IBM

ELECTRIC PUNCHED CARD ACCOUNTING MACHINES

PRINCIPLES OF OPERATION

ALPHABETICAL ACCOUNTING MACHINE

TYPE 405

INTERNATIONAL BUSINESS MACHINES CORPORATION
NEW YORK, NEW YORK

Published by

Department of Education
International Business Machines Corporation
Endicott, New York

Form 52-3179-2

PREFACE

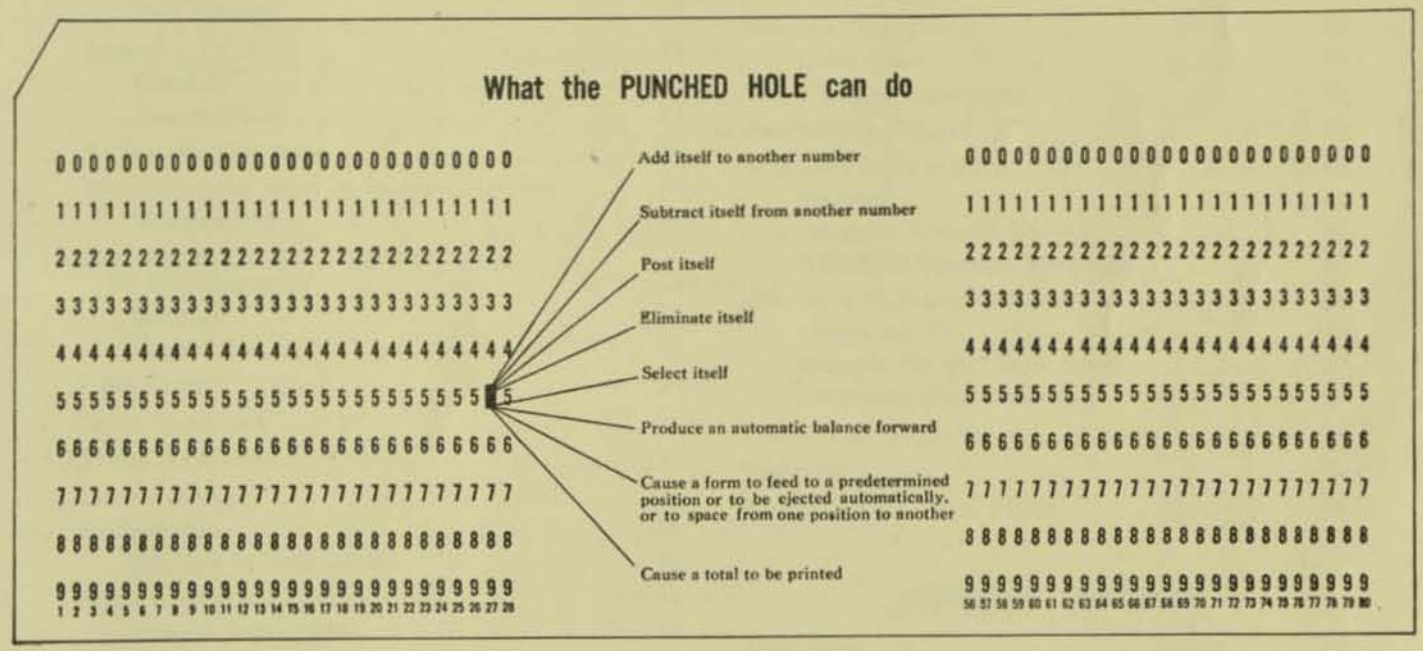
The purpose of this manual is to describe the features and functions of the IBM Alphabetical Accounting Machine. It has been prepared with three objectives in mind:

Use by beginners who are familiar with the IBM Accounting principle, but who are not skilled in the operation of the machine.

Use as a textbook by instructors in a practical course of training in the fundamentals of the machine.

Use by advanced students as a reference manual to find out why and how certain machine operations are performed.

Each machine operation is illustrated. The major machine functions are illustrated by sample card forms, reports, and wiring diagrams, which have been selected to illustrate also the major reports in each of the basic applications.



The IBM Accounting principle makes possible multiple uses of a single record in the form of a hole in an IBM card. The principle is illustrated above. It will be noted that the "5" punched in the IBM card can proceed through many operations successively, as the functions of the machine are rearranged for those operations through proper wiring of the control panel.

