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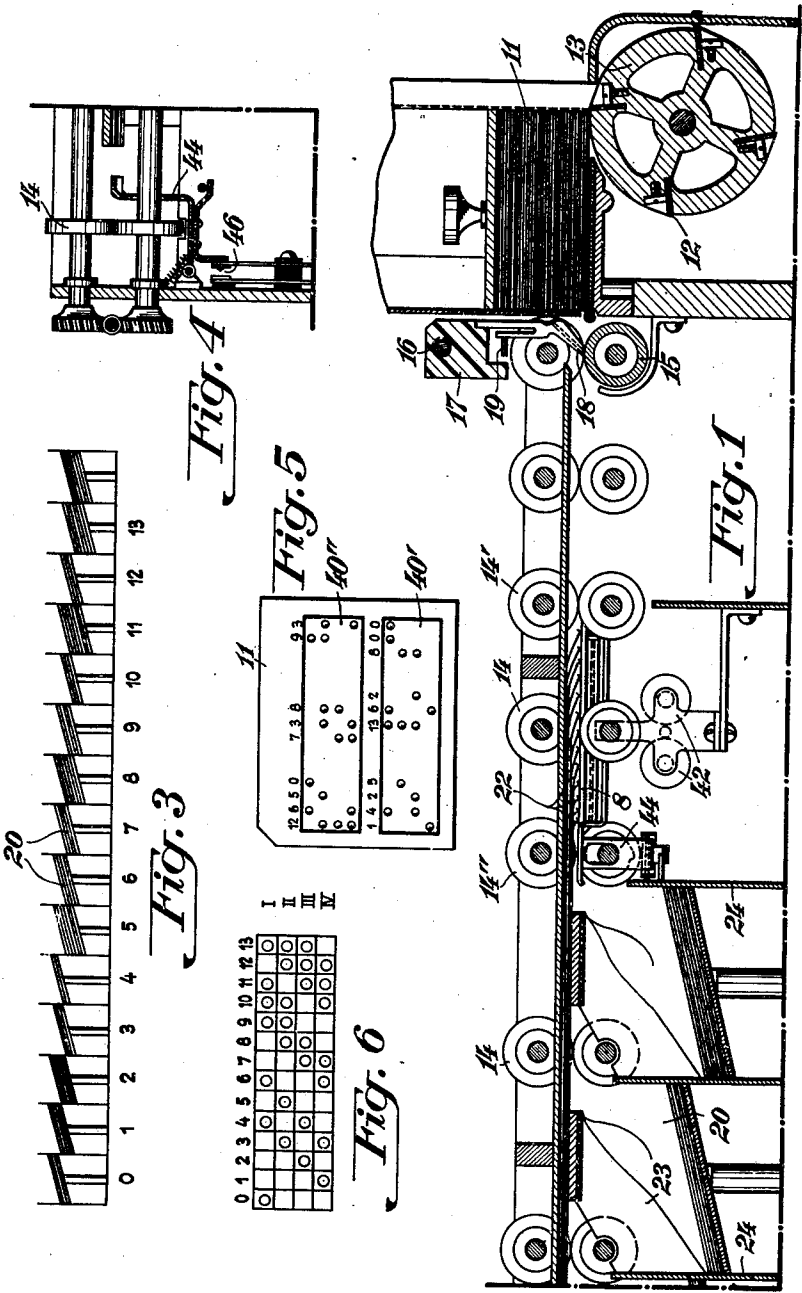
M. MAUL

2,025,602

SORTING MACHINE FOR RECORD CARDS

Filed Jan. 6, 1932

3 Sheets-Sheet 1



Inventor:
Michael Maul

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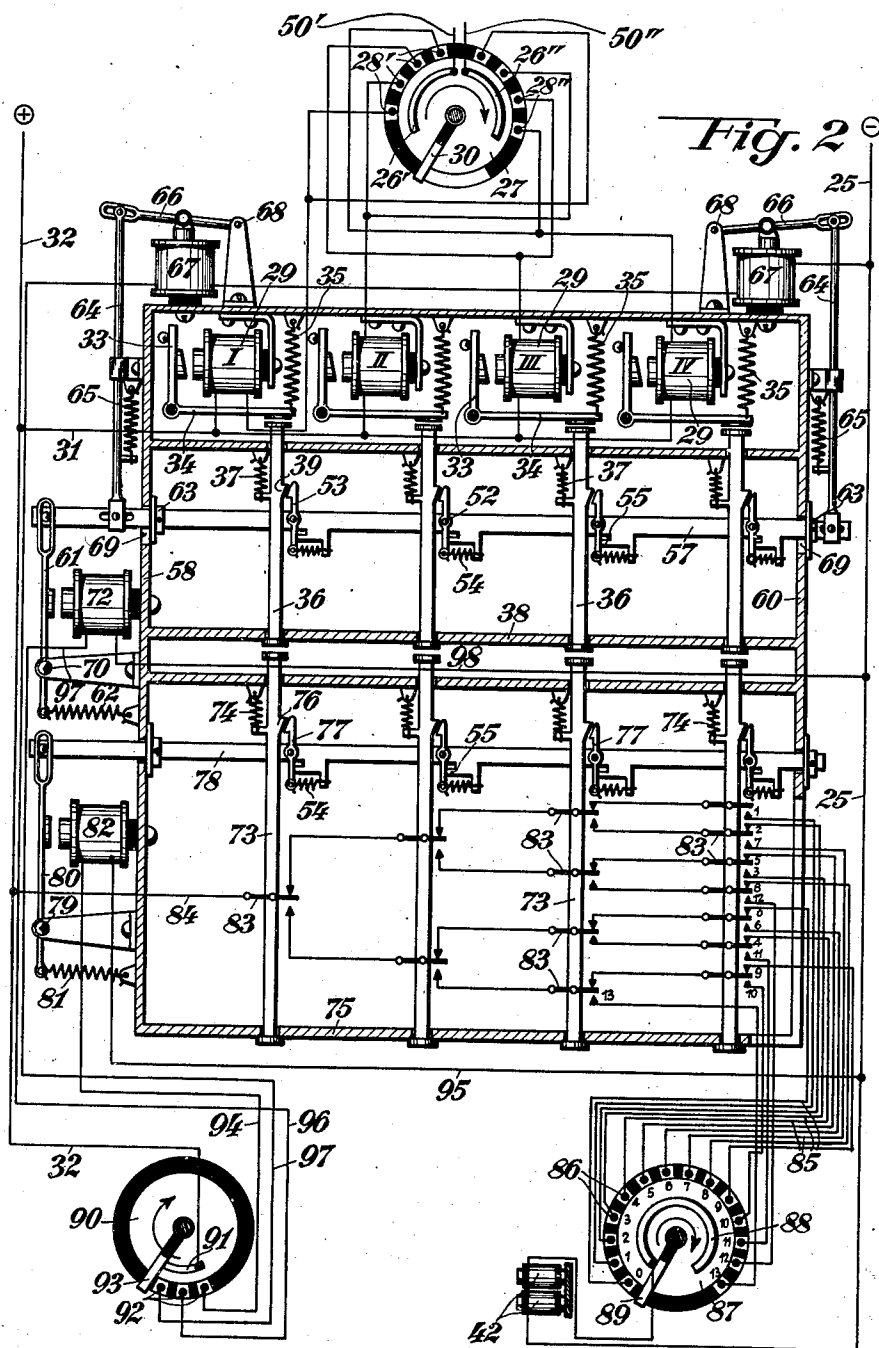
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3 Sheets-Sheet 3

