

June 28, 1927.

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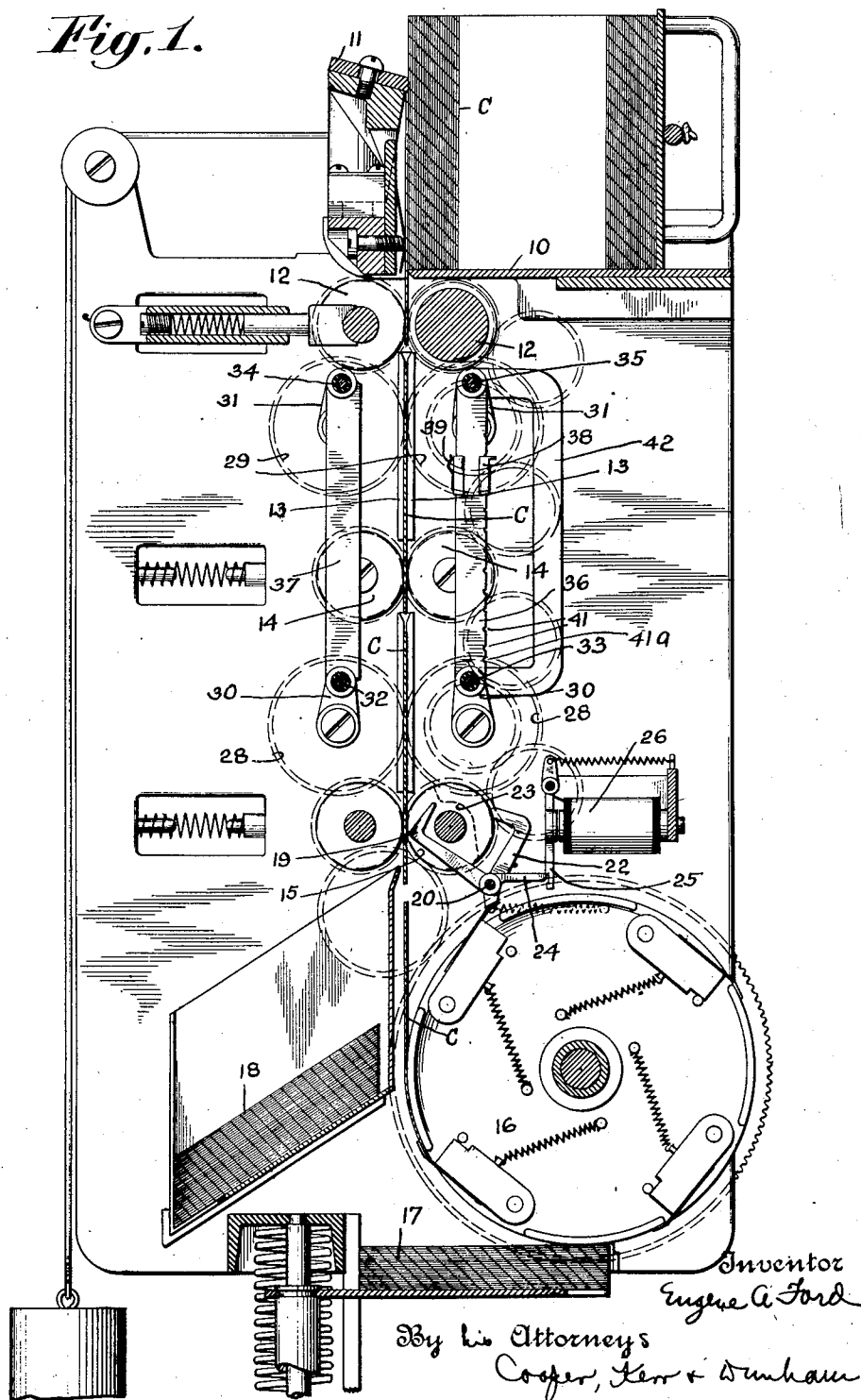
1,633,936

PERFORATION READING DEVICE FOR SORTING MACHINES AND THE LIKE

Filed Feb. 25, 1924

4 Sheets-Sheet 1

Fig. 1.



