

May 7, 1935.

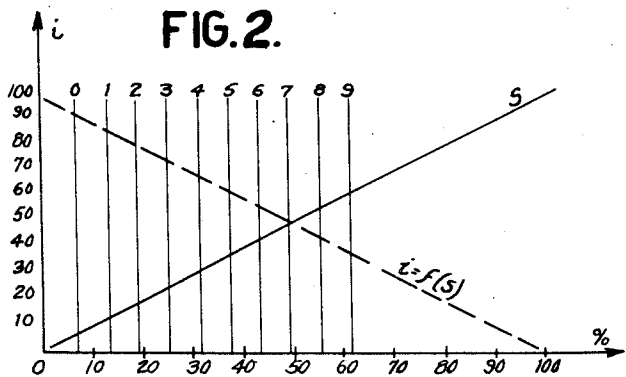
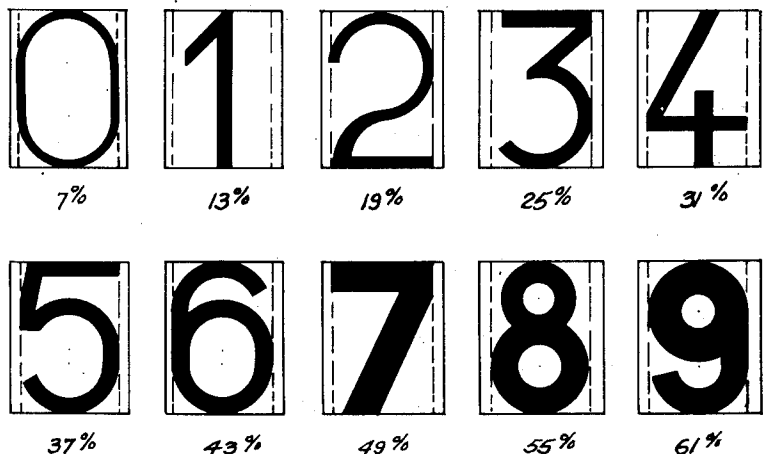
M. MAUL

2,000,404

SORTING MACHINE

Original Filed July 1, 1927 2 Sheets-Sheet 1

FIG. 1.



