

Feb. 6, 1940.

C. C. SMITH ET AL

2,189,046

PRINTING MECHANISM

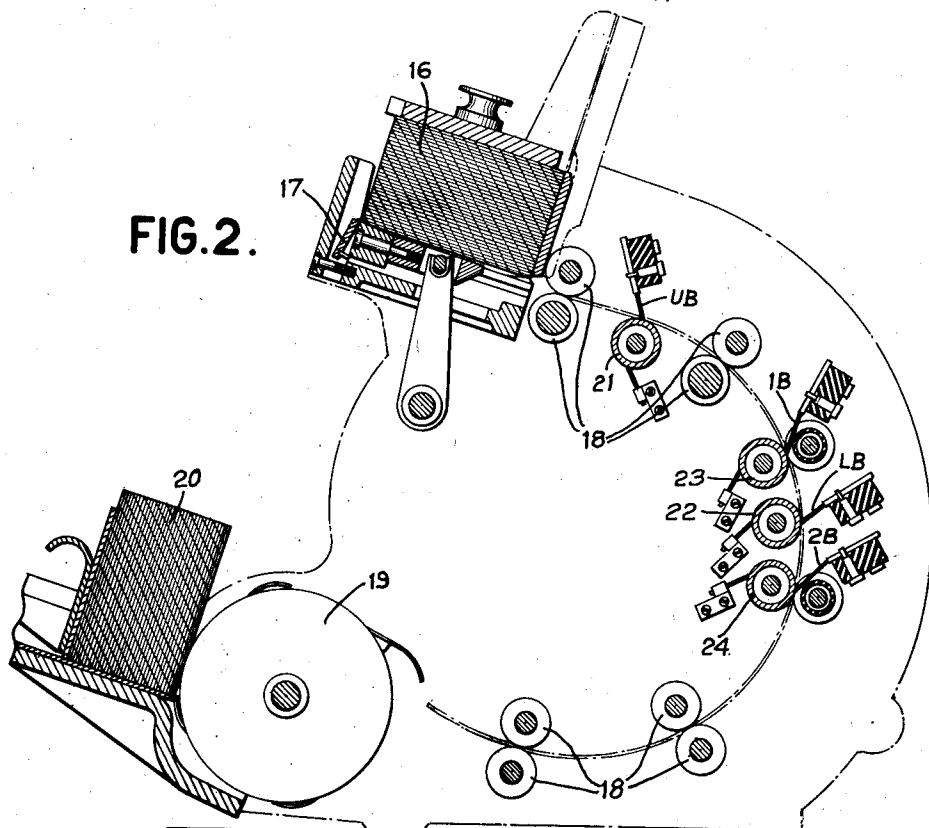
Filed Sept. 15, 1937

4 Sheets-Sheet 1

FIG. 1.

ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890 0123456789 9674302815																									
12	00000000																								
11		00000000																							
0			00000000																						
1				0																					
2					0																				
3						0																			
4							0																		
5								0																	
6									0																
7										0															
8											0														
9												0													

FIG. 2.



