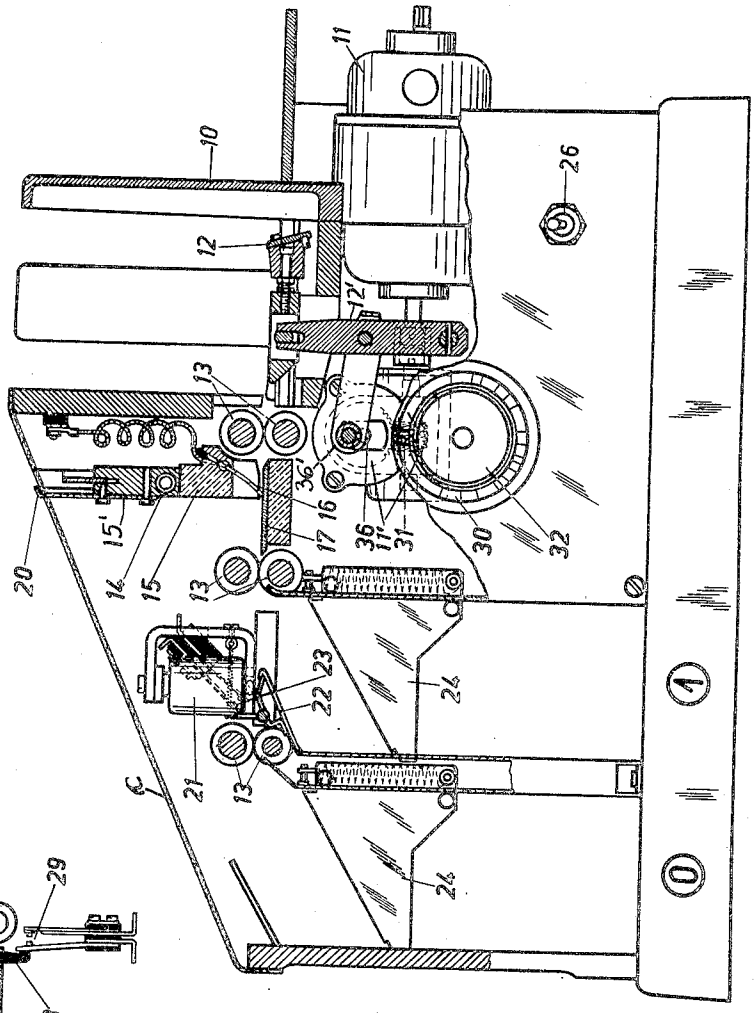
Jan. 19, 1943. M. MAUL 2,308,927

SORTING MACHINE

Filed May 11, 1939 4 Sheets-Sheet 1



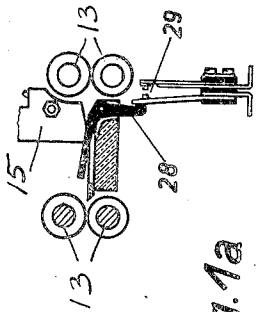


Fig. 1a

Fig. 1

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SORTING MACHINE

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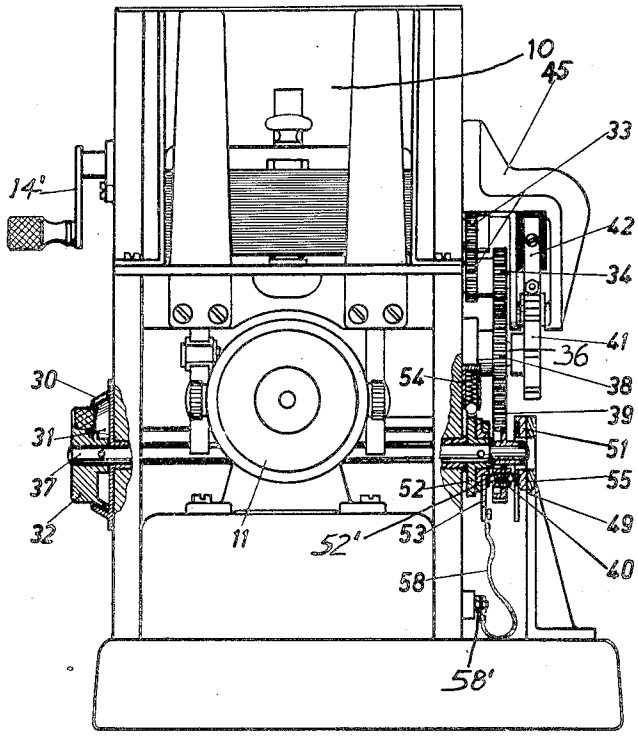
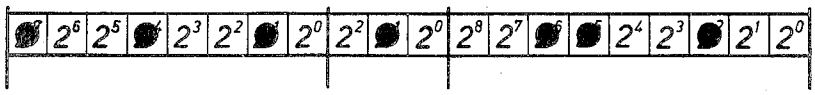


