

Dec. 7, 1943.

E. BUHLER
PRINTING MECHANISM
Filed Dec. 18, 1940

2,335,911

4 Sheets-Sheet 1

FIG.1.

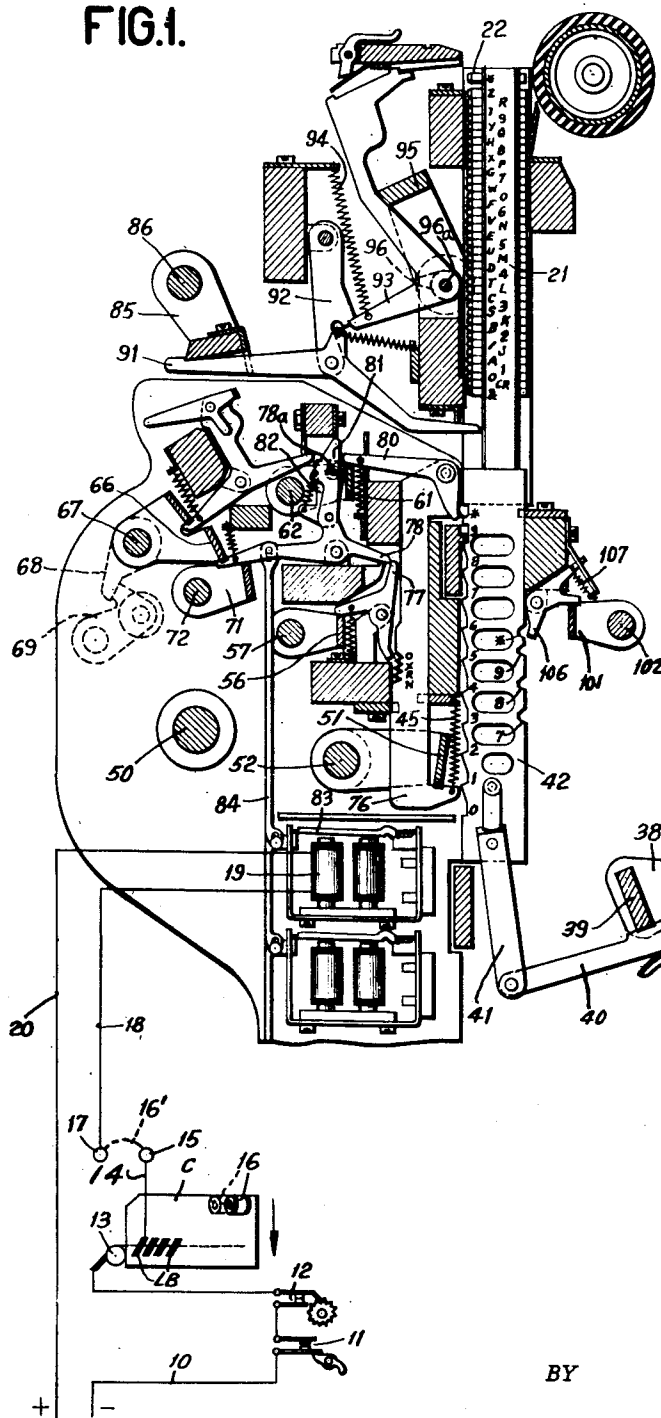
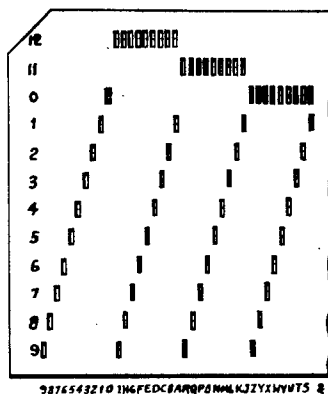


FIG.6.



BY

INVENTOR
Eugen Buhler
ATTORNEY
W. M. Mahon

Dec. 7, 1943.