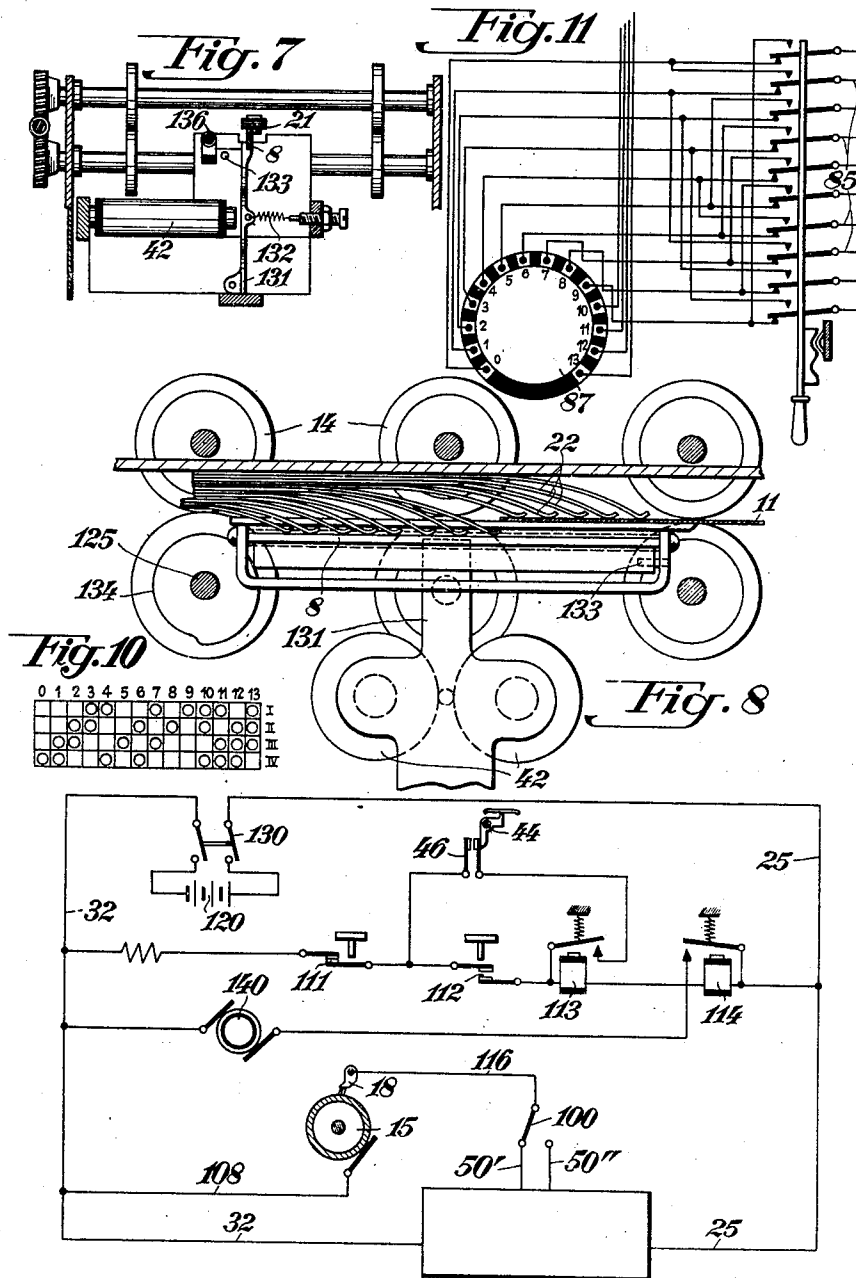


Fig. 9

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UNITED STATES PATENT OFFICE

2,025,602

SORTING MACHINE FOR RECORD CARDS

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12 Claims. (Cl. 209—110)

The present invention relates to sorting machines for perforated record cards and more particularly for record cards having a plurality of superposed record decks, each deck comprising a plurality of adjacent record columns, wherein the sorting operation takes place in a later machine cycle than the analysis of the record perforations.

