(2.)

R.M. Mueller

MACHINE METHODS OF ACCOUNTING

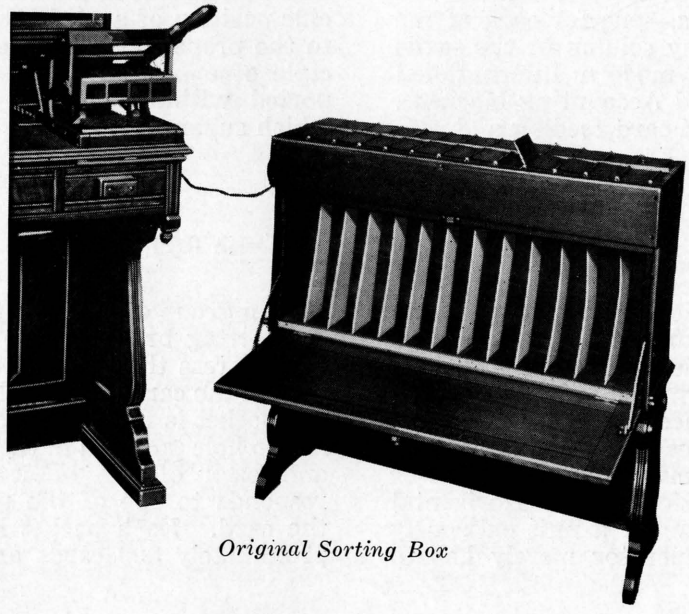
CARD-OPERATED SORTING MACHINES

IT HAS frequently been stated that the sorting machine is the heart of many tabulating installations, and that without it there would be no widespread commercial application of the punched hole system of accounting. All accounting systems based upon the use of unit records, whether manual or mechanical, necessitate a sorting or classifying operation. International Card-Operated Sorting Machines afford a speedy and accurate method of arranging cards into any desired sequence. By the use of these machines the drudgery of the manual sorting operations is entirely removed, the work being performed by fully automatic machine operation except for the feeding and removing of cards.

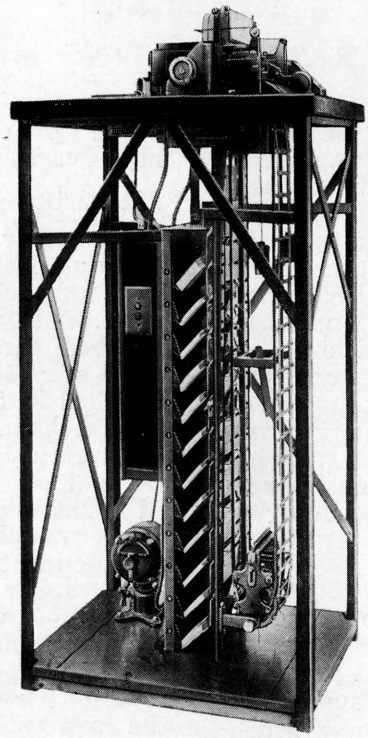
Machines of various styles and speeds are made to meet the varying requirements of users of the Electric Bookkeeping and Accounting Machine Method. In addition, special problems encountered in accounting routines have resulted in the development of special devices which may be attached to the sorting machine, making it more flexible and serviceable. Devices are available for collating cards into predetermined sets, for removal of paired cards from a file without disturbing the remainder of the cards in the file, for the selection of cards of like classification from a file of cards in a single sorting operation, for arranging cards by the use of the group sorting mechanisms according to classifications other than those recorded in the card in the form of punched holes, and for the counting of cards of similar classification.

The Sorting Box

Like other machine units of the Electric Accounting Method, the Sorting Machine underwent many changes in the course of its development. The first device to be used for classifying punched cards into groups according to the holes recorded in them was the Sorting Box attached to the old manually-operated tabulating machine. The box contained twenty-four compartments, corresponding approximately to the maximum number of classifications recorded in any one field of the early census card. As a card was placed in the press of the machine, a compartment cover was electrically unlatched if a hole appeared in one of the positions of the card which was designated for sorting. Upon removing the card from the press of the tabulator, the operator inserted it in the compartment of which the cover was unlatched. After the card was deposited, the cover was pushed down and the next card was inserted in the press of the tabulator. This card was then deposited in the compartment of which the cover was released by the closing of the electrical circuit through the hole in the card field being sorted upon. This set of operations was continued until all cards were tabulated and sorted. In this manner, the cards were arranged according to a limited number of classes for the next tabulation, simultaneously with the tabulation of the previous report.