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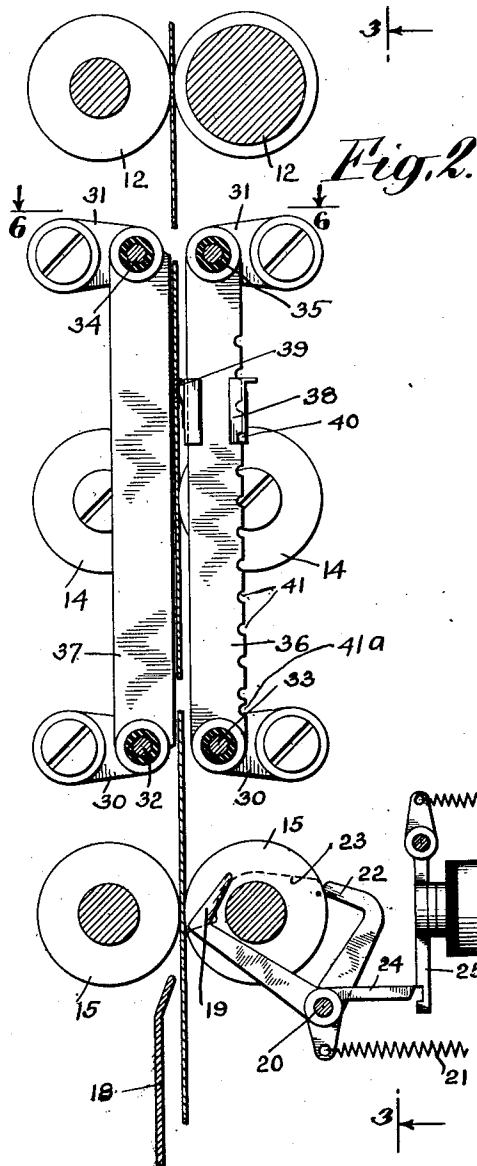
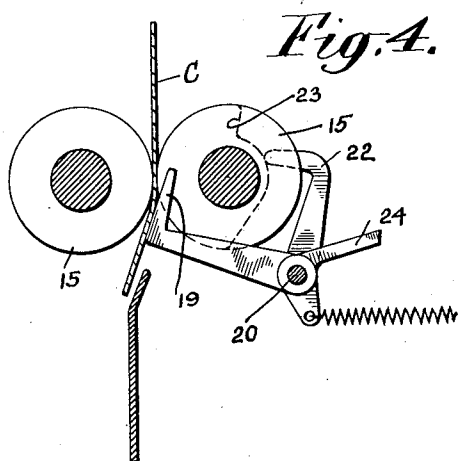
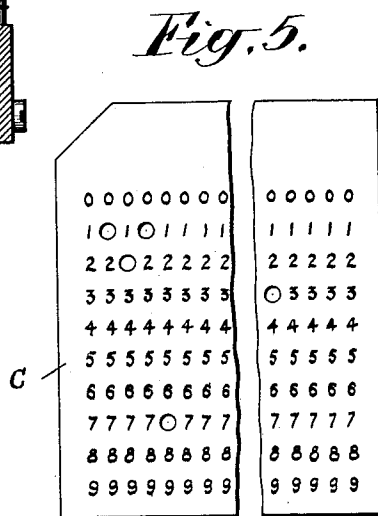
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4 Sheets-Sheet 2