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INTRODUCTION

FUNCTIONS OF THE MACHINE

OPERATING PRINCIPLES

I B M
ALPHABETICAL ACCOUNTING MACHINE

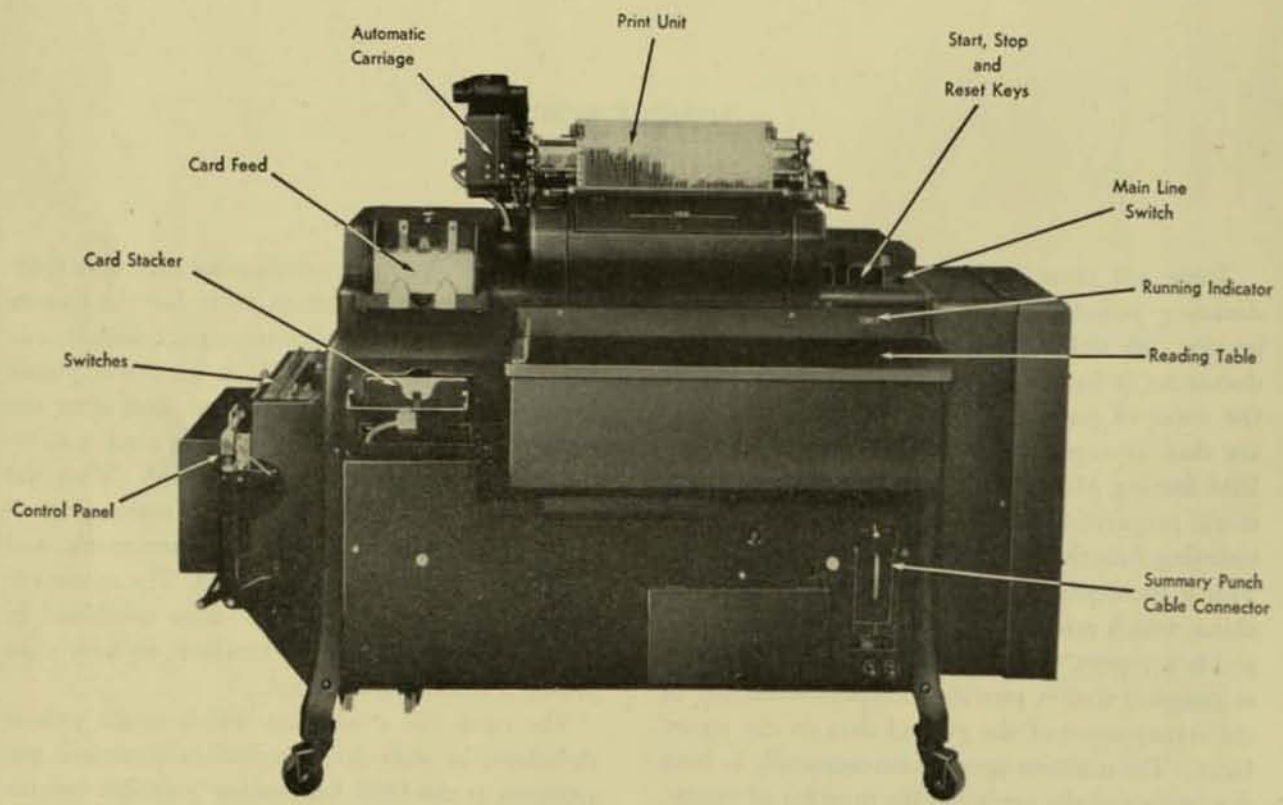
Type 405

INTRODUCTION

There are three basic steps in the IBM Accounting principle. Information recorded on an invoice, job ticket, material requisition, or other document is first transcribed to an IBM card in the form of punched holes. The punched cards are then arranged in the desired sequence by the IBM Sorting Machine. The third step is the automatic preparation of printed reports for the accounting functions of Sales, Payroll, Material, etc. This is accomplished by the IBM Accounting Machine, which reads the holes in the IBM cards and prints a report. The IBM Accounting Machine is so designed that it provides complete flexibility in the arrangement of the printed data on the report form. The machine operates automatically in both the feeding of the cards and the printing of results. Summary cards can be punched simultaneously with the printing of reports.

During the past few decades, great scientific development of IBM Accounting Machines has been made by the Research and Engineering Laboratories of the International Business Machines Corporation. The first machine built for the Census of 1890 was a simple counting device which consisted of a series of dials. Each card was placed manually on a reading mechanism, and after the registration of the information, the card was removed and replaced by another card. With the widespread application of the IBM method to all types of accounting work, more automatic and flexible machines were constructed. The automatic features of the earlier models were combined in the Numerical Accounting Machine, to which the printing feature was added.

The need for a machine which could process alphabetic as well as numerical information was apparent as the IBM Accounting principle became more widely used. The Alphabetical Accounting Machine was developed to meet this need. The machine has the added function of handling alphabetical data, and is designed for the greatest ease and flexibility of operation.



