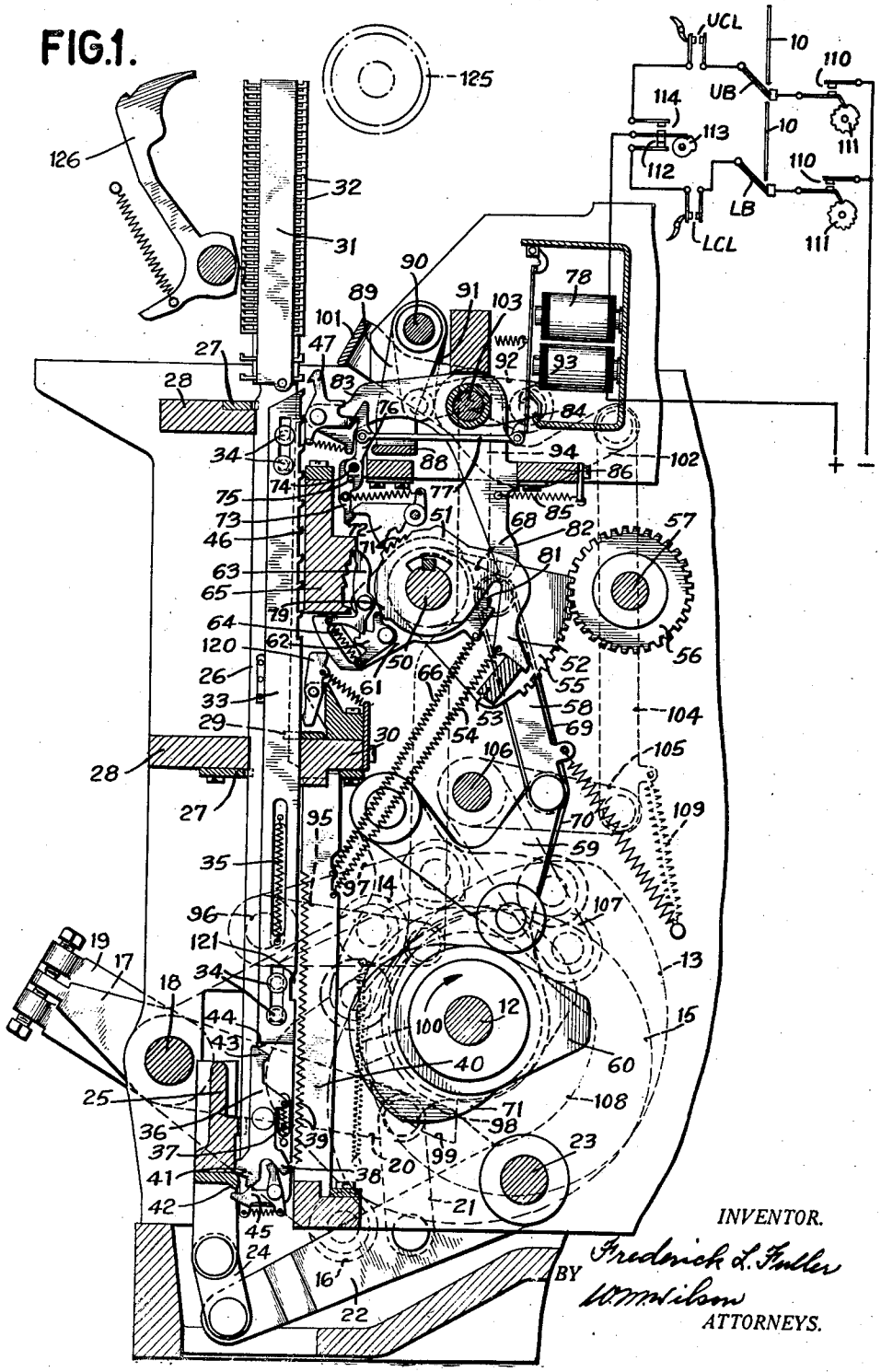
April 13, 1937. F. L. FULLER 2,076,717

PRINTING MECHANISM

Filed Dec. 11, 1935 4 Sheets-Sheet 1

FIG.1.



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PRINTING MECHANISM

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FIG. 2.