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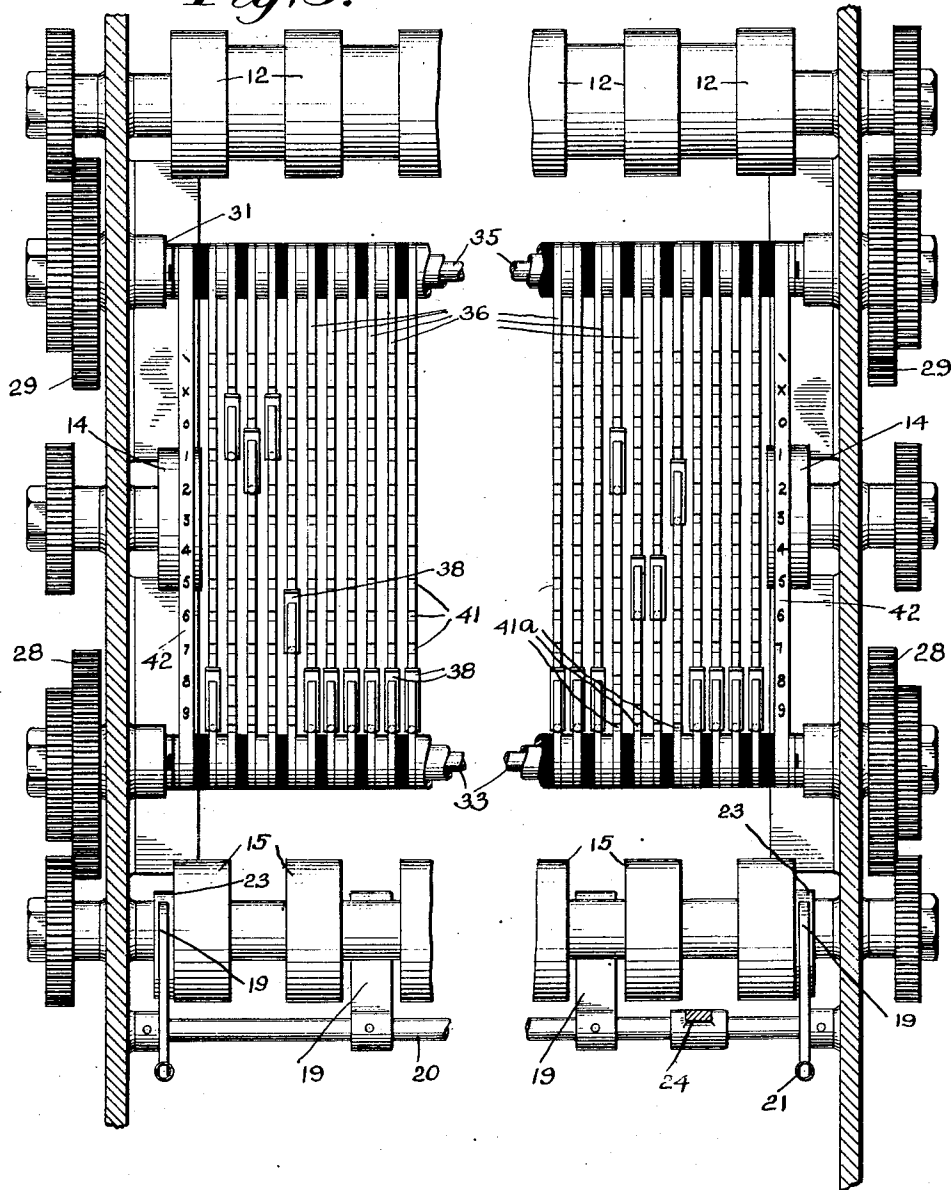
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Fig. 3.