It is one of the main objects of the invention to provide an improved sorting machine of the type referred to wherein only two sets of storing devices are necessary for retaining the result of the analysis, which sets are common to said plurality of record decks and which may be selectively rendered responsive to a record column in any one of said record decks.

A further very important object of the invention is to make provision in a sorting machine of the type referred to for selectively changing the controlling action of the record card perforations upon the sorting mechanism to control the latter in the same manner under the control of different perforations.

A further object is to provide in a machine of the type indicated common analyzing means for a plurality of record decks.

Still another object is to provide a machine of the type indicated which is adapted to operate upon combinational holes record cards.

Another important object of the invention is to provide a machine of the type indicated wherein one set of said storing devices is in each machine cycle under record card control while the other set controls the sorting mechanism, and wherein between subsequent sorting operations the latter set is adjusted by the first mentioned set.

Other objects and advantages of the invention will be seen from the following specification and claims.

The invention may be embodied in various ways as well electrically as mechanically, and the electrical sorting machine which will now be described represents only a preferred embodiment of the invention.

In the drawings:

Fig. 1 is a section through a sorting machine according to the present invention, permitting sorting of cards having a plurality of hole combinational record decks.

Fig. 2 shows the set-up and translator mechanism which is under the control of the hole combinations and which is adapted to control the sorting chutes.

Fig. 3 shows diagrammatically the arrangement of the sorting boxes of the sorting machine;

as will be seen there are 15 sorting boxes provided, one for the perforation 0, thirteen sorting boxes for the numerical perforations 1 to 13, and one special box for imperforate cards.

Fig. 4 shows in an enlarged scale a section through the sorting machine, illustrating the known card lever contact.

Fig. 5 shows in a reduced scale a record card having an upper and lower hole combinational record deck.

Fig. 6 shows the scheme or key according to which the cards in Fig. 5 are perforated.

Fig. 7 shows in an enlarged scale a vertical section through the sorting entrances of the sorting machine.

Fig. 8 shows also in an enlarged scale a longitudinal section through the terminals of the sorting chutes.

Fig. 9 shows the circuit diagram of the sorting machine.

Fig. 10 shows another hole combinational key according to which cards as shown in Fig. 5 may be perforated.

Fig. 11 shows a switch mechanism through which cards can be directed into the same sorting boxes depending upon the fact whether they are perforated according to one of the keys shown in Fig. 6 or in Fig. 10.

In the sorting machine shown in Fig. 1 the cards are fed by means of the knives 12 of the feeding drum 13 from the stack 11 to the left past the analyzing brush 18 which will contact the contact roller 15 upon the passage of a hole. The brush 18 is fastened on a brush holder seated on the insulating block 17 which is movable laterally along the worm 16 in order to permit adjustment of the analyzing brush upon different record columns. The brush holder of the brush 18 slides along a contact bar 19 serving as current supply bar for the brush. The cards are fed by the feed rollers 14, 14', 14'' and the sorting mechanism still to be described to the sorting boxes 20. The sorting chutes 21 terminate in the known manner on the holders 23 arranged on the walls 24 and their front terminals 22 are arranged in overlapping relation and form the entrances for the record cards to the sorting boxes. Provision has been made in such a way that the width of the sorting boxes 20 corresponds about to the width of the card while the distance between the first and the third (14') and the third (14') and the fifth pair of rollers 14'' (counted from the right) corresponds to one complete machine cycle and this distance is, of course, somewhat larger than the width of the card in feeding

direction due to the distance between two subsequent cards. Therefore, the card will run during one operating cycle from the rollers 14' to 14'' and during that period the sorting chutes 21, 22 are controlled in accordance with the meaning of the previously analyzed hole combination. Though the sorting chutes are controlled in a generally well known manner, I will briefly explain said control in connection with Figs. 7 and 8. The terminals of the sorting chutes 22 engage an angle plate 8 being movable in downward direction in a slot and being normally held in its upper position by a pivotally mounted arm 131 in such a manner that the card 11 will move between the fingers 22 and plate 8. The plate 8 is pivotally mounted at 136. If the sorting magnet 42 is energized and draws the arm 131 to the left against the tension of the spring 132, the resilient fingers 22 will follow the downward movement of the plate 8 as will be seen from Fig. 8 provided that there is no card 11 between the fingers 22 and plate 8. If a card has been fed past the fingers, as in Fig. 8, a separation will be effected between the fingers lying upon the card and those which rest still on the plate 8, and the card will therefore be guided in the corresponding entrance and will then be fed by the feeding rollers into a box corresponding to the meaning of the analyzed hole combination. Fig. 4 shows the well known card contact 46 being under the control of the card lever 44. As long as cards are running one by one through the machine the lever 44 will be pressed by said cards downwardly and will hold the contact 46 closed so that the operation of the machine will be automatically maintained and will be automatically interrupted after exhaustion of the card supply.

The operation of the machine is now generally as follows: upon the passage of a card past the analyzing brush 18 and depending upon the adjustment still to be described to one of a plurality of decks, analysis of the selected column of said deck takes place and the result of said analysis is adjusted in the set-up mechanism. At the end of the first operating cycle the adjustment of the set-up mechanism will be transferred to the translator and if then during the following machine cycle the card passes beneath the sorting fingers 22 the translator will cause the control of the fingers in accordance with the meaning of the analysis; the result of said analysis is transferred between two operating cycles from the set-up mechanism to the translator mechanism so that always during the one operating cycle the analysis of a card can be effected while simultaneously i. e. during the same operating cycle sorting of the preceding card will take place.