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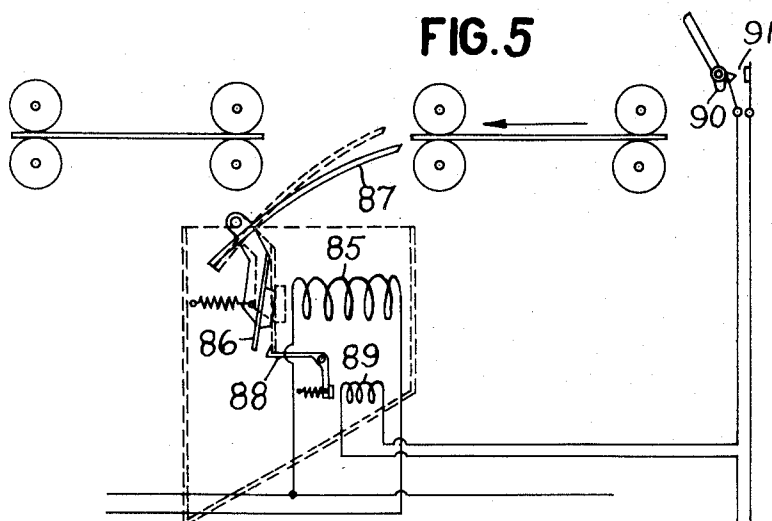
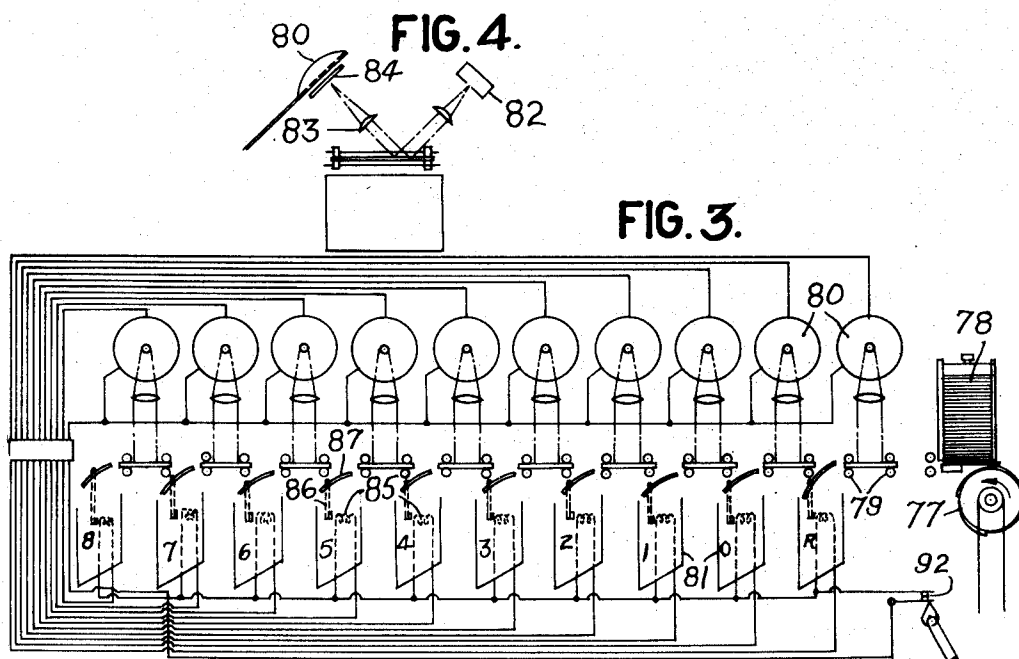
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UNITED STATES PATENT OFFICE

2,000,404

SORTING MACHINE

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Original application July 1, 1927, Serial No.
202,805. Divided and this application January
16, 1932, Serial No. 587,046

2 Claims. (Cl. 209—111)

This invention relates to accounting or sorting machines which are controlled by tabulator record cards or sheets for effecting the sorting of the records into groups, or other related accounting operations. The control of the operations of accounting or sorting machines has, previous to this invention, been effected by means of index points in the form of perforations. The perforations were positioned variously in a record field according to the data interpreted. It was also necessary to represent a character, in most known code systems by a plurality of perforations, arranged in separate adjacent columns, thus resulting in increasing the minimum width of a record sheet. The employment of a code, required a skilled operator to read and transpose from the written data into variously positioned perforations on the record. The transposition of the written data to the record required a special punching operation. The index points in the form of perforations were sensed by an analyzing means, usually a pair of contacts which were made through the perforations. The analyzing means then set up the sorting, accumulating, or printing mechanisms in accordance with the analysis.

The present application is a division of my co-pending application Serial No. 202,805 for Tabulator for operating upon printed index points, filed July 1, 1927.

The object of this invention is to control the operation of sorting machines by index points on the records other than in the form of perforations, for example, by means of printed characters. The invention includes the provision of an analyzing device which may be controlled by the form of the index point, its shape, size, or other physical characteristics. The analyzing mechanism may operate by means of radiant energy, regulated by the index point on the record. The radiant energy may take the form of light for energizing sensitive cells. The object of this invention is, further to analyze the index points by means out of contact with the record during analysis.

It is also an object of this invention to cause differential operation of the sorting mechanisms not by means of variously positioning the index points in the record field but by varying the form of the index points. The latter may be located in the same position on the record to differentially control the operation of the accounting mechanisms, its position in the record field being immaterial. The analyzing means, according to this invention, sets up different circuits, varied

according to the analysis, for operating the sorting mechanisms.

