

Oct. 4, 1938.

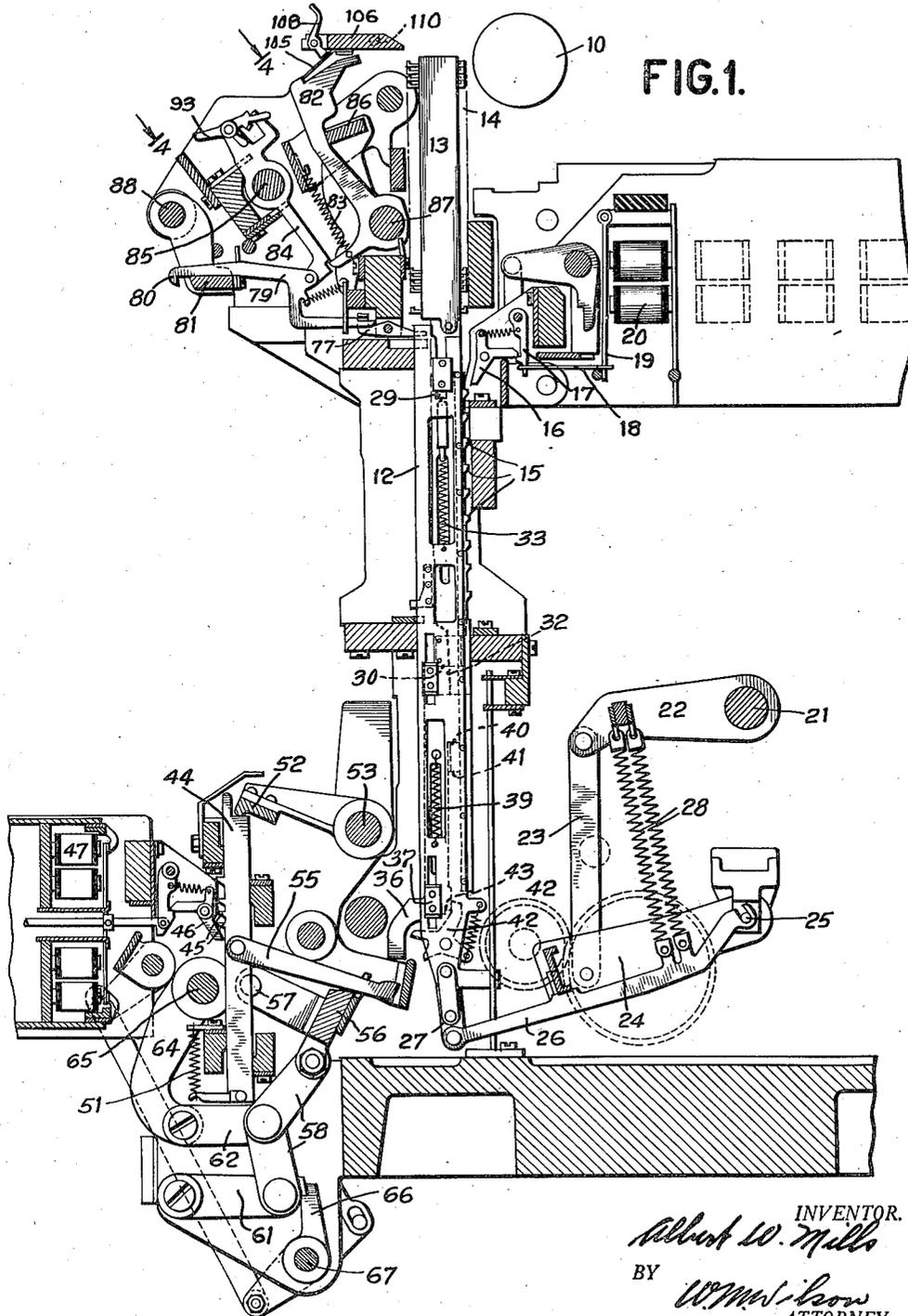
A. W. MILLS

2,131,918

PRINTING MECHANISM

Filed July 7, 1936

7 Sheets—Sheet 1

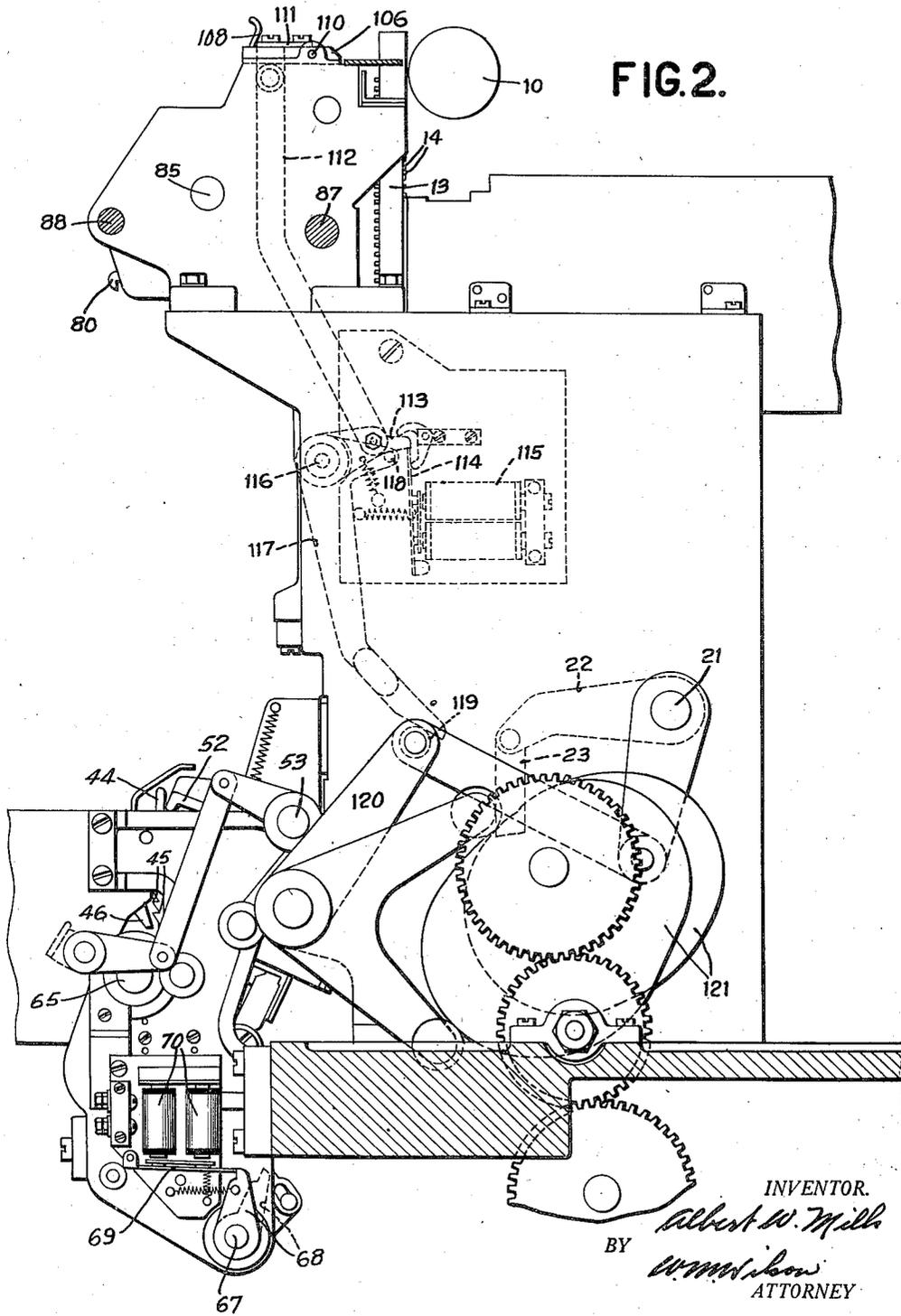


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FIG. 3.

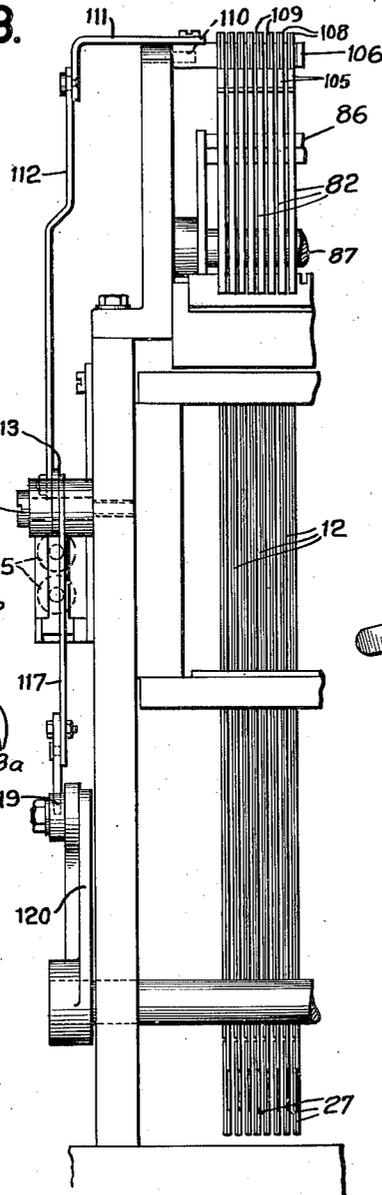