Original Sorting Box



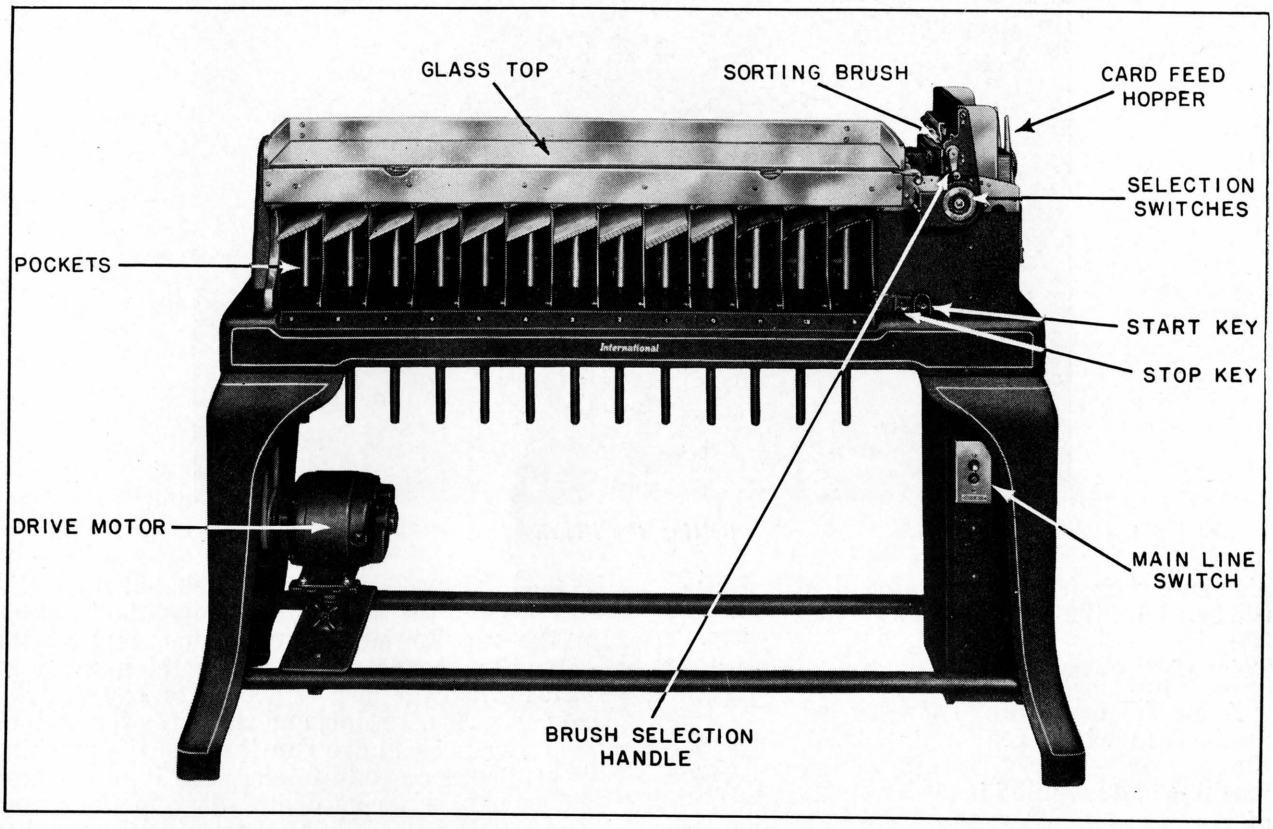
Vertical Sorter

The development of the automatic feeding mechanism for tabulating machines, and the adaptation of the Electric Accounting Method to routines which involved hundreds, or even thousands, of classifications, disclosed the need for the development of a separate and more automatic sorting machine. The next unit developed was the Vertical Sorter, which was equipped with 12 pockets,—one for each of the punching positions in any column of the cards adapted for use in the modern International Electric Bookkeeping and Accounting Machine. Also, it had an automatic card feeding and conveyor mechanism which automatically carried each of the cards at a speed of 250 to 270 cards a minute from the hopper, past the position where sorting was effected and to the pocket where the card was stacked.

A hole punched in any position of the column being sorted upon permitted a small wire brush to complete an electrical circuit. This completion of a circuit at a certain time from any specific position of a card column directed the card to the proper pocket. The success of this principle of operation resulted in its being incorported within the present Horizontal Sorter which superseded the Vertical Sorter.

Horizontal Sorter (Type 80)

This machine automatically arranges punched tabulating cards into numerical order or into groups of similar classification in numerical sequence or other predetermined order. The sorting operation is performed at a speed of 225 or 400 cards a minute for each column sorted, according to the type of machine in use. All of the steps in the operation of the Horizontal Sorter are simple, making it a unit extremely easy to operate. The operator merely has to place a group of cards in the feed magazine, set the sorting brush on the column to be sorted, and depress the start button. Thirteen pockets receive the cards during the sorting operation—one pocket is for the rejected cards (those having no hole punched in the column being sorted) and each of the other twelve pockets corresponds to one of the punching positions on the card. Each pocket has a capacity of approximately 800 cards and when this limit is



reached in any pocket the machine automatically stops, as a signal to the operator to remove them. The mechanism also stops automatically if the machine runs out of cards.

Throughout the entire design of the Horizontal Sorter, careful consideration was given to attainment of accuracy, speed, and quietness of operation. Special standard features of the machine which enhance the scope of its usefulness were incorporated in its design.

Card Feeding

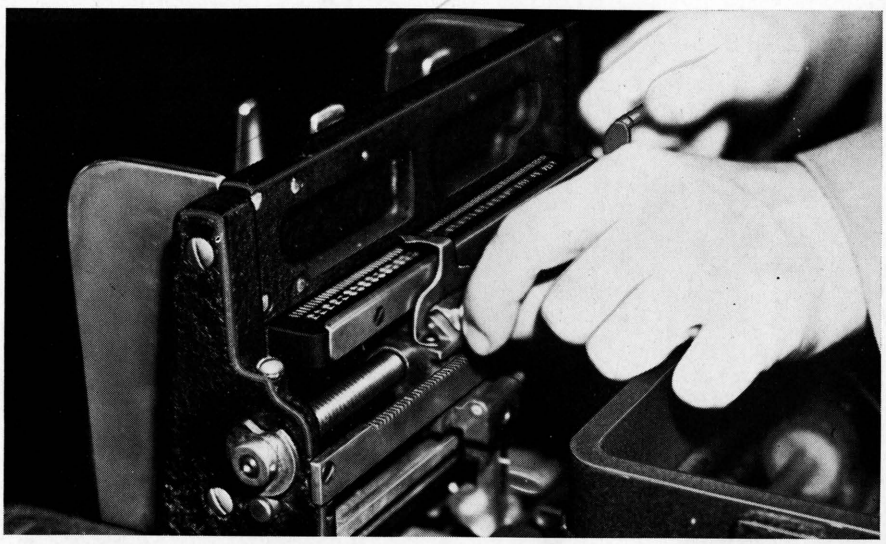
The Horizontal Sorters (Type 80) are equipped with a continuous horizontal card-feeding mechanism which permits replenishing the magazine hopper without the necessity of stopping the machine. Cards are automatically taken, one at a time, from the bottom of the pack and fed past the brush which determines the pockets into which they are to be deposited. Continuously turning rollers then carry the cards to their proper pockets where they are stacked. The speed of the Model 1 machine is 400 cards a minute for each column sorted; the Model 2, for use with 80-column cards only, operates at a speed of 225 cards a minute.

Pocket Stops

The Horizontal Sorter is equipped with an automatic pocket stop. This is a safety device which automatically shuts off the current and stops the sorter should any one of the thirteen pockets become filled to capacity with cards. After the cards have been removed from a loaded pocket, the machine can be restarted by the depression of the start key.

Quickset Sorting Brush

The sorting brush may be set on any column to be sorted by rotating the small handle located at the front of the feed magazine. Each rotation of the handle moves the brush one column. If the brush is to be moved across a number of columns, this may be accomplished by raising the handle to the upper position and moving the brush holder to the desired column while pressing down the finger lever on the top of the brush assembly. A column indicator guide and pointer is located above the brush, in a position readily



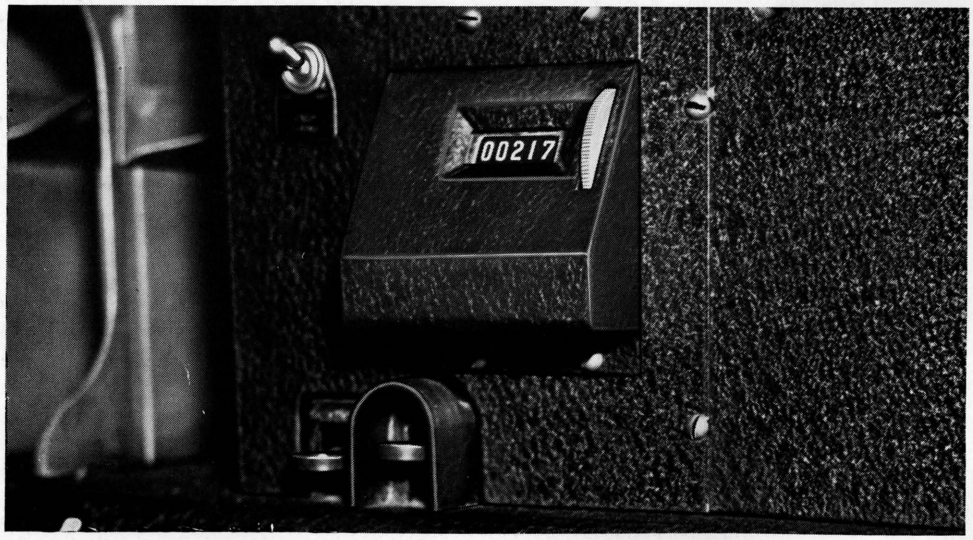
Setting the Brush

visible to the operator, for convenient setting of the brush on the column to be sorted.