Fig. 2

Fig. 3



Fig. 4



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SORTING MACHINE

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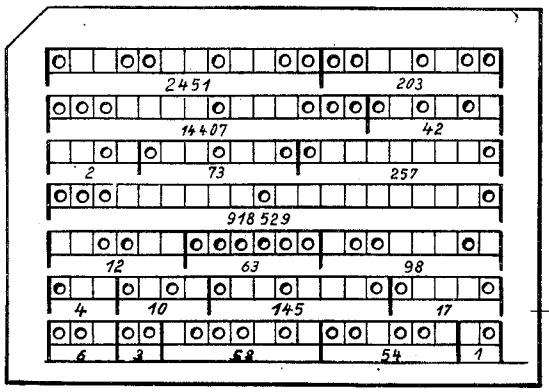
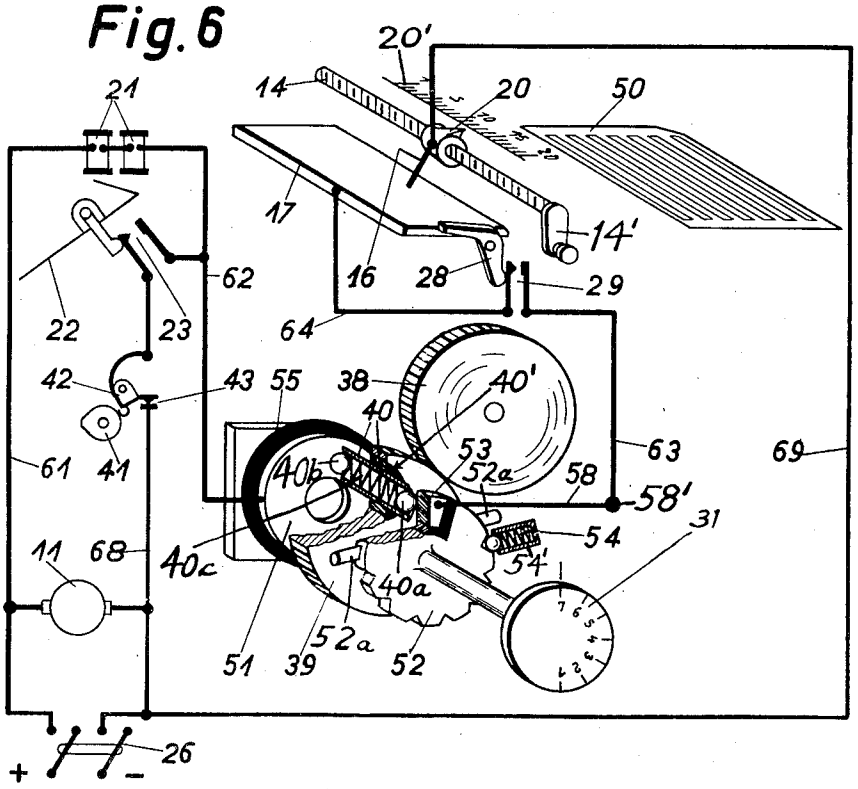