FIG. 4.

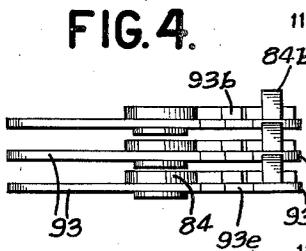
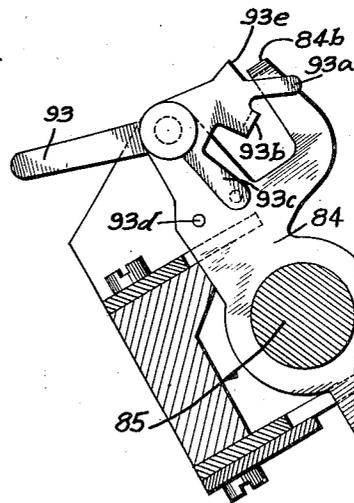


FIG. 5.



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FIG. 7.

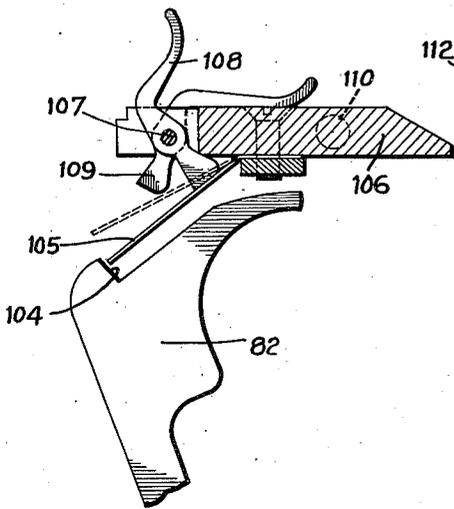


FIG. 6.

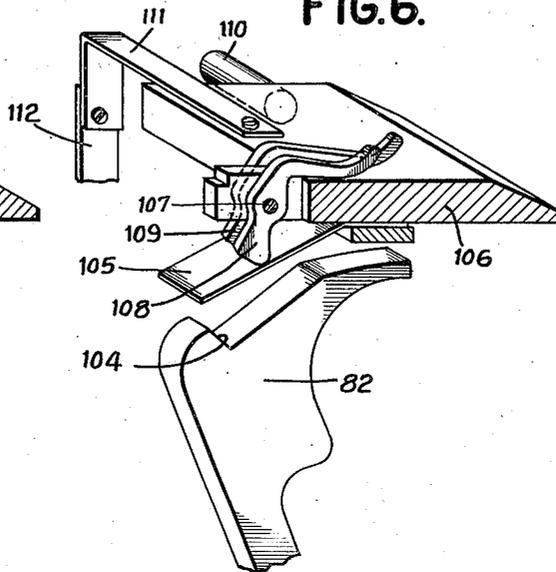


FIG. 8.