Alphabetical Accounting Machine
Type 405

FEATURES

Control Panel

The mechanism that controls the reading of information from the card and the placing of this information in the proper form and place on the report form.

Switches

Control functions of the machine.

Card Stacker

The location where cards are stacked after they pass through the machine.

Card Feed

The hopper in which cards are placed before they pass through the machine.

Automatic Carriage

The automatic carriage automatically spaces forms and reports which are being prepared on the Accounting Machine.

Print Unit

The arrangement of type bars for printing results. The print unit consists of 43 alphabetical-numerical type bars and 45 numerical type bars, or a maximum of 88 type bars.

Start, Stop, and Reset Keys

The Start key controls the actual feeding of cards. To stop the feeding of cards, the Stop Key should be depressed. The Reset keys reset or clear the machine of totals.

Main Line Switch and Running Indicator

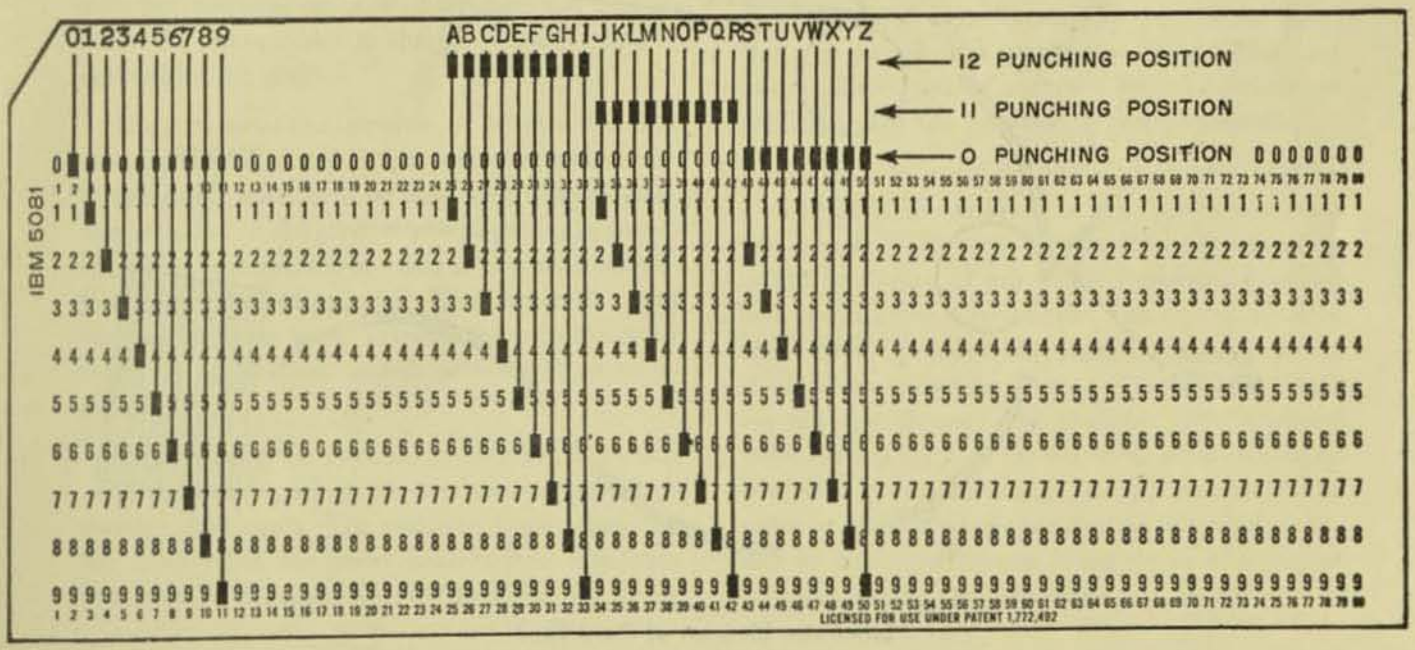
The Main Line switch controls the power and turns the running indicator light ON. The light goes out when the machine is operating and ON again when operation stops for any reason. The main line switch should not be turned OFF while the machine is operating.

Reading Table

The space provided for arranging cards prior to placing them in the card feed. It also provides a small working place at the machine.

Summary Punch Connection

This permits the dual operation of the Accounting Machine and Summary Punch for automatic preparation of total or new balance cards simultaneously with preparation of reports.