E. BUHLER

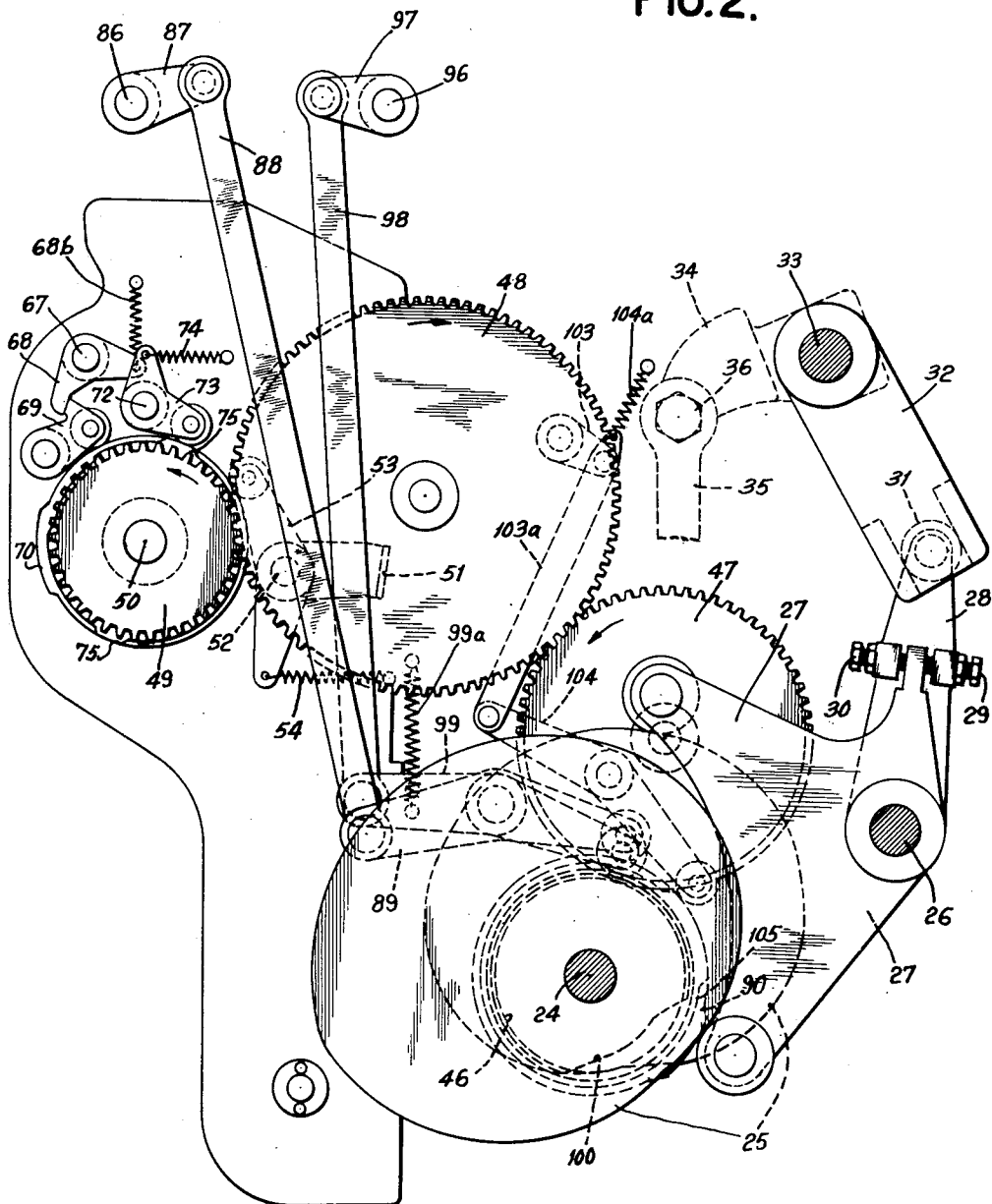
2,335,911

PRINTING MECHANISM

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4 Sheets-Sheet 2

FIG.2.



BY

INVENTOR.
Eugen Buhler
ATTORNEY.

Dec. 7, 1943.