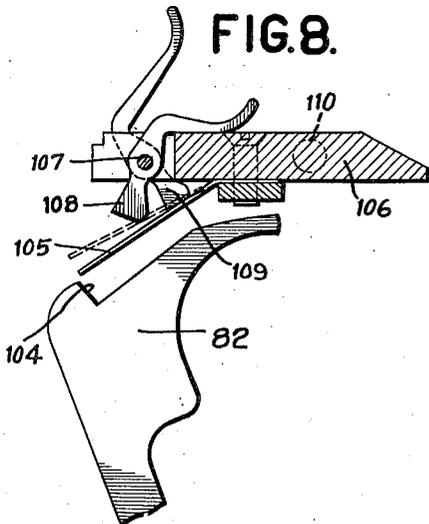
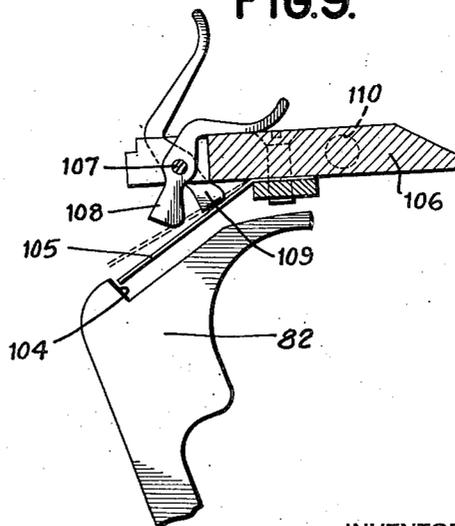


FIG. 9.



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FIG. 11.

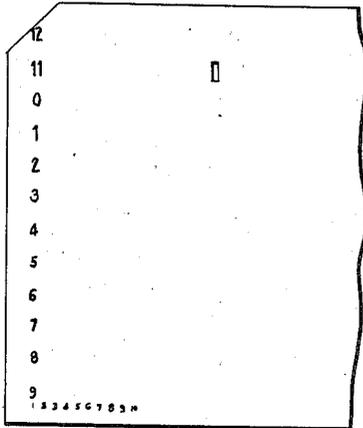
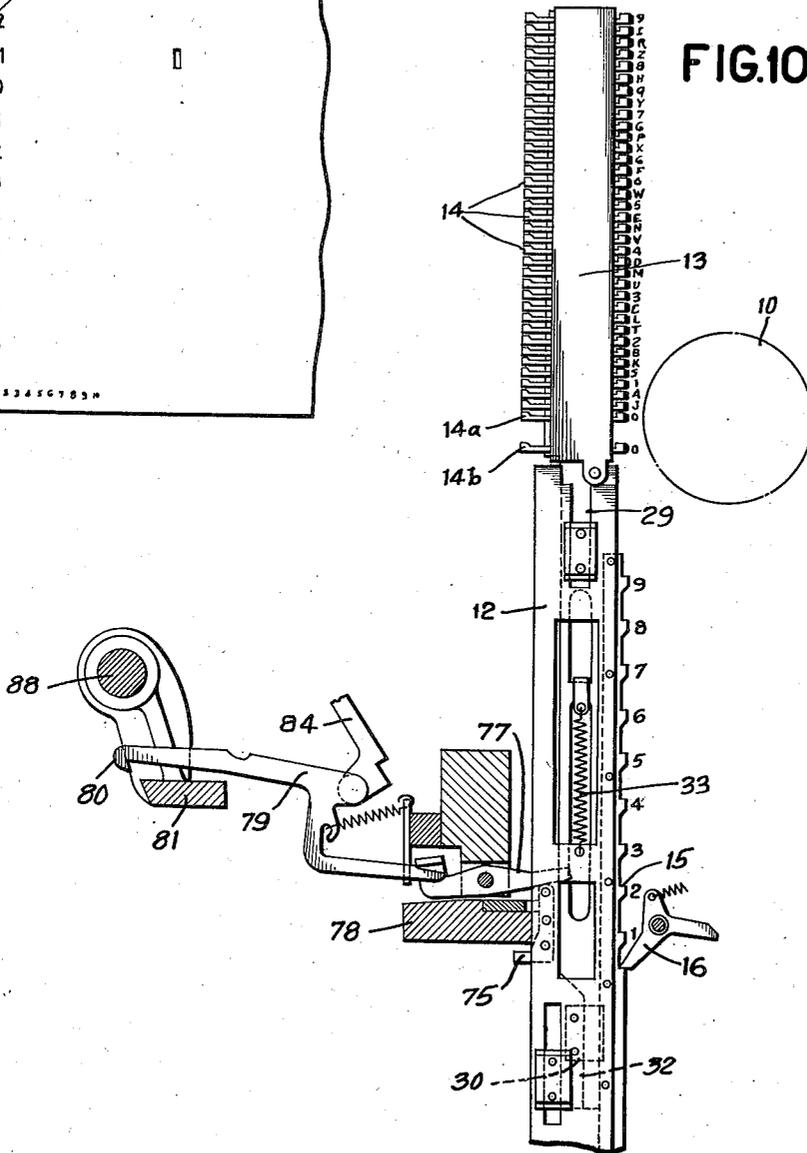


FIG. 10.



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FIG.13.

| SALES REPORT | | |
|--------------|-----------|-------|
| SALESMAN | COMMODITY | VALUE |
| JOHN JONES | TIRES | 40525 |
| | TUBES | 4976 |
| | CHAINS | 32519 |
| | PATCHES | 3654 |
| V. A. KATZ | TIRES | 65216 |
| | TUBES | 15227 |
| | CHAINS | 9450 |
| B. L. VERGE | TIRES | 53394 |
| | TUBES | 16420 |
| | CHAINS | 46153 |
| | PATCHES | 5524 |

FIG.12.

| FIRESIDE LUMBER CO | |
|--------------------|---------|
| 200 JONES STREET | |
| CLEVELAND OHIO | |
| A | A |
| 98500 | 605000 |
| 100750 | 50000 |
| 15000 | 1090550 |
| 875000 | 3900500 |

FIG.14.

| INVENTORY REPORT | | | |
|------------------|-----------|----------|------------|
| ITEM | UNIT COST | QUANTITY | TOTAL COST |
| ACME | 2350 | 26 | 61100 |
| ETHER | 2845 | 120 | 341400 |
| TONONE | | 65 | |
| WESTERN | 3420 | 31 | 106020 |
| HOTTEX | 136 | 125 | 17000 |
| LIBERTY | | 214 | |
| QUEEN | 279 | 94 | 26226 |
| DUPLEX | | 23 | |
| ROTARY | 1525 | 17 | 25925 |
| WESTERN | 2143 | 12 | 25716 |

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FIG. 15.