IBM Card

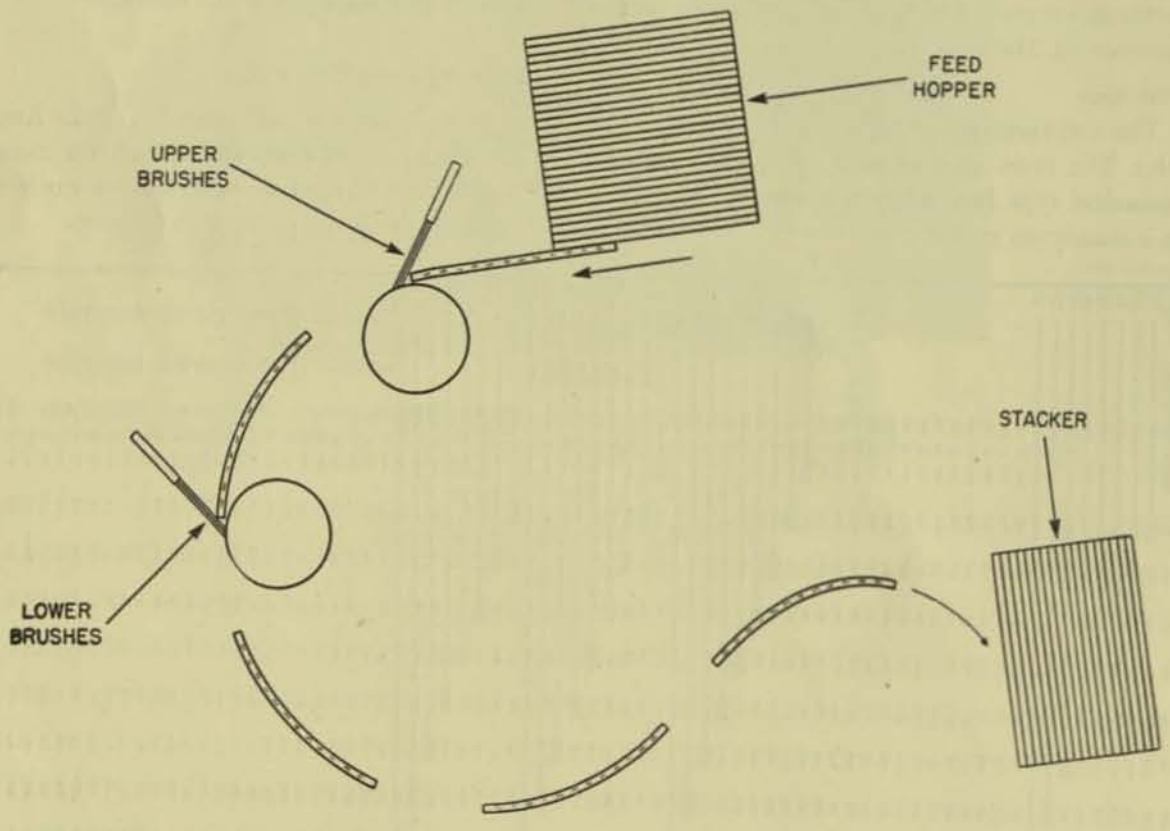
The operating unit in IBM Accounting. This illustration shows the positions punched for recording each digit or letter.

MACHINE OPERATION

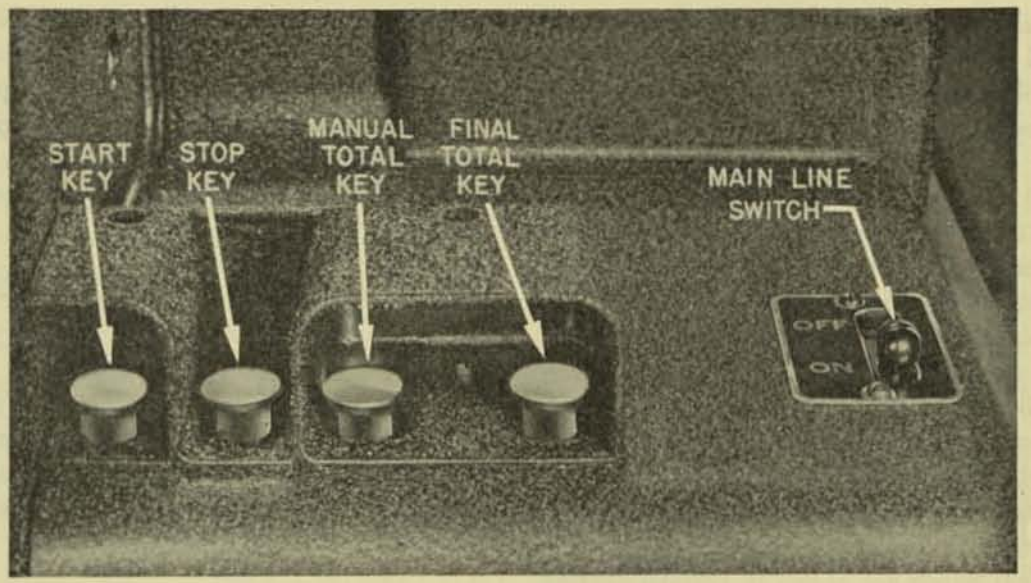
The cards, placed in the card feed hopper of the Accounting Machine, pass two sets of brushes. The brushes read the information which is punched in the cards and direct the type bars or adding mechanism to print or accumulate the data.