From the supply line bar 19 of the analyzing brush 18 leads a line 116 (Fig. 9) to a switch 100 being connected either to a line 50' or to a line 50'' leading to the mechanism shown more in detail in Fig. 2. If the upper hole combinational deck shall be analyzed this switch is adjusted as shown in Fig. 9 in the left hand position while when sorting according to a column of the lower record deck, the switch must be adjusted in the right hand position. The cards are running through the machine in such a manner that the cut-away upper corner of the card shown in Fig. 5 is leading so that the hole positions (Fig. 6) are analyzed in the sequence I, II, III and IV (at first the upper and then the lower deck) and accordingly control of the mechanism still to be

described will be effected. The lines 50' and 50'' lead to a commutator generally indicated at 27 (Fig. 2) whose contact arm 30 rotates once in each machine cycle. During said rotation the arm conducts all contact pieces 28' one by one to the contact strip 26' and then all contact pieces 28'' one by one to the strip 26''. However, a connection with the analyzing brush is only effected depending upon the position of the switch 100 so that a current will flow from the contact roller 10 15 (Fig. 9) to one of both lines 50' or 50'' i. e. depending upon the position of the switch 100 either the upper or the lower record deck is ineffective while the other deck is adapted to release controlling impulses adapted to control the 15 sorting operation. The contact pieces 28', 28'' are arranged in such a way that they are connected by the arm 30 with their coordinated contact strip if the corresponding hole positions of the record columns of both decks pass beneath 20 the brush. Consequently, depending upon the selection of one of both decks and the perforation in the selected column of said deck, a current will flow through the magnets 29 which are parallelly arranged to the contact pieces 28', and 25 said current will energize the magnets 29 thereby causing adjustment of the set-up mechanism.

Now, in connection with Fig. 2 I will describe the above mentioned set-up mechanism as well as the known translator mechanism for hole combinations. As has been mentioned before, a complete machine cycle lasts a little longer than corresponds to the passage of the record card shown in Fig. 5 past the analyzing brush 18. During this machine cycle the contact arm 30, shown in 35 Fig. 2 in its normal position, rotates synchronously with the passage of the card past the analyzing brush 18 and if the hole positions of the card pass beneath the brush 18, the contact pieces 28 will be connected in accordance with 40 the passage of said positions under the brush by the arm 30 one by one with the contact strips 26. Each hole in a certain position of a selected deck will release a current impulse leading from line 116 over 100, 50' or 50'', 26' or 26'', contact 28 45 and the magnet 29 inserted in the circuit in this moment, and then over the common back line 31 of all magnets to the left side 32 of the current source. It will be clearly seen that after a record column has passed under the brush 18, the 50 magnets 29 of the same roman numeral meaning will have been energized as indicated by the perforated positions of the respective column of the selected deck. Each magnet 29 controls a bell crank lever 33, 34 which is held by a spring 55 35 against a stop as illustrated in the drawings. Each arm 34 of a bell crank lever has a bar 36 coordinated thereto slidably mounted in a casing and drawn by a spring 37 with its lower end against the bottom plate 38 so that the bar is 60 normally held in the position illustrated in the drawings. Each bar 36 has a catch lip 39 which is just above a pawl 53 pivotally mounted at 52. The pawl 53 is drawn by a spring 54 against a stop 55 as may be seen from the drawings. All 65 pawls 53 of a record column are mounted upon a common bar 57 extending through the side walls 58, 60 to the outside of the casing. The bar 57 is normally drawn to the left by lever 61 and spring 62 so that the flanges 63 engage the walls 70 58 and 60. The bar 57 is also connected on each of both ends by means of pin and slot connections with bars 64 drawing the bar 57 by means of springs 65 upwardly. The bars 64 are connected by pin and slot connections with (at 68) pivotally 75

mounted armatures 66 of solenoids 67. If both solenoids 67 are simultaneously and instantaneously energized, the bars 64 are moved downwardly and consequently also the bar 57 will be moved downwardly in the slots 69 of the walls 58 and 60 and will return again to its home position under the influence of springs 65 if the magnets 67 are deenergized. The lever 61 being pivotally mounted at 70 is rocked in clockwise direction upon energization of magnet 72 and thereby the bar 57 is moved to the right and the slots of the same move in the lower pins of the bar 64.

The mechanism which has now been described, comprising the bars 36, pawls 53 etc. represents the set-up mechanism proper which is adapted to cooperate with the storing or translator mechanism now to be described. The translator mechanism comprises four bars 73 being coordinated to the set-up bars 36. The bars 73 are guided in slots of the translator casing and are drawn by springs 74 with their lower ends against the bottom plate 75 and are thus held in the position illustrated in the drawings. In a similar way as has been explained in connection with the set-up mechanism, each bar 73 has a catch lip 76 adapted to cooperate in a similar way as above described with a pawl 77. The pawls 77 are mounted upon a common pawl carrier 78 guided in slots of the walls 58, 60 and being normally drawn under the influence of a spring 81 to the left by means of a lever 80 pivotally mounted at 79. The bar 78, however, is (contrarily to the pawl carrier 57) movable only in horizontal direction and is moved to the right upon energization of magnet 82. The bars 73 are provided in a known way with a number of shift contacts 53 which are adapted to select (depending upon the adjustment of the bars 73 in different combinations) a single live line between the line 84 and one of the lines 85. The ends of lines 85 are connected with contact pieces 86 of a commutator being generally indicated at 87; the contacts 86 are equally spaced upon the circumference of the commutator 87 corresponding to one complete machine cycle, however, between the first and last contact piece there is a certain blank space corresponding to the distance between two subsequent cards. The sorting magnet 42 is connected to a contact strip 88 of the commutator 87. The commutator 87 includes a contact arm 89 rotating once during each machine cycle synchronously with the passage of the card under the brush and thereby connecting the contacts 86 one by one with the contact strip 88. Since the bars 73 are then adjusted in different combinations depending upon the analyzed hole combination as will still be described, a live line 85 will therefore be selected corresponding to the meaning of the hole combination. If the arm 89 slides over the contact piece 86 of the selected line 85, in the same moment a current impulse will be sent through magnet 42 and since the previously analyzed card moves past the sorting fingers 22 (Figs. 1 and 8) synchronously with the arm 89, the plate 8 will be released in a moment corresponding to the meaning of the analyzed hole combination and consequently the plate will be lowered and the card will be fed into the corresponding sorting entrance.