Fig. 5

Fig. 6



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SORTING MACHINE

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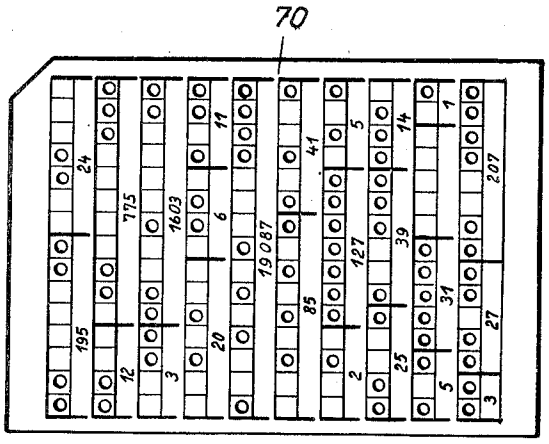
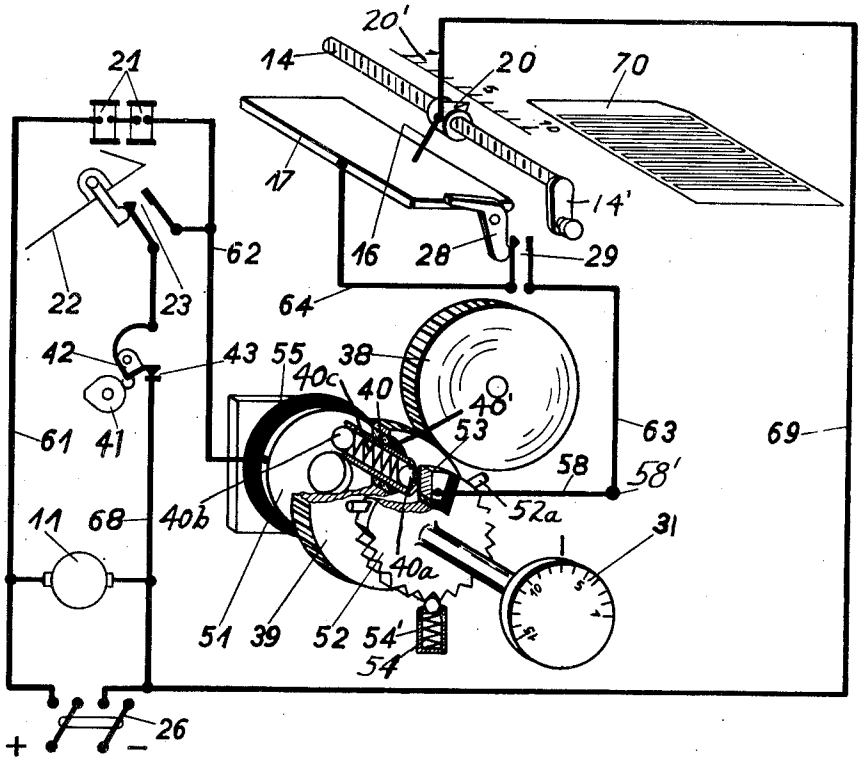


Fig. 7

Fig. 8



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Patented Jan. 19, 1943

2,308,927

UNITED STATES PATENT OFFICE

2,308,927

SORTING MACHINE

Michael Maul, Berlin-Johannisthal, Germany; vested in the Alien Property Custodian

Application May 11, 1939, Serial No. 273,016
In Germany May 28, 1938

1 Claim. (Cl. 209—110)

This invention relates to machines for sorting record cards.

A card sorting machine is one of the units of a card accounting system, and its general function is to sort cards according to characters designated on the cards. By a mode of using the sorting machine, a plurality of cards may be arranged in accordance with the ordinal sequence of values represented by characters on the cards. The characters may be designated by perforations to be analyzed electrically or mechanically, by conductive spots to be analyzed electrically, or by graphic representations to be analyzed by light reactive means. Sorting operations are usually effected in accordance with numerical characters in selected numerical fields of the card, and one or more sorting operations may be carried out to arrange the cards in accordance with the sequence of multi-denominational order numbers in such selected card fields. The known sorting machines are designed to operate on cards bearing representations of numbers in the decimal system. In order better to understand the purposes of the present invention, a general outline will first be given of the operations of the known sorting machine under control of decimal system numbers represented in numerical fields of the ordinary record card. The ordinary record card has, in each of parallel columns, index positions which may be perforated according to a selected code to represent any of the ten digits 0 to 9. Each column may be assigned to a different denominational or decimal order. If only a units order is to be represented, only a single column numerical field is needed. If a multi-denominational order number is to be represented, a plural column numerical field is needed, each such column corresponding to a different denominational order and being perforated to represent the digit in its denominational order. The sorting operation is usually effected under control of one card column at a time. In accordance with the analysis of the digit representations of a selected column of the cards, the sorting machine distributes the cards to ten different sorting pockets, each corresponding to a different digit 0 to 9. At the end of this sorting operation all the cards having the same digit in the analyzed column are in the same sorting pocket. If the cards are to be sorted in accordance with multi-denominational order numbers, each order of which is contained in one of the columns of a plural column numerical card field, the sorting operations are effected under control of one column after the other of the plural column field, starting with the units order column. For instance, a three order number, up to 999, is represented in a three column card field, each column bearing a different denominational order or decimal place of the number. To sort the cards according to the multi order numbers, the units order column is first analyzed, resulting in the separation of the cards into ten possible groups, each having cards with the same digit 0, 1, 2—8, or 9 in the units order column. The operator then arranges these individual groups into one stack by placing the 9 group at the bottom, the 8 group above the 9 group, and so on in inverse numerical order until the 0 group is on top. The sorting machine is then adjusted to operate under control of the tens order column, and the stack of cards, previously arranged in units order sequence, again run through the machine. The cards will be sorted during their second run into groups corresponding to the values in the tens order column, and, after this has been done, the operator stacks these separated groups once more in the above described manner. These sorting and stacking operations are repeated, sorting being effected each successive time under control of the next higher order column of the numerical card field until all the columns of the numerical card field have been analyzed. When the sorting under control of the highest order column has been completed and the resulting 0 to 9 groups stacked in the sequential order explained above, the cards will be found in numerical sequence according to the multidenominational order numbers of the selected card fields. Thus, considering numbers up to 999, the cards will be stacked in sequence, with the card on top having the lowest number and the bottom card bearing the highest number 999. If it should be desired to stack the cards in the reverse sequence, the operator after each sorting run, will place the 9 group above the 8 group, and so on.

