Oct. 8, 1935. A. W. MILLS 2,016,681

PERFORATED RECORD CARD

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FIG.1.

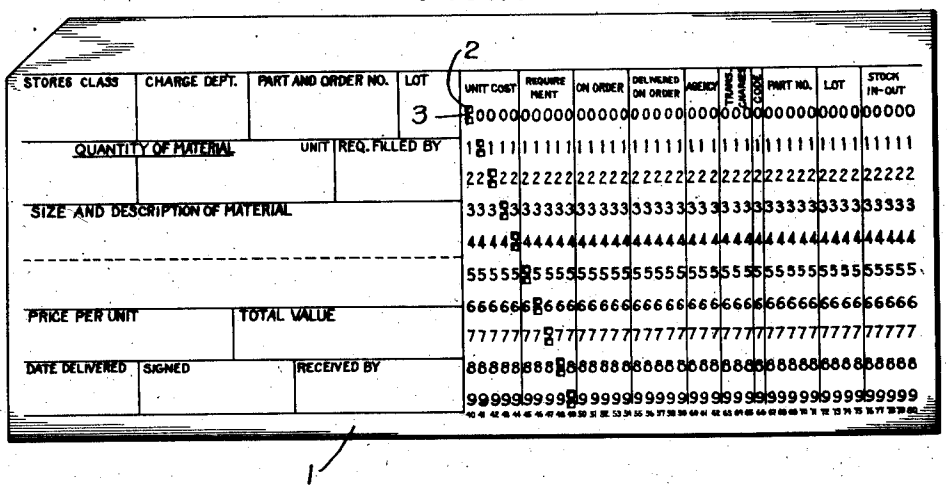


FIG.3.

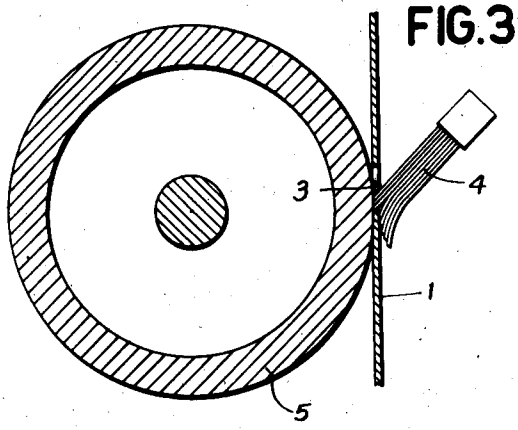


FIG.2.

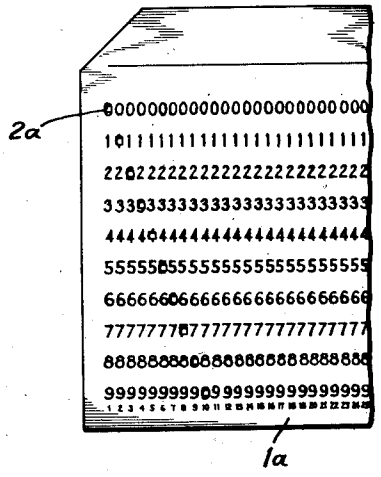
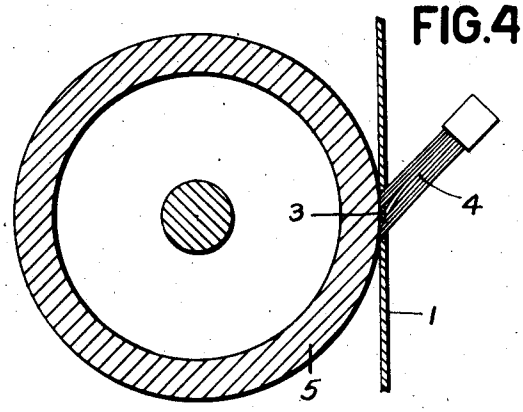


FIG.4.



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FIG.5.