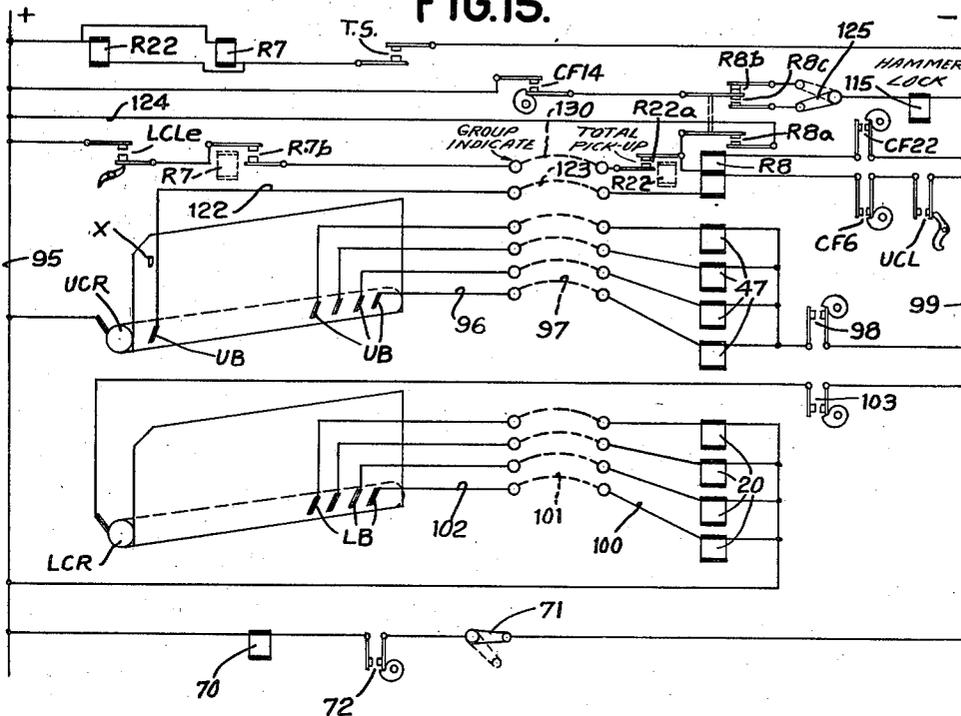
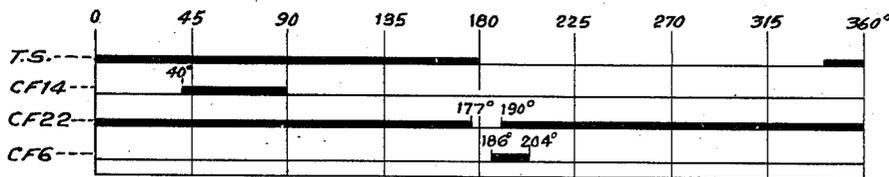


FIG. 16.



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UNITED STATES PATENT OFFICE

2,131,918

PRINTING MECHANISM

Albert W. Mills, Endicott, N. Y., assignor to International Business Machines Corporation, New York, N. Y., a corporation of New York

Application July 7, 1936, Serial No. 89,277

8 Claims. (Cl. 101—93)

The present invention relates to record controlled machines in general and, more particularly, to printing mechanism for such machines.

The broad object of the invention is to provide an improved printing mechanism which is simpler and more flexible than former printing mechanisms.

A further object is to provide means controlled by records and adapted to suppress printing operations.

A more specific object of the invention is to provide improved means for effecting group indication or non-repetitive printing of data which is sensed in each of a succession of record cards.

In prior machines, group indicating has been effected by mechanism which prevented the positioning of type bars, or, by preventing the sensing of the record cards. The present arrangement contemplates the use of so-called hammer locks which may be selectively operated to take an impression from the type bars. These hammer locks, when properly set, prevent any selected type bar hammers from operating for certain cycles of the machine and allow these hammers to operate for other cycles. Due to the flexibility of the arrangement, it can be used to prevent repetitive printing of group indications when the tabulating machine is conditioned for "listing," that is, printing from each record card. It can be used to control the selection of printing; that is, it can select certain cards or portions of cards for printing and eliminate all others. It can further be utilized for the prevention of over printing of indications and totals which would normally occur when the setting of the machine is shifted from "listing" to "tabulating" without changing the plug connections.

Another object of the invention is to provide improved means for causing the selective printing of debit and credit amounts.

Another object of the invention is to provide means for controlling the printing of zeros by a group of printing elements.

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

In the drawings:

Fig. 1 is a vertical section of a portion of the machine embodying the present invention,

Fig. 2 is an outside view of the printing mechanism showing the drive therefor.

Fig. 3 is a view of a portion of the printing mechanism as viewed from the left in Figs. 1 and 2.

Fig. 4 is a fragmentary enlarged view of the column splitting mechanism as viewed in the direction of the arrows 4—4 of Fig. 1.

Fig. 5 is an enlarged side elevation of the column splitting mechanism shown in Fig. 4.

Fig. 6 is an isometric view showing the arrangement of the hammer lock and control mechanism therefor.

Figs. 7, 8, and 9 are details showing various operative positions of the hammer locks.

Fig. 10 is an enlarged view showing the type bar and zero printing control mechanism.

Fig. 11 shows a fragment of a record card.

Fig. 12 is a sample of a record showing the manner in which zero printing is controlled.

Fig. 13 is a sample of a record showing the manner in which group indicating is effected.

Fig. 14 is a sample of a record showing the manner in which the printing of selected items is suppressed.

Fig. 15 is a circuit diagram.

Fig. 16 is a timing diagram of the essential circuit controlling devices.

The printing mechanism may be of any suitable form, but for convenience may be assumed to be substantially identical with the one described in my U. S. Patent No. 2,016,682, granted October 8, 1935. It includes the usual platen 10 (Fig. 1) and a number of vertically movable type bar assemblies including carriers 12, slidably mounted on each of which are type heads 13. The purpose of this type of construction will be explained more fully hereinafter. Each type head has type elements 14 adapted to print the numerals 1 to 9 and the letters A to Z. The type elements 14 are arranged in nine groups in the following order from top to bottom in Figs. 1 and 10: 9, I, R, Z; 8, H, Q, Y; 7, G, P, X; 6, F, O, W; 5, E, N, V; 4, D, M, U; 3, C, L, T; 2, B, K, S; 1, A, J. Below the type elements 14 are two zero type elements 14a, 14b referred to hereinafter as the numeral zero and the alphabetic zero, respectively, which are separated from each other by a distance equal to that between centers of three successive type elements 14. The numerical type elements 14 correspond to the usual numerical type elements of a conventional Hollerith type bar, but are spaced far enough apart to make room for three alphabetic type elements between successive numeral type elements.