The above described mode of sorting cards into numerical sequence is applicable generally to decimal system number representations, whether the representations be by perforations, by conductive spots, by graphical designations, or by any other known decimal system of representation. The decimal system uses the ten digits 0 to 9 and a denominational order or place value arrangement of the digits, each order or place value corresponding to a different power of the base number 10. The value in each denominational order is, in reality, the product of the corresponding power of 10 and the digit found in the order, and the magnitude of a number is the sum

of the denominational order values. For instance, in the decimal system:

$$67385=6\cdot10^4+7\cdot10^3+3\cdot10^2+8\cdot10^1+5\cdot10^0$$
$$=60000+7000+300+80+5$$

Instead of using the decimal system to represent a number, the binary system, discovered by Leibniz in 1690, may be used. The binary system differs from the decimal system in the use of only the two digits 0 and 1 and in each denominational order or place value corresponding to a different power of the base 2. In both systems, the magnitude of a number is determined by the digits of the system and their place value; i. e., the place in which the digit stands within the number. Thus, in the decimal system, to take another example:

$$431=4\cdot10^2(400)+3\cdot10^1(30)+1\cdot10^0(1)$$

In the binary system, this same number is represented as

110101111

which may be written as the addition of the different denominational orders thereof, thus:

$$1\cdot2^8+1\cdot2^7+0\cdot2^6+1\cdot2^5+0\cdot2^4+1\cdot2^3+1\cdot2^2+1\cdot2^1+1\cdot2^0$$

Converting each order into the decimal system of representation, the result is:

$$256+128+0+32+0+8+4+2+1=431$$

It is evident from the above comparison of the decimal and binary systems, that the binary system of writing requires a great many more places or denominational orders than the decimal system to represent the same numerical value. The binary system, on the other hand, has the advantage of requiring only the two digits 0 and 1 instead of the ten digits 0 to 9 of the decimal system, and, because of this fact, calculating operations based on the binary system may be considerably simplified. One application of the binary system of representation to a record card is disclosed in the British Patent 410,129 of Valtat. This card has columns or lines of index positions corresponding to different binary place values, and each such position may be referred to as a binary position, binary index mark position, or the like, while each line of such positions may be referred to as a binary line, binary index mark line, or binary line of writing or representation. A perforation in a binary position indicates digit 1, while the absence of a perforation indicates the digit 0. In this manner, a number may be represented, so to speak, by binary hole writing along different binary lines. A card may have a plurality of binary lines, each line representing only one binary number, or, if smaller numbers are required, each line may be divided into smaller sections, fields, or divisions, each individually bearing a binary representation of a number.

It may be stated now that the general object of the present invention is to provide sorting apparatus for sorting record cards on which numbers are represented in the binary system, as distinguished from the known sorting machines which are adapted to sort cards on which numbers are represented in the decimal system.

According to the present invention, a sorting machine is provided for sorting cards according to numbers represented in the binary system by perforated and unperforated index positions of binary lines. The invention includes means for selecting only one binary index position at a time to control the sorting machine. To select one binary index position of the cards for controlling sorting, the invention contemplates the provision of means to select one of several binary lines of the cards and also means to select one index position of the selected line. In accordance with whether the selected index position of a card is or is not perforated, the card will be sent to one of two different destinations, so that during a sorting operation, all cards having a perforation in the selected position will be placed in one group and all cards unperforated in the selected position will be placed in a different group. As an illustrative embodiment of the invention, the machine may have a selector for selecting any of the binary lines of writing on the card and a selector for selecting the index position of the line to control sorting. Further, the machine may have a sorting blade controlled according to whether the selected binary index position is blank or perforated to route the cards to one of two pockets, one corresponding to the 0 binary digit or blank position and the other to the 1 binary digit or perforated position.

Further, the present invention provides for the sorting of cards on which the binary lines are placed horizontally or at right angles to the direction of feed of the cards through the machine and for the sorting, alternatively, of cards on which the binary lines extend vertically or in the direction of card feed.

The specifically disclosed embodiments of the machine involve electrical analysis of the cards while in motion to control electrical means for positioning a card distributor. It will be clear, however, that equivalent non-electrical sorting apparatus may be devised to operate according to the principles herein disclosed.