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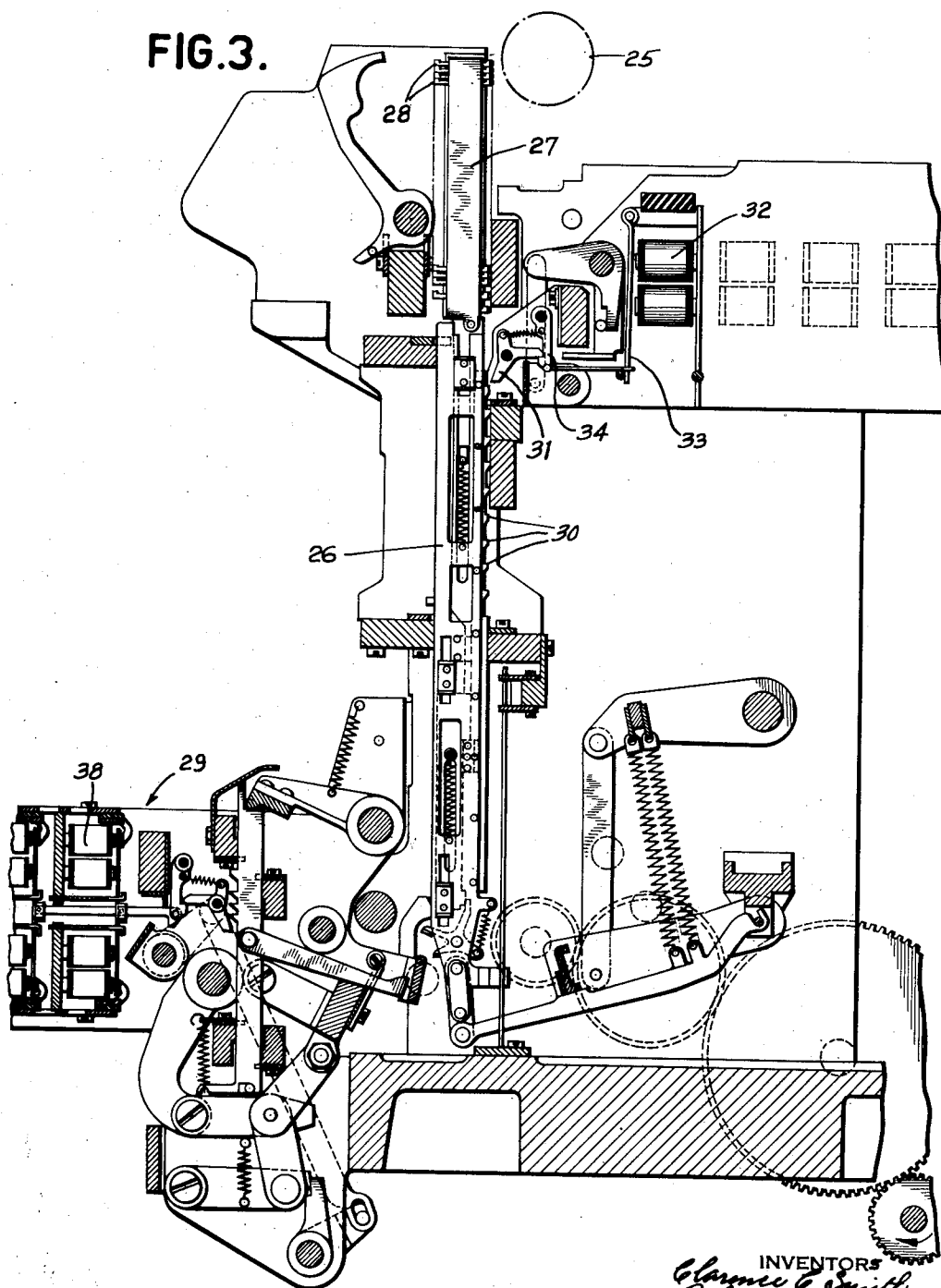
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4 Sheets-Sheet 2

FIG. 3.



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4 Sheets-Sheet 3

FIG. 4.