E. BUHLER

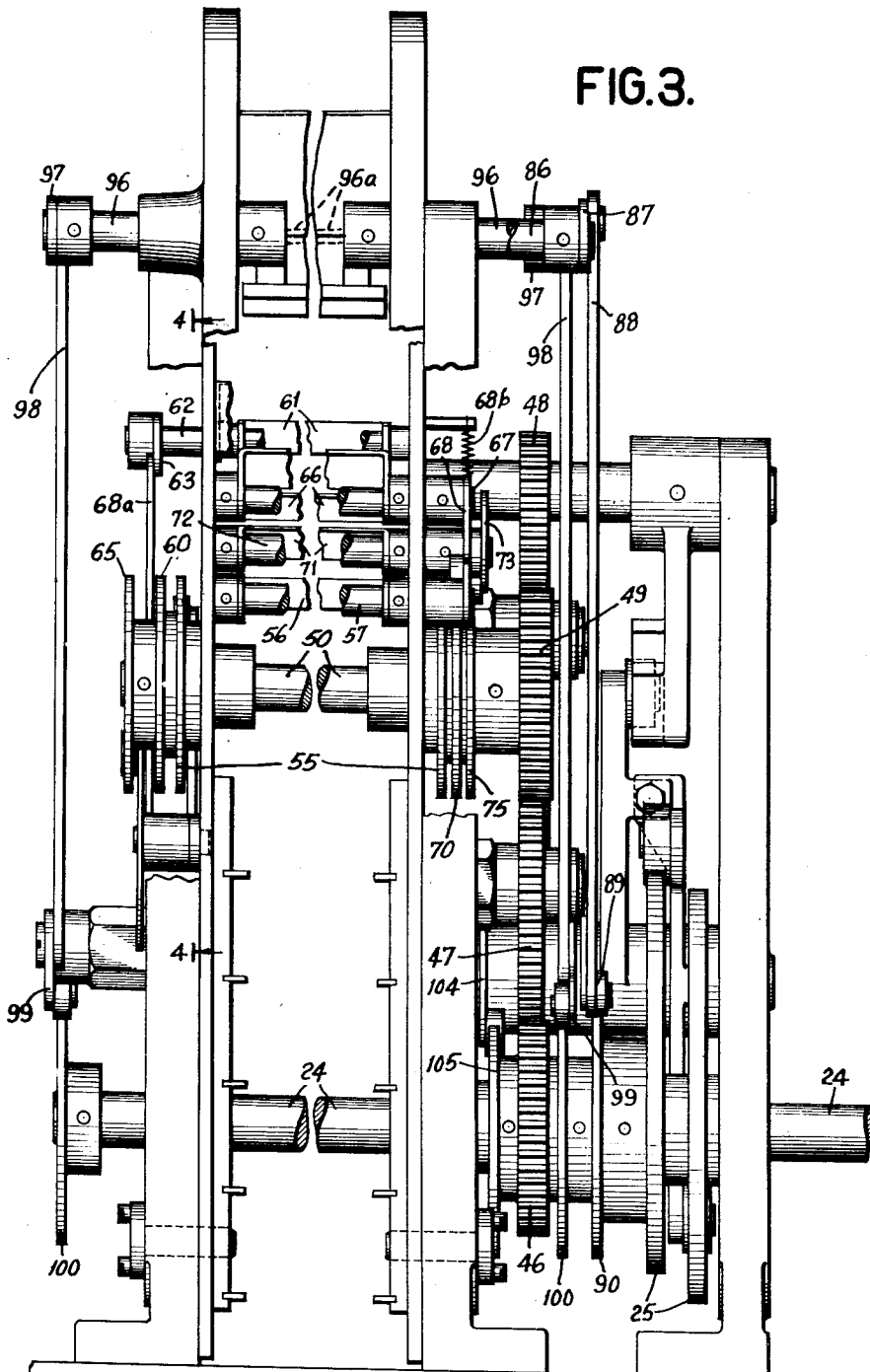
2,335,911

PRINTING MECHANISM

Filed Dec. 18, 1940

4 Sheets-Sheet 3

FIG.3.



BY

INVENTOR
Eugen Buhler
ATTORNEY

Dec. 7, 1943.

E. BUHLER

2,335,911

PRINTING MECHANISM

Filed Dec. 18, 1940

4 Sheets-Sheet 4

FIG. 4.