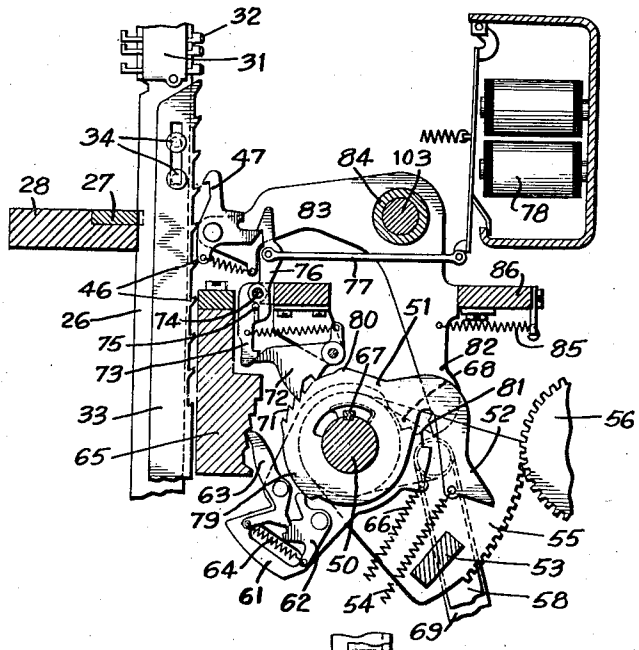
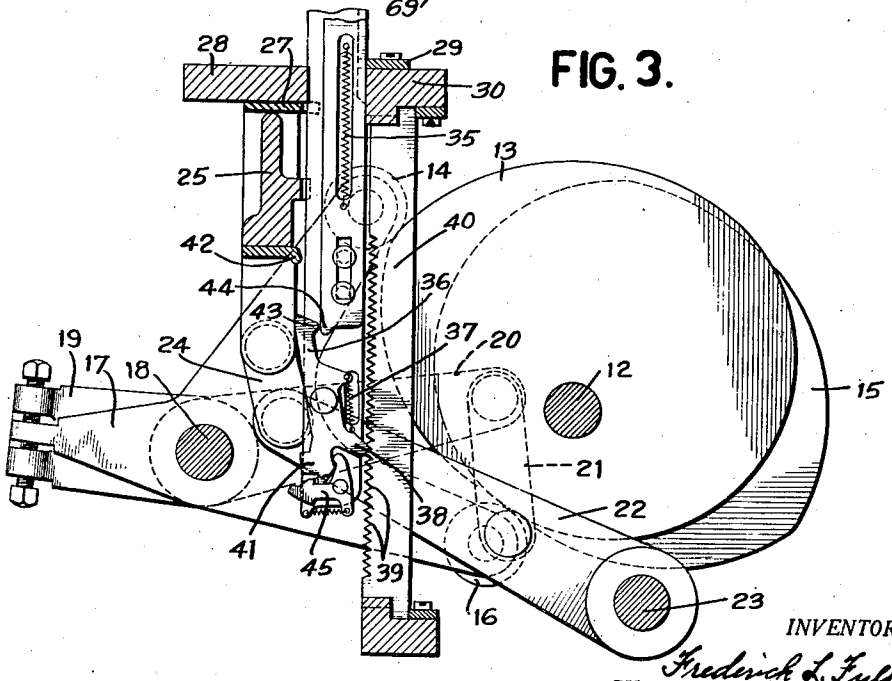


FIG. 3.



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PRINTING MECHANISM

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FIG.4.

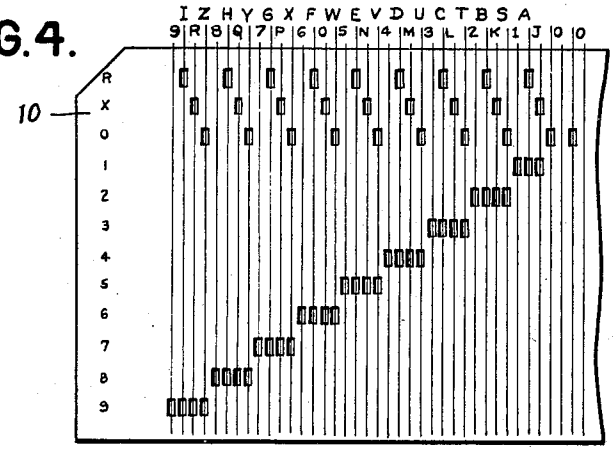


FIG.5.

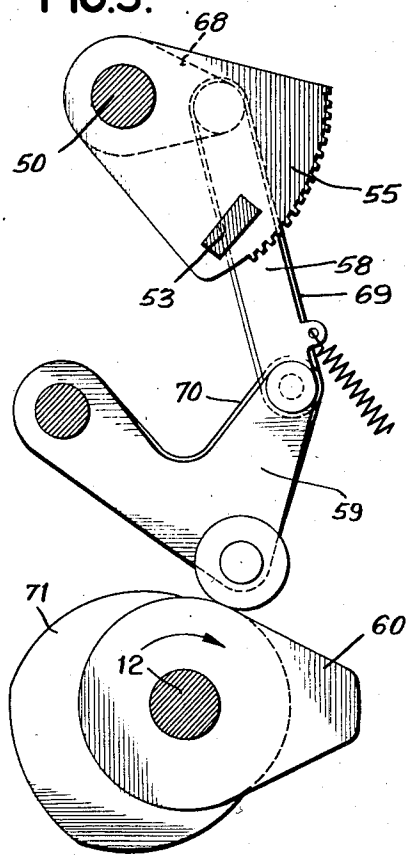


FIG.6.