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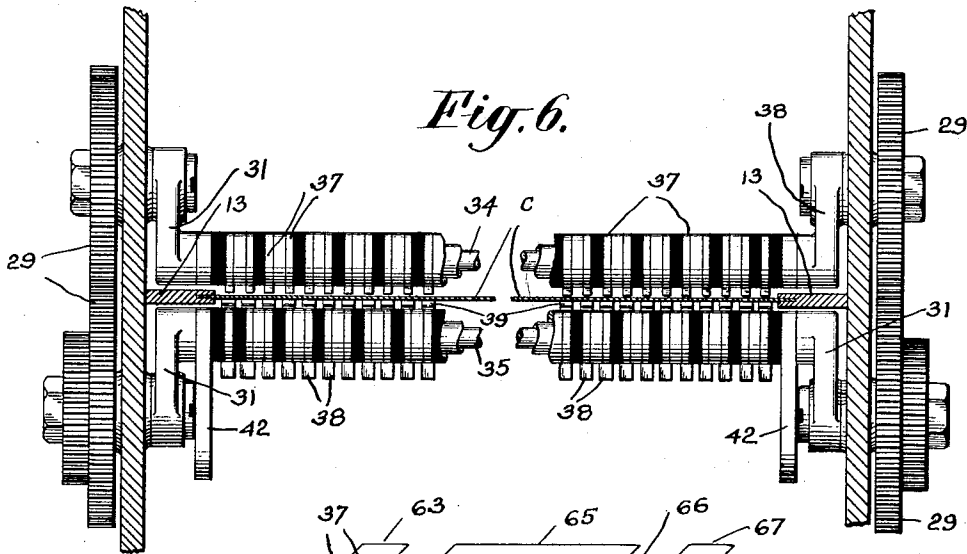
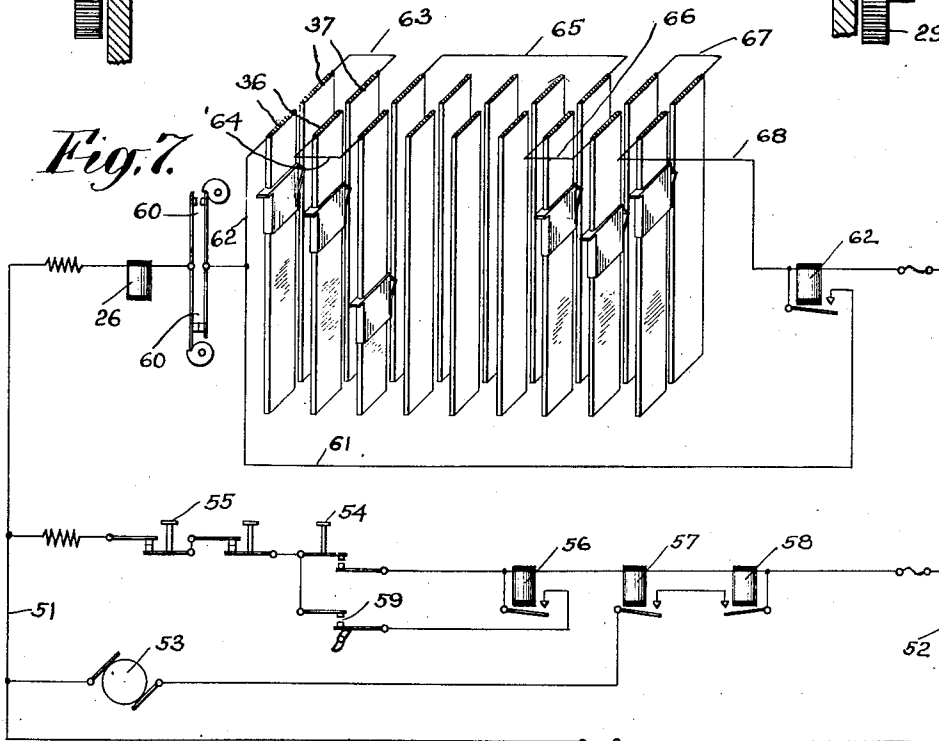
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PERFORATION READING DEVICE FOR SORTING MACHINES AND THE LIKE

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

EUGENE A. FORD, OF WEST NEWTON, MASSACHUSETTS, ASSIGNOR TO THE TABULATING MACHINE COMPANY, OF ENDICOTT, NEW YORK, A CORPORATION OF NEW JERSEY.

PERFORATION-READING DEVICE FOR SORTING MACHINES AND THE LIKE.