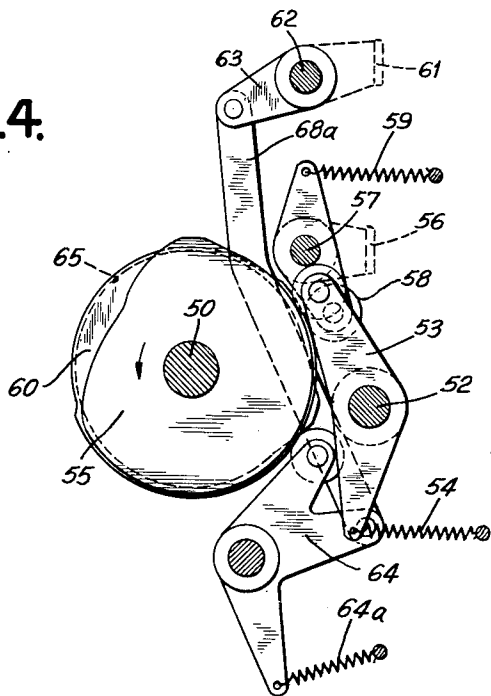
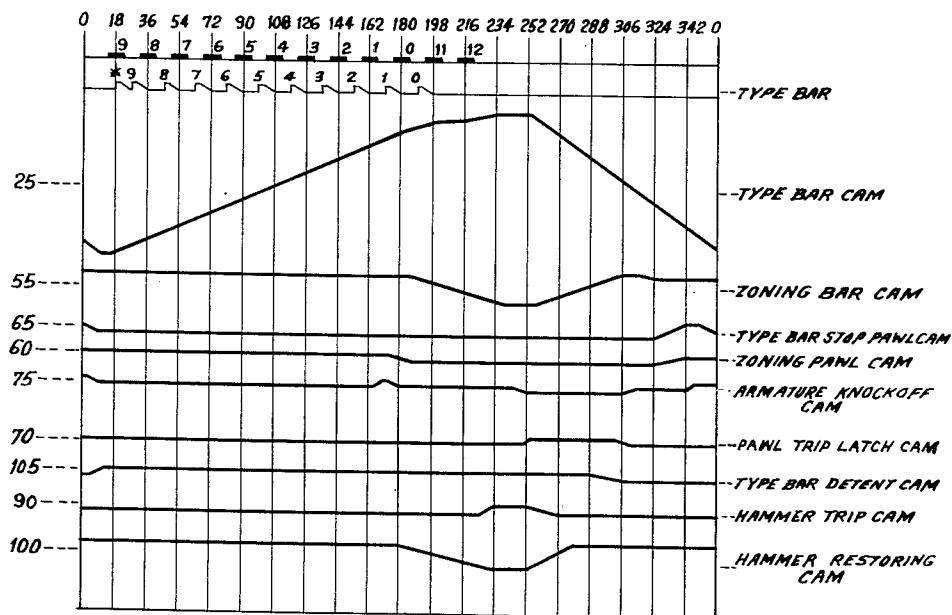


FIG. 5.



BY

INVENTOR
Eugen Buhler
ATTORNEY
W. M. Wilson

UNITED STATES PATENT OFFICE

2,335,911

PRINTING MECHANISM

Eugen Buhler, Binghamton, N. Y., assignor to International Business Machines Corporation, New York, N. Y., a corporation of New York

Application December 18, 1940, Serial No. 370,681

4 Claims. (Cl. 101—93)

This invention relates to printing mechanisms and, more particularly, to devices for selectively printing alphabetic or numerical data.

An object of the present invention is to provide a printing mechanism of the above type which is of improved construction and arrangement of parts.

A further object is to provide an improved form of printing mechanism of the type which is controlled in its operations by code perforations in the index point positions arranged in a column on a record card, whereby it is possible to utilize a larger number of the index point positions to control positioning of type elements.

In the particular embodiment of the invention which is disclosed a zoning bar is arranged adjacent each type carrier and is driven in the same direction as the type carrier, the zoning bar and type carrier being controlled by a single magnet and a single armature to effect printing of the desired characters. The individual printing control magnets may be operated by differentially timed impulses established by any appropriate means such, for example, as the sensing of differentially disposed perforations on record cards in machines of the well known Hollerith type. The record cards are provided with a plurality of columns of index point positions generally designated R, X, 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9, as illustrated in Fig. 6. The index points 1 to 9 are the ordinary digit positions. Alphabetic characters are represented by different combinations of perforations in the R—X—0 zone with the perforations in the 1 to 9 zone of the same column. For example, the letter "A" may be represented by perforations in the "R" and "1" positions, the letter "B" by perforations in the "R" and "2" positions, etc. Only one character is represented in any one column at a time, however.