Other objects of this invention will be disclosed and pointed out in the succeeding portions of the specification.

In the drawings:

Fig. 1 shows a system of characters for causing variations in the analyzing light by the form of the printed characters.

Fig. 2 is a graph showing the proportion of the field covered by each character and the resulting current.

Fig. 3 is a schematic showing of a form of sorter used with the characters of Fig. 1.

Fig. 4 is a detail of the analyzers used in Fig. 3. Fig. 5 is a detail of Fig. 3.

In Fig. 1 is shown a system of printing characters on a standard field which does away with the necessity of analyzing the field at predetermined basic points. The characters are differentiated from each other by varying their relative sizes, each character covering a different percentage of a standard field. If characters 0-9 for example be printed on the fields, they may be varied in area according to the percentages marked in Fig. 1. If the analyzing beam of light be directed with uniform intensity at all portions of the field, the quantity of light reflected toward the photo cell unit will be varied according to the area of the field covered by the character. In this system, only one photo cell is required for each analyzing mechanism which will have a current produced therein varying with the quantity of light reflected and consequently with the size of the character. Each character thus produces a different current in the photo cell as illustrated by the dotted line in Fig. 2 which also shows the graph of the area covered by the characters of Fig. 1, the intensity of the current varying inversely as the area of the character which constitutes the black portion of the field.

In Fig. 3 is shown an adaptation of this system to a sorter for record cards. The rotating picker device 77 feeds one card at a time from magazine 78 to a series of feed rollers 79 which conduct the card beneath a series of photo cells 80, one for each sorting pocket 81. The card field is illumined diagonally at each sorting station by an individual light source 82 (Fig. 4). The rays of light reflected from the field are concentrated by means of a converging lens 83 on the transparent plate 84 above which is the photo cell 80. The current in the photo cell energizes a magnet 85 corresponding thereto to

attract its armature 86 and raise reflector 87 to intercept the advancing card causing it to drop into the pocket 81.

The magnet coil 85 for each pocket has a different number of ampere turns, the minimum number of turns being on the magnet in the reject pocket, taking care of blank fields, the next highest number of turns on the magnet in the 0 pocket and the greatest number of turns on the magnet in the 9 pocket. The card passes successively through the reject sorting station, the 0 sorting station, the 1 sorting station, the 2 sorting station, etc., in the order indicated. It is known that the magnetic attraction of a coil varies directly as the number of ampere turns. If, for example, Figure 5 is on the card field, it will pass successively under the analyzing cells for the reject, 0, 1, 2, 3 and 4 pockets. The current produced in any of these cells energizes the magnets for these pockets but the magnet field set up by the coils of these magnets is insufficient to attract their armatures. When the card reaches the 5 analyzing cell, the number of ampere turns of the magnet in the 5 pocket is sufficient to attract the 5 armature and hence guide the card into the 5 pocket. To hold the armature in position till the end of the cycle, after actuation, a detent 88 is provided behind which the armature 86 snaps as soon as it is attracted. At the end of the cycle, a magnet 89 under control of cam 90 closing contacts 91, actuates detent 88 to release the armature 86. The current through the cells and the magnets is completed when the cards are in their proper position in front of the photo cells by means of contacts 92.

It is apparent that in the above described machines, means are provided to prevent light not reflected by the card field from reaching the photo cells.

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:

1. In a record sorting machine, a plurality of control devices, said devices including light sensitive elements, the different elements being operable in response to different amounts of light and record sorting means controlled by said devices.

2. In a record sorting machine, a plurality of stations, records having printed characters thereon representing different values, the characters representing each value having the capacity to cause the record bearing it to reflect a different quantity of light from that reflected by a record bearing a character representing any other value, a light source for projecting light upon the records, and light sensitive control means for receiving light reflected by said record, said means causing the record to be selectively deposited at said stations in accordance with the quantity of light reflected thereby.

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