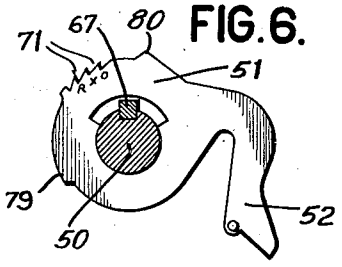
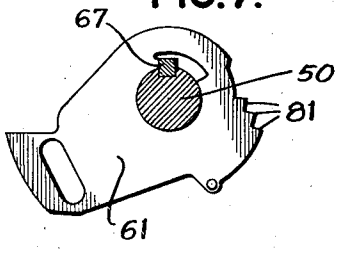


FIG.7.



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PRINTING MECHANISM

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FIG.8.

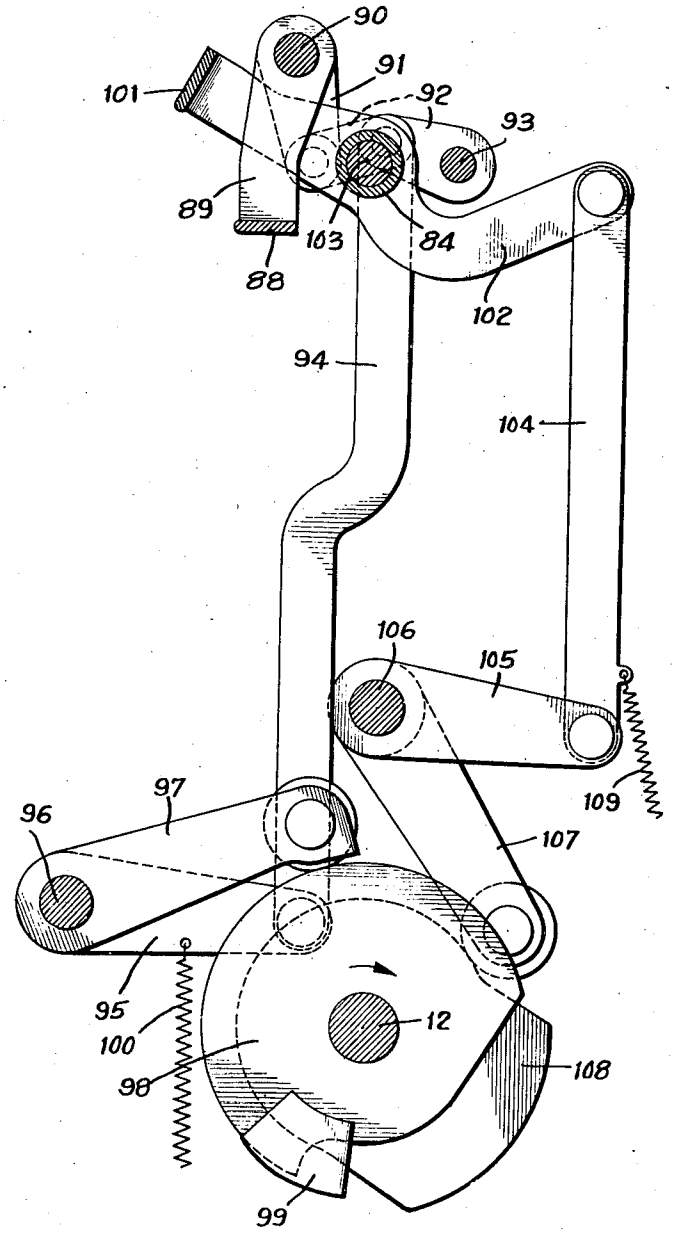
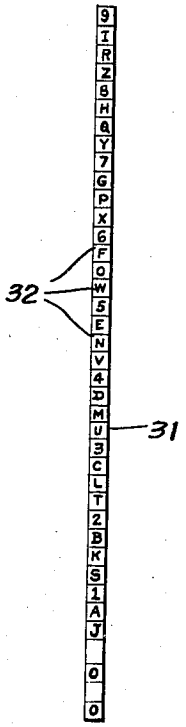


FIG.9.