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

In the drawings:

Fig. 1 is a vertical sectional view of the sorting mechanism which may be used with either embodiment of the invention,

Fig. 1*a* shows the card lever and contacts;

Fig. 2 is a rear view of the machine, with some of the parts in section,

Fig. 3 shows a binary line of writing, representing a single binary number,

Fig. 4 shows a binary line divided into sections, each bearing the representation of one binary number,

Fig. 5 shows a record card on which the binary lines of binary numbers extend horizontally,

Fig. 6 diagrammatically indicates the index position and line selector and circuit arrangement of the machine operating on cards of the kind shown in Fig. 5,

Fig. 7 shows a record card on which the lines of binary numbers extend vertically, and

Fig. 8 diagrammatically illustrates the index position selector and circuit arrangement of the machine for sorting cards of the kind shown in Fig. 7.

Binary index marking

Fig. 3 shows a binary line of index positions representing one number, with each index position corresponding to a different place value or power of 2, the power being indicated in each index box. Since each blank index position represents the digit 0 multiplied by a power of 2,

and since such product, in any case equals 0, the value of the binary line of writing may be obtained by adding only the powers of 2 of the perforated index positions. Thus, in Fig. 3, the value of the number is:

$$2^{14}+2^{10}+2^{9}+2^{5}+2^{3}$$

which may be represented in the decimal system as:

$$16{,}384+1024+512+32+8=17{,}960$$

In Fig. 4, the binary line is divided into three sections to represent three binary numbers. The left hand section is equivalent to

$$2^{7}+2^{4}+2^{1}=128+16+2=146$$

the marking in the middle section corresponds to $2^{1}=2$; while the marking in the right hand section corresponds to

$$2^{6}+2^{5}+2^{2}=64+32+4=100$$

The highest number which a binary field is capable of representing is obtained by perforating each index position of the field. Thus, by perforating all the index positions of the middle section of Fig. 4, the highest number obtainable is:

$$2^{2}+2^{1}+2^{0}=4+2+1=7$$

By perforating all the index positions of Fig. 3, the highest number which may be obtained is 1,048,575.

Mechanical construction of the machine

As shown in Fig. 1, the machine has only two sorting pockets 0 and 1 which correspond to the two digits of the binary system. The cards to be sorted are stacked in the supply hopper 10. Below the hopper is a drive motor 11 which acts through worm gearing 11' to rotate a shaft 36, connected through linkage 36' to a rocker arm 12' for periodically reciprocating card picker 12. The picker 12, during its forward stroke, feeds the bottom card out of hopper 10 and into the grip of a first pair of feed rolls 13, which continue the feed of the card through the analyzing station. Other pairs of feed rolls 13 feed the card from the analyzing station to the selected sorting pocket 0 or 1. The first pair of feed rolls is continuously rotated from the motor 11 through gearing which includes meshed gears 33 (see Fig. 2) on the shafts of the upper and lower feed rolls. The lower feed roll gear 33 is rigid with a gear 34 driven by a gear 38 on the previously mentioned shaft 36. Suitable gearing (not shown) between gear 38 and the second and third pair of feed rolls 13 is provided to continuously rotate the latter pairs of feed rolls.

The analyzing means comprises a single analyzing or sensing brush 16 adapted to engage, through a perforation in the card, with a contact plate 17 to establish the sorting or analyzing circuit, which will be traced later. The analyzing circuit, when established, energizes a sorting magnet 21 to rock its armature 22 counterclockwise (Fig. 1) to a position for intercepting the card to direct it into the 1 pocket to be supported by the spring-elevated stacker plate 24 within the 1 pocket. Thus, all the cards perforated in a selected index position will be directed to pocket 1. If the selected index position is blank, then an analyzing circuit is not completed, magnet 21 remains deenergized, and armature 22 stays in normal position, permitting the card to pass into pocket 0 to be supported by the stacker plate 24 thereof. Thus, all the cards blank in the selected index position are directed into pocket 0.