Total Card Counter

A special electrically-operated card-counting mechanism which registers "1" for each card that passes the brush may be connected to the machine and mounted in such a manner that the dials are in a position that facilitates the reading and manual transcribing of totals. The counter does not affect the normal speed or method of operation of the machine to which it is attached. The maximum capacity of the device is 99,999. Normally, this mechanism counts only the total number of cards passing through the machine. A count by pockets may, however, be made by a second sort. The customary method is to run all the cards through the machine in the regular sorting operation, and at the same time to determine the total number of cards. Then the largest group for any individual pocket is set aside, and the cards for each of the other pockets are run through the machine separately for group totals. The total of these groups may then be deducted from the grand total number of cards, to determine the number of cards in the largest group. This eliminates the necessity of running the latter group through the machine a second time.

When more than a single sorting and counting operation is to be performed, the counting for each group resulting from one sort may be



Total Card Counter

accomplished as each group is fed through the machine to effect the next sort.

Selection Device

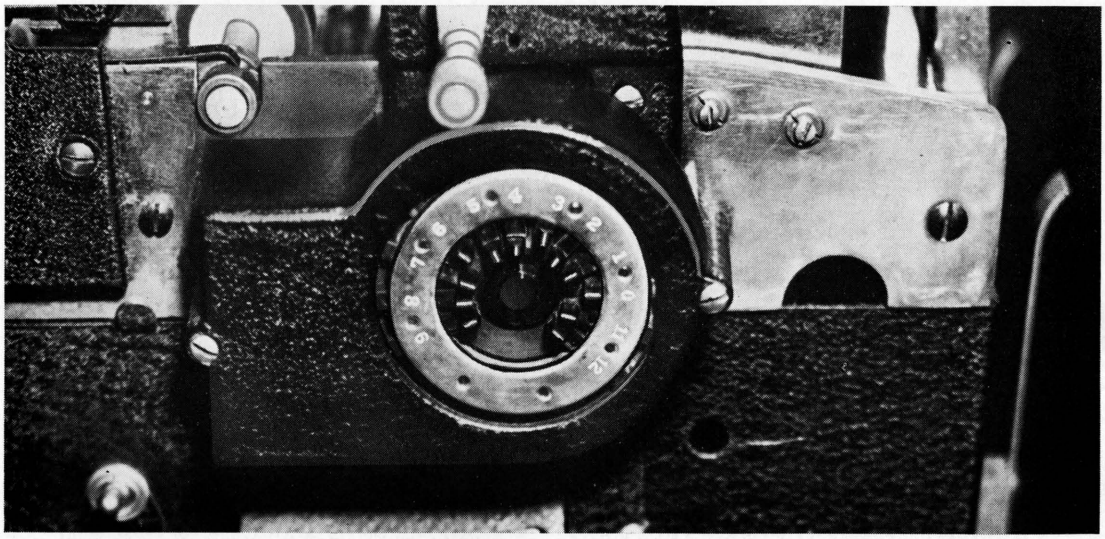
A selection device enables the machine to segregate into their respective pockets all cards punched in one or more specified individual positions of a single column and to deposit the remaining cards into the reject pocket without disturbing their sequence. Thus, if in a given card form, one column is devoted to recording the source of entries:—1. Sales Invoice, 2. Credit Memo, 3. Debit Memo, 4. Journal Voucher, 5. Inter-branch Transfer Memo, 6. Consignment Memo,—it is possible to select the cards punched from any one or more of these source records without disturbing the sequence of the other cards. To select all entries made from Journal Vouchers, the small black switch in the segment corresponding to the pocket marked "4" on the commutator device (located directly in front of and below the magazine hopper) would be set to the outer edge, and all of the other small black switches would be pushed toward the center.

If it is desired to sort all positions on the card from 9 to 12 inclusive (regular sorting) all of the switches on the commutator must be in the outer position. Should it be desired to select a group of one or more numerals in a given column, it is necessary to pull all the commutator switches to the center except those corresponding to the positions to be selected. The accompanying illustration shows the commutator with the switches arranged to select and sort into their corresponding pockets the cards punched 6 or 3 or 0 in the column being sorted. The remaining cards will fall into the "R" pocket in their original sequence.

In some cases it may be desirable to segregate the selected cards in such a manner that their sequence will not be disturbed, regardless of the possible disarrangement of the other cards. In that event the reverse principle should be followed—the 6 and 3 and 0 switches toward the inner ring, all others out in the normal positions. Cards unpunched in the column being sorted would be extraneously introduced into the "R" pocket along with those punched 6 or 3 or 0.

Capacity

The Horizontal Sorter is built to accommodate either 5⅝″ (short) or 7⅜″ (long) cards. It is supplied for either 5/32″ or 3/32″ (80-column) spacing, and may readily be changed from one spacing to the other in the field.



Selection Device

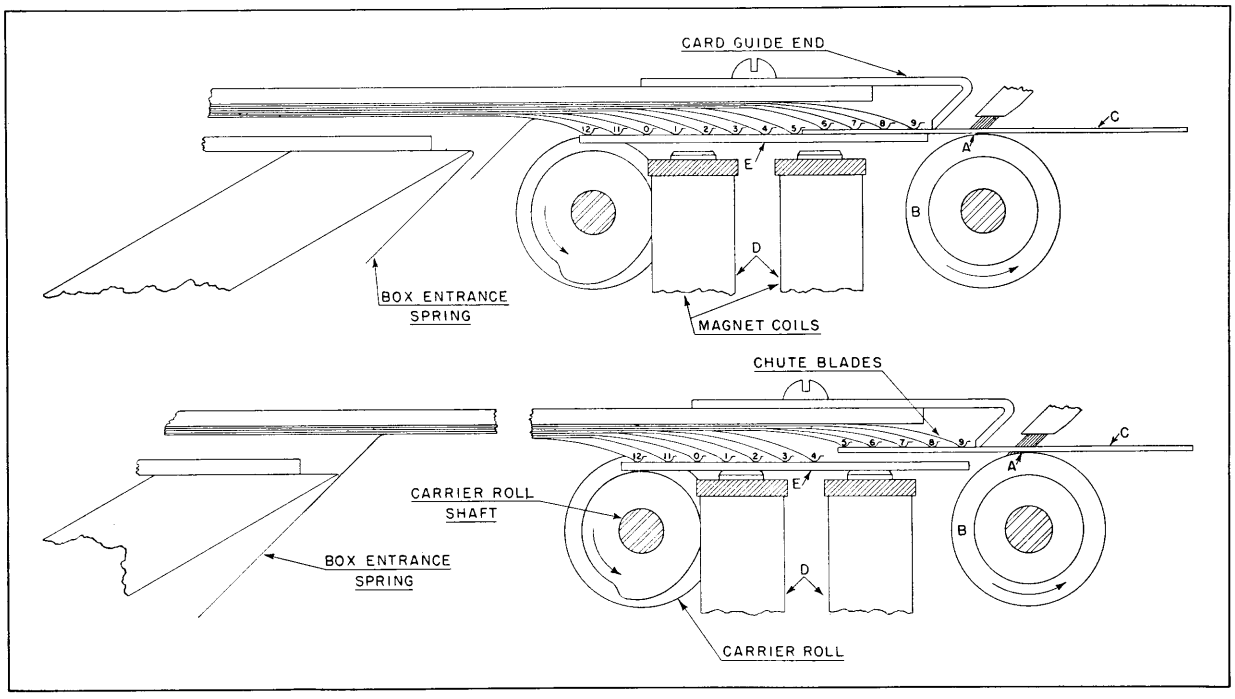
Electrical Energy

This machine is equipped for two different sources of electrical energy. The machine most generally used is operated entirely by direct current—110 or 220 volts, and consumes 6.5 amperes for starting and 2.5 amperes for running. When generators in use are not of sufficient capacity to provide the necessary current for starting this type of machine, one which is equipped with an alternating current drive motor will be furnished. The sorting circuit of this machine is operated by direct current and

consumes 1.0 ampere when running. When ordering the latter type of machine the cycles and phase of the alternating current must be shown on the specifications.