Application filed February 25, 1924. Serial No. 695,000.

This invention relates to improvements in sorting machines for perforated tabulating cards such as are used in the Hollerith systems. 55

5 Straight sorting machines when used for sorting cards having designating numbers embodying a plurality of figures, say, three, requires three runs of the cards, sorting first the thousands column, then the hundreds 10 and finally the units column.

In certain statistical work occasion arises where there are a great multiplicity of cards of like designation intermingled with other differently designated cards and it is frequently desirable to rapidly sort from the 15 stack a considerable number of like cards to permit other statistical operations such as tabulating to be put under way thereon before the sort is finally completed on the entire stack. For such purposes it is desirable that multiple column sorting be made 20 in one run through the sorting machine to avoid the necessity of making individual runs for each column.

25 The present invention is directed to a multiple unit or column sorter of this character which will be simple and inexpensive to manufacture.

Further objects reside in the provision of 30 a sorting machine of this character in which set-ups of the machine for a given number embodying figures in a plurality of record card columns may be readily made and changed from time to time.

35 A further object of the present invention resides in the provision of means for sorting cards having multiple digits disposed in a great number of card columns without the attendant expense and complication of 40 controlling relays for each column.

A further object of the present invention resides in the provision of perforation reading devices of such character that the selection of controlling columns may be made 45 from a plurality of columns which may be either adjacent or not upon the record and, in fact, they may be disposed in any desired groups or combinations of card fields as selected by the operator.

50 A further object of the present invention resides in the provision of a novel form of card reading devices which may be set for

a desired reading and which will take the reading from the cards while the latter are in continuous motion through the machine. 55

In the drawings,

Fig. 1 is a sectional view of the machine.

Fig. 2 is an enlarged detail sectional view.

Fig. 3 is a transverse section taken on line 3—3 of Fig. 2. 60

Fig. 4 is a detail of the card deflector in operating position.

Fig. 5 is a view of one of the tabulating cards.

Fig. 6 is a horizontal sectional view taken 65 on line 6—6 of Fig. 2.

Fig. 7 is a circuit diagram.

In the drawings, 10 represents the supply pocket containing a stack of record cards, from which the cards C are removed one by one by a picker 11 and advanced to sets of 70 feed rolls 12. Suitable guides 13 (Fig. 6) guide the cards at their edges to other sets of feed rolls 14 and 15. Below the lowermost rolls is a stacker 16 of conventional 75 form which places emerging reject cards in the reject box or stack 17. The stacker and feed rolls are all geared together by the gearing shown diagrammatically in Fig. 1.

Adjacent the card stacker is a sorting 80 pocket 18. For deflecting sorted cards into this pocket I provide a deflector device comprising deflector blades 19 fixed to shaft 20 (Figs. 2, 3 and 4) and adapted to be rocked anticlockwise into deflecting position by 85 suitable springs 21. Finger arms 22 are fixed to the shaft 20 and cooperate with a cam 23 fast on one of the feed roll shafts.

Also fixed to the shaft 20 is a suitable finger or arm 24 which engages a notch in the 90 armature 25 of sorting magnet 26. When cards are to pass to the reject box, the parts are in the position shown in Fig. 1. When the sorting magnet is energized to cause the cards to pass to the sorting box, the notch clears the finger as shown in Fig. 2 but the deflector plates are not rocked until a later time in the machine cycle on account of the contacting of finger arms 22 with cam 23. The parts are timed to permit the deflector plates to be rocked just before the lower edge of the next following card reaches the plates. The deflector plates then operate to deflect the card into the sorter pocket in the manner

shown in Fig. 4. The foregoing devices are those commonly used in sorting machines and require no further detailed description.

Card reading devices.

The means for reading the card perforations which are disposed in a plurality of columns is of such type that readings may be effected with the cards in motion. Furthermore, the reading devices may be initially set up to any desired amounts, which amounts may be in a plurality of columns disposed adjacent to each other or in non-adjacent fields. Thus the machine may be set to sort out at one operation all cards which are perforated with certain designations in a plurality of fields.