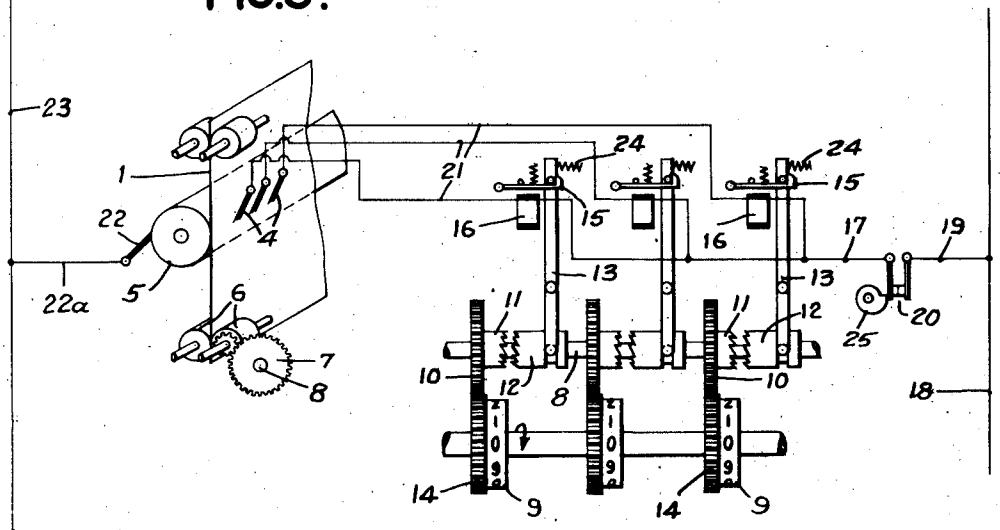


FIG.6.

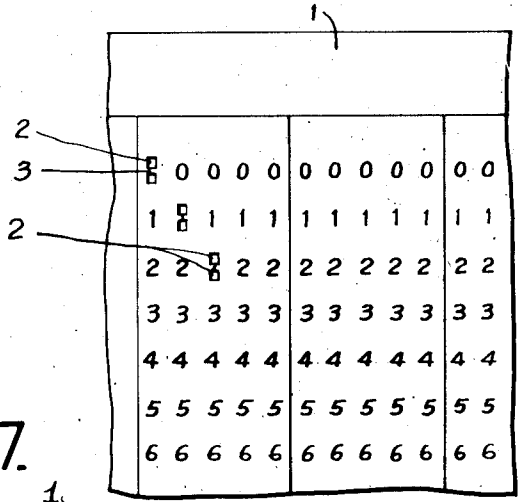
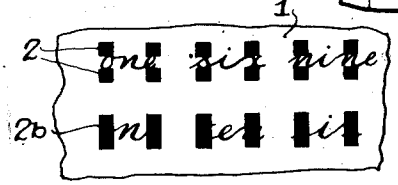


FIG.7.



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UNITED STATES PATENT OFFICE

2,016,681

PERFORATED RECORD CARD

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Application April 23, 1932, Serial No. 607,114

1 Claim. (Cl. 235—1)

This invention relates to perforated record cards for controlling tabulating, sorting and other accounting machines. Record cards used in the Hollerith system have for a long time contained adjacent columns of index point positions in which a round perforation is made in one or more of the positions in each column to indicate a value. According to U. S. Patent #1,772,492 the perforations are long in the vertical direction and narrow in the horizontal direction, thus making it possible to increase the number of columns of perforations and at the same time to produce a record card which after all the data has been entered is stronger than in the case of the earlier card in which the perforations were round.

It is often desirable to enter data upon the record cards by writing or typing in words and figures before the data is entered in the form of perforations. Operators then take the cards and enter the data by perforating in the appropriate columns of index point positions. The perforations often obliterate some of the hand writing or typing and render it difficult to read correctly. I have found that by using two smaller perforations in the place of one of the elongated perforations of Patent #1,772,492 less of the written information on the card is obliterated and it is easier to read such written data after the card has been perforated. On the other hand, this double perforation does not interfere with the usual operation of the tabulating or sorting or other accounting machines in which the card is employed.

Referring to the drawings in which I have shown what I now consider to be the preferred form of my invention;

Figure 1 represents a record card perforated in accordance with my invention;

Figure 2 shows a card in which single small perforations are employed;

Figure 3 is an enlarged sectional detail view showing the manner in which the perforations are analyzed as the record card passes through the machine;

Figure 4 is a similar view with the card slightly farther advanced through the machine than Figure 3;

Figure 5 is a wiring diagram of a tabulating machine controlled by the card;

Figure 6 is a portion of a card on an enlarged scale showing the double perforations.