Operating Principles

As illustrated in the figure, cards are fed horizontally from a magazine and pass directly under a brush "A" and over a brass contact roll "B." Assuming that the card "C" is punched "4," it will have travelled under the 9, 8, 7, 6, and 5 chutes blades before the brush makes contact to complete the selecting circuit. As this contact is made, the sorting magnet "D" is energized, attracts the armature "E" and the 4, 3, 2, 1, 0, 11, and 12 chutes blades follow down with the armature "E." This creates an opening between the 5 and 4 chute blades through which the card is conveyed by carrier rolls to its pocket. If an unpunched card is fed into the machine the brush "A" fails to make contact with the brass roll "B" and, since the sorting magnet "D" receives no impulse, the armature "E" is not pulled down. The card is, therefore, carried to the "R" pocket.

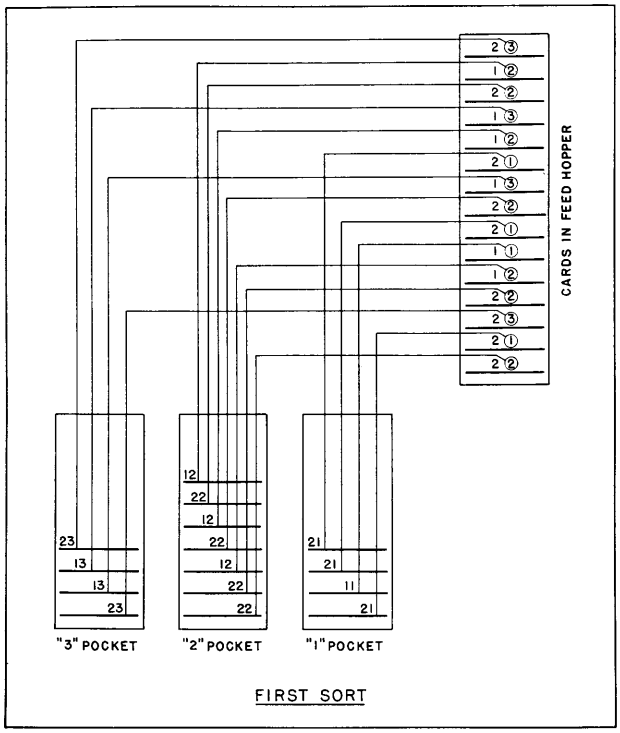


Operation

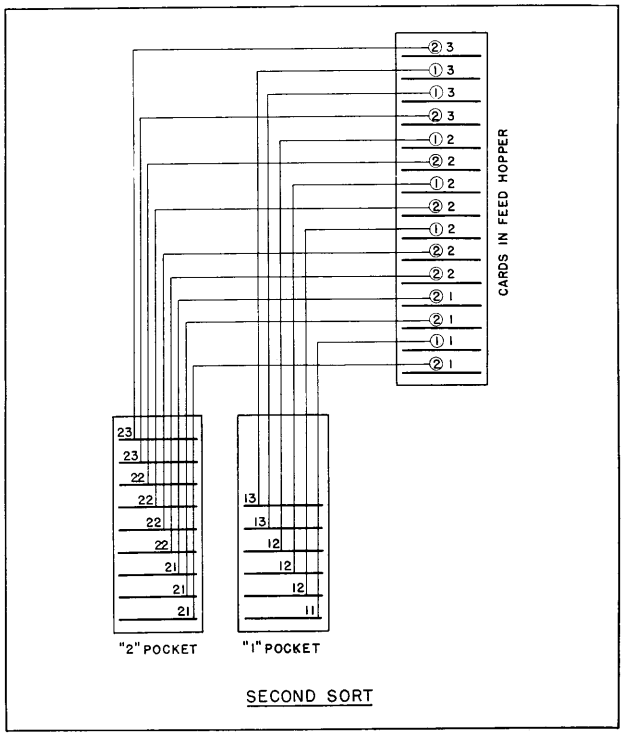
The first step in the operation of the Sorter is to set the brush in the position corresponding to the column to be sorted. This is accomplished by turning the operating handle until the pointer is set on the index corresponding to that of the column to be sorted. The normal method of sorting is to start with the units column, removing the cards from the pockets as the sorting proceeds, so that for the next sort on the tens columns all of the 0's will be fed into the machine first, followed by the 1's, 2's, 3's, etc., in succession. This process is then repeated for the columns of hundreds, thousands, and so on, until the entire classification field has been sorted.

The principle upon which this is based may be best illustrated by an example. Consider the following columns of numbers as cards first arranged in miscellaneous order and punched in a two digit field with numbers from 11 to 24. When sorting is effected upon the units column, all cards punched with a 1 in that column fall in the 1-pocket, all cards punched with a 2 in that column fall in the 2-pocket, etc.

The cards from the units sort are then fed through the machine from pockets 0, 1, 2, ... 9, to effect the sort on the tens position. When sorting is effected upon the tens column, all cards punched with a 1 in that column fall in the 1-pocket, etc. By placing the cards from the 1-pocket face up and in front of those from



FIRST SORT

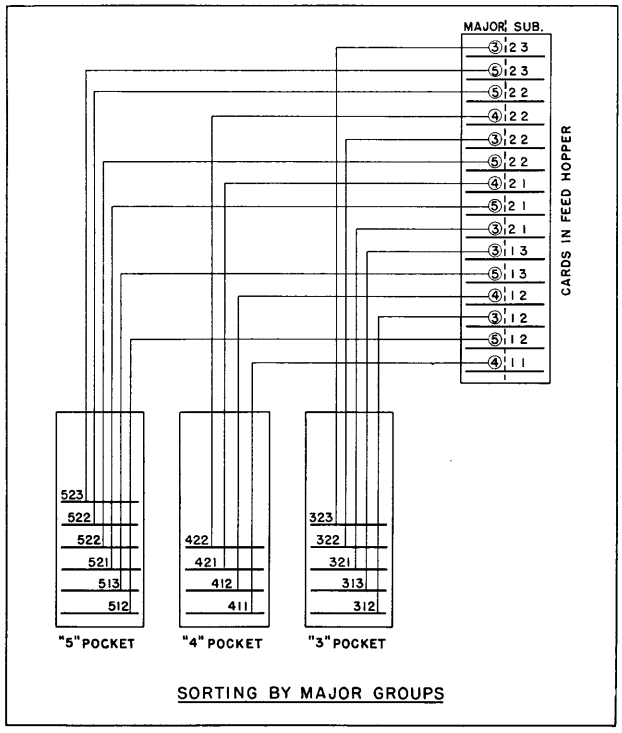


SECOND SORT

the 2-pocket, the original group of miscellaneous cards are found to be in numerical order from 11 to 23.

This sorting process could be illustrated further by the use of larger numbers; but from the above it will be observed that upon the completion of the second sort, all cards will appear in groups arranged in correct numerical sequence.

The procedure for sorting of cards to arrange them in proper sequence according to major and minor classifications follows the same gen-



SORTING BY MAJOR GROUPS

eral principle. If the above 2-digit numbers were subclassifications, and another one column field was a major classification, the next sort for major classification would bring these groups together, and the subclassifications would be in order within each group.