For the control of magnets 67, 72 and 82 there is a commutator 90 provided having a contact strip 91 and three adjacent contact pieces 92. The arm 93 of said commutator which is shown in Fig. 2 in its normal position, rotates syn-

chronously with the arms 30 and 89 of the two other illustrated commutators and, as will be clearly seen from the drawings, said arm connects during the blank space between two subsequent machine cycles at first the right, then the middle and finally the left hand contact piece 92 with the contact strip which is connected to the left side 32 of the current source. The right hand contact piece 92 is connected over line 94 to the magnet 82, the back line 95 of which leads to the right hand side 25 of the current source. The middle contact piece 92 is connected over line 96 with two magnets 67 being in series, said magnets being also connected to the right hand side 25 of the current source. The left contact piece 92 is connected over line 97 to the magnet 72 having a back line 98 leading also to the right hand side 25. During the synchronous movement of all commutator arms 30, 89 and 93, the contact arm 89 will analyze the contacts 86 during the whole machine cycle while about in the first or second half respectively of the machine cycle the contacts 28 (corresponding to the arrangement of the hole positions upon the card according to Fig. 5) are analyzed by the contact 25 arm 93 and during the period between two subsequent machine cycles the contact arm 93 will energize at first the magnet 82, then over line 96 the two magnets 67 and thereupon the magnet 72.

Now the operation of the various parts will be explained more in detail in connection with the operation of the whole machine. If the machine is in normal position all parts are in the position as shown in Figs. 1 and 2. If the machine is then started and the respective hole combination column of the first record card passes under the brush 14 the arm 30 will connect the contacts 28 one by one and the magnets 29 will be instantaneously energized in accordance with the passage of the holes of a column of the selected deck under the brush. Through this energization the coordinated bell crank levers 33, 34 will instantaneously be rocked in clockwise direction thereby pressing their control bars 36 downwardly; the lip 39 of each bar snaps then behind the latch 53 so that the bar will be retained if the arm 33, 34 returns to its normal position under the influence of spring 35. At the end of the passage of a hole combination past the analyzing brush 14 the control bars 36 will therefore be adjusted or set up in the same way, i. e. either singly or in different combinations as determined by the holes of the record column which has passed under the brush. As has been already mentioned, the magnets 29 may be controlled selectively by the upper or lower deck, depending upon the position of the switch 100. During the first machine cycle, however, also the arm 39 has been rotated and the contacts 86 will have been analyzed one by one. Since, however, the translator bars 73 remain during this cycle in their illustrated home position in which no connection between line 84 and any one of the lines 85 is established, the magnet 42 will receive no current impulse during the first cycle so that the machine performs an idle cycle. An actuated cross bar 36 is pressed by its magnet 29 so far downwardly and is held by the latch 53 in such a position that its lower end is just above the head of the coordinated bar 73, however, without engaging the same so that the respective bars 73 are not influenced by the movement of bars 36 which is due to the energization of magnets 29.

Now, at the end of the first machine cycle and before the beginning of the second machine cycle the three contacts 92 of the commutator 90 will be connected one by one with the contact strip 91; this causes at first a current impulse over line 94 to the magnet 82 thereby energizing the same and moving the pawl carrier 78 to the right. This movement serves to release all control bars 73 which have been latched in the previous machine cycle. Since, however, during the first machine cycle no control bars 73 have been adjusted there will also be no release in this moment and the movement of the bar 78 to the right at the end of the first machine cycle will be an idle movement. Thereupon the two magnets 67 will be simultaneously energized over line 96 thereby moving the control bar 57 downwardly by means of bars 64. It has already been explained that the bars 36 are kept in latched position in a combination corresponding to the hole combination punched in the column of the preceding card and that the lower ends of the actuated set-up bars are just above the heads of the coordinated bars 73 while the bars 36 which have not been set up will remain in their illustrated position. Consequently, if bars 57 are moved downwardly, they will also move their coordinated translator bars 73 downwardly which will then be held latched in the lower position by the pawls 77. If therefore after deenergization of the magnets 67 the control bar 57 has again returned to the illustrated position, the adjustment of the bars 36 will have been transferred to the bars 73 and these bars are then adjusted in the same way as determined by the hole combination which has passed under the brush. In accordance with the adjustment of bars 73 a current circuit will be selected over one of the lines 85, said circuit corresponding to the meaning of the analyzed hole combination; however, this circuit will not yet be effective since there is no conducting connection between the contacts 86 and the contact strip 88. Upon the further movement of arm 93 between two subsequent machine cycles the magnet 72 will be energized over line 97 and consequently the control bar 57 will be moved to the right; the bar 57 is held during said movement in the illustrated horizontal position by bars 64. Consequently to their movement to the right, the pawls 53 are disengaged from the noses 39 so that all latched bars 36 are permitted to return under the influence of springs 57 to normal position. It will be clearly seen that before the beginning of the second machine cycle the translator bars 73 are adjusted in accordance with the hole combination of the column of the selected deck of the preceding card and that the set-up bars 36 are in their normal position in which they are ready to be set up by the hole combinations of the following card. Now, during the second machine cycle, exploitation of the adjustment of the translator is effected by the arm 89 and it will be clearly seen that for this exploitation the whole machine cycle is available. During the second machine cycle the magnet 42 will therefore be controlled in a sense corresponding to the meaning of the analyzed hole combinational column of the preceding card and during the same machine cycle the commutator 27 effects the control of the set-up bars 36 corresponding to the hole combination of the second card which now follows.