The gear trains for the feed rolls include lower pairs of intermeshing gears 28 and upper pairs 29. Suitable upper and lower pairs of cranks 30 and 31 are fast to the studs upon which the gears are mounted and carry upper and lower cross shafts 32, 33, 34 and 35. These cross shafts form supports for two series of vertical bars 36 and 37. These bars are insulated from the shafts and individually from each other. The number of bars of each series and their spacing is arranged to correspond with the numbers and spacing of the index point columns on the record cards which are to be sorted.

Disposed upon each of the bars 36 are bent metal members 38, each of which carries a spring contact element 39. Each member 38 also is provided with a suitable spring-pressed locking element 40 which is adapted to snap into one or another of a series of notches 41 upon the edge of the bars 36. The location of these notches is such that their position corresponds with the index point positions upon the record card. At the bottom of the bars there are a series of supplementary notches 41^a which are used to retain any desired contact members in wholly inoperative position in which the contact elements do not align with any index position on the card.

In Fig. 2, for example, the member 38 is set in the fourth notch from the top of the bar which represents the index point designation 1 on the record card. It will be understood that in setting up the machine for sorting the contact members must be initially set up to the desired numbers in the various controlling columns. To facilitate the setting up of the contacts suitable index plates 42 (Fig. 3) are provided which have their index numbers in alignment with the corresponding valued notches on bars 36 (see Fig. 3).

In the operation of the machine the movement of the bars 36 and 37 is such due to the arrangement of the gearing and the proportions of the parts that the contact elements

have an initial movement of approach towards the card, then for a short period when in contact with the card they move substantially synchronously therewith in a downward direction. During this period the spring contact elements 39 will move through corresponding valued holes in the card if these holes are disposed in the corresponding columns and establish contact with the bars 37 which are moving in a similar manner. By the provision of these movable contactors it is possible to take a reading of the card when the latter is in motion without impeding the card movement and it is also possible to take a simultaneous reading of different valued and positioned index point perforations in different record card columns.

Referring now to the circuit diagram (Fig. 7), 50 represents a switch adapted to connect lines 51 and 52 with a suitable source of current. 53 is the sorting motor. The motor circuit is the conventional one used in sorting machines. Depression of start key 54 closes a circuit from line 51 through the two stop keys 55 through relays 56, 57 and 58 to line 52. Energization of relays 57 and 58 closes the motor circuit which is afterwards maintained after the opening of the start key contacts by card lever contacts 59 which close upon the passage of cards. The starting motor may be stopped automatically upon the exhausting of the cards by the opening of the contacts 59 or at any time by the depression of either stop key 55.

The sorting circuit.

The sorting circuit includes sorting magnet 26 and cam contact devices 60 which are those usually used in machines of this class to make the circuit during the passage of the cards and to break the circuit at a fixed point in the cycle. From the right side of the contacts 60 one lead 61 leads to the contact point of a relay 62 which is connected to line 52. In setting the machine preparatory for sorting a number of connector wires are utilized to connect the various bars 36 and 37 on the columns in which sorting is to be effected. In the diagrammatic view sorting is desired on the first 3 left hand columns and upon the last three right hand columns. Accordingly, a lead 62 connects the contacts 60 with the left hand bar 36. The corresponding bar 37 is connected by a jumper 63 to the next adjacent bar 37 and a similar jumper 64 connects second bar 36 with third bar 36. The balance of the connections are made in a similar manner by jumpers 65, 66 and 67 and from the right hand bar 36 a lead 68 connects to the relay 62. The foregoing connections in cooperation with the contact elements and contact bars provide a series path for current, which

path is only completed provided index point holes are present of corresponding value to the set up of the machine in all columns. The absence of any perforation in the series will interrupt the circuit. In operation, if the series or multiple contact sorting circuit is completed the relay 62 will be energized and will then act as a stick relay to maintain current flow to the sorting magnet after the card contacts open and to prevent arcing at the contacts when the latter move away from the card.