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UNITED STATES PATENT OFFICE

2,076,717

PRINTING MECHANISM

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Application December 11, 1935, Serial No. 53,875

5 Claims. (Cl. 101—93)

This invention relates to accounting machines and more particularly to improvements in the printing mechanism of such machines in which all of the characters of the alphabet as well as the numerical characters are used.

One object of the invention is to provide an improved printing mechanism for printing alphabetical as well as numerical characters in which the type characters are moved and locked into printing position in a positive manner. In carrying out this invention there is provided a type carrying member carrying type elements arranged in four groups. One group comprising all of the numerical characters and each of the other groups comprising substantially ⅓ of the alphabetical characters for each group. Each group of alphabet type is represented on a Hollerith record card by perforations in what is known as a zoning position and the numerical type are represented by single perforations in the usual manner. The analyzing stations consist of the usual upper and lower sets of brushes generally used in the well known form of Hollerith tabulating machines and as the record cards pass the upper set of analyzing brushes the zoning perforations are sensed causing a mechanical set to be made in the machine and as the record card passes the lower brushes the numerical perforations are sensed which causes a positive advance in the type bar to select a numeral type or a type adjacent to the corresponding numeral type according to the mechanical setup of machine parts made by the sensing of the zone perforations.

A further object of the invention is to provide a single magnetic tripping means responsive from both upper and lower brushes for initiating both the zoning operation and the type selecting operation.

A still further object of the invention is to provide means for shifting the circuit of the magnetic tripping means from the upper to the lower set of brushes during each card cycle.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specifications and claims and shown in the drawings which show by way of illustration a preferred embodiment and the principle thereof and what is now considered to be the best mode in which the application of that principle is contemplated.

In the drawings:

Fig. 1 is a section through the printing mechanism showing all essential parts together with a diagram of the necessary circuits to operate the invention.

Fig. 2 is a detailed position view of the zone selecting mechanism.

Fig. 3 is a detailed position view of the type bar driving mechanism.

Fig. 4 is a fragment of a card illustrating the combinational arrangement of perforations for the various characters.

Fig. 5 shows the cams and cooperating mechanism for operating the zone selecting mechanism.

Fig. 6 is a detailed view of a zone setup disc.

Fig. 7 is a detailed view of a cam member for locating the type bar in printing position.

Fig. 8 is a detailed view of the cams and reset bails operated thereby.

Fig. 9 shows the arrangement of the type characters in the type carrier.

Referring to Fig. 4, the card 10 has the usual arrangement of index point positions starting with 9 at the bottom and running upwards to 0 at any one of which index point positions a perforation may be located to designate the numeral of the corresponding index point position. Two index point positions above these are provided and will be hereinafter termed the R and X positions. These two together with the 0 index point position constitute the zoning positions for the alphabetical characters. The relative arrangement of these positions are indicated at the left hand end of the card shown in Fig. 4. The alphabetical characters from A to I are represented by a combination of one of the numerical index point positions from 9 to 1 plus the R index point position. Characters J to R are represented by a combination of one of the numerical index point positions from 9 to 1 plus the "X" index point position. Characters S to Z are represented by a combination of one of the numerical index point positions from 9 to 1 plus the "0" index point positions. Perforations appearing in combination in any of these index point positions will cause the printing of the alphabetical character designated by that particular combination and a single perforation appearing in any one of the numerical index point positions from 9 to 1 will cause the printing of that respective numeral. As the zero position affects the zone setup it is obvious that a single perforation in the zero position will not effect the printing of zero in the same manner as effected by other numerical characters. It is necessary to provide means for

printing zero from the zone set-up mechanism which will be explained later.

Type bar drive

Shaft 12 is the main drive shaft of the machine and makes one revolution per machine cycle (Figs. 1 and 3). Fixed to said shaft is a cam 13 which cooperates with a cam wiper 14, and a cam 15, complementary to said last named cam, which cooperates with a cam wiper 16. These two cam wipers are rotatably mounted on the arms of a Y-shaped member 17 which is rotatably mounted on a shaft 18 journaled in the side frames of the machine. Fixed to the shaft 18 is an arm 19 which is adjustably fixed to one arm of the Y-shape member 17 so that it will be oscillated by the arm 17 as the cams 13 and 15 are rotated by the drive shaft 12 and thus oscillate the shaft 18. The shaft 18 extends across the type section of the machine and has fixed thereto two arms 20 at each end of the shaft. Links 21 connect these arms 20 with arms 22 pivoted at 23 to the frame of the machine. The arms 22 are in turn connected by links 24 to a cross head 25 which is slidably mounted in suitable guide members fixed to the machine frame to permit the crosshead to be moved upwardly and downwardly with the oscillating motion of the arm 22. The crosshead 25 extends transversely of the printing section of the machine and adjacent to a plurality of type bars 26. These type bars are disposed side by side across the printing section of the machine and are held in upright slidable alignment by means of notched plates 27 and 29 mounted on transverse frame members 28 and 30 which are fixed to the side frames of the machine. Each type bar 26 is provided with a type carrier 31 which in turn is provided with a plurality of slidable alphabetical and numerical type elements 32 (arranged as illustrated in Fig. 9).