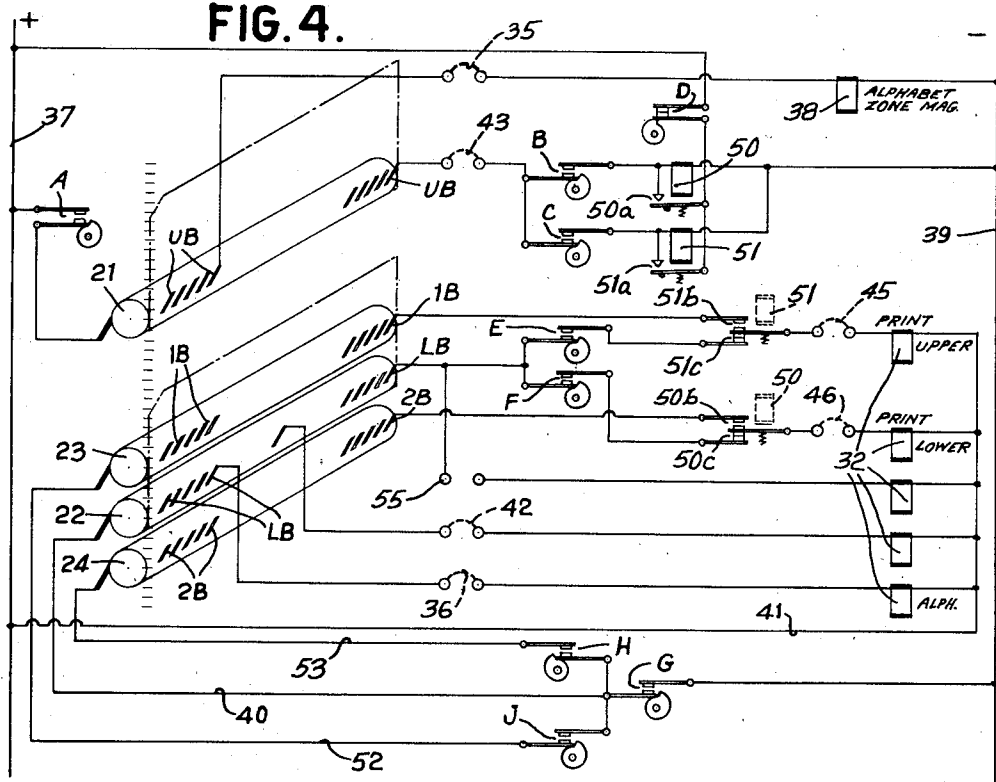
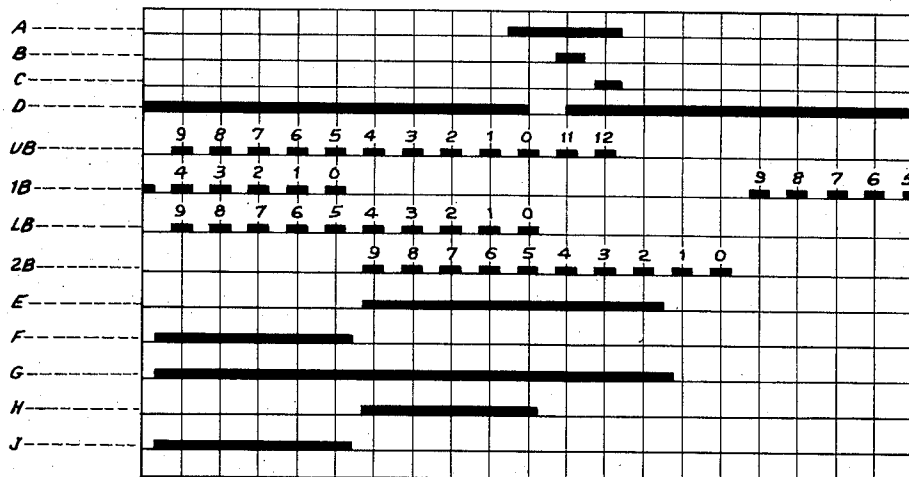


FIG.5.



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4 Sheets-Sheet 4

FIG. 7.