The numeral type elements are selected for a printing operation in identically the same manner as in conventional Hollerith tabulating machines, for instance, as in Patent No. 1,822,594 under control of a perforation in one of the index point positions 1 to 9 of a record card column. The alphabetic type elements are selected under control of combinations of perforations, each of which may comprise a perforation in one of the index point positions 0, 11, and 12, with another in the remaining nine index point positions; thus, the letter I of the type group is selected by the combination of a 9 perforation and a 12 perforation in one of the columns of the record card; the letter R by a 9 perforation and an 11 perforation. The entire code is similarly arranged and the particular combinations are as set forth in my copending application Serial No. 701,444, filed December 8, 1933.

The selection of the alphabetic type elements 14 is effected by arresting each carrier 12 in the appropriate position corresponding to the value of a perforation in index point positions 1 to 9 of the record card and by further movement of the type head 13 relative to its carrier one, two, or three steps according to whether the other perforation of the combination necessary for a selection is in the 12, 11, or 0 positions, respectively.

As a matter of convenience, the four positions of the type elements in each group will be termed zones 1, 2, 3, and 4, the numeral type being in zone 1, the letters A to I being in zone 2, the letters J to R in zone 3, and the letters S to Z in zone 4, the 0, 11, and 12 perforations which control the selection of the alphabetic type elements will be termed "zone perforations." The mechanism which effects relative movement between each carrier 12 and its type head 13 may be termed the "zoning" mechanism.

Each carrier 12 is provided with a series of stops 15 which in Fig. 1 are labelled 0 to 9 and represent the corresponding index point positions on the record card. As the carrier 12 is moved upwardly, the stops 15 move in succession to pass a stopping pawl 16. The latter is held in the position of Fig. 1 by a latch 17 which has connection 18 with armature 19 of the usual printing magnet 20.

When a type carrier is used to print numerals only, it will, of course, be controlled by a single perforation in one of the index point positions 0 to 9, inclusive. In such case, each type head 13 and its carrier 12 is maintained in the relationship shown in Fig. 1, and as the card is passing the lower analyzing brushes, a circuit completed through the perforation in the card will energize the magnet 20 in a well known manner and will effect the release of pawl 16, causing it to engage the stop 15 corresponding in value to the location of the single perforation in the record card column. This operation results in bringing the corresponding numeral type element in the type head 13 to the printing line.

The carriers 12 are moved upwardly by a cam operated shaft 21 which carries arms 22 having depending link connection 23 with a bail 24 pivoted at 25. Also pivoted at 25 are actuating arms 26 which are connected at their free ends to the lower extremity of carriers 12 through link connections 27. Arms 26 are urged in a clockwise direction by springs 28 which are connected at their upper ends to a cross bar secured to arms 22. Thus, as the arms 22 and bail 24 are rocked in a clockwise direction by shaft 21,

the springs 28 will rock the arms 26 in the same direction and will cause elevation of the carriers 12.

The manner in which the type bar assemblies comprising carriers 12 and heads 13 are constructed to permit relative movement will now be explained, after which the zoning mechanism whereby such relative movement is effected will be set forth briefly.

The carrier 12 is shown in Figs. 1 and 10 as being provided with a slot 29 and a guide 30 which are adapted to receive a slotted block and the lower end 32 respectively of the type head 13, the block sliding within the slot 29 and the lower end 32 sliding in the guide 30. A spring 33 whose lower end is anchored to the carrier 12 is provided at its upper end with a hooked member which engages the lower edge of an opening in the shank of the type head 13, the spring 33 tending to resiliently hold the head 13 in cooperation with the carrier 12.

Mounted upon the lower portion of each carrier 12 is a slide 36 provided with grooved blocks 37 which cooperate with suitable slots in the carrier 12. A spring 39 anchored at its lower end to the carrier 12 and at its upper end to the slide 36 tends to move the slide downwardly to bring a shoulder 40 in the slide into engagement with a block 41 riveted to the carrier 12. With the parts assembled as in Fig. 1, the spring 39 draws the slide 36 downwardly and spring 33 urges the type head 13 in the same direction so that the lower end 32 thereof engages the slide 36.

It is plain that if the slide 36 is moved upwardly relative to carrier 12, the head 13 will move likewise.

A spring-pressed latch 42 pivoted at the lower end of the carrier 12 is adapted to cooperate with three shoulder stops 43 formed in the slide 36. When the slide is moved upwardly one or more steps with respect to the carrier, the latch 42 will cooperate with one of the steps 43 to hold the parts in their displaced relationship. The manner in which such displacement is automatically effected under control of the zone perforations in the card will now be explained.

Associated with each alphabetic type bar assembly is a vertically slidable comb 44 which is adapted to be moved downwardly and then upwardly during each cycle of the machine. Each comb has a series of three stops or lugs 45 which on the upward movement of the comb passes a stopping pawl 46 in synchronism with the passage of the zone perforations 0, 11 and 12 by the upper analyzing brushes of the machine. Each pawl 46 is controlled by a zone magnet 47, the energization of which operates its armature to release pawl 46, allowing the latter to be moved by its spring into engagement with one of the stops 45. By this action, further upward movement of the comb 44 is prevented for the time being. The combs 44 are moved upwardly by means of a spring 51 and moved downwardly by a bail 52 secured to a shaft 53. The bail engages the upper ends of the combs and moves the latter downwardly whenever the shaft 53 is rocked at the proper time by a suitable cam (not shown).

The comb 44 has pivoted thereto an arm 55 whose free end lies in the path of movement of the associated slider 36 and whose lower edge rests upon a bail 56 which is pivoted at 57. Under control of the zone perforations the pivot point of arm 55 may take one of three positions below that of Fig. 1. In this figure the parts are shown

with the comb in the position it assumes when no zone holes are present in the card; that is, when numerals only are to be printed. When the carrier 12 is in its lowermost position, the ball 56 is rocked in a counterclockwise direction to move the arm 55 in a similar direction into engagement with the lower extremity of slide 36. It will be apparent that the distance which the free end of arm 55 is moved upwardly under control of the ball 56 depends upon the location of the pivot point of arm 55 at such time. Thus, if the pivot point is located as shown in Fig. 1, the free end of arm 55 will be moved upwardly to a position where it barely touches slide 36. A zone perforation in the 0 index point position will result in the movement of the free end of arm 55 three steps upwardly from the position of Fig. 1. A perforation in the 11 position will cause it to move two steps, while a perforation in the 12 position will cause it to move only one step above the position in Fig. 1. These steps of movement are, of course, transmitted to the slide 36 and it, in turn, will be moved upwardly one, two, or three steps in accordance with the setting of the related comb 44, the latch 42 carried by the carrier 12 serving to hold the slide at its displaced position with respect to the carrier.