Inasmuch as the mechanism for positioning and effecting printing for each type bar is the same it will be understood that the description hereinafter presented as applied to a single type bar, applies to each type bar carrying alphabetical characters. A slide 33 is loosely secured to type bar 26 by means of studs 34 fixed to the type bar and extending through slots in the slide 33. The slide is normally held in its uppermost position relative to the type bar by means of a spring 35 located in slots cut in the type bar and slide and fastened to the slide at its lower end and to the type bar at its upper end.

Pivotally mounted on the lower end of the type bar is a pawl 36 urged in a clockwise direction by a spring 37. This pawl has an extension 38 adapted to cooperate with notches 39 in a stationary lock comb 40 which is fastened to the framework of the machine. A nose piece 41 integral with pawl 36 is normally disposed in the path of a projection 42 extending along the bottom of the crosshead 25 and fixed thereto, (Figs. 1 and 3). At the upper end of the pawl 36 is a cam-shaped projection 43 disposed in the path of the slide 33 and adapted to cooperate with a projection 44 on the slide. A locking pawl 45 adapted to hook over the lower end of the pawl 36 when said pawl is moved in a counterclockwise direction. The locking pawl 45 is provided with a projection disposed in the path of and below the crosshead projection 42 and in the plane of the extension 38 of pawl 36. The locking pawl 45 is urged in a clockwise direction by a spring as illustrated clearly in Figs. 1 and 3. The slide 33 is provided at its upper left hand edge with a plurality of teeth 46, one for each numerical index point position in the record cards. Cooperating with these teeth is a pawl 47 controlled by an electromagnet in a manner to be later described.

As the crosshead 25 moves upwardly the projection 42 abuts the nose piece 41 and carries the type bar 26 and slide 33 upwardly with it. When the pawl 47 is released to engage one of the teeth 46 the slide 33 is held stationary and the type bar 26 continues moving upwardly. The cam shaped projection 43 then strikes the projection 44 of the slide causing the pawl 36 to be rotated counterclockwise withdrawing the nose piece 41 from contact with projection 42 and permitting the crosshead to pass by as shown in Fig. 3. As the pawl 36 is thus rotated the extension 38 engages one of the notches 39 of the comb 40 to positively lock the type bar and at the same time the hook on the locking pawl 45 engages the end of the pawl 36 to lock it in position. Upon restoration of the crosshead 25 downwardly the pawl 47 is restored, in a manner to be described later, releasing the slide 33 which moves back to normal position under influence of the spring 35 and disengages itself from contact with the pawl 36. As the crosshead reaches the bottom of its travel the projection 42 strikes the horizontal extension of the locking pawl 45 turning it counterclockwise and disengaging it from the pawl 36 which is rotated in a clockwise direction by the spring 37 to its normal position. The vertical arm on the locking pawl 45 at the same time positively kicks the pawl 36 into its restored position. All of the type carriers reciprocate vertically past a horizontal platen 125 and the type elements are slidable in the type head so that when a type is struck by the printing hammer 126 the element is projected against the platen in the usual manner to effect printing.

Zoning mechanism

A shaft 50 runs transversely of the printing section and is journaled in the side frames of the machine. Loosely supported on this shaft are a series of zone setup discs 51, there being one disc for each alphabetical type bar assembly. An extension 52 on each disc is normally held against a bail 53 by means of spring 54. The bail 53 is supported by two gear sectors 55 located at each end of the printing bank and each sector meshes with a gear 56 which is fixed to a shaft 57 journaled in the side frames of the machine. The purpose of this shaft is to keep the bail 53 from twisting when the sectors are rotated since the actuating member for rotating said sectors is connected to only one of the sectors. This actuating member consists of a link 58 pivotally connected to one of the sectors and to a cam follower 59 which cooperates with a cam 60 fixed to the drive shaft 12. Adjacent to each disc 51 is a cam member 61 which pivotally supports a pawl 62 and a latch 63 cooperating with said pawl. The pawls and latch are tensioned by a spring 64 fastened between them. The pawl 62 is adapted to cooperate with notches in a fixed member 65. The cam member 61 is urged in a clockwise direction by a spring 66 and is normally held against a key 67 fixed in the shaft 50 which extends through slots in all of the discs and cam members, (Fig. 7). The slot in the disc is of sufficient size to clear the key at all positions of the zoning disc or shaft 50 whereas the slot in the cam member is smaller so that one side normally abuts the key (Figs. 6 and 7). A crank arm 68 is pinned to

the shaft 50 and is connected by a link 69 to a cam follower 70 which cooperates with a cam 71 fixed to the drive shaft 12, (Figs. 1, 2 and 5).

