

Feb. 11, 1936.

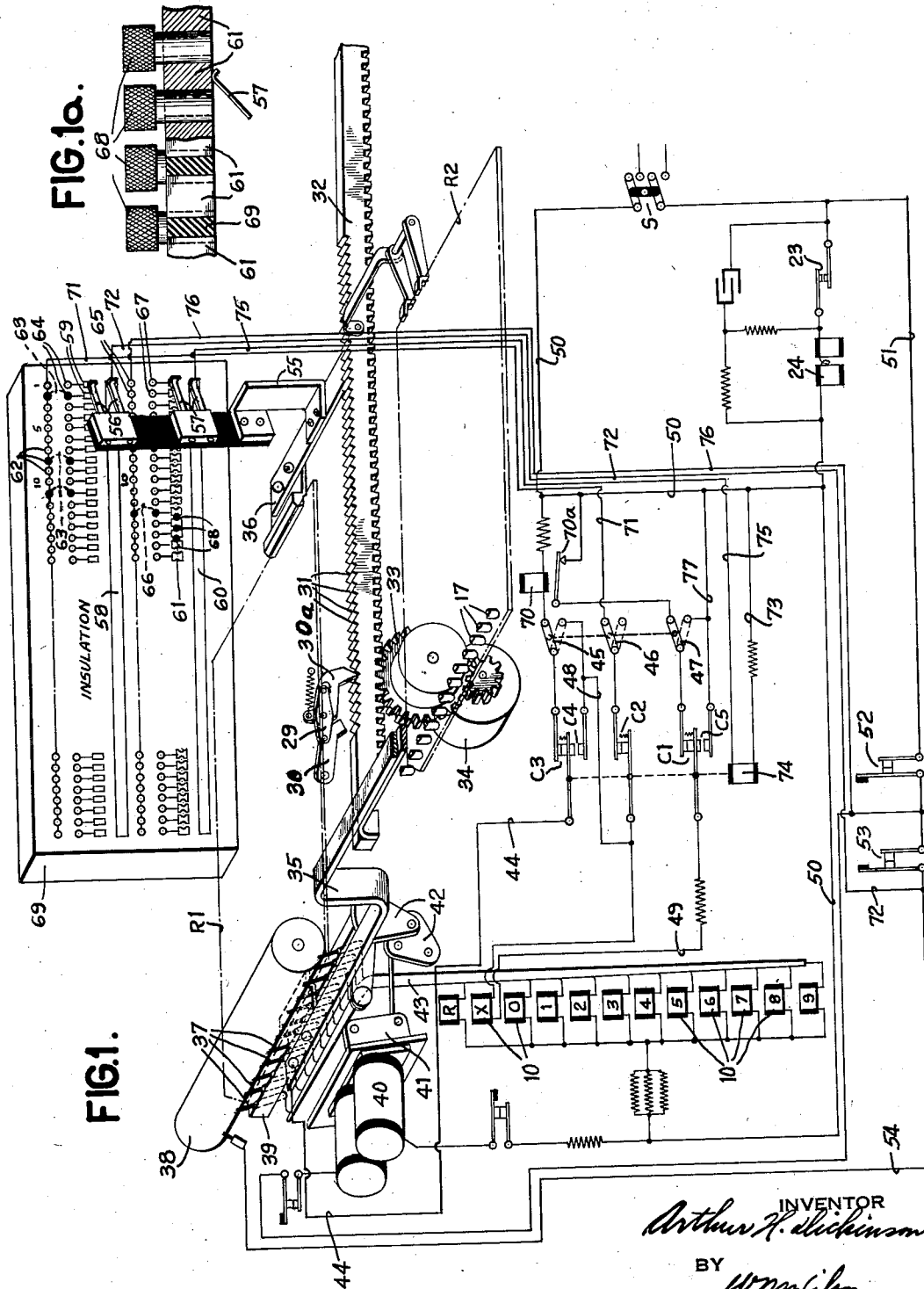
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2,030,432

PUNCHING MECHANISM

Filed March 24, 1934

2 Sheets-Sheet 1



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FIG.2.