Bail 56 is actuated through the medium of a toggle mechanism comprising links 58, one of which is pivoted to the bail and the other is pivoted to an arm 61. The point of connection of the links 58 carries an arm 62 which is also pivoted to an arm 64 secured upon a cross shaft 65. The shaft 65 is rocked in a counterclockwise direction once each card cycle by a suitable cam (not shown) thus tending to straighten the toggle comprising links 58.

Referring to Fig. 2, an arm 66 carried by a rod 67 is adapted to be rocked from the broken line position to the solid line position of Fig. 1 prior to the straightening of the toggle links 58. When shaft 65 is rocked in a counterclockwise direction under control of its cam, the right end of arm 61 will be engaged by arm 66 so that the pivot point of the toggle will be restrained against downward movement and subsequently straightening of the toggle will cause the bail 56 to rock in a counterclockwise direction.

In Fig. 2, it will be noted that the rod 67 carries an arm 68 whose upper end is adapted to be engaged by the free end of an armature latch 69 operated by a magnet 70. Energization of this magnet will permit arm 68 to rock in a counterclockwise direction under the influence of a spring and thereby rotate the rod 67 and the arm 66 to the solid line position of Fig. 1. The magnet 70 is in series with a switch 71 (Fig. 15) and cam contacts 72 which close once at the proper time in each card cycle to energize magnet 70. When the machine is used for printing numerals only, the zoning mechanism may be partially disabled to lighten the operating load on the machine by opening switch 71 so that the magnet 70 remains deenergized and the arm 66 remains in the position shown by broken lines in Fig. 2 and straightening of the toggle through the action of the controlling cam will merely cause the pivot of the toggle to move downwardly, arm 61 rocking about a pivot to permit such action, but the bail 56 will remain undisturbed.

It will be understood from the foregoing description and the more detailed explanation found in my U. S. Patent No. 2,016,682 that in the case where a perforation occurs in one of the 1 to 9

index point positions only, the mechanism controlled by the zone magnets 47 will not be effective to shift slide 36 relative to carrier 12 and the type assembly will be arrested differentially, purely by the operation of print magnet 20, as in former Hollerith tabulating machines. On the other hand, if a zone perforation also appears in the 0, 11 or 12 positions, the magnet 47 will be effective in conjunction with magnet 20 to control the zoning mechanism, as described, to cause selection of one of the three alphabet type separating numeral type. In the present arrangement of the type elements which differs from that in prior machines in the location of the zero type elements, if no perforation appears in a given column, the associated carrier 12 will move to a position where the blank position immediately below the type element 14a (Fig. 10) is at the printing line. If only a zero perforation is present in a column, the type element 14a is positioned under control of the magnet 20. If the zoning mechanism is operative, the sensing of a zero alone in a column will cause positioning of the lower zero type element 14b at the printing line. Whether or not a zero is actually printed will depend upon the operation of the type hammers as will be explained hereinafter.

Referring now to Fig. 10, each of the type carriers 12 is provided with a stop 75 which cooperates with a cross member 78 to position the type carrier when its movement is not otherwise interrupted. When the zoning mechanism is ineffective and pawl 16 is tripped to position the type element 14a on the printing line, the stop 75 will have moved to a position where its upper end engages an arm 77 rocking the latter counterclockwise to cause clockwise rocking of latch member 79 to raise hook 80 thereof out of cooperation with a bail 81. As will be explained hereinafter, this raising of hook 80 prevents the tripping of the printing hammer in the associated type bar position through member 79. With the zoning mechanism operative, the type head 13 would have been displaced upwardly three steps to present the lower zero type element 14b to the printing line and in this case, also, the cooperation of stop 75 with arm 77 would rock member 79 to the same position and again tripping of the associated type hammer would have been prevented. With no perforation in the column, the carriers 12 would have risen an additional step, presenting the blank space following either of the type elements 14a or 14b and consequently no printing can take place in either position regardless of whether or not the associated printing hammers are tripped.

In my prior application Serial No. 701,444 and in U. S. Patent No. 2,016,682, the type elements were so arranged that when no perforation was present in a column, one of the zero type elements was presented to the printing line and it was necessary to provide additional mechanism to prevent printing from these zero type elements in certain positions. With the present arrangement whereby no type elements are presented to the printing line when a column is blank, the provision of this mechanism is obviated and zero printing only takes place when a zero perforation is present to definitely position the type elements. The manner in which printing of the zeros is effected under control of the column splitting mechanism will be set forth after the printing hammer mechanism has been explained.

The printing hammers are designated 82 in Fig. 1 and are controlled in substantially the same

manner as those in U. S. Patent No. 1,867,026, granted July 12, 1932 to J. R. Peirce and in application Serial No. 442,348, filed April 7, 1930 by J. R. Peirce. Such differences as exist will be described in detail hereinafter. The type hammers 82 are operated by springs 83. Normally, hammer latches 84 pivoted on a cross shaft 85 prevent the springs from forcing the hammers into contact with the heads of type elements 14, 14a or 14b. The hammers are re-latched after each operation by means of a cam operated ball 86 mounted on a shaft 87. Pivoted to each latch 84 is a spring operated hook member 79 normally in position to be engaged by bail 81 secured to a shaft 88. The latter is operated by a cam (not shown) which functions once each card cycle to draw any members 79 through their hooks 80, which may be in the position of Fig. 1 to the left and operate the latches 84 to release the re-latched hammers 82 for actuation of their springs to strike the type elements at the printing line. Each member 79 cooperates with an arm 77 which, as explained, cooperates with the stop 75 on the carrier. This stop is so placed that movement of the carrier to any printing position for printing from any of the type elements above element 14a will not disturb the member, and hook 80 will remain in cooperative relationship with the bail 81.

The column splitting mechanism is substantially identical with the one described in the Peirce U. S. Patent No. 1,867,026. A hammer coupling member 93 (see Figs. 1, 4, and 5) is pivoted to the upper end of each latch 84. The members 93 have narrow tongues 93a which are adapted to underlie bent-over lugs 84b formed in the adjacent latch 84, which lugs act as stops to limit counterclockwise movement of member 93. A bent-over lug 93b, formed in each member 93, permits only limited clockwise movement of each member 93 by contact with the edge of the latch 84 to which said member is pivoted. A short arm 92c, formed in each member 93, has a rivet or boss adapted to engage holes 93d in latch 84 to retain members 93 in the operative position of Fig. 5 or the alternative inoperative position in which lug 93b engages latch 84. Each member 93 also has an abutment 93e adapted to engage the lug 84b of the next adjacent latch 84 to the one on which said member is pivoted.