The stick relay also serves to maintain the sorter magnet energized until the lower edge of the card C has advanced in proximity to the deflector plates. Upon the rotation of the deflector controlling cam the deflector will deflect the previously read card into the sorting pocket.

In practice the leads and jumpers 62, 63, 68, etc., will be provided with suitable jaw clips, plugs or like devices to enable the connections to be made readily and to permit them to be changed from time to time when various column combinations are to be used.

The final step in the sorting circuit cycle consists in the breaking of the sorting circuit and the stick circuit 61 by the opening of contacts 60. The sorting operation is repeated for following cards so long as controlling perforations are present which agree with the set up of the machine. If other cards pass under the contactors the pick up or series circuit is not established and the card or cards are delivered to the reject pocket.

What I claim is—

1. In a card controlled machine adapted for reading the index point perforations of passing record cards and determining the control of the machine upon the passage of all cards having predetermined index point punched designations therein, said machine comprising in combination, means for feeding record cards through the machine, means for simultaneously sensing at one reading operation a plurality of the perforations of each passing record card while the card is in motion, means for setting the aforesaid sensing means in accordance with desired index point values, and means for controlling the operation of the machine upon the passage of a record card which has punchings therein corresponding to the set-up of the sensing devices.

2. In a card controlled machine adapted for reading the index point perforations of passing record cards and determining the control of the machine upon the passage of all cards having predetermined index point punched designations therein, said machine comprising in combination, means for feeding record cards through the machine, means including a settable element for each different index point column for simultane-

ously sensing at one reading operation a plurality of perforations of each passing record card while the card is in motion, means for coupling the aforesaid settable means for conjoint action in accordance with the desired index point columns upon which readings are to be taken, and means for controlling the operation of the machine upon the passage of a record card which has punchings therein corresponding to the set-up of all the settable elements.

3. In a card controlled machine adapted for reading the index point perforations of passing record cards and determining the control of the machine upon the passage of all cards having predetermined index point punched designations therein, said machine comprising in combination, means for continuously feeding record cards through the machine, means for simultaneously sensing at one reading operation a plurality of perforations of each passing record card, such perforations being disposed in a plurality of selected columns, means for setting the aforesaid sensing means in accordance with desired index point values, means for coupling the sensing means of different index point columns for conjoint operation, and means for controlling the operation of the machine upon the passage of a record card which has punchings therein corresponding to the set-up of the sensing devices.

4. A card controlled machine including means for feeding cards through the machine, card sensing devices, means for moving said sensing devices relatively to the cards to analyze the cards while the cards are in motion, and means for variously setting the element of the sensing devices to cause said sensing means to become operative only upon the passage of cards which have perforations therein corresponding to the set-up of sensing elements.

5. A card controlled machine in which one operation is effected when cards of a given index point value pass through the machine and in which a different operation is effected upon the passage of differently punched cards, said machine including in combination with means for reading a single index point perforation in each of a plurality of columns of the record card while the card is in motion, means for setting the reading means for each index point column in accordance with desired values, and means for coupling the reading means of a plurality of columns for conjoint action, said last mentioned means being selectable at will of the operator over the various index point columns for the purpose described.

6. In a card controlled machine means for feeding record cards through the machine, a control circuit, a plurality of perforation reading means adapted to simultaneously

read perforations in a plurality of index point columns on the record cards while the cards are in motion, means for serially connecting reading devices which are disposed to read various index point columns, and means for serially connecting the control circuit with the aforesaid means and reading devices for the purpose described.

7. The invention set forth in claim 6 in which the serially connected reading devices are cooperatively disposed over non-adjacent index point columns of the record cards.

8. A card controlled machine including in combination with a single controlling circuit having a single controlling magnet therein, of means including contact elements having a movement of translation with the forwardly advancing cards and adapted to contact through holes in one or more columns of the perforated records for controlling said circuit, said circuit extending serially through a plurality of said contact elements, and detachable means for interconnecting desired sets of contacts for the purpose described.