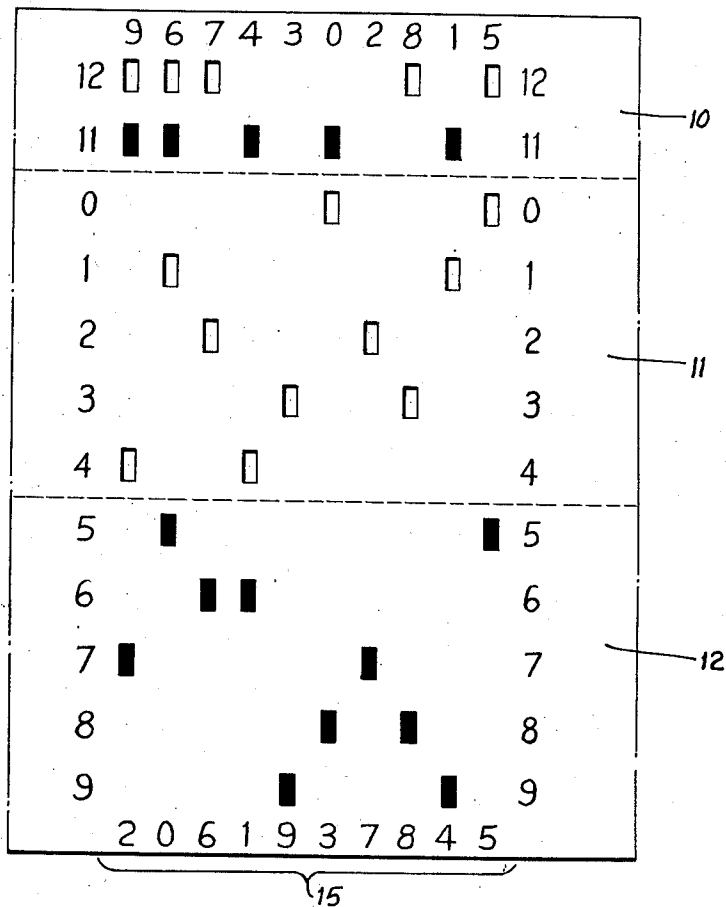


FIG. 6.

UPPER FIELD	LOWER FIELD
9674302815	2061937845

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2,189,046

PRINTING MECHANISM

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Application September 15, 1937, Serial No. 163,890

8 Claims. (Cl. 101—93)

This invention relates to record controlled machines and more particularly to machines controlled by perforated record cards of the Hollerith type.

5 The principal object of the invention resides in the provision of an improved form of record card having increased data receiving capacity.

A more specific object of the invention is to provide improved means for interpreting data-representing perforations in our improved record card, said means being in the form of an attachment which can readily be utilized in connection with commercial tabulating, printing, and like accounting machines.

15 A still further object of the invention is to provide means for sensing and interpreting a column of a record card in which code perforations representing two characters are punched and in which the perforations representing one of the characters may lie between the perforations representing the second character resulting in what may be termed "interspersed" perforations.

A still further object of the invention is to provide means for concurrently sensing both entries in a column of a card during the transit of the card through the machine to control two separate printing devices, each in accordance with a different one of the two entries.

25 In carrying out the objects of the invention, one or all of the columns of a Hollerith record card may be doubly punched, each punching to represent a different digit. The well known Hollerith card is provided with 45 or 80 data receiving columns, each of which is provided with ten index point positions representing the digits and zero, and two further index point positions identified as the "X" or "11" and the "R" or "12" index point positions. Alphabetic characters are represented in any column according to a two-hole code punching, one being made in the "0", "11" or "12" index point positions, known as the "alphabet zone positions" and the second, in one of the digit index point positions "1" to "9". Thus, the letter A is represented by holes in the "12" and "1" positions. Digits are represented normally by a single hole in the index point position corresponding to that digit.

30 According to the present invention, the columns of the record card whose capacity it is desired to double are divided into three fields, one field including the "11" and "12" positions, the second including the positions 0, 1, 2, 3, and 4, and the third including the positions 5, 6, 7, 8, and 9. The first field will be known as the "zone

field"; the second, as the "upper digit field"; and the third, as the "lower digit field." One of the digits is represented in a column by either a single perforation in the upper digit field or such perforation plus a perforation in the "12" position, and the second digit is represented by either a single perforation in the lower digit field or such perforation plus a perforation in the "11" position.

Further objects of the instant invention reside in any novel feature of construction or operation or novel combination of parts present in the embodiment of the invention described and shown in the accompanying drawings whether within or without the scope of the appended claims and irrespective of other specific statements as to the scope of the invention contained herein.