At the beginning of the printing cycle the type carrier is set in motion in a given direction and moves the type elements thereon successively past a printing line, or printing position with respect to a platen. Synchronously therewith, the record card is moved so that the index point positions thereon, 9 to 0, X and R, pass successively the sensing brushes of the sensing station. While the index point positions 9 to 0 are passing the sensing brushes, the zone bar is held stationary, and immediately thereafter, the zone bar is also set in motion and in the same direction as the type carrier. As an example, if the column of the card being sensed is perforated to represent an alphabetic character, one

perforation will be sensed by the brushes during the passing of the 9 to 1 index point positions and this will result in a pawl carried by the zone bar being released and engaging the type bar to lock the latter to the zone bar, the latter being stationary during that portion of the cycle. A second perforation in the 0, X or R positions will be sensed and will result in the releasing of a second pawl carried by the frame to engage the zone bar and lock the latter to the frame, thereby preventing further movement of the zone bar and also of the type bar. As the zone bar does not commence its movement until after the zero point position of the card has passed the sensing brushes, the releasing of the second pawl will prevent the beginning of such movement if the second perforation is in the zero position and will stop such movement if the second perforation is in an X or R index point position. At the time the zone bar and the type bar are locked to the frame due to the sensing of the second perforation in the 0, X or R position, the type carrier is then in position to print the alphabetic character corresponding to the combination of perforations in the particular column of the card being sensed.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a central section of the printing mechanism showing the improved construction.

Fig. 2 is an outside view of the mechanism showing the operating cams and the connecting linkage.

Fig. 3 is an end view of part of the printing mechanism, the view looking from the left in Figs. 1 and 2.

Fig. 4 is a section taken at 4—4 of Fig. 3.

Fig. 5 is a timing chart showing the timing of the various operating cams.

Fig. 6 is a fragment of a record card showing the combinational arrangement of perforations to represent the alphabetic characters and also the usual digit perforations.

In order that the record cards may be analyzed for perforations thereon, the cards are placed in the card feeding mechanism of the machine, which is not shown but which may be of the type fully disclosed and described in Patent No. 1,827,259, issued to J. R. Pierce, October 13, 1931.

Fig. 1 discloses, in diagrammatic manner, the

analyzing brushes LB past which the cards are traversed in succession under the control of feed rollers 16. The circuit for any card column may be traced from the negative side of line 10, through the usual card lever contacts 11, circuit breaker contacts 12, common contact roller 13, perforation in the record card C, sensing brush LB, wire 14, plug socket 15, plug wire 16 to plug socket 17, then via wire 18 through print selecting control magnet 19 to positive side of line 20.

As mentioned hereinbefore, the cards are fed past the brushes LB with the 9 index point positions leading so that for any column in which an alphabetic character is entered, the digit perforation will first complete the circuit to energize magnet 19 and thereafter when the R—X—0 zone hole arrives at the brush, the circuit is again completed to energize the magnet a second time.

The type carriers 21, with their type elements 22, are arranged to be moved past the printing position opposite platen 23 in synchronism with the movement of the card by the brushes LB. Thus, as the 9 index point positions traverse the brushes, the Z type element will be approaching the printing position; as the 8 index point positions traverse the brushes the Y type element 22 will be approaching the printing position, etc.

Referring now to Fig. 2, the main operating shaft 24 of the printing mechanism, from which the card feeding mechanism may also be driven, carries a pair of complementary cams 25 which are arranged to oscillate a shaft 26 through follower arms 27. Loosely mounted on shaft 26 is an arm 28 which is held in position by adjustable screws 29 and 30. Roller 31 is mounted on arm 28 and rides in a slide portion of arm 32, the latter arm being pinned to shaft 33. Arms 34, one on each side of the print head, are rocked upon oscillation of shaft 33. A link 35 is connected at one end to arm 34 by a stud 36 and is joined at the other end with a bail arm 38 by means of a stud 37. Bail arm 38 carries a bail 39 against which type bar operating arms 40 normally rest. Arms 40 are connected by links 41 to type bars 42 which support the type carriers 21. As bail 39 moves up, spring 43 extending between arms 40 and 34 cause arms 40 to also move upwardly, thereby raising the type bars 42 and hence the type carriers 21 with their type elements 22.