Cards are fed face down, 9's or the lower edge first. The feeding is continuous and the operator can insert cards while the machine is in operation. The hopper holds from 800 to 900 cards and as soon as the last card passes the second reading station, the machine automatically stops.

As shown in the illustration below, each card passes two reading stations, the upper and lower. Each reading station consists of 80 wire brushes, one brush corresponding to a card column. At the first reading station are the upper or control brushes, and at the second reading station are the lower or add brushes. The 9's position of a card is read first; then the 8's, etc.; to the 12's position. A punched hole in any column allows the corresponding brush to contact the conductor roll. This contact completes an electrical circuit, and the electrical impulse available from this circuit can be used to actuate the type bars or adding mechanism. The



Schematic Diagram of Card Feed



Control Keys

type of impulse emitted is controlled by the time at which a contact is made; that is, a 9 impulse would come before an 8, an 8 before a 7, etc. Unpunched positions on a card separate the brushes from the contact roll so that no impulses can be emitted by the brushes.

The purpose of the upper set of brushes is to read the card as it passes the first reading station in order to determine what is to be done with the information punched in the card; that is, should it be printed, added, subtracted, or compared with information on the preceding card? Then, when the card reaches the lower set of brushes, the information is ready to be printed, added, subtracted, or compared.

After passing the two sets of brushes, the cards enter the stacker, which has a capacity of approximately 1000 cards. The machine stops when the last card passes the lower brushes, and the Start key must be depressed to run the three remaining cards to the stacker. Whenever the stacker is filled, the machine automatically stops.

The feeding of the machine is controlled by the Start and Stop keys. To stop feeding at any time, the Stop key should be depressed; the Main Line switch should not be turned OFF while cards are feeding unless the Stop key is first depressed.

The time required for the reading of a card by a set of brushes is referred to as a "card cycle" or a "feed cycle." The term "list cycle" means printing or the possibility of printing information punched in a card during a feed cycle. The terms "total or reset cycle" indicate the possibilities of printing totals from counters. During a total cycle, cards are not fed through the machine. The speed of cards passing through the Alphabetical Accounting Machine varies according to specifications; the speed is either 80 cards per minute when set to list and 80 cards per minute when set to non-list, or 80 cards listing and 150 cards non-listing.

CONTROL PANEL

The basis of the automatic operation of the Alphabetical Accounting Machine can be found in the control panel and the controlling switches. The control panel fits into a rack on the left side of the machine.

Control panel wiring is similar in principle to the operation of a telephone switchboard, in that electrical impulses are picked up and directed to specific places in the machine. Because of the fact that the control panel acts as the "brain" of the machine, flexibility of machine operation is obtained. By making various connections on the control panel, the operator directs the machine and tells it which operations to perform. Therefore, once a knowledge of the control panel is gained, the operator can produce innumerable reports.

The cards which are placed in the Accounting Machine pass two sets of brushes. A punched hole in a card column allows a single brush to touch a conductor roll. As a result of this contact, an electrical impulse travels to the control panel on the side of the machine. By means of external wires, this impulse can be directed to a type bar where the information can be listed, to a counter where the information can be added or subtracted, to a comparing position where the information can be compared, or the data can be eliminated completely.

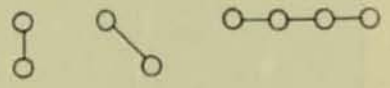
The various connections are made through the control panel, which consists of groups of holes referred to as "hubs."

Types of Hubs

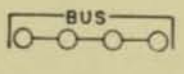
Any hub on the control panel of the IBM Accounting Machines generally can be classified either as an outlet or an inlet hub. An outlet hub, sometimes called exit or output hub, is any hub which emits an electrical impulse.

An inlet hub is one which can accept an electrical impulse which is wired into it from an outlet hub. Generally, outlets give the signal and inlets do the work.

Two or more hubs on the control panel sometimes are connected with a line either vertically, diagonally, or horizontally. These hubs are called common hubs and are exactly alike. Common outlet hubs make it possible to wire the same impulse out of either common hub. After an impulse has been wired into a common inlet hub, the same impulse is available out of the other hub. The purpose of common hubs is to allow multiple plugging of the same impulse, thereby eliminating the need of split wires (a wire which has three or more plug-ends).