The invention will be described to show how it may be attached to a printing machine, but it will be apparent that it may, with equal facility, be applied to other forms of accounting and statistical machines.

In the drawings:

Fig. 1 is a view showing an 80-column record card with a section thereof provided with double punching.

Fig. 2 is a section through the card feeding mechanism of an accounting machine showing the manner in which additional sensing brushes are provided.

Fig. 3 is a central section of the printing mechanism.

Fig. 4 is a wiring diagram of the essential circuit connections for carrying out the objects of the invention.

Fig. 5 is a timing diagram of the circuit closing devices of the circuit diagram.

Fig. 6 is a portion of a record printed under control of the double punched section of the card.

Fig. 7 is a diagrammatic showing at an enlarged scale of the manner in which two numbers of ten positions each are both punched in the same ten columns of the record card.

The card

In Fig. 1 is shown a record card in which the left hand portion is perforated to represent the various letters of the alphabet and the adjacent section is perforated to represent a single digit in each column. These perforations are in accordance with the customary manner of representing alphabetic and numerical information and the manner in which they control the operations of tabulating and like machines is well known.

For the purposes of the present invention, a section or all of the card is divided horizontally into three fields; an upper field 10 including the "11" and "12" index point positions; a field 11 embracing the positions "0" to "4"; and a field 12 embracing the positions "5" to "9".

The digits 0, 1, 2, 3, 4, may be represented by perforations in the correspondingly numbered index point positions of the upper field 11 or they may be represented by perforations in the positions 5, 6, 7, 8, and 9, respectively, of field 12, each accompanied by a perforation in the "11" index point positions. The digits 5, 6, 7, 8, and 9 may be represented by perforations, respectively, in the 0, 1, 2, 3, 4, positions of the upper digit field 11, accompanied by a "12" perforation or this group of digits may be represented by single perforations in the correspondingly numbered index point positions of the field 12. Thus, the numbers printed across the top of the card in the double-punched field are coded as indicated in the field designated 13 and the numbers printed across the lower edge of the card are represented by the perforations indicated in the field designated 14.

In field 15 is shown the manner in which perforations representing both the numbers printed across the top of the card and across the bottom of the card are represented. This field 15 is shown at an enlarged scale in Fig. 7 in which the perforations related to the upper line of printing are represented in outline and those related to the lower line of printing are shown in solid black.

It will be observed that in several instances the perforations related to the upper line and lower line digits are "interspersed," for example, as in the first four columns of the field.

Card feed mechanism

In Fig. 2 is shown a section of the card feeding mechanism of the well known International tabulating machine in which the cards are fed singly from a stack 16 by a picker knife 17 to a series of pairs of feed rollers 18 which convey the card in an arcuate path to a stacking device 19 which stacks the cards in a hopper 20. In the path of the cards is disposed the usual sensing station at which the brushes UB make contact through the perforations in the card with a contact roller 21. Exactly one machine cycle later, the lower brushes LB make contact through the perforations with a contact roller 22. These are the well known upper and lower sensing stations.

For the purposes of the present invention, two additional sets of sensing brushes 1B and 2B are provided which cooperate with contact rollers 23 and 24, respectively, and are located a distance equivalent to five index point positions of the record card in advance of and beyond the brushes LB. The effect of this is that as the lower brushes sense the index point positions of the card 9, 8, 7, 6, 5, the brushes 1B will at the same time be sensing the index point positions 4, 3, 2, 1, 0 of the same card and as the brushes LB sense the positions 4, 3, 2, 1, 0, the brushes 2B will concurrently sense the positions 9, 8, 7, 6, and 5 of the same card. This relationship between the positions which the three sets of brushes sense is shown in the timing diagram, Fig. 5.