As a general rule, the sorts for the minor or subclassifications are made first and the sorts for the major groups are made last.

If it is desired to sort all positions of the card column from 9 to 12 inclusive (regular sorting) all of the commutator switches must be set in the outer position. Should it be desired to sort or select any one or more numerals in a given column, it is necessary to pull to the center all commutator switches except those corresponding to the positions to be selected.

After setting the brush and commutator switches for the positions of the column to be sorted, take enough cards to fill the magazine about two-thirds full; hold them loosely in one hand on the joggle plate, with the back of the cards toward the operator and one end of the cards against the end plate. Gently tap the top and other end of the cards until all four sides are even. Next place the cards face down (printed side down) in the magazine so that the lower edge (9's) will feed into the machine first. The pressure weight should then be put on the top of the cards.

The depression of the start key will begin the feeding of cards. After the machine has been started, it will continue to operate until the magazine is emptied, a pocket becomes too full, or a damaged card fails to feed. While one pack of cards is running through the machine, another pack should be prepared and placed in the magazine in order to maintain continuous operation. Cards may be removed from the pockets while the machine is running, but care should be exercised not to catch another card being conveyed into the pocket from the chutes while doing so.

After sorting one column, be sure to clear the chutes of cards by depressing the start key before proceeding to the next column sort. Cards taken from the Sorter may be placed face down in the compartments of a sorting tray as an aid in maintaining the proper sequence. They may be conveniently checked as they are taken from the pockets with a sorting needle, or by holding the cards up to the light and sighting through the punched holes.

The operation of the Sorter is extremely simple. An operator, however, should be taught to acquire the skill of handling the cards properly and to analyze each job in order that the most efficient routine may be developed.

Sorting Short Cuts

Block Sorting

Ordinarily cards are sorted by beginning with the units column, but where a large quantity is handled, it is usually advisable to separate them first into groups. This is done by sorting in the columns at the extreme left of the field. Each resulting group is then sorted in the customary manner. For example, if cards are to be arranged so that all cards for each customer will be together and all customers within each state will also be grouped, the cards should be sorted first according to state, and then each state group should be sorted by customer. The cards for each state would have to be kept segregated.

In this way it would be possible to finish all of the sorting involved for state 01 necessary to arrange the cards in customer number sequence. Then this batch of cards could be started through the Accounting Machine while the cards for state 02 are being sorted to customer sequence.

The superiority of this method of block sorting lies in the reduction of time required to prepare complete tabulated reports by taking advantage of the concurrent operation of the Accounting and Sorting Machines. The best explanation of the procedure is a practical illustration of the handling of 20,000 cards to prepare a report showing sales by customers and by states.

Assuming that the coding by state is recorded in a two-column field and that for customer in a four-column field, it would be necessary for all of the 20,000 cards to pass through the Sorter six times to classify them by customer by state. The total operation would require 5 hours, taking the speed of the sorter to be 400 cards a

$$(20{,}000 \times 6) \div (400 \times 60) = 5$$

minute. This means that, according to the ordinary sorting routine, it would be 5 hours after the sorting operation began before the Accounting Machine could begin producing the required report.

By using the block method of sorting, it would require 1 2/3 hours to effect a division of the

$$(20{,}000 \times 2) \div (400 \times 60) = 1\,2/3$$

cards by state. Assuming that the group of cards for any one state would not exceed 2,000, such a group could then be classified by customer in 1/3 hour. According to this method of attacking the sorting problem, the Accounting

$$(2{,}000 \times 4) \div (400 \times 60) = 1/3$$

Machine operation could begin 2 hours after the sorting is begun.

As the time required for the subsequent sorting of the remaining cards and the tabulating of all cards will be the same regardless of the method of sorting, it is evident that the 3 hours difference in starting time of the tabulating operation will result in the completion of the report approximately 3 hours sooner than under the regular sorting method.

Unless speed in the preparation of finished reports is essential, or if the Accounting Machine would be idle while the sorting is being accomplished, there is no special time advantage in block sorting. It does, however, permit the convenient subdivision of work where several Sorting Machines are to be utilized in arranging the cards.

Pre-Sorting

Whenever a peak load of sorting would be involved in the preparation of month-end reports, the condition may be corrected by performing the block sorting just described on a daily or semi-weekly basis. Such detail cards as referred to in the above example could be presorted according to state classifications to eliminate the necessity for sorting two columns at the end of the accounting period.

Sequence of Sorting for Reports

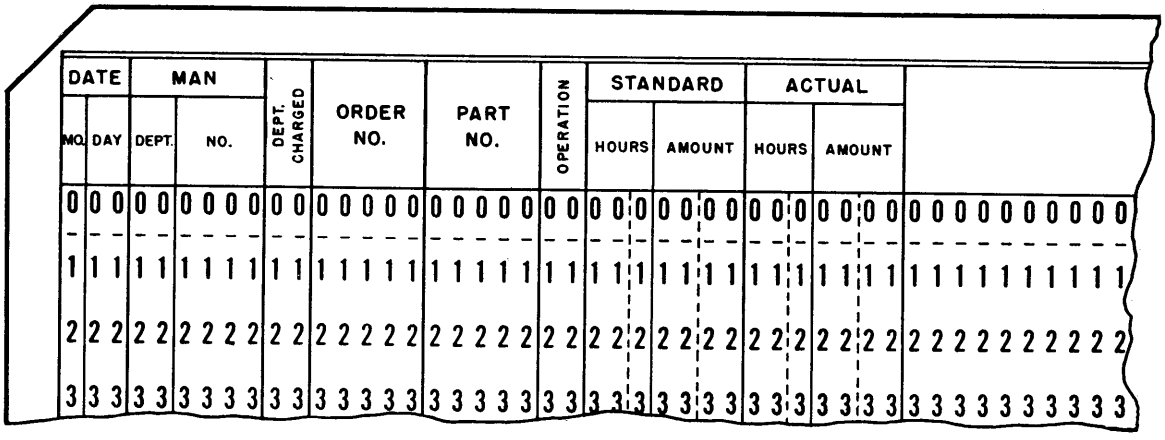
The simplicity with which routine tasks are performed by automatic machines may obscure some of the steps in which application can be eliminated. The proper scheduling of reports is of extreme importance in the attainment of maximum economy in the preparation of reports through the medium of Electric Accounting Machines. These machines have the ability to sense changes of the group classifications of cards in such a way that major and minor totals are accumulated and printed automatically. In order for this to be effected, however, the sorting operation must have been performed first upon that group classification for which minor totals are to be obtained and then upon the group classification for which major totals are desired. Where the same cards are to be used for furnishing a set of reports involving certain group classifications in major and minor totals, proper sorting routine should be given careful consideration. The following illustration of the comparison between two methods of accomplishing the tasks involved in the preparation of reports will reveal the advantages of a well-organized routine.

A company using the illustrated payroll card requires the following reports showing total hours and amounts for each major and subclassification:

(1) By Employee.
(2) By Part subdivided by Operation.
(3) By Operation subdivided by Employee.
(4) By Department subdivided by Order.
(5) By Order subdivided by Part.