The zoning disc 51 is provided with notches 71 to correspond to the 0, X and R index point positions on the record card (Fig. 6) and these notches are adapted to cooperate with a pawl 72 which is normally held out of cooperation with the notches by a latch 73 pivoted at 74. The latch 73 carries a pin 75 which extends into the plane of a tail piece on the latch 76 so that when said latch is pulled in a clockwise direction by the pull rod 77 attached to the armature of the magnet 78, the latch 73 is also turned clockwise. This latch may, however, turn of itself in a clockwise direction without affecting the latch 76. The zoning disc 51 is further provided with a cam surface 79 adapted to cooperate with the latch 62 to move it counter-clockwise and unlatch the pawl 63 to permit said pawl to engage one of the notches in member 65. Said disc 51 is also provided with cam surface 80 which is adapted to move the pawl 72 clockwise after it has been released by latch 73 to restore the pawl 72 to latched position. When so moved the end of pawl 72 cams the latch 73 clockwise and permits it to snap into latched position under the end of latch 73 without disturbing the latch 76. The cam member 61 has stepped cam surfaces 81 which are adapted to cooperate with the arm 82 of a lever 83 rotatably mounted on a sleeve 84 and normally urged in a counterclockwise direction by a spring 85 against a fixed limit stop 86.

Operation of zone selecting mechanism

In the operation of the machine it will be understood that the zone selecting mechanism is controlled by the three top index point positions, 0, X, and R as they pass the upper brushes. While the lower index point positions 9 to 1 are passing the upper brushes the circuits from these brushes to the magnets 78 are cut off in a manner to be described later. As the zero index point position is about to pass the upper brushes, the bail 53 will be rocking downwardly from its uppermost position and the zoning disc 51 will be rotating in a clockwise direction so that the notches 71 will pass the end of the pawl 72 in synchronism with the passing of the index point positions past the brushes. Assuming a perforation existed in the zero point position: When the brush enters the perforation, magnet 78 will be energized pulling the latch 76 and consequently the latch 73 clockwise thus releasing the pawl 72 which will enter the first notch as shown in Fig. 6 and locking the disc in position while the bail 53 continues its downward travel. Later in the cycle the crank arm 68 will rotate the shaft 50 clockwise and the cam member 61 pressed against the key 67 will follow until the latch 62 strikes the cam surface 79 at which time it will be rocked counterclockwise to release the pawl 63 which will engage one of the notches in the member 65 thus locking the cam member 61 into position which position will be held during the time the lower brushes are reading the index point positions from 9 to 1 and the type bar is rising.

It will be seen that the zone selecting setup is being made from the upper brushes during printing operation for the preceding card. The angular position of the cam surface 79 is determined by the position in which the pawl 72 retains the disc and in turn determines the time for unlatching the pawl 62 to select the proper notch in the member 65. The setting of the cam member 61 locates the proper stepped cam surface adjacent the arm 82.

To complete the selection of an alphabetical character let it be assumed that it is desired to print the letter "L". Such a selection would require a perforation in the "X" and in the "3" index point position in accordance with the code set forth.

In the manner previously explained, the perforation in the "X" position passing the upper brushes will cause the pawl 72 to be released to engage the second notch in the zone setup disc 51 as illustrated in Fig. 2. Accordingly the latch 63 will operate to select the proper notch in the member 65 corresponding to the setting of the zone disc 51, thus locking the cam member 61 in position to be held while the lower part of the card from 9 to 0 is passing the lower brushes to be read thereby.

After the R position has passed, the magnet 78 is shifted to the circuit including the lower brushes and the pawl 47 is relatched prior to the passing of the 9 index point position past the lower brushes. The change in circuits and the restoration and relatching of different elements will be explained later. As the record card passes the lower brushes the crosshead 25 starts to move upwardly carrying the type bar 26 and slide 33. As the "3" index point position passes the lower brush, the magnet 78 operates and unlatches pawl 47 to catch the corresponding tooth 46 of the slide 33. The slide and type bar continue rising and carry the pawl 47 with it rotating the lever 83 clockwise (the pawl 47 being mounted on said lever) until the extension 82 strikes the cam step 81, which has been previously set in its proper position, at which the slide 33 is arrested and the type bar 26 moves on slightly to release the pawl 36 as previously described, thus positively locking the type bar 26 and disengaging the crosshead 25. In this locked position the "L" type character will be in printing position to receive the blow of the printing hammer to effect printing.