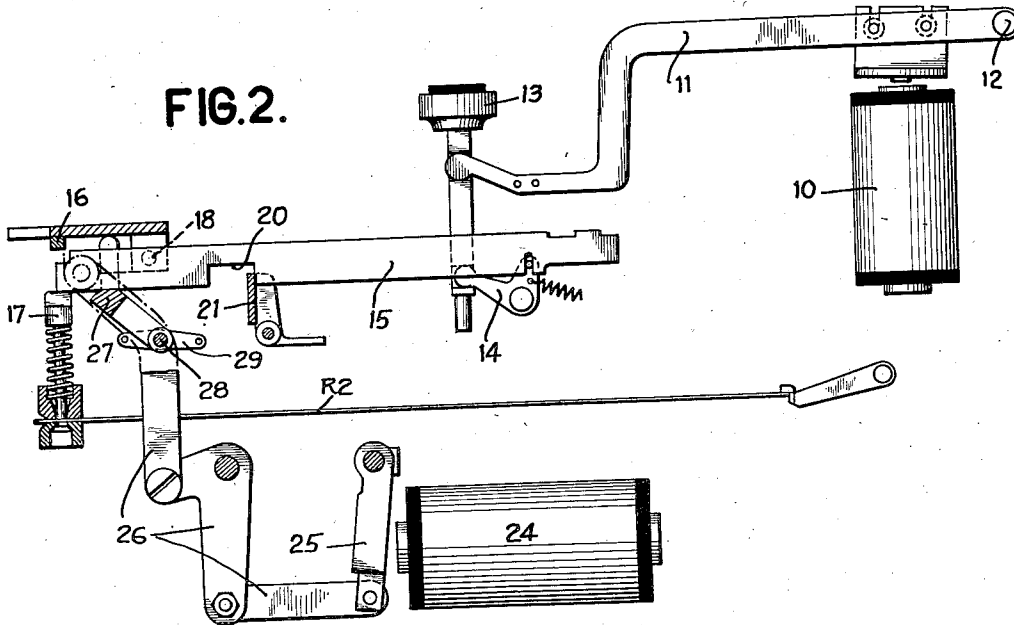


FIG.3.

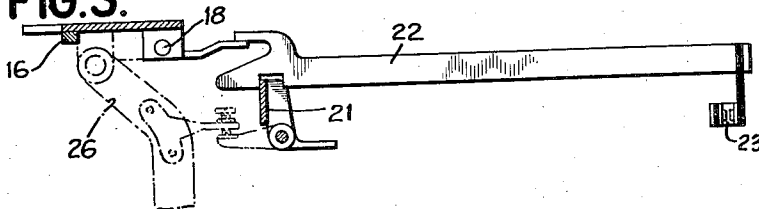


FIG.4.

R1

R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
X	O															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

FIG.5.

R2

R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
X																
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

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PUNCHING MECHANISM

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8 Claims. (Cl. 164—115)

This invention relates to punching or perforating machines and more particularly to machines of the type in which the punching may be controlled manually or by a previously punched card.

Machines of this type are well known in the art and are illustrated in Patent No. 1,772,186, granted August 5, 1930 to Lee and Phillips. In this machine, a previously punched card is placed in the reading or sensing section of the machine and the columns thereof successively read by electric contact devices. Concurrently a blank card is advanced column by column across a row of punches which are actuated under control of the analyzing devices to perforate corresponding information in the blank card.

It is frequently desirable to have the information reproduced not as an exact replica; for example, data in the field of a pre-punched card representing a number may be accompanied by an identifying perforation made in the well known "X" index point position of one of the columns. In accordance with some accounting systems, this "X" perforation may identify the number as having a negative value and the absence of such perforation may denote that the number has a positive value. For accounting purposes it may be desired to duplicate the information on a group of cards in which such sign identifying perforations are present but it is required that the sign be changed; that is, that all numbers previously indicated as positive be represented as negative and vice versa. It may also be desired that the identifying perforation be made in a different column than in the original card. The machine is further provided with means whereby certain fields which have an accompanying "X" perforation will be reproduced without omitting or disturbing the location of the "X" punching; that is, in such field the duplication will be exact in all respects.

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 novel features of construction and combination of parts hereinafter set forth and claimed.

In the drawings:

Fig. 1 represents a wiring diagram of the electric circuits of the punch, including the card carrying mechanism in perspective outline.

Fig. 1a is a detail sectional view of certain circuit controlling devices.

Fig. 2 is a section of the essential operating mechanism of the punch.

Fig. 3 is a detail of a punch magnet operating contact mechanism.