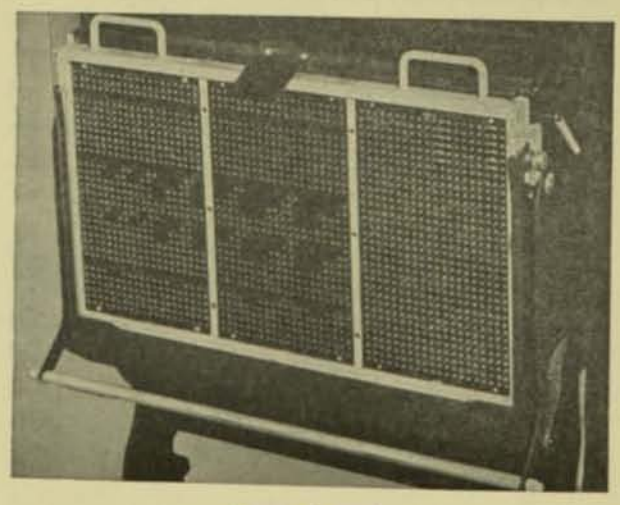


Another way of avoiding the use of split wires is by the use of the bus hubs. There are four common bus hubs; by plugging any impulse into one hub of the bus unit, three outlets for the same impulse are available.



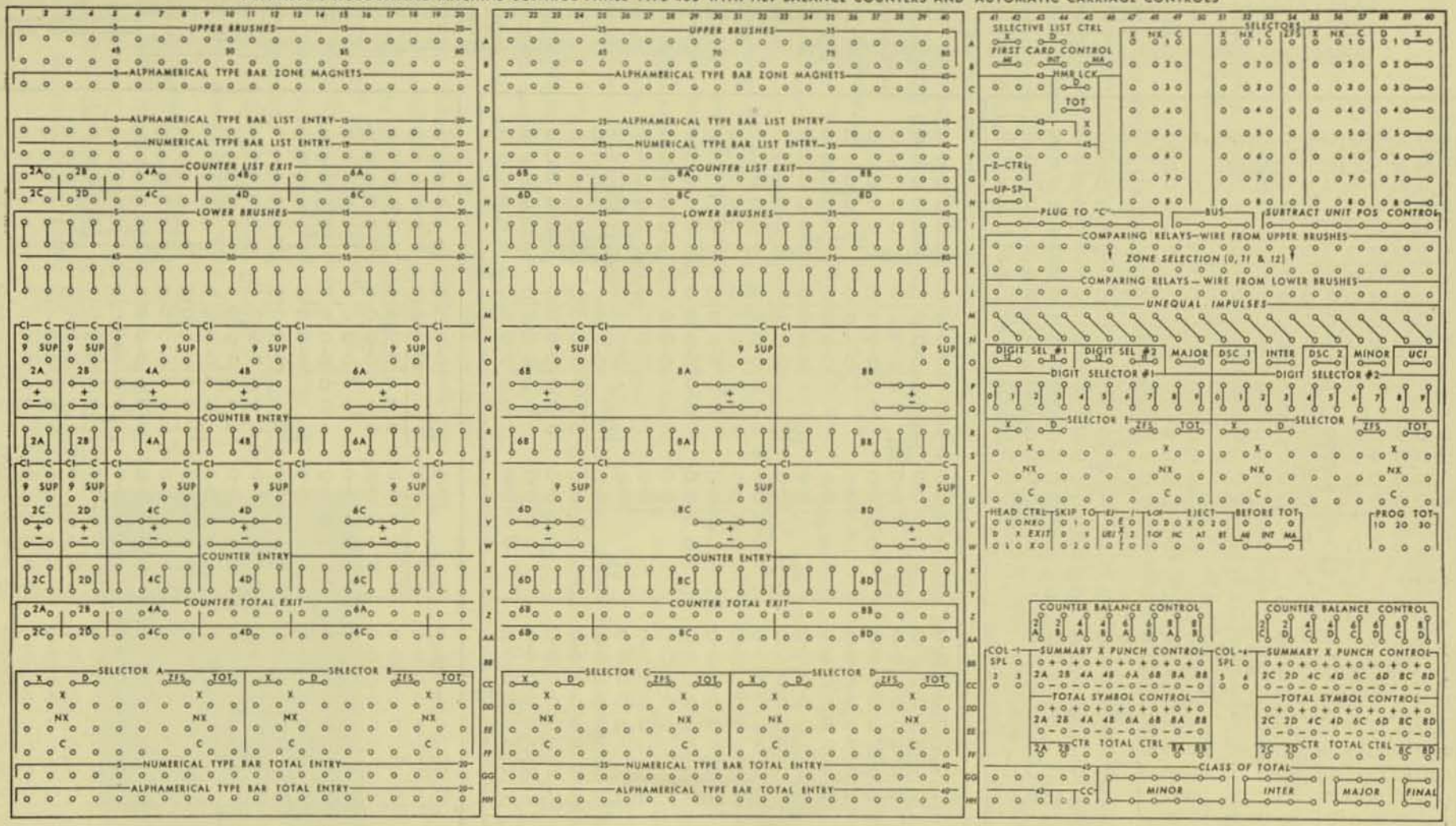
Dotted hubs on the control panel diagrams represent hubs for devices which are not standard on the machine.