If the reports are prepared in the sequence shown, the sorting would involve running the cards through the Sorter thirty-four times, as shown below:

Order of Report Preparation	Necessary Sorts
1	4
2	7
3	6
4	7
5	10
	Total 34



But if the sequence of reports is changed to permit the maximum use of previous sorts for reducing the sorting involved in arranging subclassifications, the sorting would be reduced to a total of eighteen runs through the sorter as follows:

Order of Report Preparation	Necessary Sorts
1	4
3	2
2	5
5	5
4	2
	—
	Total 18

In this manner, 16 columns of sorting would be completely eliminated. Should the work involve 10,000 cards, the economy would result in a saving of 6 2/3 hours.

$$(10{,}000 \times 16) \div (400 \times 60) = 6\ 2/3$$

Needle Sorting

Whenever comparatively large groups of cards having the same punching in a certain column are likely to be grouped together, the sorting operation can readily be performed by needle sorting. The sorting needle is held by the right hand and dropped through the similarly punched holes of a group of cards, while the left hand is used to raise the cards. In this manner the cards which are punched alike are separated from the rest of the cards at the card through which the needle did not pass. Each batch of similarly punched cards may then be placed in the proper compartment of the sorting tray.

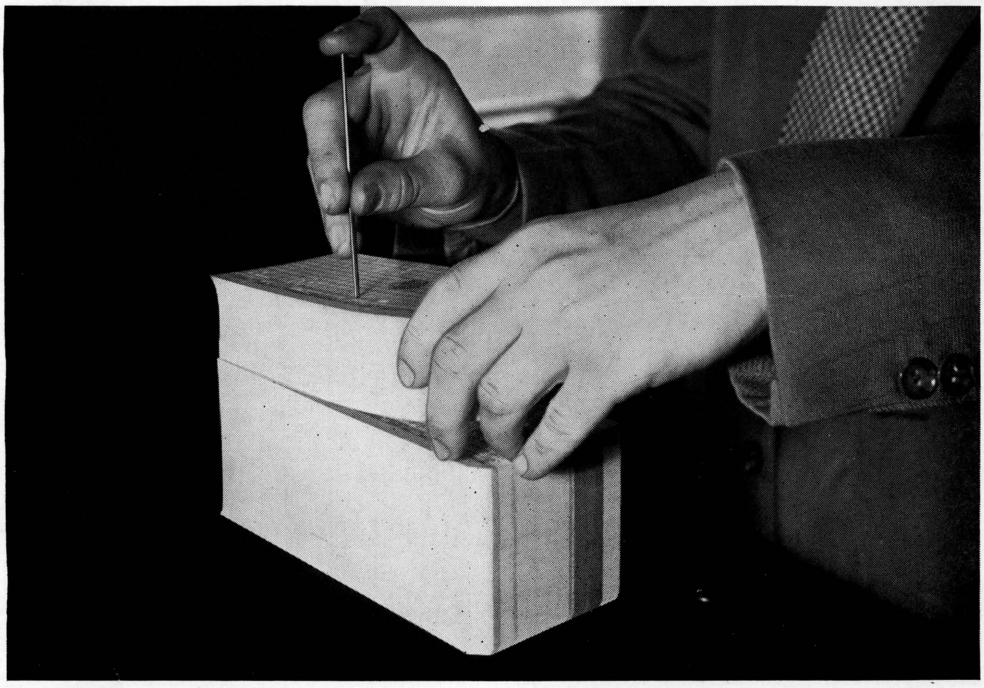
It is possible to combine needle sorting and machine sorting whenever the bulk of the cards can be needled but some small batches of cards with widely varied punching are interspersed.

Alphabetic Sorting

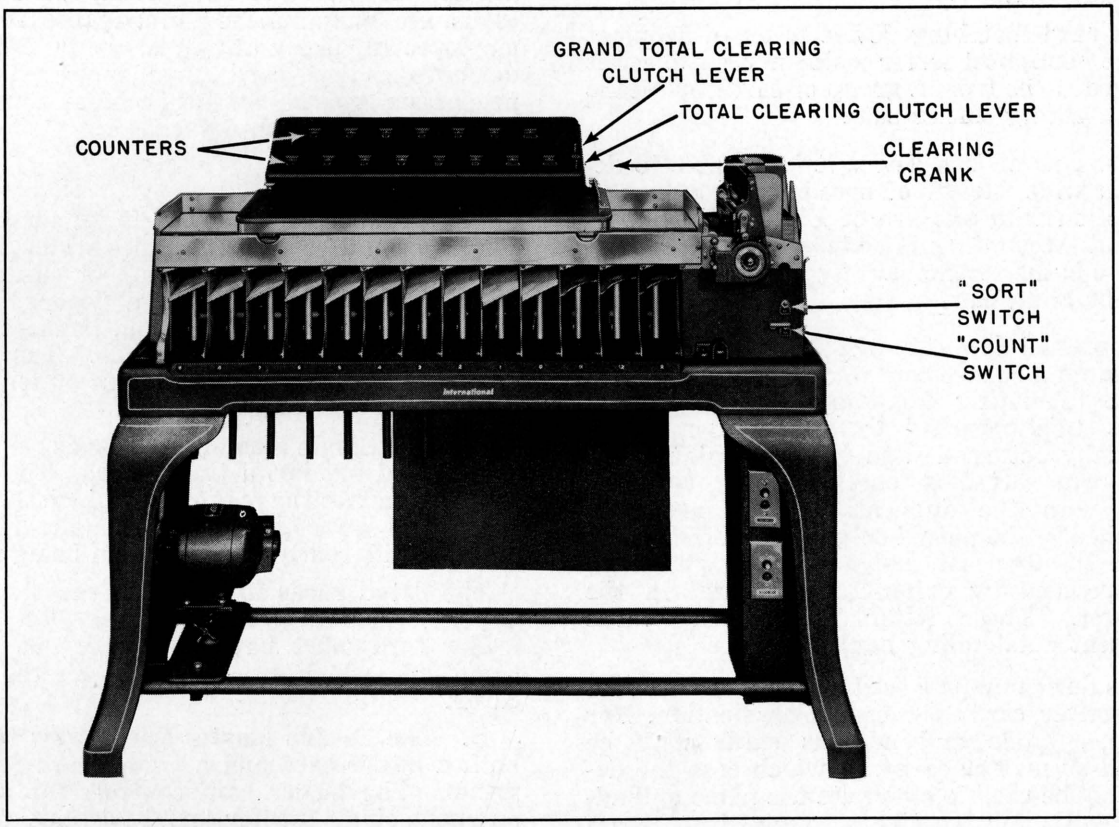
To arrange cards containing names into alphabetic sequence necessitates the double sorting of each column, since each letter is recorded by two holes in a single column—one of which is 12, 11, or 0 and the other of which is a digit from 1 to 9.

The cards are first sorted in the normal manner according to the digits 1 to 9. In the next operation the selection switches corresponding to these digits are moved to the center to permit sorting of the 12, 11, and 0 positions. The cards which fall in the 12-pocket will contain the letters A to I in alphabetic sequence; those in the 11-pocket the letters J to R; and those in the 0-pocket the letters S to Z.

A special switch may be installed on the sorter to eliminate the necessity for changing the position of the selector switches after each sorting operation. When this switch is turned to the ON position, the machine will function in the same manner as when the selector switches 1 to 9 are moved to the inner position.



Card Counting Horizontal Sorter (Type 75)



The Card Counting Horizontal Sorter is designed for the purpose of counting the holes punched in any or all positions of a given column of the card, and also to register the number of cards not punched in the column. It will simultaneously group all cards of similar classification and arrange such classifications in numerical sequence in the same manner as the Type 80 Horizontal Sorter.