Also mounted on drive shaft 24 is a gear 46 which meshes with a gear 47 to operate gears 48 and 49 in the directions indicated by the arrows. Gear 49 is fastened to shaft 50 on which are mounted operating cams 55, 60, 65, 70, and 75, to be described hereinafter. The gear ratios employed are such that one revolution of shaft 24 is accompanied by one revolution of cam shaft 50.

The operation of the printing mechanism is controlled by the movements of a number of bails which in turn are controlled by the aforementioned cams, the timings of which are shown in Fig. 5. A bail 51, later to be identified as the zoning bar bail, is pinned to a shaft 52 which is oscillated by a follower arm 53 cooperating with cam 55 under the bias of spring 54. A bail 56, later to be designated the zoning pawl bail, is pinned to a shaft 57 which is arranged to be oscillated through the medium of a cam follower 58 cooperating with cam 60 under the bias of spring 59. Similarly, a bail 61, which will be

known hereinafter as the type bar stop pawl bail, is secured to a shaft 62, the latter shaft being oscillated by cam 65 through cam follower 64 under the bias of spring 64a, link 68a and arm 63. Cam 70 controls the movement of a bail 66 pinned to shaft 67. Bail 66, later to be known as the trip latch bail, connects with the cam 70 through arms 68 and 69 held in operative connection with the cam by a spring 68b. A knock-off bail 71 is pinned to shaft 72 and is actuated by a cam arm 73 which follows cam 75 under the bias of spring 74.

During the card reading time from index point 9 until slightly after zero, the zoning bar bail 51 holds all zoning bars 76 in the extreme downward position as shown in Fig. 1. From index point position 9 until slightly after position 1 the zoning pawl bail 56 holds zoning pawls 77 in such a position that the latching points of the pawls clear the latching points of trip latches 78. During the entire card reading time, a type bar stop pawl bail 61 is away from type bar stop pawl 80, thereby allowing each pawl 80 to rest against the latching point of a deflector 81 which is pivotally mounted on each trip latch 78 and held against a stop pin 78a on the latch. The arrangement is such that an elongated hole in deflector 81 rides on pin 78 and spring 82 holds the deflector in its normal position with one end of the hole against the stop pin 78a. It should be noted that the stop pawls 80 are pivotally carried by zoning bars 76.

During the time from index point 9 until after printing, the pawl trip latch bail 66 is held in the home position as shown in Fig. 1. Now if, for example, a magnet 19 receives an impulse through an 8 hole in the card, this causes armature 83 to be attracted to move its connected pull rod down, thereby rocking the respective trip latch 78 with the deflector 81 in a counterclockwise direction to effect the release of type bar stop pawl 80. Pawl 80, upon its release, will be moved in a counterclockwise direction to fall into stop notch 8 on the type bar. In order that this operation may be realized, the bails 61 and 71 must be out of home position, while the remaining bails are in the position shown in Fig. 1. Upon engagement of the pawl 80, the upward movement of type bar 42 will be stopped. However, at this time the Y symbol rather than the 8 symbol will be just approaching the printing line. This condition will change immediately after the zero position on the card passes the sensing brushes, because the zoning bail 51 then moves counterclockwise in synchronism with the card as the X and R index points are passing the brush station. The zoning bars 76 will follow the bail 51 and terminate against the zoning pawl 77 at the numeral print stop position N on the zoning bar 76 because spring 45 fastened to the zoning bar 76 tends to keep the bar against the zoning bar bail 51 during the time the bail 51 is moving. Type bars 42 of course will follow because the type bar stop pawl 80 is moving with the zoning bar 76. When the zoning bar 76 stops, the 8 symbol will be in printing position.