Any machine (Net Balance or Non-Net Balance) manufactured after July 31, 1941, is equipped with the control panel illustrated on Page 7. Any Non-Net Balance Machine manufactured before July 31, 1941, is equipped with the control panel illustrated on Page 8.



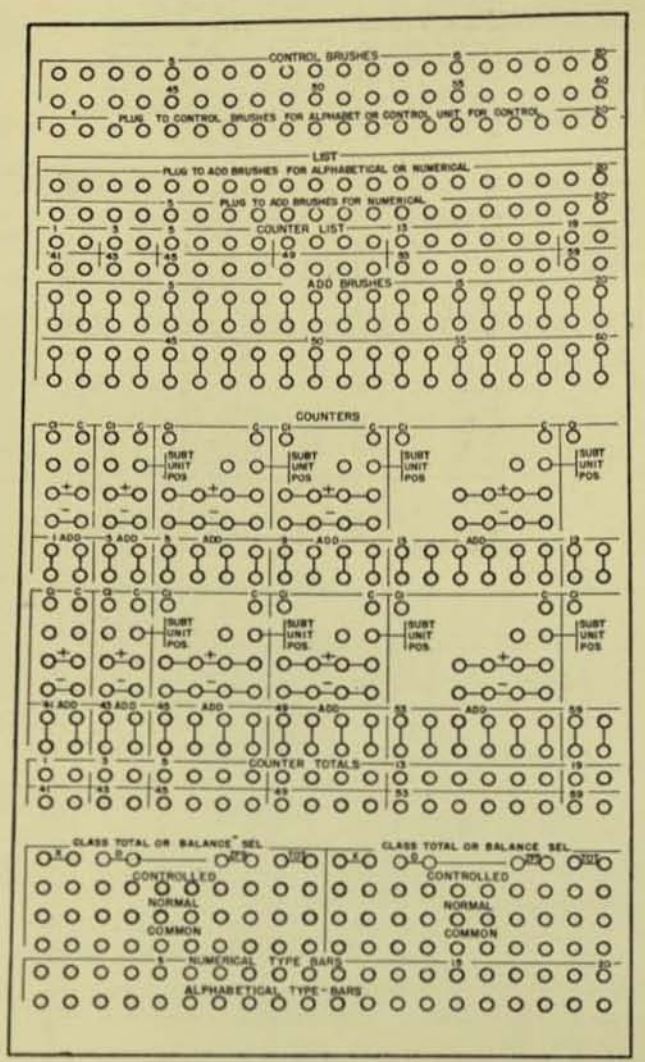
Control Panel

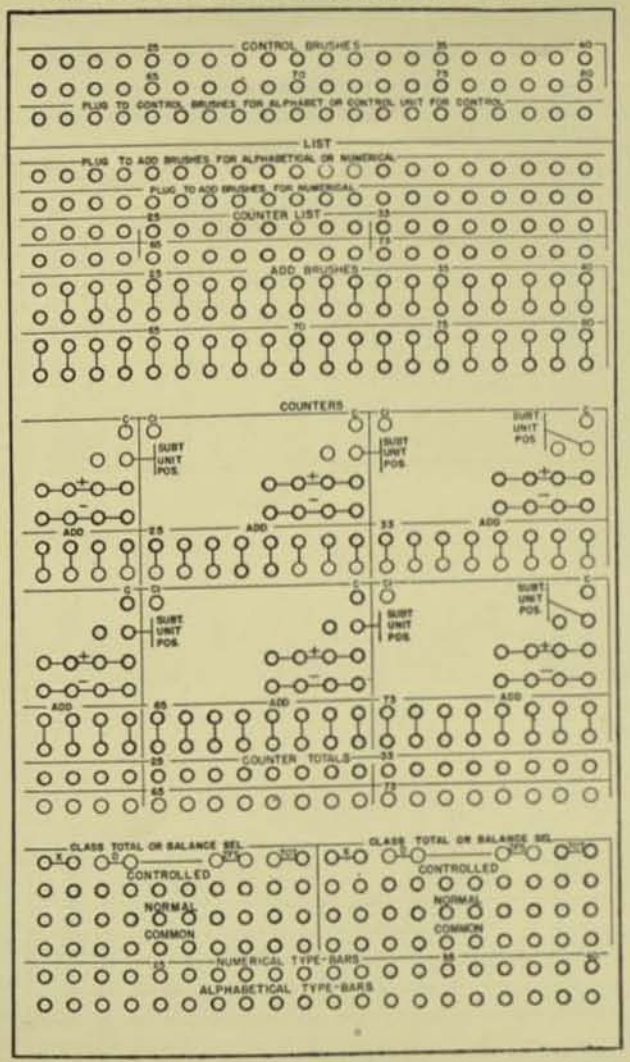
ALPHABETIC ACCOUNTING MACHINE CONTROL PANEL TYPE 405 WITH NET BALANCE COUNTERS AND AUTOMATIC CARRIAGE CONTROLS