These operations will now cyclically continue as long as cards are passing through the machine,

i. e. during one machine cycle the translator bars 36 are adjusted in accordance with a hole combination; at the end of this machine cycle the bars 73 are released by magnet 82 from the previous adjustment and thereupon the adjustment of the set-up bars 36 is transferred to the bars 73 (the new adjustment of which is then exploited during the following machine cycle) and after the transferring operation the bars 36 are released to free the same for the set up by the following hole combination. If the card supply is exhausted the machine is automatically stopped in the described manner; a further machine cycle will then be necessary in order to exploit the adjustment of the translator from the last card; for this purpose the stop key may again be depressed after the automatic stop in the generally known way or a retarding mechanism may be coordinated to the machine holding the same in operation for one machine cycle longer.

The circuit diagram of the machine is shown in Fig. 9. The machine is connected by the main switch 130 with the current source 120 so that to the lines 32, 25 the following circuits are parallelly connected: From the line 32 leads a line 25 over the stop contact 111, start contact 112, relay 113 and relay 114 to the right hand side 25. The start contact 112 is bridged by the contact 46 held closed by the lever 44 when the machine is in operation. The motor 140 is connected by the relay 114 to the lines 32 and 25. From the left side 32 leads also a line 108 to the current supply brush sliding upon the contact roller 15, and the analyzing brush 18 is connected through a line 116 to the switch 100. The lines 50' and 50'' lead to the mechanism shown in Fig. 2 more in detail which has already been described; said mechanism controls the sorting operation in the described manner.

In order to start the machine for operation, the contact 112 is closed by the start key so that the relays 113 and 114 become energized, the latter being adapted to close the motor current circuit. The start key must be depressed long enough until the contact 46 has been closed by the first card which contact will then remain closed so that a current circuit will be established over the contact 46, armature of relay 113, through said relay 113 and relay 114 which circuit will thereupon remain energized. During the passage of the first card past the analyzing brush the set-up mechanism will be adjusted, depending upon the selection of one of both decks, under the influence of the perforation in the selected column, and at the end of the first operating cycle said adjustment will be transferred to the translator whereupon the set-up mechanism is again restored. Then, during the second machine cycle the control of the sorting chutes is effected in the above described manner in accordance with the adjustment of the translator mechanism, and simultaneously the set-up mechanism is controlled by the second card; these operations will continue until the card supply is exhausted whereupon the machine is automatically stopped. The last cards are fed in the known manner to their sorting boxes by depressing again the start key of the machine until the cards have arrived in their boxes.

If desirable, different hole combinations can be fed in different sorting operations into the same sorting boxes; for instance, if in one sorting operation sorting shall be effected according to alphabetical characters while in another sorting operation sorting shall be effected according to

to numerical characters. For this purpose a switch mechanism shown in Fig. 11 may be provided which must only be inserted between the lines 85 of Fig. 2 and the commutator 87. This switch mechanism can be adjusted manually in accordance with the desired perforation key. If the switch is shifted to the lower position as shown in Fig. 11 its adjustment corresponds to a hole combinational key according to Fig. 6 while upon adjustment in the upper position (not being shown) sorting is effected according to the key in Fig. 10 so that different hole combinations will be fed into the same sorting boxes shown in Figs. 6 and 7.

As will be seen from a comparison of Figs. 6 and 10, the numerals 10, 11, 12 and 13 are perforated in both schemes in the same manner. Consequently, no switching means need be provided for these numerals since they control the sorting mechanism in the same manner.

It will for instance be seen that with the adjustment shown in Fig. 11 the lines 85 are connected in the same manner with the contact pieces of the commutator 87 as in Fig. 2 so that sorting of the cards will be effected in accordance with the key shown in Fig. 6. If cards in accordance with the key shown in Fig. 10 shall be sorted (the switch mechanism being then in the upper position) identical hole combinations will also select the same lines 85 but due to the changed connections with the commutator 87 the same hole combinations will control different sorting boxes as will be shown by the following examples. The hole combinations of the meaning 3, 6 and 9 according to Fig. 6 are identical with the hole combinations 6, 4 and 3 according to Fig. 10. In two different sorting operations the following selection of lines will be effected: The hole combinations 3 (Fig. 6) and 6 (Fig. 10) will select in both instances the fourth line 85 from above. However, this line is connected in the adjustment shown in Fig. 11 to the contact piece "3" of the commutator 87 while in the upper adjustment it is connected to the contact piece "6". The cards having identical hole combinations are therefore fed in the one instance into the sorting box "3" (Fig. 3) and in the other instance into the sorting box "6" as required in accordance with the different meaning of both hole combinational keys. In a similar way the connections may be verified for the hole combinations "6" (Fig. 6) and "4" (Fig. 10) as well as for the hole combinations "9" (Fig. 6) and "3" (Fig. 10) and all remaining pairs of hole combinations, and it will be seen that depending upon the adjustment of the switch in Fig. 11 a certain hole combination will be fed into a box corresponding to the meaning of said hole combination.

The described arrangement may, of course, also be readily applied in sorting machines if the different perforation schemes represent characters of different nature such as letters and numerals. The switch mechanism may also be provided for more than two shift positions so that for instance in the one position sorting may be effected according to the numerals 0 to 13 while in the second position sorting according to the letter characters *a* to *n* and in the third position according to the characters *m* to *z* can be effected. If the sorter is provided with 26 boxes—the arrangement shown in Fig. 2 must then, of course, be provided for more than four hole positions and also a corresponding number of sorting entrances 22 (Fig. 1) should then be provided—additional switching means must only be effected

for those extra boxes (such as for instance for the first 10 boxes *a* to *k*) serving also for sorting of numerical hole combinations while the remaining boxes which are only used for the letters *l* to *z* need no additional switch mechanism.