The printing mechanism may be of any suitable form, but for convenience may be assumed to be substantially identical with the one described in Patent No. 2,016,682, granted to A. W. Mills, October 8, 1935. It includes the usual

platen 25 (Fig. 3) and a number of vertically movable type bar assemblies including carriers 26 slidably mounted on each of which are type heads 27. Each type head has type elements 28 adapted to print the numerals 1 to 9 and the letters A to Z. To the left of the type bars is the well known alphabet zoning mechanism generally designated 29. This mechanism is controlled by the alphabet zone perforations of the columns in which alphabetic information is recorded and functions to cause relative displacement between the carrier 26 and the type head 27 to effect selection of the proper alphabetic character. The operation of this particular mechanism forms no part of the present invention and its detailed description may accordingly be omitted. When numerals only are printed by the printing mechanism the type head 27 and carrier 26 maintain the relationship shown in the drawings and the two parts move as a single unit.

Each type carrier is provided with a series of stops 30, one for each of the digits, which, as the type bar rises, pass the toe of a stopping pawl 31 in succession. Energization of printing magnet 32 will attract its armature 33 and operate latch 34 to release the pawl 31 for engagement with one of the stops 30.

Circuit diagram

The manner in which perforations in the alphabet and single hole digit fields complete print selecting circuits will first be briefly explained after which the circuits controlled by double perforated columns will be set forth in greater detail.

In any column to be sensed for alphabet designations plug connections 35 and 36 are made as indicated in Fig. 4. Thus as the card passes the upper set of brushes UB a circuit will be completed through the 0, 11 or 12 zone perforation from line 37, contacts A (closed while brushes UB traverse to 0, 11 or 12 positions, see Fig. 5) contact roller 21, zone hole, brush UB, plug connection 35, zone magnet 38 in zoning unit 29 of Fig. 3 to line 39. Later as the digit positions 9-1 pass the lower brushes LB a circuit is completed from line 39, contacts G, wire 40, contact roller 22, digit hole, brush LB, plug connection 36, magnet 32, wire 41 to line 37. The successive energization of magnets 38 and 32 related to the same type carrier will in the well known manner select the appropriate character for printing.

In columns where single digits are represented by the usual single hole, a plug connection 42 is made and as the card passes brushes UB a circuit is completed to the connected magnet 32 in the same manner as through the afordescribed digit hole of the alphabetic character.

In columns containing coded digit perforations such as in field 15 of Fig. 7 plug connections 43, 45 and 46 are made as indicated in Fig. 4 and circuits will be completed in response to the sensing of such column which may best be explained by considering a column with a specific pair of digits punched therein, for example, the first column of Fig. 7 which has a "9" and a "2" punched therein. The "9" is to be printed under control of magnet 32 labelled "upper" and the "2" is to be printed under control of magnet 32 labelled "lower" selected to effect printing on a single line of a record such as Fig. 6.

As the column of the card passes brushes UB, the holes in the 1 and 2 positions will not complete circuits as no current is on the contact roller at such times. A pair of contacts B close mo-

mentarily as the "11" hole is sensed, completing a circuit from line 37, contacts A, roller 21, "11" hole, brush UB, plug connection 43, contacts B, relay magnet 50 to line 39. As the "12" hole is sensed contacts C close momentarily and a parallel circuit is completed through the "12" hole to energize a relay magnet 51. Both relays close their respective contacts 50a and 51a to provide holding circuits through cam contacts D which will maintain the magnets 50 and 51 energized throughout the period in the following cycle during which the digit holes 9-1 are sensed by the brushes LB, contacts D opening just before the holes "11" and "12" of the next following card arrive at brushes UB (see Fig. 5).

As a consequence to the energization of magnet 51 its contacts 51b will close and 51c open and for the same reason energization of magnet 50 will open its contacts 50c and close its contacts 50b. Now when the "4" hole of the column under consideration is at brush 1B, the "9" position is at brush LB and the "9" type element is in printing position. At this time contacts J are closed (see Fig. 5) and a circuit is traceable from line 39, contacts G, contacts J, wire 52, roller 23, "4" hole, brush 1B, contacts 51b, plug connection 45, to upper print magnet 32 and wire 41 to line 37. Magnet 32 will intercept the type bar to print a 9.