Fig. 4 is a fragment of a record card which is to control the punching mechanism.

Fig. 5 is a fragment of a record card punched under control of the card in Fig. 4.

The punching mechanism is generally of the form shown in the Lee and Phillips Patent No. 1,772,186, above referred to, and also as shown in Patent No. 1,921,408, granted August 8, 1933 to W. F. Gutgesell. The description thereof will accordingly be limited to those features essential to an understanding of the present invention. In Fig. 2, punch selecting magnets 10 are provided, there being one for each index point position of the record card.

Energization of magnet 10 will attract its armature to rock an arm 11 in a counterclockwise direction about its pivot 12, thus moving key 13 downwardly to rock a bell crank 14 which has connection with an interposer 15 suitably mounted for horizontal reciprocation. The forward end of interposer 15 is suitably guided between an operating bar 16 and the upper end of a punch 17.

Forward movement of the interposer will position its widest portion between bar 16 and punch 17 so that subsequent counterclockwise rocking of bar 16 about pivot 18 will move the interposer and punch downwardly to perforate the record card R2. A notch 20 in the interposer cooperates with a bail 21 to rock the same in a counterclockwise direction when the interposer is moved toward the left. Rocking of bail 21 in such manner will draw a hook-shaped member 22 (see Fig. 3) toward the left to close a pair of contacts 23. Closure of contacts 23 completes a circuit through the punch magnet 24, causing it to attract its armature 25 and through linkage generally designated 26 draw downwardly on the bar 16 to cause depression of the selected punch. Depression of key 13 may, of course, be effected independently of the operation of the magnet 10 for the purpose of manually controlling punching operations.

Disposed beneath the interposers 15 is a bail 27 which is carried by rod 28 upon one end of which is secured an arm 29 for operating the escapement mechanism. Rocking of arm 29 (see Fig. 1) will lower holding pawl 30 into engagement with ratchet teeth 31 and will raise stepping pawl 30a out of engagement therewith and one oscillation of arm 29 will serve to permit

advance of the escapement rack 32 one space. The rack 32 is suitably mounted for horizontal movement in the frame of the machine and may be manually moved toward the right to the position shown in Fig. 1, wherein a blank record card R2 is placed in position with the first column thereof in line with the row of punches 17.

Gear teeth cut on the underside of the rack cooperate with suitable gearing 33 which is connected to the usual spring barrel 34 which tends to move the rack toward the left and which effects such movement under control of the escapement mechanism. Rack 32 is provided with extensions 35 and 36 between which the prepunched or controlling card R1 is positioned and which is adapted to be moved to pass a row of analyzing brushes 37 as the card R2 moves by the punches 17. Brushes 37 cooperate with a contact roller 38 through the perforations in card R1. The brushes are carried by a bar 39 which is normally in the position shown holding the brushes down out of engagement with the card R1. A magnet 40 upon energization will attract its armature 41 actuating linkage 42 to cause upward movement of brushes 37 into engagement with the record card. This brush operating structure is fully shown and described in Patent No. 1,878,935, issued September 20, 1932 to F. L. Lee to which reference may be had for further details of construction.

There are twelve brushes 37, one for each of the index point positions of the record card. These brushes are connected through a cable 43 with punch selecting magnets 10 with the exception of the brush that traverses the "X" index point positions. The "X" brush 37 is connected for the purposes of the present invention through a wire 44 to the common contact blade of pairs of contacts C3 and C4. When the machine is used for straight duplicating operations switches 45, 46 and 47 are set in their dotted line positions and the "X" brush 37 will be connected through wire 44, contacts C3, switch 45, wire 48, "X" magnet 10, wire 49, contacts C1, switch 47 (in dotted line position) to wire 50 to which the other magnets 10 are also connected.

The occurrence of one or more perforations in any column of the record card R1 will complete a circuit through corresponding magnets 10 and punching will take place in the same positions in the corresponding column of the record card R2. A representative circuit may be traceable as follows, assuming a perforation present in the "5" index point position of a column of card R1: from line through switch S, wire 51, safety contacts 52, 53, wire 54, contact roller 38, perforation in the record card, "5" brush 37, cable 43, "5" magnet 10, wire 50, to switch S. Energization of the "5" magnet 10 will advance the corresponding interposer and will also close the contacts 23, thereby energizing the punch magnet 24 to cause perforation of the card R2. Thus far, the operation of the punch is similar to that described in the patents referred to.