Only one binary index position of each card is selected during a single run of the cards through the machine for exercising sorting control. To confine the sorting control to one selected index position requires that the analyzing brush 16 be effective to analyze only this one index position so as to determine energization of sorting magnet 21 according to whether the selected position is or is not perforated. The means for selecting a single binary index position of each of the cards for exercising sorting control involves a selection of one of the binary lines of each of the cards and a selection of an index position along the selected binary line. One of the selections is effected by transverse adjustment of brush 16 to aline it with a vertical column of the cards. For this purpose, brush 16 is carried by a holder 15, of insulating material, which is part of a transversely slidable carriage 15'. The carriage 15' coacts with a screw shaft 14, one end of which has a crank handle 14' (see Figs. 6 and 8) for rotating the screw to adjust the carriage transversely and, thereby, to set the analyzing brush 16 in position for sensing a selected vertical strip, portion, or column of the card. A pointer 20 provided on the carriage 15' projects at its upper end through the cover plate c and coacts with a scale 20' of graduations (see Figs. 6 and 8). The machines shown in Figs. 6 and 8 respectively operate on the card 50 of Fig. 5 and the card 70 of Fig. 7, but are similar in all essentials with the exception of a few minor differences. Thus, in Fig. 6, the graduations of scale 20' correspond to the different index positions of the horizontally extending binary lines of binary number representations on the card 50 while in Fig. 8, the graduations correspond to the different vertically extending binary lines of writing of the card 70. The index positions of both types of cards 50 and 70 are closer together than the binary lines, so that in Fig. 6 the graduations of scale 20', corresponding to the index positions, are closer together than in Fig. 8 where the graduations correspond to the binary lines. In both the machines of Figs. 6 and 8, an additional selector, including a graduated dial 31 and a correspondingly notched disk 52, is provided. In Fig. 6, the additional selector selects one of the horizontal binary lines of the cards 50 to be operated on, while in Fig. 8, the additional selector selects one of the index positions of a vertical binary line of cards 70 to be operated on. Accordingly, in Fig. 6, the graduations of the dial 31, as well as the notches of the disk 52, corresponding to the different binary lines are further apart than in Fig. 8 where the graduations of dial 31 and the notches of the disk 52 correspond to the index positions of a binary line. It will be clear from the above explanation that to select an index position of the card 50 (Fig. 5) for analysis in the machine of Fig. 6, the analyzing brush 16 is adjusted transversely by operation of handle 14' into alinement with the column of corresponding index positions of the several horizontal binary lines. The selection of one binary line will then be effected, in a manner which will be explained later, by adjustment of dial 31. With the machine of Fig. 8, the transverse adjustment of brush 16 selects a vertical binary line of the card 70 of Fig. 7, while the adjustment of dial 31 selects a horizontal row of corresponding index positions. Aside from the above described differences, the machines of Figs. 6 and 8 are of the same con-

struction and operate similarly. In both the machines of Figs. 6 and 8, the two adjustments, one of brush 16 and the other of dial 31, combine to isolate one index position of one binary line of the cards to be effectively analyzed for controlling sorting operation.

The additional selector, referred to above as including the indicating dial 31, also includes a cover 30 (see Fig. 2) for the dial and which is provided with a sight opening to expose one dial number at a time. The exposed number, considering the machine of Fig. 6, corresponds to the selected binary line, and considering the machine of Fig. 8 corresponds to the selected column of index positions. Dial 31 is provided with a knurled hand knob 32 and is pinned to one end of a cross shaft 37, to the other end of which is pinned a contact assembly comprising the aforementioned notched disk 52 and an insulating disk 52' (see Fig. 2). Imbedded in the face of insulating disk 52' is a contact segment 53 connected by a cable wire 58 to a terminal post 58'. Rotatably mounted on the reduced end of shaft 37, adjacent to the contact assembly 52—52'—53, is a gear 39 provided, off center, with an insulating sleeve 40' containing the conductive tube 40. Within tube 40 are two feelers, in the form of contact balls 40a and 40b, which are held by a spring 40c at opposite sides of the tube, with a portion of each ball projecting externally of the adjacent tube end. The ball 40a is thus held by spring 40c in position to wipe contact segment 53 during rotation of gear 39. The other ball 40b is adapted to wipe the face of a fixed contact ring 51. The contact ring 51 is imbedded in the face of an insulating disk 55 fastened to the upper end of frame standard 49.

Gear 39, carrying the feeler balls 40a and 40b, is meshed with the previously mentioned gear 38 which is fast to shaft 36 driven by motor 11. Gear 38, as explained before, also actuates the feed rolls 13 while the card picker 12 is actuated by connections from shaft 36. Since gear 39 and the card feeding means are driven from the same shaft 36, the rotation of gear 39 is in synchronism with the feed of the cards past the analyzing brush 16. The period between the arrival of the corresponding leading edges of successive cards at the analyzing brush may be considered as the card cycle. The gear 39 is geared to shaft 36 to make one revolution each such card cycle, so that feeler 40a, carried by this gear, moves in synchronism with the travel of one card past the brush 16 during the cycle.