While there have been shown and described and printed out the novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details 10 and the manner of operation may be made without departing from the spirit of the invention.

What I claim is:

1. In a cyclically operable automatic sorting machine for perforated record cards having a plurality of superposed record decks, each deck comprising a plurality of adjacent record columns, wherein one machine cycle corresponds to the passage of one card, means for analyzing the record card perforations, a sorting mechanism controlled in a subsequent machine cycle in accordance with the perforations of a record column analyzed in one machine cycle, two sets of storing devices cooperating with the analyzing means and the sorting mechanism, each storing device being adapted to retain the result of the analysis and one set of said storing devices being under card control in one machine cycle while the other set controls in the same machine cycle the sorting mechanism, and means for selectively rendering said two sets of storing devices common to said plurality of record decks responsive to a record column in any one of said record decks.

2. In a cyclically operable automatic sorting machine for perforated record cards having a plurality of superposed record decks, each deck comprising a plurality of adjacent record columns, wherein one machine cycle corresponds to the passage of one card, common means for analyzing any one of the aligned record columns in superposed record decks, a sorting mechanism controlled in a subsequent machine cycle in accordance with the perforations of a record column analyzed by said analyzing means in one machine cycle, two sets of storing devices cooperating with the analyzing means and the sorting mechanism each storing device being adapted to retain the result of the analysis and one set of said storing devices being under record card control in one machine cycle while the other set controls in the same machine cycle the sorting mechanism, and means for selectively controlling said two sets of storing devices through said common analyzing means by a record column in any one of said plurality of superposed record decks.

3. In a cyclically operable automatic sorting machine for hole combinational record cards having a plurality of superposed record decks, each deck comprising a plurality of adjacent record columns, wherein one machine cycle corresponds to the passage of one card, common means for analyzing any one of the aligned hole combinational record columns in superposed record decks, a sorting mechanism controlled in a subsequent machine cycle in accordance with the hole combination analyzed by said analyzing means in one machine cycle, two sets of storing devices cooperating with the analyzing means and the sorting mechanism each set being adapted to retain for one machine cycle the result of an analysis and one set of the storing devices being in one machine cycle under record card control while the other set controls the sorting mechanism in the same machine cycle, and means for selectively controlling said two sets of storing de-

vices through said common analyzing means by a hole combinational record column in any one of said plurality of superposed record decks.

4. In a cyclically operable automatic sorting machine for perforated record cards having a plurality of superposed record decks, each deck comprising a plurality of adjacent record columns, wherein one machine cycle corresponds to the passage of one card, analyzing means for said record cards, a sorting mechanism controlled in the subsequent machine cycle in accordance with the perforations of record cards analyzed by said analyzing means in one machine cycle, a storing device for retaining the result of the analysis, the same storing device being in each machine cycle under record card control, another storing device also adapted to retain the result of the analysis and controlling in each machine cycle said sorting mechanism while the first mentioned storing device is under record card control in the same machine cycle, means for causing said card controlled storing device to adjust after analysis in said one machine cycle and before the sorting operation in said subsequent machine cycle said sorting mechanism controlling storing device, means for clearing before said adjustment said sorting mechanism controlling storing device and for clearing after said adjustment and before analysis of the subsequent card said card controlled storing device, and means for selectively rendering said card controlled storing device responsive to a record column in any one of said plurality of superposed record decks.

5. In a cyclically operable automatic sorting machine for perforated record cards having a plurality of superposed record decks, each deck comprising a plurality of adjacent record columns, wherein one machine cycle corresponds to the passage of one card, common means for analyzing any one of the aligned record columns in superposed record decks, a sorting mechanism controlled in the subsequent machine cycle in accordance with the perforations of record cards analyzed by said analyzing means in one machine cycle, a storing device for retaining the result of the analysis, the same storing device being in each machine cycle under record card control, another storing device also adapted to retain the result of the analysis and controlling in each machine cycle said sorting mechanism while the first mentioned storing device is under record card control in the same machine cycle, means for causing said card controlled storing device to control after analysis in said one machine cycle and before the sorting operation in said subsequent machine cycle said sorting mechanism controlling storing device, means for clearing before said operation said sorting mechanism controlling storing device and for clearing after said operation and before analysis of the subsequent card said card controlled storing device, and means for selectively controlling said card controlled storing device through said common analyzing means by a record column in any one of said plurality of superposed record decks.

6. In a cyclically operable automatic sorting machine for hole combinational record cards having a plurality of superposed record decks, each deck comprising a plurality of adjacent record columns, wherein one machine cycle corresponds to the passage of one card, common means for analyzing any one of the aligned hole combinational record columns in superposed record decks, a sorting mechanism controlled in the subsequent machine cycle in accordance with the

perforations of record cards analyzed by said analyzing means in one machine cycle, a storing device for retaining the result of the analysis, the same storing device being in each machine cycle under record card control, another storing device also adapted to retain the result of the analysis and controlling in each machine cycle said sorting mechanism while the first mentioned storing device is under record card control in the same machine cycle, means for causing said card controlled storing device to adjust after analysis in said one machine cycle and before the storing operation in said subsequent machine cycle said sorting mechanism controlling storing device, means for clearing before said adjustment said sorting mechanism controlling storing device and for clearing after said adjustment and before analysis of the subsequent card said card controlled storing device, and means for selectively controlling said card controlled storing device through said common analyzing means by a hole combinational record column in any one of said plurality of superposed record decks.