Fig. 7 is an enlarged detail showing the manner in which the double punching sometimes makes it possible to read writing on a card where a single large perforation would make it difficult or even impossible to read the words.

In perforated record controlled machines such as tabulating or card sorting machines, it is customary to feed the cards one at a time to a set of electric brushes, the brushes pressing against the card as the latter moves through the machine. When a perforation reaches a brush, the brush passes through the perforation and makes contact with a terminal on the opposite side of the card and in this way closes a controlling circuit through the perforation, to effect the proper operation of the machine. The number of cards fed through the machine over a given period has become standardized within certain limits of speed. With cards feeding at the desired speed, the duration of contact through the perforation must be sufficient to bring about complete energization and operation of the electromagnet which it controls. The duration of contact is thus controlled by the length of the perforation. The length of the perforation has therefore become standardized under normal conditions. To decrease the length of the perforation a substantial degree would necessitate lowering the speed of the machine in proportion or else it would hamper the accuracy of the machine.

I have found, however, that by using two small perforations instead of one large one to represent a given value, the outer extremities of the two perforations being equal to the distance of the outer extremities of the single larger perforation, the same duration of contact may be maintained. The multiwire brush which senses the perforations will maintain contact through the two perforations without breaking the circuit while passing from one perforation to the other. The double perforation thus has the advantage of a single long perforation so far as duration of contact is concerned and has the advantage of not cutting out so much of the record card. In this way, written data is less apt to be obliterated by the punching of a card than where the single long perforation is employed.

In Figure 1, the card 1 is shown as divided into two portions. The left half of the card is arranged for written entries and the right half for perforated entries. If the card were used strictly in accordance with this arrangement then the single large perforations in the right half would not interfere with written entries, but it is often desirable to make written entries on the right half of the card also and it is sometimes desirable to make perforated entries on

the left side of the card where the written entries are made and again it is desirable to make written as well as perforated entries across the entire width of the card. In such instances, the double small perforations make this possible where a single larger perforation would often make it impossible to read the writing correctly. The double perforations are shown at 2 on the right side of the card. According to this method of punching, a strip of paper stock 3 remains between the upper and lower perforations so that where the perforation cuts through a written character, part of the writing continues to be visible on the intervening strip thus making it easier to read the writing. In analyzing record cards the cards are fed one at a time between brushes 4 and a contact member which is here shown as a roller 5. The brush and roller are included in an electric circuit which contains an operating magnet so that when the brush engages the roller it closes the circuit through the magnet and thus controls the operation of the machine.

As the card passes between the roller and the brush the fine strands of the brush reach through the perforations and engage the roller thus closing the circuit. The time at which the circuit is closed with respect to the cycle of operation of the machine determines the nature or value of the control effected upon the machine. This in turn, of course, depends upon the position of the perforation in the particular column on the card. The length of time that the brush is in contact with the roller through the perforation is important because some definite length of time is required for the electromagnet to operate. If the card is fed too rapidly the circuit through the perforation is closed for so short a time that the magnet does not become fully energized and does not have time to operate. If the perforation is too small this reduces the duration of contact and the magnet will not operate. In the case of the double perforation as disclosed here the strands of the analyzing brush enter one of the perforations and then ride out of this perforation and drop into the next one. While this is happening additional strands are falling into the first perforation, thus maintaining the circuit until the last of the strands are lifted out of the second perforation. In this way, the circuit is maintained closed for the same duration of time where the intervening strip of paper is left between the two perforations as where it is cut out to make one elongated perforation.

Figure 3 shows the upper strands of the sensing brush 4 in contact with the roller 5 through the lower part or perforation of the double perforation. In Fig. 4, the card has been fed a little farther and these strands have been lifted out of the lower perforation and have dropped into the upper perforation, again making contact with the roller. In the meantime other strands of the brush have passed through the lower perforation as shown in Fig. 4, thus making contact with the roller.