Before describing the mechanism in further detail, reference will be made to Figs. 4 and 5 to illustrate a problem typical of those which the machine is arranged to perform.

Card R1 of Fig. 4 may have four separate fields each of four column capacity. The numerical data in the index point position "0" to "9" is to be exactly duplicated in the record card R2 but the perforations in the "X" index point position are to be altered as follows: The "X" punching in column 2 of card R1 is to be

omitted and "X" punching is to be added in column 8 of card R2, where there is no corresponding hole in card R1. The perforation of column 11 of R1 is to be omitted and the "X" perforation in column 13 is to be reproduced in the same column of the card R2. The "X" perforation may indicate that the value perforated in the associated field is negative. Thus in Fig. 4, the first, third and fourth fields have negative amounts and the second field contains a positive amount.

In accordance with the particular accounting system, the sign of these values has changed and it is desired to reproduce a card in which the new or changed signs will appear on the card. Thus in Fig. 5, the first and third fields are now positive, the second is negative, and the fourth has remained negative. As a practical illustration of the occurrence of such sign changing, the data perforated in, let us say, the first field of card R1 may represent a quantity of goods in stock and the same field of card R2 may represent the same quantity of goods taken out of stock.

Referring now to Fig. 1, the arm 36 has mounted thereon a brush carrier 55 provided with pairs of electrically connected brushes 56 and 57. One of the brushes 56 traverses a common conducting strip 58 and the other brush traverses segments 59. One of the brushes 57 traverses a common conducting strip 60 and a plurality of segments 61. There is a segment 59 and a segment 61 for each columnar position of the cards and the brushes 56 and 57 connect their corresponding segments to the strips 58 and 60 respectively, as the correspondingly numbered columns of the cards R1 and R2 are in cooperation with the brushes 37 and punches 17 respectively. A row of plug sockets 62 is provided from which plug connections 63 may be made to sockets 64 of the segments 59. A second row of sockets 65 is provided from which similar plug connections 66 may be made to sockets 67 of the segments 61. The operation of the device may now be described with particular reference to the example illustrated in Figs. 4 and 5.

In the first field of card R1 it is desired to eliminate the reproduction of the "X" perforation in column 2. Accordingly, a plug connection 63 is made between one of the sockets 62 and socket 64 associated with the second column. A similar connection is made in the eighth position where the "X" perforation is to be added to card R2 and a third connection is made in the eleventh columnar position. In the fourth field, where it is desired to reproduce the "X" punching, a connection 66 is made between sockets 65 and 67 associated with the thirteenth column and plugs 68 (see also Fig. 1a) are inserted from the rear of the panel 69 so that the segments 61 of the columns of this field are electrically connected to one another. For this operation, switches 45, 46, and 47 are thrown to their full line positions and with the cards in position to analyze and punch in the first column, this column will be reproduced as explained above and the carriage will escape to the second column in which the "X" punching occurs in card R1 and a circuit will be immediately completed under control of the "X" perforation which is traceable from switch S, wire 51, contacts 52, 53, wire 54, contact roller 38, "X" brush 37, wire 44, contacts C3, switch 45, relay magnet 70, to switch S. Magnet 70 will open its contacts 70a which are now in series with the "X" magnet 10 and prevent the completion of the circuit through this magnet due to the fact that

magnet 70 is quick acting and will open its contacts before the "X" magnet 10 can operate. Consequently, column 2 of card R2 will receive only the perforation in the "8" index point position.

If there were no "X" punching in column 2 of card R1, the machine would automatically effect and "X" punching in column 2 of card R2. This is brought about as follows. With the cards in position to sense and punch the second position, a circuit is completed from switch S, wire 50, contacts 70a (now closed since there is no "X" perforation present), switch 47, contacts C1, wire 49, "X" magnet 10, contacts C2, switch 46, wire 71, plug socket 62, connection 63, and socket 64 associated with column 2, brushes 56, common connector 58, wire 72, contacts 53, 52, wire 51, back to switch S. Accordingly, an "X" perforation would be made in column 2. The reproducing then proceeds in columns 3 to 7.