Referring to Fig. 4, it will be assumed that the three coupling members 93 shown correspond to the units, tens and hundreds denominational orders ranging from bottom to top, respectively, of a bank assigned to printing data and that all are in the position of Fig. 5. If the hundreds type bar now moves to print a "4," for example, its latch 84 will be rocked clockwise (Fig. 5) as described above, to release the hammer for the hundreds type bar. The abutment 93e of the hundreds coupling member will, by engagement with the lug 84b of the tens latch 84, rock the latter clockwise also. The latch 84 of the units type bar will also be operated by the tens latch 84, due to the abutment 93e of the coupling member 93 of the tens latch engaging the lug 84b of the units latch and rocking the units latch 84 clockwise with reference to Figs. 1 and 5. Thus, if neither of the units and tens type bars are arrested in one of the numerical positions 1 to 9 or A to Z, inclusive, the three type bars corresponding to the three coupling members 93 shown in Fig. 4 will print "400."

Now, if the upper member 93 (Fig. 4) associated with the hundreds type bar is moved clock-

wise (Fig. 5) until its lug 93b stops further movement of said member, the abutment 93e of this member will move to a position below the lug 84b of the tens latch 84. As a result, the moving of the hundreds type bar to the "4" position, as before, will cause an ineffectual movement of the coupling member of the hundreds latch 84 and neither the tens nor units latch 84 will be operated, and only the numeral "4" will be printed. It will be seen that the coupling members 93 may be selectively set to inactive position to split the solid bank of type bars into arbitrary groups and under these conditions, any type bar assuming a position to present either of the zero type elements 14a or 14b, will, through members 93, cause zeros to be automatically printed to the right of the operated type bar, up to the point where a coupling member is set to inactive position.

An example of the manner in which zero printing is effected without the use of special mechanism is shown in Fig. 12. In this figure the levers 93 of Fig. 5 are set to the position shown in that figure in the sections designated A, so that positioning of any type bar in these fields will cause tripping of the hammers 82 in all lower order positions. Thus, when the card bearing the street address is analyzed, the type bars will be set to the positions indicated with two of the bars adjusted to present zeros for printing. The hammers for printing the two zeros are tripped under control of the hammer which prints the numeral 2. The hammer in the position between 200 and Jones is also tripped, but since the type bar in this position is at a blank position, no printing takes place.

The circuit connections for controlling the operation of the zone magnets 47 and the print magnets 20 are shown in Fig. 15. A typical circuit established by the zone perforations is traced as follows: from left hand line wire 95, upper contact roll UCR and an upper brush UB, through a 0, 11, or 12 perforation in the record card, a wire 96, a plug wire 97, a magnet 47, and cam contacts 98 to right hand line wire 99. A typical circuit established by a perforation in the 1 to 9 positions is traced as follows: line wire 95, a magnet 20, a wire 100, a plug wire 101, a wire 102, a lower brush LB, a lower contact roll LCR, through a hole in the record card and cam contacts 103 to line wire 99. As described before herein, a circuit is also established through magnet 70 when switch 71 is closed, as would be the case when alphabetic printing is being done.

Referring now to Figs. 1 and 6, each of the type hammers 82 is notched to provide a shoulder 104 above each of which is located a leaf spring latch 105 secured at one end to a bar 106. Supported on the bar 106 by a pivot rod 107 is a pair of cam levers 108 and 109, a pair of which is provided for each latch 105. The lever 108 has its camming surface at a slightly greater distance from the pivot point 107 than the lever 109 and when rocked from the position of Fig. 6 to that of Fig. 7 will depress the latch 105 from the dotted line position of Fig. 7 to the full line position where the free end of the latch lies in the path of shoulder 104 of the printing hammer. With the latch in this position, the hammer is effectively locked against operation for all operations of the machine. The lever 109 when rocked to the position of Fig. 8 will move the latch 105 from the dotted line position in this figure to the full line position wherein the free end of the latch has approached the shoulder 104, but not far

enough to interfere with the operation of the printing hammer. The supporting bar 106 is mounted for oscillation on pins 110 journaled in the frame of the machine and may be rocked in a counterclockwise direction as will be explained. When so rocked, as indicated in Fig. 9, the levers 109, which have been rocked to the position of Fig. 8, together with their latches 105, will assume the position of Fig. 9 wherein the latches now cooperate with shoulders 104 to block the printing hammers. Those latches 105 which have not been preset by the levers 108 or 109 will assume the dotted line position indicated in Fig. 9, wherein they do not interfere with the operation of their respective hammers. It will thus be seen that in positions in which the levers 109 have been preset, blocking of the hammers will take place when the bar 106 is rocked. This is brought about as follows:

Secured to the bar (Figs. 3 and 6) is a bracket 111 which has pivoted thereto a link 112 whose lower end is connected to an arm 113 normally held in the position shown in Fig. 2 by the armature 114 of a pair of magnets 115. Arm 113 is pivoted on a stud 116 on which is also pivoted a bell crank 117 having a pin 118 underlying the arm 113. The lower arm of the bell crank lies in the path of a roller 119 on arm 120. Arm 120 is part of the linkage controlled by complementary cams 121 which serve to reciprocate the type bars once each cycle of the machine and during the operation roller 119 causes counterclockwise rocking of bell crank 117 to raise arm 113 slightly away from armature 114. It is at this time that magnet 115 may be energized and if energization takes place, arm 113 will be permitted to move in a clockwise direction and rocking of bar 106 will consequently take place. Energization of magnet 115 may take place under control of a special perforation in the 11 index point position of a record card, such as indicated at "X" in Figs. 11 and 15. Upon sensing of this perforation by one of the upper brushes UB, a circuit is completed from line 95, upper contact roller UCR, "X" perforation, brush UB, wire 122, plug connection 123, pick-up winding of a relay R8, cam contacts CF6, timed to close when the "X" hole is at the brush UB, upper card lever contacts UCL, to line 99. Energization of relay R8 will close its contacts R8a to provide a holding circuit traceable from line 95, wire 124, contacts R8a, upper holding winding of relay R8, cam contacts CF22, to line 99. As indicated in Fig. 16, this holding circuit will be maintained throughout the remainder of the cycle and during the first half of the next following cycle during which the record card having the "X" perforation will traverse the lower brushes LB, during which time the data perforations will be sensed by these brushes to position the type carriers. Energization of relay R8 will also cause closure of its contacts R8c and if switch 125 is in its full line position, a circuit will be completed during the next cycle through cam contacts CF14, which extends from line 95, through cam contacts CF14, relay contacts R8c, switch 125, hammer lock magnet 115, to line 99. In this manner, record cards containing the special "X" perforation will cause locking out of those hammers whose levers 109 have been preset to the position of Fig. 8 so that printing in those positions will not take place. If switch 125 is in its dotted line position, the operation will be reversed; that is, the hammer lock magnet 115 will be energized each cycle when cam contacts CF14 close, the circuit being trace-