As the strands are now lifted out of the upper portion of the hole, additional strands will fall into this portion maintaining contact with the roller until the last strands are lifted out. Besides making it possible to perforate a record card upon which written entries have been made the double perforation while making it possible to maintain the same duration of electrical contact as in the case of a single elongated perforation also produces a card which when fully perforated is much stronger than a similar card punched with the elongated hole and still stronger than the card punched with the larger round holes.

In Figure 2 the card 1*a* is shown with single small perforations 2*a*. Such a perforation may be employed but where the brush is of the same dimensions as in Figs. 3 and 4 the duration of contact will be shorter and it will be necessary to feed the card more slowly through the machine than where the double perforation of Figs. 1, 3 and 4 is used. On the other hand the duration of contact through the double perforation is the same as in the case of the single elongated perforation and it is possible to feed the card through the machine at the same speed as where the single elongated perforation is employed.

By increasing the distance between the upper and lower perforations and using a brush which is still capable of cooperating with the second perforation before ceasing to cooperate with the first, the duration of energization of the control magnet may be materially lengthened.

Fig. 7 discloses a fragment of a record card having the double small perforations 2 and the single long perforation 2*b*. Words are written between or through the perforations in such manner that in the case of the double perforation, the words may be read whereas in the case of the single larger perforation so much of each word is punched out that the words cannot be read. This view shows extreme cases. In actual practice, the results will, of course, be somewhat between these two extremes but it will be seen that the double perforation has a marked advantage over the single larger perforation.

In Figure 5 the card 1 is shown as being fed by feed rollers 6 so that it passes between the contact roller 5 and the sensing brushes 4. The feed rollers are driven through gearing 7 on shaft 8 which is also adapted to drive an accumulator 9. Loose on the shaft 8 is a gear 10 provided with a clutch member 11 adapted to be engaged by a clutch member 12 which is slidably mounted on the shaft 8 but constrained to rotate therewith.

A spring pressed clutch operating lever 13 cooperates with the clutch member 12 and is adapted to move the latter into engagement with member 11 so as to cause the gear 10 to rotate. This gear meshes with gear 14 fixed to the accumulator member 9. A latch 15 is adapted to normally hold the clutch member 12 disengaged from member 11. This latch also serves as the armature of an electromagnet 16. The magnet is connected by a wire 17, through contacts 20 and wire 19 to one side 18 of the electric supply line. The other side of the magnet is connected by wire 21 to sensing brush 4 which is adapted to make contact with the roller 5. The roller 5 on the other hand, is connected to a common brush 22 which is connected by a wire 22*a* to the other side 23 of the line. As the card is fed between the sensing brush and the roller 5 the brush reaches through the perforations thus closing the circuit from the left side of the line through the magnet 16 to the other side of the line. The energization of the magnet causes the latch 15 to release the lever 13 and the spring 24 causes the clutch member 12 to mesh with member 11 to turn the gears 10 and 14 and thus actuate the accumulating wheel 9. This type of accumulating mechanism is shown in many U. S. patents

including No. 1,534,532 and No. 1,658,023 and is well known in this art so that it need not be shown in all its details here.

The contacts 20 are controlled by a cam 25 and are closed during the time that the card 1 is passing between the sensing brush and roller 5 and are open when no card is between the brush and roller so that the circuit through the magnet 16 will not be closed between cards.

According to the present invention, as the card is fed past the brushes 4 the strands of the sensing brush will reach through the lower one of the two perforations 2 at any one of the index point positions on the card thus causing energization of the magnet 16 to close the clutch 11—12. As the card continues to feed downwardly, the strands of the brush will ride into the upper one of the holes 2 and additional strands will ride into the lower one of the holes as in Figure 4 thus continuing the energization of the magnet 16 until the last of the strands ride out of the upper hole 2. During the passage of the double perforation with respect to the sensing brush 4 the brush will maintain closure of the circuit through the magnet 16 first through one of the perforations then through both of the perforations simultaneously and then through the other of the perforations without any break in the continuity.

What is claimed is,

A record card for controlling accounting machines provided with columns each having a plurality of value positions, said card being provided with a plurality of separate perforations at one of said positions in a column for controlling a machine in accordance with the value corresponding to said position.

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