In the eighth column, the absence of the "X" perforation in the card R1 will cause completion of the circuit just traced and such perforation will be made in card R2 since in that column there is a plug connection 63. Normal duplicating will then proceed until the card arrives at column 11 where the "X" punching in card R1 will be eliminated on card R2 due to the energization of relay 70 which, by opening its contacts 70a, prevents the completion of the circuit through connection 63 in this position. Upon arrival of the thirteenth column of card R1 to the analyzing brushes, the brushes 57 will be in contact with the plug connected segment 61 of this position and a circuit will immediately be completed which is traceable from line through switch S, wire 50, wire 73, relay magnet 74, wire 75, conducting strip 60, brushes 57, segment 61 associated with column 13, socket 67, connection 66, socket 65, wire 76, contacts 52, wire 51, to switch S.

Energization of relay magnet 74 will cause closure of contacts C4 and C5 and opening of contacts C1, C2 and C3. Opening of contacts C3 will prevent energization of relay magnet 70 and opening of contacts C1 disconnects the circuit through contacts 70a. Closure of contacts C5 will complete a circuit from switch S, wire 50, wire 77, contacts C5, wire 49, "X" magnet 10, wire 48, contacts C4, wire 44, "X" brush 37, contact roller 38, wire 54, contacts 53, 52, to switch S. The energization of relay magnet 74 thus permits the duplication of the "X" perforation under the direct control of the perforation in the R1 card. The fourth field on the card R1 may be one in which several other columns may have perforations which are to be reproduced and in such circumstances it is not desirable to make a separate plug connection 66 for each column whereby relay magnet 74 would be repeatedly energized and again deenergized between columns.

The connecting plugs 68 are therefore provided and inserted from the rear of the panel 69 so that one continuous electrical connection is provided between all the orders associated with this field and relay magnet 74 after energization during the analysis of the first column of the field will remain energized during the analysis of the remaining columns of the field and if such columns contain "X" perforations, they will be reproduced directly, in the same manner as explained for the first column of this field.

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 perforated card reproducing machine, 10 means for analyzing a field of a record card in which a characteristic perforation may be present, means for perforating a field of another card under control of the field of the first card to reproduce all perforations other than the characteristic perforation, and automatically effective upon analysis of the index point position of the characteristic perforation for suppressing the reproduction of a corresponding perforation if one is present in the analyzed card and for effecting a characteristic perforation if there is none in said analyzed card. 15 20

2. In a perforated card reproducing machine, means for analyzing a column of a card in which one or two index point positions may be perforated, means for punching a column of another card, and means controlled by said analyzing means for causing said punching means to punch one hole in the second named card when there are two in the first and to punch two holes when only one is present in the first card. 25 30

3. In a perforated card controlled machine, means for analyzing a field of a record card having data representing perforations therein and in which the presence or absence of a perforation in a predetermined position indicates the arithmetical sign of the data, punching means controlled by said analyzing means to reproduce the analyzed data in another card and further means controlled by said analyzing means for changing the arithmetical sign indication of the data punched. 35 40

4. In a card reproducing system, means for analyzing an index point position of a record, means independent of said analyzing means for punching another position of a card column, a relay and a circuit controlled thereby for causing punching in said other position if no hole is present in the analyzed position and means controlled by said analyzing means for operating said relay to open said circuit for suppressing punching if a hole is present in the analyzed position. 45 50

5. In a machine of the class described, means for analyzing an index point position of a record card, a punch, controlling means, independent of said analyzing means for controlling said punch, means cooperating with said analyzing means for suppressing the operation of said punch controlling means if a hole is present in the analyzed position and for effecting an operation of said punch controlling means if no hole is present in the analyzed position. 55 60

6. In a card reproducing machine, means for analyzing a record column by column, means for punching a second record column by column under control of said analyzing means, and settable means cooperating with said analyzing means for causing said punching means to perforate selected columns with an equal, greater or lesser number of perforations than are present in the corresponding analyzed column. 65 70

7. In a card reproducing system, means for analyzing a predetermined index point position of a card column, a punch for effecting a perfora- 75

tion in a corresponding index point position of another card column, means normally operative to cause an operation of said punch and means controlled by said analyzing means upon sensing a perforation in said predetermined index point position for preventing operation of said punch to perforate said corresponding index point position.

8. The invention set forth in claim 7 in which settable means is provided for rendering said punch normally ineffective and responsive only to the presence of a perforation in the predetermined position whereby a duplicate perforation will be made in the said corresponding position.

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