9. A card controlled machine including a control magnet and a control circuit, means for establishing said control circuit while the record cards are in motion through the machine, said circuit being established simultaneously through a plurality of record card perforations disposed in a plurality of index point columns.

10. A sorting machine comprising a plurality of contact carrying elements, means for selectively adjusting the position of said elements to correspond with various index point positions upon a record card which is to be sorted, a circuit through said contact elements, means for controlling said circuit by record cards, and a sorting magnet controlled by said circuit.

11. A sorting machine comprising in combination with controlling means for deflecting record cards to a sorting station, means operative with the record cards in continuous advancing forward motion for simultaneously presenting contact elements to a plurality of perforations variously disposed in various card columns, and means controlled by the establishment of a controlling circuit through said perforations and said contact elements for controlling the first mentioned means.

12. In a card controlled apparatus in combination with means for feeding record cards through the machine, a plurality of contact carrying elements and means for imparting motion thereto to cause the latter to travel for a time synchronously with the advancing cards and in proximity thereto, contact elements carried by said elements and contact members disposed upon the opposite side of said record card from said

elements with which said contact elements make electrical contact upon the passage of index point perforations therebetween.

13. In a card controlled machine having means for reading the index point perforations of passing record cards and determining the passage of all cards having index point perforations representing a predetermined number, said means comprising in combination, means for simultaneously sensing the perforated index points in one or a plurality of columns variously disposed upon the record cards while the cards are in motion, and means for setting the aforesaid means in various relative positions with respect to the cards to cooperate with the desired index numbers in the different columns.

14. In a card controlled machine having means for reading the index point perforations of passing record cards and determining the passing of all cards having index point perforations representing a predetermined number, said means comprising in combination, means for feeding record cards through the machine, means for simultaneously sensing the perforated index points in one or a plurality of columns variously disposed upon the record cards while the cards are in motion and controlling means brought into operation upon the correspondence of the index point perforations of a passing card with the said sensing means.

15. In a record controlled apparatus, in combination with means for feeding the records through the machine, means for sensing the records while the latter are in motion, said means having provisions for simultaneously sensing index point designations in various fields of said records, and means for controlling the operation of the machine in one way when the values of each passing record agrees with the set-up of the machine and in a different way when the designation number disagrees with the said set-up.

16. In a card controlled machine adapted for reading the index point perforations of passing record cards and determining the control of the machine upon the passage of all cards having predetermined index point punched designations therein, said machine comprising in combination, means for feeding record cards through the machine, means movable synchronously with the motion of the cards for sensing predetermined groups of perforations of each passing record card while the card is in motion, and means for controlling the operation of the machine to deflect to a sorting station such record cards which have punchings therein which correspond to the group of perforations which are read by the reading devices.

17. In a card controlled machine adapted for reading the index point perforations of passing record cards and determining the control of the machine upon the passage of

all cards having predetermined index point punched designations therein, said machine comprising in combination with a control circuit, means for feeding record cards
5 through the machine, means for simultaneously sensing at one reading operation a plurality of perforations of each passing record card while the card is in motion, means for
10 thereby establishing or failing to establish through the aforesaid sensing means and perforations a series control circuit, and means for controlling the operation of the machine in one way upon the establishment
15 of said circuit and in a different way upon the opening of said circuit.

18. In a card controlled machine adapted for reading the index point perforations of

passing record cards and determining the control of the machine upon the passage of all cards having predetermined index point
20 punched designations therein, said machine comprising in combination, means for feeding record cards through the machine, means movable synchronously with the motion of
25 the cards for sensing at one reading operation all selected perforations of each passing record card while the card is in motion and means for controlling the operation of the machine upon the passage of a record card
30 which has punchings therein corresponding to the set-up of the sensing devices.

In testimony whereof I hereto affix my signature.

EUGENE A. FORD.