Toward the end of the cycle, between 1 and 0, all trip latches 78 will be restored by the knock-off bail 71 which temporarily is restored to the position shown in Fig. 1 at this time. It will be noted that bail 71 then moves away from the trip latches 78. Simultaneously with the movement of bail 71 away from the trip latch 78, the bail 56 moves away from the zoning pawls 77,

thereby permitting the pawls to rest against the restored trip latch 78 and in a position to be tripped by the latch 78 while the card positions 0, X, and R pass the sensing brushes. However, in the event that say a zero zoning hole in the respective column of the card passes the brush station, another impulse is sent to energize the print selecting magnet 19 which once more attracts its armature 83 to operate the trip latch 78 which had been previously restored between 1 and 0 by bail 71. Attraction of the armature 83 causes release of trip latch 78 from zone pawl 77 so as to permit zone pawl 77 to engage the "0" stop notch on the related zone bar 76, thereby holding the type symbol Y at the printing line. As the bail 51 prevents movement of the zone bar 76 until after the zero index point position has passed, the just described engagement of pawl 77 with the "0" notch on the zone bar took place without movement of either the zone bar or its related type bar.

The actual printing occurs under the control of trip bail 85 pinned to shaft 86 which is actuated through an arm 87 also pinned to shaft 86 and connected through link 88, to cam arm 89 co-operating with cam 90 on drive shaft 24. The trip bail 85 rocks clockwise at the printing time to move the hammer trip latches 91 to the left, as viewed in Fig. 1. This pulls release levers 92 to the left to release the hammers 93 for printing movement in a clockwise direction about the rod 96a under the impetus of springs 94 to strike those type elements 22 which are at the printing line at the time. In order that the hammers may fire properly, a restoring bail 95 is moved out of the way. Bail 95 is pinned to shafts 96 and is actuated through arms 97 and links 98 connected to follower arms 99 which cooperate with cams 100 on drive shaft 24, under the bias of springs 99a. After the hammers have fired, and bail 95 becomes active to restore the hammers to their latched position as shown in Fig. 1.

After printing the bail 66 moves clockwise to force the trip latches 78 in a counterclockwise direction in order that the zoning bars 76 along with the type bar stop pawls 80 can be restored without having the latter pawls disengaged from the type bar stop notch.

While the restoration of the zoning bar is taking place a bail 101, pinned to shaft 102 and connected through arm 103 and link 103a to follower arm 104 which cooperates with cam 105 under the bias of spring 104a, is moved away from its normal position so as to permit pawls 106 to be urged by spring 107 against the type bars 42. Those type bars which have been stopped in either an asterisk, 9, 8, or 7 position or in any adjacent alphabetical position, will be prevented from springing up, by reason of the entrance of the pawls 106 into notches related to the asterisk, 9, 8, or 7 position on the right hand edges of the type bars 42. The provision of these auxiliary notches in the type bar insures smoother operation.

Thereafter, the zoning bars 76 move slightly upward. However, the type bars will not follow because they are stopped by the detent pawls 106. A slight additional movement of the zoning bar 76 with the stop pawls 80 thereon relieves the latter pawls from the pressure of the type bar 42. Then the type bar stop pawls 80 may be restored by bail 61. Simultaneously, the zoning pawls 77 are restored by bail 56.

The bail 39 on its downward movement will eventually pick up those type bars 42 which were

held from springing up by pawls 106 and move them completely down. Immediately after complete downward movement of the zoning bars, the bail 66 rocks in counterclockwise direction allowing trip latches 78 to assume their restored position against the tips of the type bar stop pawls. Bail 71 mechanically knocks off any armature which might have been held by residual magnetism.

Before the type bar starts on its upward movement during the next cycle the detent pawls 106 will be moved out of the way by bail 101 so that the type bars may move up again to perform another printing operation in the normal manner.

In the event that there is no perforation in a card column from the 9 through the zero index point positions, which would cause pawl 80 to be tripped during that period, continued upward movement of the related zone bar 76 after the zero index point position passes the sensing brushes, will result in the pawl 80 pivoting itself into the zero stop notch on the type bar and in thereby locking together the zone bar and type bar. This is due to the fact that the pivot stud for pawl 80 is carried by the upwardly moving zone bar and the pawl spring tends to hold the tail of the pawl against the latching point of the deflector 80. Also, as the zone bar and type bar always move together immediately after the zero index point position of the card passes the brushes, the zero stop notch on the type bar continues to remain opposite the pawl 80 during the sensing of the X and R positions and the pawl can therefore readily enter the zone stop notch at any time, for example, when it automatically pivots itself into the notch in the manner just explained. Because of this construction and operation the X, or 11 hole and the R, or 12, hole in the card can be used to position additional printing characters at the printing line. In the construction shown, the sensing of an X, or 11, hole will result in energizing the magnet 19 which, through the armature 83 and pull rod 84, will rock the trip latch 78 counterclockwise and release the pawl 77 which will enter the "X" stop notch on the zone bar 76, thereby stopping the zone bar and type bar with the symbol "CR" at the printing line. The sensing of an R, or 12, hole in the card will trip the pawl 77 and cause it to enter the "R" stop notch on the zone bar and stop the latter and the type bar with the symbol "&" at the printing line. If there is no perforation in a card column, the related zone bar and type bar continue to move upward until the pawl 77 strikes the stop notch "N" on the zone bar which stops the zone bar and type bar at a point where no printing character is opposite the printing line.