able from line 95, contacts CF14, normally closed relay contacts R8b, switch 125, hammer lock magnet 115 to line 99. In this case, the energization of relay R8, in response to the sensing of the "X" hole, will cause opening of contacts R8b and the operation of the hammer lock will be suppressed for cards having this perforation.

Fig. 13 illustrates a report as it would appear when listed with the hammer locks under "X" punch control. In this report the first four lines represent data contained on four cards, each of which contains the name "John Jones" and of which only the first card contains the "X" perforation. The levers 109 in the field in which this name of the salesman is to be printed are set to the position of Fig. 8 and switch 125 is moved to its dotted line position so that the hammer lock operation is suppressed for the "X" punched card and locking is effective for other cards. Alternatively, all the cards, except the first card of each group, may have the "X" punching; in which case, with switch 125 in its full line position, the same report will be printed; that is, the hammers will be locked for all the "X" punched cards and they will be free to operate for the non "X" punched cards.

Fig. 14 illustrates a report in which the hammer lock control is used for printing certain portions of certain cards and eliminating the printing of these same portions of other cards as in the case where the management does not wish the cost figures of certain items to be printed although they are punched in the tabulating cards. Thus, in the report of Fig. 14, the hammer lock levers 109 are set in the unit cost and total cost positions in the sections of the type bars which are to print unit cost and total cost. The switch 125 is set in its full line position and the third, sixth, and eighth cards are "X" punched. Another manner of controlling the hammer locks to effect group indication which does not require "X" punching either the first or subsequent cards of a group may be effected as follows:

A tabulating machine to which the present invention is applied is provided with contacts which are closed during total taking operations which follow the accumulation of data from each group of record cards. These contacts are generally designated as total setting contacts in the machine and an additional contact, designated TS in Fig. 15, is provided, whose time of closure is indicated in Fig. 16. When such contact closes during total taking operations, a circuit is completed from line 95, through relay magnets R22 and R7 in parallel, contacts TS, to line 99. Relay R7 closes its contacts R7b and relay R22 closes its contacts R22a, thus establishing a circuit from line 95, lower card lever contact LCL, closed if there is a card in position to pass the lower brushes, contacts R7b, a plug connection 130, contacts R22a, upper winding of relay R8, contacts CF22, to line 99. With switch 125 in its dotted line position, the closure of contacts CF14 will prevent the energization of hammer lock magnet 115 so that printing will take place when the first card of the next group passes the lower brushes. The contacts TS are opened during card feeding operations so that the hammer lock magnet 115 is energized for each record card after the first printing of the group indication data is suppressed for such record cards. With this arrangement, the report just described in Fig. 13 may be readily obtained without "X" punching the cards themselves.

It will be apparent that printing from record

cards may be selectively suppressed or enabled for the handling of a variety of problems.

A further example of the use of the mechanism may be in handling of debit and credit values. For example, where credit amounts are perforated in their true value in a card field and the same field is utilized to record the combinations of debit amounts, in such case, if all credit cards are "X" punched and switch 125 set in its dotted line position, only the true credit figures will be printed and the printing of complements of debit items will be suppressed.

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 as follows:

1. In a machine of the class described, a plurality of differentially positionable type carriers, record sensing means and means controlled thereby to cause positioning of said carriers, printing hammers, one for each carrier, means normally operative to trip said hammers, pre-settable means arranged to select one or more of said hammers for suppression of operation thereof, and means controlled by said sensing means to render said pre-settable means effective to prevent operation of said selected hammers.

2. In a machine of the class described, means for sensing a group of record cards, one or more of which may contain a special designation, type carriers, and printing hammers therefor, locking means for said hammers, selectively settable means positionable to render said locking means normally effective or ineffective, and means controlled by said sensing means in response to the analysis of said special designations for reversing the normal condition of said locking means.

3. In a machine of the class described, a plurality of differentially positionable type carriers, printing hammers, one for each carrier, means for actuating said hammers, latches normally holding said hammers against action, a bail for releasing said latches, a second, manipulative latch for each hammer partially advanceable to hammer locking position, record sensing means and means controlled thereby to effect completion of the advance of said partially advanced latches to thereby lock said hammers against operation.

4. The invention set forth in claim 3 in which each of said second latches is separately adjustable to partially advanced position whereby any selected hammer or group of hammers may ultimately be locked thereby.

5. In a machine of the class described, a plurality of type carriers, a printing hammer for each, means for tripping said hammers for printing action, a pivoted bar, a plurality of latches, one for each hammer, carried by said bar adjacent to the corresponding hammers, means for moving one or more of said latches partly toward the corresponding hammers without engaging the same, and automatically operated means for rocking said bar to move said partly advanced latches into locking engagement with their hammers.

6. In a machine having a plurality of type carriers and a printing hammer for each, a zero printing device for type elements which normally move to a blank position unless selectively moved to a position to print a zero or other character, means for disabling the printing hammers in positions in which the carrier is set to print zero and means controlled by a hammer related to a carrier set to print another character for rendering the disabled hammer effective to print zero from its carrier.

7. In a machine of the class described, means for sensing record cards for data representative of debit and credit amounts, including means for determining the character of the amount sensed, type carriers controlling in accordance with the amount sensed, printing hammers and actuating means therefor, and selectively settable means controlled by said determining means for causing the suppression of said actuating means for either kind of amount.

8. In a machine of the class described, means for sensing a group of record cards, one or more of which may contain a special designation, type carriers, printing hammers, one for each carrier, means normally effective for actuating said hammers to effect printing of data from each card of said group of cards, means controlled by said sensing means in response to the analysis of said special designations for suppressing the operation of the hammers for the card or cards containing said special designation, and selectively settable mechanism for causing said suppressing means to effect suppression of less than all of said hammers whereby only part of the data contained in cards having said special designation will be printed.

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