Upon the return operation of the zone setting disc 51 in a counterclockwise direction after the cam member 61 has been set, the cam surface 80 will strike the projection adjacent the pivot of pawl 72 camming it clockwise against latch 73 so that said latch will spring over the nose of the pawl without disturbing latch 47. This return movement is effected while the 9 to 0 positions on the card are passing the brushes.

Later in the cycle after the type bar has been positively locked the shaft 50 will be rocked counterclockwise and the key 67 will pick up the cam member 61 carrying the pawl 63 downward, said pawl will strike the lowest projection on the member 65 and will be rotated clockwise about its pivot and will be latched on the lower step of the latch 62, the cam surface 79 having been removed from cooperation with said latch at this time.

After the "1" index point position has passed the brushes and before the passage of the "0" index point position, the latches 76 and 73 will be restored to normal position by a bail 88 (Figs. 1 and 8). This bail is supported by two members 89 at each side of the printing bank and the members 89 are fixed to a shaft 90 journaled in the frames of the machine and having fixed thereto an arm 91 connected to a toggle linkage 92 pivoted at 93 and pivotally connected at its center point by a link 94 which in turn is connected to an arm 95 fixed to a shaft 96 journaled

in the machine and having a cam follower 97 fixed thereto and cooperating with a cam 98 fixed to the drive shaft 12. The cam 98 is provided with a sector 99 fastened to its side to cooperate with the pointed end of the cam follower arm 97 to give a quick and accurate drop, whereas the roller on said arms rides on the cam 98. The bail 88 therefore has a very quick action as the toggle mechanism drops quickly through its center or straight line position. Such action is necessary because of the limited time in which it has to act, that is, during the passage of the card between two adjacent index point positions. The spring 100 fastened to the arm 95 acts to pull the cam follower against the cams. The toggle linkage is restored by the roller on arm 97 rolling up on cam 98 and again restores the latches 76 and 73 after zoning operations.

After the type bar has been selected and locked in printing position, with one of the type elements in line with the printing hammer and the platen, the pawls 47 and levers 94 are repositioned by the bail 101 which strikes the shoulder behind the pawl 47 rotating it clockwise to disengage it from the type bar, and striking the upper edge of the lever 94 moving them both downwardly until the pawl 47 locks under the latch 76. The bail 101 is supported by levers 102 at each end of the printing bank and fixed to a shaft 103 running through the sleeve 84. One of said levers is connected by means of a link 104 to an arm 105 fixed to shaft 106 which has fixed thereto a cam follower 107 cooperating with the cam 108. The link 104 is biased downwardly by the spring 109.

Due to the transferring of the printing magnet circuit from the upper brushes UB to the lower brushes between the zero and one index point position, the selection of a zero numerical print which is called by a single perforation in the zero position cannot be obtained in the same manner as the other numerical characters, namely, by selection from the lower brushes to release the pawl 47 to engage and arrest the slide 33. Arrangements therefore must be made to select the zero type position by means of the zone selecting mechanism which is controlled by the upper brushes. To take care of this, a dog 120 is pivotally mounted in alinement with each slide 33 on a comb mounted on the transverse member 30. This dog being urged in a clockwise direction by a spring as illustrated and the upper extremity of the dog resting against the lower edge of cam member 61.

In such a position however the cam member will be swung counterclockwise from its position shown in Fig. 1 so that the lower part of said cam disc will be swung to the right and free of the dog 120 so that it will no longer rest against the cam but instead the lower end of the dog will rest against the slide 33. As the type bar rises synchronously with the passage of the record card past the lower brushes, and there being no further perforations in the card to cause a release of the pawl 47, a notch 121 in the lower end of slide 33 will reach the position of the lower end of dog 120 at which time the dog will engage the notch to arrest the slide 33 and positively lock the type bar with the "0" type in alignment with the printing hammer and platen.

The lower zero character illustrated in the type carrier relates to zero elimination mechanism which is not shown or described and plays no part in the present invention.

When alphabet printing is being effected and a space is required between two words, no perforations appear in the column of the record card corresponding to the space, consequently there is no type bar selection and the crosshead carries the type bar clear up to where the type carrier entirely passes the printing hammer so that no printing is effected when the hammer is operated.