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.

What is claimed is:

1. In a printing mechanism of the type wherein for each cycle of operation a predetermined number of index point positions arranged in a column on a record card are successively sensed and wherein a type carrier is advanced synchronously therewith to place type elements in suc-

cession at a printing position; a zoning member held stationary during the sensing of a predetermined first part of the column of index point positions and being advanced along with said carrier during the sensing of a predetermined second part of said column; stop means acting in response to the sensing of a perforation in said second part of the column for preventing movement of said zoning member; a locking element carried by said zoning member and operable when released to lock together said zoning member and type carrier and thereby interrupt movement of said carrier if said member is stationary, and provide for movement of said carrier and member together as a unit if the latter is moving; and means for releasing said locking element at a preselected point within a period beginning with the start of the card sensing time and ending with the actuation of said stop means.

2. In a printing mechanism of the type wherein for each cycle of operation a predetermined number of index point positions arranged in a column on a record card are successively sensed and wherein a type carrier is advanced synchronously therewith to place type elements in succession at a printing position; a zoning member held stationary during the sensing of a predetermined first part of the column of index point positions and being advanced along with said carrier during the sensing of a predetermined second part of said column; stop means acting in response to the sensing of a perforation in said second part of the column for preventing movement of said zoning member; a locking element carried by said zoning member and operable when actuated to engage said carrier and to lock said carrier and member together for movement as a unit; and means operable in response to movement of said zoning member for actuating said locking element.

3. In a printing mechanism of the type wherein for each cycle of operation a predetermined number of index point positions arranged in a column on a record card are successively sensed and wherein a type carrier is advanced synchronously therewith to place type elements in succession at a printing position; a zoning member held stationary during the sensing of a predetermined first part of the column of index point positions and being advanced along with said carrier during the sensing of a predetermined second part of said column; stop means acting in response to the sensing of a perforation in said second part of the column for preventing movement of said zoning member; a locking element carried by said zoning member and operable when

actuated to engage said carrier and to lock together said carrier and member and thereby interrupt movement of said carrier if said member is stationary and provide for movement of said carrier and member together as a unit if said member is moving; and means for actuating said locking element comprising means operable in response to the sensing of a perforation in said card column during the time said member is stationary so as to effect locking engagement of said element and carrier and means operable in response to movement of said zoning member for automatically effecting said locking engagement of said element and said carrier.

4. In a printing mechanism, means for successively sensing a plurality of index point positions arranged in a column of a record card; a type carrier; means for advancing said carrier along a prescribed path synchronously with the sensing of said column; a plurality of type elements positioned in a predetermined order on said carrier and so that as said carrier is advanced the elements are successively placed at a printing position; said carrier having a plurality of stops thereon corresponding in number to the index point positions comprising a selected group first to be sensed, and said stops being spaced so that as said carrier is advanced they pass a given point synchronously with the sensing of the positions of said selected group; a zoning member; means for holding said member stationary during the sensing of said selected group and for advancing said member in the same general direction as and synchronously with said carrier immediately following the sensing of the last position in said group; a locking element carried by said member and operable when released to engage one of said stops and thereby lock said carrier and member together as a unit and said member and element being positioned so that during the sensing of said selected group said stops pass successively a position where they are engageable by said element and so that immediately after the sensing of said group and while said member is advancing, said element continues in a position to engage the stop corresponding to the last position in said selected group; stop means for preventing movement of said member in response to sensing of a perforation in the part of the column following said selected group; and means for releasing said locking element at a preselected point within a period beginning with the start of the card sensing time and ending with the operation of said stop means to prevent movement of said zoning member.

EUGEN BUHLER.