When the 7 hole reaches brushes 2B, the 2 position will be at brushes LB and the 2 type element will be in printing position. At this time a circuit is traceable from line 39, contacts G, contacts H, wire 53, roller 24, "7" hole, brush 2B, contacts 50b, plug connection 46 to lower print magnet 32 and wire 41 to line 37. Magnet 32 will accordingly position the type bar to print a 2.

It is thus seen that the sensing of a "12" hole in a column will connect the brushes 1B to sense the positions 4, 3, 2, 1 and 0, five points in advance of their sensing by the normal brushes LB so that any one of these holes will cause printing of a digit five units higher, i. e., a 4 will print a 9, a 3 an 8 and so on. On the other hand the sensing of a "11" hole in a column will connect the brushes 2B to sense the positions 9, 8, 7, 6 and 5, five points later than their sensing by the normal brushes LB so that a hole in any one of these positions will cause printing of a digit five units less, i. e., a 9 will print a 4, an 8 a 3, etc.

Let us assume now that the column sensed contains no "11" or "12" holes, as, for example, in the fifth column of Fig. 7 which contains a 3 and a 9 hole. As this column passes brushes UB, no circuits are completed and contacts 50C and 51C remain closed, and contacts 50b and 51b are open, rendering brushes 1B and 2B for this column ineffective. When the "9" hole reaches brush LB, contacts F are closed permitting a circuit to be completed from line 39, contacts G, wire 40, roller 24, "9" hole, brush LB, contacts F, contacts 50C, plug connection 46 to "lower" print magnet 32, causing the 9 to be printed in the selected position. When the 3 subsequently arrives at the same brush LB, contacts F are open and contacts E are closed (see Fig. 5) so that the circuit is completed through the "3" hole, contacts E, contacts 51C, plug connection 45, to the "upper" print magnet 32.

A plug socket 55 is provided and connected to the brush LB traversing the double punched columns, so that where such column is used to read the digits as single holes, a plug connection such as 42 can be made. In such case the plug connections 43, 45 and 46 are omitted.

According to the foregoing explanation it is apparent that a hole in any position of field "12" of Figs. 1 and 7 will cause printing of the digit corresponding to the location of the hole where there is no accompanying "11" hole and when such "11" hole is present, printing will be of a value five lower than the value of the position punched in field 12. Also a hole in any position of field 11 will print according to the value of such position if there is no accompanying "12" hole, but where the "12" hole is also present the value printed will be five higher than the position punched in field 11.

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 cyclically operable record controlled printing machine, a presensing device, a plurality of secondary sensing devices, means for feeding a record card to first pass said presensing device and to then pass said plurality of secondary devices, said feeding means being arranged to feed a card past said plurality of secondary devices in a single cycle of operation of the machine, a plurality of printing controlling devices, concurrently operable during said cycle one for each secondary sensing device and means controlled by said presensing device for causing either or both of said print controlling devices to be connected to their respective sensing devices for control thereby during the said single cycle.

2. In a record controlled printing machine, means for sensing the index point positions of a card column in succession, a pair of print controlling devices, means for connecting said sensing means to one of said devices during the sensing of certain of said index point positions and for connecting said sensing means to the other of said devices during the sensing of other of said index point positions, means for presensing said column and means controlled by said presensing means for selectively rendering either or both said connecting means ineffective.

3. In a cyclically operable record controlled printing machine, three sensing devices for sensing a column of a record card having an upper field and a lower field, a pair of print controlling devices, one of said sensing devices being arranged to sense the lower and upper fields of said column fields in succession, the second sensing device being arranged to sense the upper field while the first sensing device is sensing the lower field; the third sensing device being arranged to sense the lower field while the first sensing device is sensing the upper field, all of said sensing devices being arranged to completely sense the card column during a single cycle of operation of the machine, means for causing the first and second sensing devices to control the operation of one of said print controlling devices, means for causing the first and third sensing devices to control the operation of the other of said print controlling devices, means for presensing said column and means controlled thereby for rendering said two last named means effective.