The general operation of the card feeding mechanism shown and described in patent to C. D. Lake and G. F. Daly No. 1,976,617 issued October 9, 1934, in which cards are fed downwardly in succession past the upper brushes UB and the lower brushes LB. A simplified diagrammatic circuit being shown in Fig. 1 in which one of the magnets 78 is shown in circuit. Make and break contacts 110 are operated by cams 111 suitably geared to the machine drive to break the circuit at each index point position to prevent sparking at the brushes when a circuit is established through a perforation. When the first card passes the upper brushes upper card lever contact UCL is closed and lower card lever contact LCL is opened so that no current passes to the magnet during the first point of the cycle when the card is passing from the "9" point position to the "1" index point position at which time contact 112 is closed. A cam 113 is suitably geared to the driving train to rotate in timed relation to the travel of the card past the brushes. Said cams operate the contacts 112 and 114 so that as the "1" to "0" index point positions are passing the brushes contact 114 closes and 112 opens thus connecting magnet 78 in circuit with the upper brushes UB while they are reading the 0, X and R position. As the first card leaves the upper brushes and is about to pass the lower brushes the cam 113 causes contacts 114 to open and contacts 112 to close connecting magnet 78 in circuit with the lower brush LB and the lower card lever contacts LCL are closed by the passage of these cards past the lower brushes. Contact 114 now being open the passage of the second card pass the upper brushes from "9" to zero index point positions does not effect the magnet 78 whereas the lower brushes are now reading this portion of the first card.

Thus the upper brushes read the 0, X and R positions only on a card first for zone selecting and the lower brushes read the 9 to 1 index point positions only on the same card during the next following machine cycle.

While the fundamental and novel features of the invention as applied to a single modification have been shown and described and pointed out it is to be understood that various omissions 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. I intend to be limited therefore only as indicated by the scope of the following claims.

What is claimed is as follows:

1. In a printing mechanism operated in accordance with indicia represented by indicia bearing elements, the combination of a plurality of printing elements selectively controlled by said indicia bearing elements, a plurality of sensing stations for reading said indicia bearing elements, means for causing different portions of said indicia bearing elements to be read in successive machine cycles, means common to said sensing stations and responsive to the readings effected from the different portions of the indicia bearing elements, storage means controlled from

said last named common means when operated by one of the sensing stations, for storing said reading in the printing mechanism, and means controlled by said common means when operated by another sensing station for positioning a certain printing element in accordance with reading of said sensing station in conjunction with setting of the storage means.

2. In a printing mechanism operated in accordance with indicia represented by indicia bearing elements, the combination of a movable type carrier, a plurality of type elements arranged in groups on said carrier and individually selected under the control of said indicia bearing elements, a plurality of sensing means for reading said indicia bearing elements, means for causing different portions of said indicia bearing elements to be read by different sensing means in successive machine cycles, means common to said different sensing means and operable thereby for controlling a plurality of type positioning elements, group selecting means controlled by said common means for temporarily setting up a group reading in said printing mechanism during one machine cycle, group setup storage means controlled by said group selecting means for storing said group reading in said printing mechanism during a succeeding machine cycle, and means controlled by said common means during said succeeding machine cycle for selectively engaging said type carrier to select an individual type in accordance with setup of the group storage means.

3. In a printing mechanism operated in accordance with indicia represented by indicia bearing elements, the combination of a type carrier having a plurality of type elements arranged in groups, sensing means for reading said indicia bearing elements, means controlled by said sensing means for selecting a group of said type elements, said means including a movable group selecting disc, a latch for arresting the movement of said disc, under control of said sensing means in accordance with the reading on said indicia bearing element, a group setup device controlled by said group selecting disc and movable into operative position in accordance with the position of the group selecting disc and means controlled by said group setup device for controlling the setting of said type carrier.

4. In a printing machine operating in accordance with indicia represented by an indicia bearing element, the combination of a movable type carrier having a plurality of type elements arranged in groups, a driving member for moving said type carrier, means for coupling said driving member to said type carrier, a slidable member mounted on said type carrier, a plurality of sensing means for reading said indicia bearing elements, means controlled by one of said sensing means in accordance with the reading on said indicia bearing element for engaging said slidable member while in motion and to move therewith, a storage member controlled by another of said sensing means for storing the reading of the indicia bearing element by said sensing means, means controlled by the storage member for arresting the motion of the means engaged with the slidable member whereby the slidable member becomes arrested, and means controlled by the slidable member upon becoming arrested for uncoupling the driving member from the type carrier to arrest the motion of said type carrier.

5. In a printing mechanism operated in accordance with indicia represented by indicia bearing elements, the combination of a movable type carrier, a plurality of reading stations for reading said indicia bearing elements, means for causing different portions of a single indicia bearing element to be read in successive machine cycles, means responsive to the reading of one station for storing said reading in the printing mechanism, and means responsive to the reading of another reading station for positioning the type carrier in conjunction with the setting of the storing means.

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