Referring to Figs. 5 and 6, as gear 39 rotates synchronously with the feed of the card past the brush 16, the feeler ball 40a carried by gear 39 moves in step with the passage of the successive binary lines of card 50 past the analyzing line. The contact segment 53 (Fig. 6) may be adjusted to a position corresponding to one of the seven horizontal binary lines of the card 50. Thus, as the selected binary line of a card reaches the analyzing line, the feeler ball 40a will wipe the contact segment 53. The adjustment of the segment 53 to the position corresponding to the desired binary line is effected by the turning of knob 32 to rotate shaft 37 until the dial number designating the desired binary line of cart 50 is exposed through the sight opening of the cover 30. This sets the contact segment in the position corresponding to the selected binary line, and the setting is maintained by coaction of impositive lock 54 with a notch of disk 52, the notches being spaced correspondingly to the numbers on dial 31. With segment 53 adjusted to a selected binary line position, the feeler 40a of gear 39 wipes the segment at a differential point of the card cycle during which the selected binary line of the card of Fig. 5 traverses the analyzing line. The engagement of the feeler 40a with segment 53 permits the circuit of sorting magnet 21 to be established should the analyzing brush 16 find a perforation in the selected index position or place value position of the selected binary line. The selection of the index position or place value position along the selected line of the card of Fig. 5 is effected, in the manner previously explained, by the transverse adjustment of brush 16.

Referring to the machine shown in Fig. 8, each position of adjustment of the segment 53 corresponds to a different horizontal row of corresponding index positions of the card 70 of Fig. 7. Thus, when the shaft 37 is adjusted to bring the 14th graduation into view through the sight opening of the cover 30, the segment 53 is set in the position corresponding to the row of "14" index positions of the card 70. Since gear 39 is rotating in synchronism with the card travel past the brush 16, the feeler 40a carried by the gear 39 will wipe the segment 53 as the selected "14" index position row of the card 70 traverses the analyzing line. The selection of the vertical binary line of which the 14th index position is to effect sorting is made, as described before in connection with Figs. 7 and 8, by the transverse adjustment of brush 16.

By these two adjustments, one of the shaft 37, and the other of the brush 16, a single binary index position of each card is selected for analysis. In both the machines of Figs. 6 and 8, the adjustment of the shaft 37 selects a horizontal strip of each card, while the adjustment of the brush 16 selects a vertical strip of each card, both adjustments combining to select a single index spot, position, or area of each card to be analyzed.

To prevent the operator from turning shaft 37 through a complete revolution, with possible damage to cable 58, a pair of stop pins 52a on the periphery of notched disk 52 are provided to abut the casing 54' of the impositive ball lock 54.

A cam disk 41 is fixed to the right hand end of card cycle shaft 36 (see Fig. 2) to operate an impulse emitter 42 carried, through insulation, by the frame bracket 45. The impulse emitter comprises the contacts 43 (see Figs. 6 and 8) which are opened by cam 41 once each card cycle as the leading edge of the card analyzed during the cycle passes the right hand end of the card deflecting blade portion of armature 22 (see Fig. 1).

Referring to Fig. 1a, the usual card lever 28 is provided which is held by a card feeding through the analyzing station in position to keep card lever contacts 29 closed. When the cards are exhausted or fail to feed through the analyzing station, contacts 29 open to prevent making of the analyzing circuit.

Circuits and operation

Referring to Figs. 5 and 6, the cards 50 have parallel horizontal binary lines, each with twenty index positions 1 to 20. The binary lines may be divided into sections, the index positions of which are selectively perforated or left blank to represent desired binary numbers, the decimal system equivalents of which are written below each section. As may be understood from Figs. 3 and 4, the lowest place value position is the

right hand index positon of each binary section and the index positions to the left correspond in succession to progressively higher value place positions. Assuming that the cards are to be sorted in accordance with the ordinal value sequence of the binary numbers in the third section from the left of the seventh binary line, the operator first turns shaft 37 (Fig. 6) to bring the "7" graduation of dial 31 into view at the sight opening of cover 30. This sets the contact segment 53 in position to be wiped by feeler 40*a* as the 7th binary line of each of cards 50 traverses the analyzing line. The third section from the left of the 7th binary line includes index positions "6" to "12," with the position "12" corresponding to the lowest order binary place position. To sort the cards into numerical sequence, the place value positions of the desired section must be analyzed during successive runs of the cards through the machine, starting with the lowest order value place position. The operator, having selected the 7th binary line by adjustment of shaft 37, then turns handle 14' (Fig. 6) until the pointer 20 is opposite the "12" graduation of scale 20', thereby setting the analyzing brush 16 in position to analyze the "12" index positions of the cards. However, due to selection of the 7th binary line, only the "12" position of the 7th line will be effectively analyzed during the feed of the cards through the analyzing station. Assuming that a card 50 is blank in the "12" position of the 7th line, then the card will pass to the 0 sorting pocket. If a card 50 has a perforation in the "12" position of the 7th line, then the perforation reaches brush 16 at substantially the same time as ball 40*a* engages the contact segment 53. Accordingly, the following circuit is established (see Fig. 6):

Analyzing or sorting circuit.—From the positive side of the supply, through one side of main switch 26, through line 61, the sorting magnet 21, line 62, stationary contact ring 51, ball 40*b*, ball 40*a*, segment 53, cable 58, terminal post 58', line 63, card lever contacts 29, contact plate 17, analyzing brush 16, and, through line 69 and the switch 26, to the minus side of the supply.