Counting Mechanism

The counting mechanism is equipped with fifteen adding counters of five digit capacity each, arranged as follows:

12 counters, one for each of the 12 punching positions of the card
1 counter for unpunched cards (rejects)
1 counter for sub totals (number of cards)
1 counter for grand totals (number of cards)

All counters can be cleared in a single operation by pushing the clutch levers at the right end of the counter mechanism to the rear position and rotating the crank located at the right side of the device. The grand total may be allowed to accumulate by keeping the Grand Total clutch lever forward during the clearing of sub totals.

Switches

Two special switches are placed on the machine marked SORT and COUNT. When both switches are ON, the machine will simultaneously sort all cards passing through the machine and count the punched holes appearing in the column being sorted. When only the SORT switch is on, the machine is similar in operation to the Type 80 Sorter. When only the COUNT switch is on, the machine will count the punched holes, but all cards will be deposited in the R-pocket.

Electrical Energy

This machine may be operated on direct current at 110 or 220 volts. At 110 volts the current required for starting is 14.5 amperes, and the current for running 3.9 amperes.

When an alternating current drive motor is utilized, the direct current sorting circuit requires only .7 amperes. The alternating current motor operating at 110 volts requires 18.0 amperes for starting and 5.0 amperes for running.

Special Devices for Sorting Machines

Card Matching Device

The card matching device is an attachment for the horizontal sorter which is used to select matched cards from a group of cards by means of contrasting corner cuts.

By means of this device it is possible to develop a wide variety of specialized routines in connection with the use of Electric Bookkeeping and Accounting Machines. A representative use is the reconciliation of bank statements for tabulating card checks.

A punched duplicate of each check issued is created on a square cornered card and retained in the tabulating department. The original checks (distinguished by a corner cut) are eventually returned with the bank statement. These are sorted to check number sequence along with the duplicates. They are then "matched"—the paired originals and duplicates fall in the 9-pocket, but duplicates which are not preceded by original checks fall in the R-pocket. These latter "unmatched" cards represent outstanding bank checks.

This device may be used where there are several master cards for each classification. For example, name and address cards may be treated as master cards, in which case the device may be used to eliminate the name and address cards for inactive accounts, i. e., those for which there are no detail cards.

Collating Device

The horizontal sorter can be equipped with a collating device which will prepare sets of cards without requiring any identifying punching.

A number of cards of each kind exactly equal to the number of sets required are placed in the hopper of the sorting machine. The sorting brush is raised so that it does not touch the cards.

The collating device switch is then turned ON which causes the chutes to the pockets to open in rotation so that one card of each kind is distributed to each pocket.

The device can be adjusted by means of switches to prepare from two to twelve sets at one time. Any number of sets may be made by multiple runs.

The installation of this device does not affect the speed of the sorting machine or its normal operation.

This attachment can be used to advantage in an application such as payroll, where daily cards are gang-punched in advance for each employee for every day in a pay period. The device takes these cards, in employee order, and prepares a separate set for each day containing one card for each employee.

Group Sorting Device

The group sorting device is an attachment for horizontal sorting machines which enables the sorting of an entire group of cards to be controlled by the punching in a "leader" master card which precedes the group, irrespective of the punching of the detail cards. This device can be furnished for operation in either one of two ways.

A. The Single Master Card Basis requires a leader card but not a trailer card. The leader card determines the pocket into which the detail cards will be sorted even though they are punched differently in the column being sorted.

The detail cards in this case must have an upper corner cut (either right or left). The leader card must have no corner cut on the same side which is corner cut on the detail cards.

B. The Double Master Card Basis requires both a leader card and a trailer card for each group. The leader card controls the sorting, as in the single master card basis, but a trailer card is required to prepare the machine for the next group. The leader card has a lower corner cut, the detail cards an upper corner cut, and the trailer card no corner cut.

A special brush, permanently mounted on the right (or left) outside rail, distinguishes between the classes of cards in both cases.

The use of the group sorting device does not affect the speed of the machine or its operation for other work. A switch is provided to render the device inoperative.

Multiple Column Selector

The multiple column selection device is an attachment which may be placed on the Horizontal Sorter to select in a single operation all cards which are punched with identical data in six adjacent columns. Cards of the desired classification are selected from a file of cards without disturbing the sequence of the remaining cards.

By means of this device it is possible to select all of the cards for a specified branch, or agent, or product, or date, or other class of data.

MACHINE METHODS OF ACCOUNTING

FACTS TO KNOW ABOUT SORTERS

The following questions and answers have been compiled to present the comparative features of each of the types of sorting equipment, as well as some general information concerning the operation of each of the devices.

1. *What Is the Purpose of the Sorter?*

   To arrange cards according to numerical sequence or other predetermined groupings.

2. *On What Type of Current Does the Sorter Operate? What Voltage?*

   Sorters operate on Direct Current only —110 or 220 volts. The drive mechanism, however, may be operated by an AC motor.

3. *What is the Type of Card Feeding?*

   Horizontal sorters have a continuous horizontal feed.

4. *What Is the Speed Per Minute?*

   Horizontal sorters operate at a speed of 400 and 225 cards a minute for Model 1 and Model 2 respectively.

5. *How Are the Punched Holes Sensed?*

   By means of a brush contact with a brass roll through the punched hole.

6. *How Many Card Pockets Has the Machine?*

   The horizontal sorters have 13 pockets—one pocket for each of the twelve punching positions in each column of the card, and one pocket for unpunched cards.

7. *Is the Sorter Equipped With Automatic Pocket Stops?*

   All horizontal sorters are so equipped.

8. *How Can One Check the Sorting?*

   By holding the sorted cards up to the light and sighting through the punched holes.

9. *Are All Sorting Machines Equipped for Selective Sorting?*

   The horizontal sorters are equipped for selective sorting.

10. *If It Is Desired to Select Only the Cards Punched "6" in a Given Column and Retain the Remaining Cards in Their Original Sequence, How Are the Selector Switches Set? Into What Pocket Do the Unselected Cards Fall?*

    The small selector switch corresponding to the "6" position remains at the outer position; all others are pushed toward the center.

    The unselected cards fall into the "R" pocket.

11. *How Would You Sort a Four Column Field to Place the Cards in Numerical Sequence?* (3,000 *cards*)

    The cards must be run through the sorter four times—beginning with the units column and following with the tens, hundreds, and thousands columns in succession.

12. *A Report, Involving* 100,000 *Cards to Be Sorted in a Five Column Field, Is Desired as Soon as Possible. How Would You Sort the Cards?*

    Break the block of cards down into ten groups which can be conveniently handled, by sorting the first column at the left, (ten thousands column) and then sort each group as described in the previous question.

13. *Three Thousand Cards Are Punched as Follows:*

Employee Number	Columns 17-20
Department Number	Columns 21-22
Order Number	Columns 23-27
Part Number	Columns 28-32
Operation Number	Columns 33-34

    Five Tabulations Are Desired as Follows:

    a. Employee Number.

    b. Part Number Subdivided by Operation Number.

    c. Operation Number Subdivided by Employee Number.

    d. Department Number Subdivided by Order Number.

    e. Order Number Subdivided by Part Number.

    In What Sequence Should These Reports Be Made in Order to Reduce Sorting to a Minimum?

Order	*Sort By*
(a)	Employee No.
(c)	Operation No.
(b)	Dept. No.
(e)	Order No.
(d)	Part No.