7. In a cyclically operable automatic sorting machine for perforated record cards having a plurality of superposed record decks, each deck comprising a plurality of adjacent record columns, wherein one machine cycle corresponds to the passage of one card, analyzing means for said record cards, a sorting mechanism controlled in a subsequent machine cycle in accordance with the perforations of a record column analyzed by said analyzing means in one machine cycle, two sets of storing devices common to said plurality of record decks and cooperating with the analyzing means and the sorting mechanism, each storing device being adapted to retain the result of the analysis and one set of said storing devices being under the control of any one of said record decks in one machine cycle while the other set controls in the same machine cycle the sorting mechanism, and means for selectively changing the controlling action of said record card perforations upon said sorting mechanism to control the latter in the same manner under the control of different perforations.

8. In a cyclically operable automatic sorting machine for perforated record cards having a plurality of superposed record decks, each deck comprising a plurality of adjacent record columns, wherein one machine cycle corresponds to the passage of one card, common means for analyzing any one of the aligned record columns in superposed record decks, a sorting mechanism controlled in a subsequent machine cycle in accordance with the perforations of a record column analyzed by said analyzing means in one machine cycle, two sets of storing devices cooperating with the analyzing means and the sorting mechanism each storing device being adapted to retain the result of the analysis and one set of said storing devices being under record card control in one machine cycle while the other set controls in the same machine cycle the sorting mechanism, means for selectively controlling said two sets of storing devices through said common analyzing means by a record column in any one of said plurality of superposed record decks, and means for selectively changing the controlling action of said record card perforations upon said sorting mechanism to control the latter in the same manner under the control of different perforations.

9. In a cyclically operable automatic sorting machine for hole combinational record cards

having a plurality of superposed record decks, each deck comprising a plurality of adjacent record columns, wherein one machine cycle corresponds to the passage of one card, common means for analyzing any one of the aligned hole combinational record columns in superposed record decks, a sorting mechanism controlled in a subsequent machine cycle in accordance with the hole combination analyzed by said analyzing means in one machine cycle, two sets of storing devices cooperating with the analyzing means and the sorting mechanism each set being adapted to retain for one machine cycle the result of an analysis and one set of the storing devices being in one machine cycle under record card control while the other set controls the sorting mechanism in the same machine cycle, means for selectively controlling said two sets of storing devices through said common analyzing means by a hole combinational record column in any one of said plurality of superposed record decks, and means for selectively changing the controlling action of said hole combinations upon said sorting mechanism to control the latter in the same manner under the control of different hole combinations.

10. In a cyclically operable automatic sorting machine for perforated record cards having a plurality of superposed record decks, each deck comprising a plurality of adjacent record columns, wherein one machine cycle corresponds to the passage of one card, common analyzing means for analyzing any one of the aligned record columns in superposed record decks, a sorting mechanism controlled in accordance with the perforations in the record cards, a first set of storing means for retaining the result of the analysis, each card passing through the machine controlling the same first set of storing means, a second set of storing means also adapted to retain the result of the analysis, said sorting mechanism being in each machine cycle under the control of the same second set of storing means while in the same machine cycle the first set of storing means is under record card control, automatic means operative between subsequent sorting operations for clearing at first said second set of storing means, for controlling then said second set of storing means by said first set of storing means and for clearing then said first set of storing means before control of the same by the subsequent card, and means for selectively controlling said first set of storing means through said common analyzing means by a record column in any one of said plurality of superposed record decks, and means for selectively changing the controlling action of said record card perforations upon said sorting mechanism to control the latter in the same manner under the control of different perforations.

11. In a cyclically operable automatic sorting machine for perforated record cards wherein one machine cycle corresponds to the passage of one card, means for analyzing each record card, a

sorting mechanism controlled in a subsequent machine cycle in accordance with the perforations of the record cards analyzed by said analyzing means in one machine cycle, a storing device for retaining the result of the analysis, the same storing device being in each machine cycle under record card control, another storing device also adapted to retain the result of the analysis and controlling in each machine cycle said sorting mechanism while the first mentioned storing device is under record card control in the same machine cycle, means for causing said card controlled storing device to control after analysis in said one machine cycle and before the sorting operation in said subsequent machine cycle said sorting mechanism controlling storing device, means for clearing in each machine cycle said sorting mechanism controlling storing device before said controlling operation, means for clearing in each machine cycle said card controlled storing device after said controlling operation and before control of said card controlled storing device by the subsequent card, and means for selectively changing the controlling action of said record card perforations upon said sorting mechanism to control the latter in the same manner under the control of different perforations.

12. In a cyclically operable automatic sorting machine for hole combinational record cards wherein one machine cycle corresponds to the passage of one card, means for analyzing each record card, a sorting mechanism for sorting said record cards in accordance with the hole combinations represented thereon and controlled in a subsequent machine cycle in accordance with the hole combination analyzed by said analyzing means in one machine cycle, a storing device for retaining the result of the analysis, the same storing device being in each machine cycle under record card control, another storing device also adapted to retain the result of the analysis and controlling in each machine cycle said sorting mechanism while the first mentioned storing device is under record card control in the same machine cycle, means for causing said card controlled storing device to control after analysis in said one machine cycle and before the sorting operation in said subsequent machine cycle said sorting mechanism controlling storing device, means for clearing in each machine cycle said sorting mechanism controlling storing device before said controlling operation, means for clearing in each machine cycle said card controlled storing device after said controlling operation and before control of said card controlled storing device by the subsequent card, wherein one of said storing devices includes a translator for hole combinations, and means for selectively changing the controlling action of said hole combinational perforations upon said sorting mechanism to control the latter in the same manner under the control of different hole combinations.

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