4. In a cyclically operable record controlled machine of the class described, three sensing elements for sensing a column of a record card having an upper field and a lower field, a pair of magnets, one of said sensing elements being arranged to sense the lower and upper fields of said column in succession; the second sensing element being arranged to sense the upper field while the first sensing element is sensing the lower field; the third sensing element being arranged to sense the lower field while the first sensing element is sensing the upper field, all of said sensing devices being arranged to completely sense the card column during a single cycle of operation of the machine, means for causing the first and second sensing elements to control the operation of one of said magnets, means for causing the first and third sensing elements to control the operation of the other magnet, means for presensing said column and means controlled thereby for rendering said two last named means effective.

5. In a machine of the class described, means for sensing a column of a record card in which a digit may be represented by a perforation in an index point position corresponding to the value of the digit and in which the same digit may be represented in duplicate by a pair of further perforations, one in an index point position corresponding to a value five digits higher than said digit and the other by a perforation in a special position, means for sensing said special position, print controlling means and means jointly controlled by both said sensing means for causing said print controlling means to concurrently print the recorded digit in duplicate.

6. In a machine controlled by a record card having a plurality of designation columns, each column having twelve index point positions divided into three fields, the first field containing index point positions representing the digits 0, 1, 2, 3 and 4, the second field containing index point positions representing the digits 5, 6, 7, 8 and 9 and the third containing two special positions, one related to each of the first two fields, in the first field of which column the digits 0, 1, 2, 3 and 4 may be recorded by a perforation in the corresponding position and the digits 5, 6, 7, 8 and 9 by two perforations, one in the related special position and the other in the position which is five digits less in value than digit to be recorded, and in the second field of which column the digits 5, 6, 7, 8 and 9 may be recorded by a perforation in the corresponding position and the digits 0, 1, 2, 3 and 4 by two perforations, one in the related special position and the other in the position which is five digits greater in value than the digit to be recorded, in combination with a presensing element, upper, intermediate and lower sensing elements, means for moving the card column past said elements in succession, said three last named sensing ele-

ments being spaced apart so that as the intermediate one is sensing any index point position the upper and lower ones are sensing a position five digits lower and five digits higher respectively, said presensing means being arranged to sense the two special positions before said three other sensing elements sense the column, a pair of entry receiving devices, and means controlled by said presensing element for causing the intermediate sensing element to control the operation of both devices; or the upper and lower sensing elements to each control a separate one of said devices; or either of said other upper and lower sensing elements to control one of the devices and the intermediate sensing means to control the other device.

7. In a machine controlled by a record card having a plurality of designation columns, each column having five index point positions and a further special position and in which column five of the digits may be represented each by a perforation in a different one of said five positions and the other five digits may be represented by combinational perforations, one perforation in one of said five positions and another in said special position, in combination with a presensing element, a further pair of sensing elements, means for moving the card column past said elements in succession, said pair of sensing elements being arranged to each in turn sense said five index point positions, said presensing element being arranged to sense said special position in advance of the sensing by the pair of sensing elements, an entry receiving device coordinated with said card moving means to effect a single complete operation during the movement of said column past said pair of elements, and means controlled by said presensing means upon sensing said special position for causing a selected one of said pair of sensing elements to control said device during its single operation as said five index point positions pass the selected element.

8. In a machine of the class described, a pair of sensing devices arranged to concurrently sense a column of a record card, said column containing a plurality of perforation receiving index point positions, means for feeding a card containing said column past said devices, said devices being spaced so that each index point position passes the sensing devices in succession with a predetermined interval, a magnet, circuit connections between each device and said magnet, means for presensing said card before it passes said pair of sensing devices and means controlled by said presensing means for selectively rendering one of said pair of sensing devices effective to control said magnet through the related circuit connections.

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