The above circuit energizes sorting magnet 21 to rock its armature 22 into card intercepting position. To hold the armature 22 in actuated position until the card reaches it, a holding circuit for magnet 21, operable after the perforation leaves the brush 16, is established. For this purpose, a portion of armature 22, when rocked counter-clockwise (Fig. 1) into card intercepting position, closes a switch 23 to shunt the analyzing means and the selector 40*a*—53 through contacts 23, impulse emitter contacts 43 (now closed), and line 68. This shunt circuit remains in operation until contacts 43 are opened by cam 41 after the card is deflected by armature 22 into the 1 pocket.

In the above manner, all the cards 50 perforated in the "12" position of the 7th binary line will be grouped in pocket 1 while the cards blank in this position will be grouped in pocket 0. The operator now stacks the cards of pocket 0 above the cards of pocket 1 and places the combined stack of cards in hopper 10.

Having sorted the cards 50 according to the marking of the "12" index position or lowest value place or 2^0 position of the desired binary section of the 7th line (positions 6 to 12), the next higher value place or 2^1 position, which is the "11" index position, must next be analyzed to control sorting. Accordingly, leaving the segment 53 in the previously set 7th line position, the operator now turns handle 14' to adjust the brush 16 to the "11" value place, as indicated by coaction of pointer 20 with scale 20' (Fig. 6). During the second run of the cards, all the cards perforated in the "11" position of the 7th line will be grouped in pocket 1 and the cards unperforated in this position will go to pocket 0. The cards are then restacked as before with the cards of the 0 pocket above the cards of the 1 pocket. Similar sorting and stacking operations are effected in succession until the "6" position or highest place value of the section "6" to "12" of the 7th line has been analyzed. After the last sorting operation, when the cards of the 0 pocket are placed above the cards of the 1 pocket, the cards will be found to be in a sequence corresponding to the value sequence of the binary numbers of the selected section of the cards. Thus, at the bottom of the stack will be found the cards having the highest binary number in the selected section; i. e., the cards perforated in all the index positions or value places of the selected section and on the top will be found the cards not punched at all or only in the first place value position, 2^0, designating value 1. The intermediate cards will be arranged in sequence between the lowest binary number and the highest.

The machine of Fig. 8 functions similarly to the machine of Fig. 6, but since the machine of Fig. 8 operates on the cards 70 (Fig. 7), the transverse adjustment of brush 16 selects the binary line while the successive adjustments of shaft 37 select successively higher place value index positions of the selected binary line to be analyzed in succession. The manner in which the cards are arranged in sequence by the machine of Fig. 8 is the same as described in connection with Fig. 6. Thus, the lowest place value of the selected binary section will first be analyzed, then the next higher value place, and so on.

Motor 11 is across the lines 61 and 68 of opposite polarity, and the motor circuit is established by closing main switch 26 and broken by opening the main switch.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to two modifications, it will be understood that various omissions and substitutions and changes in the form and details of the devices illustrated and in their 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 claim.

What is claimed is:

A machine to sort records according to binary number representations, each record having parallel lines of binary number place positions, a perforation in a position designating the presence of the base value therein and the lack of a perforation designating absence of the base value in the place position, comprising electrical sensing means for sensing only one selected position in one selected line of each record, a pair of successively disposed receiving pockets for the records, a deflector at the first pocket, a magnet effective when energized to place the deflector in the path of a record to deflect it into the first pocket, drive mechanism, feeding mechanism operated thereby for continuously feeding a record past the sensing means and to the first and second pockets in succession, a line selector

including a rotary contact element, means operated by the drive mechanism for rotating said contact element in synchronism with the record feed, a single contact segment and a carrier therefor mounted for rotation coaxially with but independently of the contact element, a line indexing member rigidly connected to the contact segment and manually rotatable to a desired line index position for rotatively adjusting the contact segment to a corresponding line position in which it is engaged, while stationary in the selected line position, by the contact element concurrently with the arrival of the corresponding line of the record at the sensing means, means for manually adjusting the sensing means parallel to the direction in which the lines of the record extend to select a desired position of the selected line to be sensed, a pickup circuit for energizing said magnet closed upon the sensing means sensing a perforation in the selected position of the selected line of the record concurrently with the engagement of the contact segment by the contact element, whereby the deflector is placed by the energized magnet in the path of the record to deflect it into the first pocket whereas other records lacking a perforation in the selected position of the selected line will proceed to the second pocket, and a holding circuit for the magnet including stick contacts operated thereby upon energization and a circuit breaker for maintaining the magnet energized and the deflector in operated condition until the record has moved from the analyzing means into the first pocket.

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