14. *Two Thousand Cards Are Punched as Follows:*

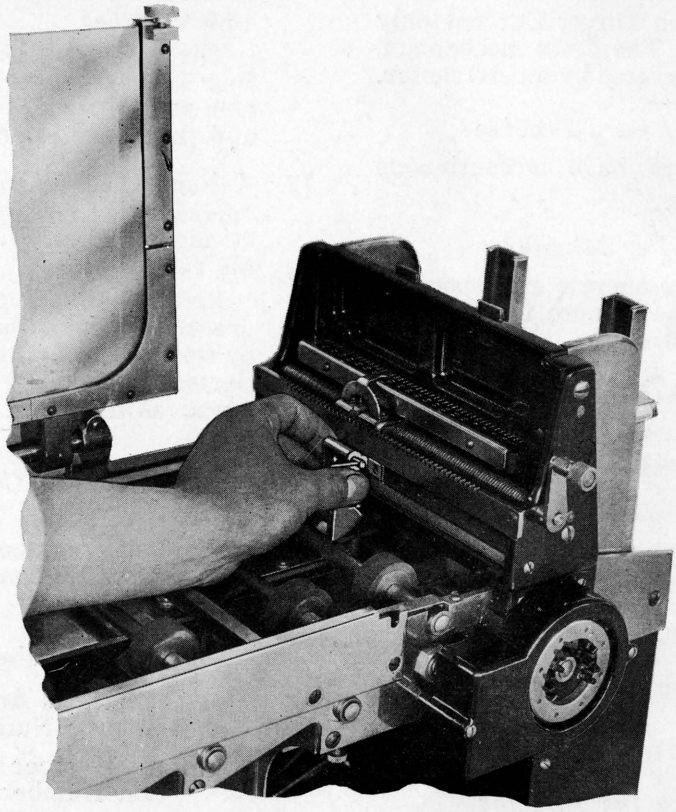
Customer	Columns 18-19
Town	Columns 20-22
State	Columns 23-24

What Column Sequence Should the Sorting Follow in Order to Obtain a Tabulation of Each State Subdivided by Town and Each Town Subdivided by Customer?

19, 18, 22, 21, 20, 24, 23.

15. *How Should a Damaged Sorting Brush Be Replaced?*

To insert a new card brush, raise the brush column change operating handle one-half turn until it is directly opposite from its normal position.



Removing Brush-Holder

This has raised the brush holder from the brass contact roll. The brush holder locating lever can now be raised to the position shown and the brush holder assembly removed. Next loosen the brush retaining screw and pull out the defective brush.

After inserting a new brush it must be timed in the following manner: Feed a card punched "8" by hand until the card brush just makes contact through the punched hole. When contact is made the end of the nine chute blade should overlap the edge of the card 1/64" to 1/32" maximum. There must not be less than 1/64" overlap of the chute blade on the card when turning the machine by hand.

Moving the brush so that the strands project further from the holder will cause it to make contact later, so that the card travels a greater distance underneath the nine blade before contact is made. Drawing the brush strands up into the brush holder will cause the brush to make contact earlier giving less overlap of the blade on the card when contact is made. Be very careful to time the brush correctly.

When replacing the brush holder, do not lower the handle and allow the brush to touch the contact roll until the brush holder is clamped in place.

16. *How Are Jammed Cards Removed?*

When cards become jammed in the chute blades, they should be removed very carefully to prevent damage to these blades. First, turn off the power. Then raise the

glass top and carefully remove the cards. It is best to remove the card brush holder when doing this to prevent damaging the card brush. See that all cards are removed before again resuming operation.

17. *What Purposes Are Served by the Fuses?*

The machine is protected with 6 ampere main line cartridge fuses. If these fuses are blown the machine will not operate in any way. The individual circuits are protected with small glass fuses. If the machine will run, but the cards go into the R box, it probably indicates that the 1 ampere glass fuse on the left, facing the relay cabinet, is blown or broken. If the motor fuse on the right, facing the cabinet, is blown or broken the machine will not run. Always replace fuses with the proper capacity. Both the fuses and the fuse block are marked to indicate the proper fuse capacity. All fuses are located in the relay cabinet under the right end of the machine.

18. *What Precautions Should Be Observed by the Operator?*

1. Don't leave the power turned on when the machine is not in use. This wastes electrical energy and causes unnecessary heating of the coils.

2. Don't fail to cover the feeding mechanism when the machine is not in use. This is to keep out dust, dirt and other foreign substances. A dust proof cover suitable for this purpose will be supplied by this company.

3. Don't forget that this machine must be cleaned and oiled regularly, but when cleaning be very careful not to disturb wires, springs, the brush or the brush holder, etc.

4. Don't call a Customer Serviceman until you have made certain that the trouble is not due to blown or broken fuses, selector switches set wrong, start or stop keys stuck down, improper brush timing, brush not set to proper column, etc.

5. Don't use a sorting needle with a sharp point, as it may pierce the cards. Use only a sorting needle such as supplied by this company.

6. Don't pull out damaged cards carelessly. If the machine tears cards, be careful when removing the damaged cards not to injure the ends of the blued steel chute blades.

7. Don't be careless about operating this machine.

8. Don't attempt to do any work on the machine such as removing jammed cards and changing fuses without first turning off the power.

19. *What Is the Purpose of the Multiple Column Selecting Device?*

To separate all cards punched with a predetermined number or group of consecutive numbers from a file of cards without in any way disturbing the sequence of the remainder of the cards in the pack.

20. *What Is the Maximum Number of Digits in a Number That May Be Selected by the Multiple Column Selecting Device?*

Six.

21. *How Would You Proceed to Select Cards Punched* "125," "126," *and* "128"*?*

1. Set switches 5, 6, and 8 in the units column.

2. Set the "2" switch in the tens column.

3. Set the "1" switch in the hundred column.

4. Make sure all other number switches are OFF.

5. Turn on the three control switches corresponding to the columns set.

6. Replace the regular brush holder by the multiple brush assembly.

7. Turn on the switches on top of the device.

8. Close the cover door.

9. Set the knurled knob on the rear to ON.

22. *What Is the Purpose of the Card Matching Device?*

To select matched cards from a group of cards by means of contrasting corner cuts.

23. *What Arrangement of the Cards Is Necessary for the Functioning of the Card Matching Device?*

The cards must first be sorted so that the detail cards (corner-cut cards) for each code number precede the master card (square-corner card) for that group.

24. *Will the Card Matching Device Match More Than One Detail Card With a Master Card? If So, Under What Conditions?*

Yes, provided all the detail cards are corner-cut cards, and only one master or square-corner card appears in the group.

25. *What Is the Purpose of the Counting Sorter (Non Printing)?*

To simultaneously classify and count punched tabulating cards.

26. *At What Speed Does This Machine Operate Per Minute?*

Four hundred cards per minute.

27. *How Many Counters Has It?*

Fifteen.

28. *How Many Counting Wheels in Each Counter?*

Five.

29. *Which Counters Clear in Unison and Which Clear Separately?*

All except the grand total counter can be cleared in one operation or by throwing in a clutch all counters may be cleared together.

DIMENSIONS AND WEIGHTS OF SORTERS

Type	Dimensions in Inches			Weight in Pounds	
	Length	Width	Height	Packed	Unpacked
Horizontal Sorter Type 80	61	16	45	670	425
Counting Sorter Type 75	61	22½	48	848	585