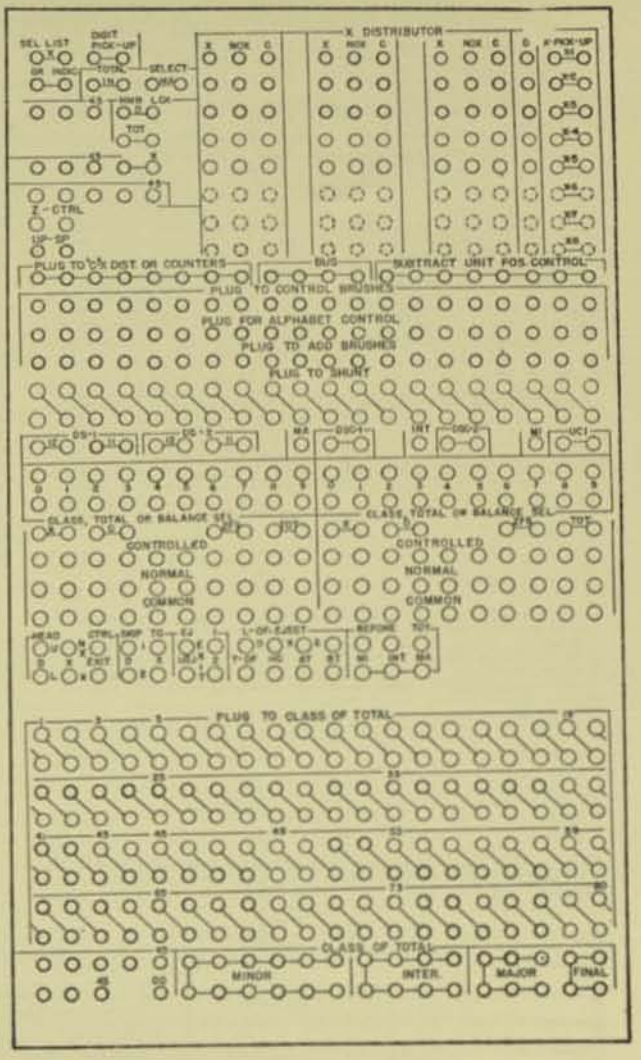


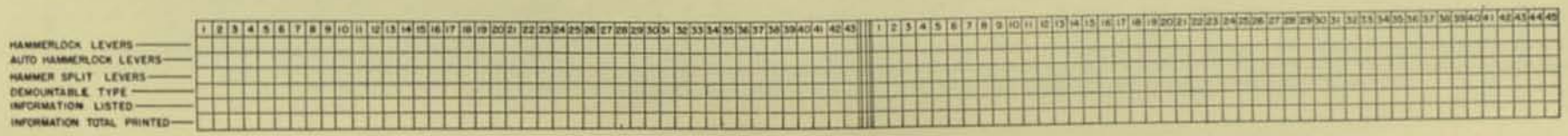
HAMMERLOCK LEVERS
AUTO HAMMERLOCK LEVERS
HAMMERSPLIT LEVERS
DEMOUNTABLE TYPE
INFORMATION LISTED
INFORMATION TOTAL PRINTED

ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NON-NET BALANCE COUNTERS









LISTING

Listing is the printing of information from each card as it passes through the machine.

Print Unit

The print unit of the machine is referred to as the type bars, and it can perform three functions: listing, printing totals, and printing symbols. The number of type bars in a machine may vary according to specifications but the maximum number is 88. Of these, 43 can print both alphabetic and numerical information and are called alphamerical type bars; 45 of the type bars can print only numerical information and are called numerical type bars.

The alphamerical type bars are to the left and the numerical type bars are to the right. The two sections are separated by a space equivalent to one type bar. Each alphamerical type bar consists of 26 alphabetic characters, the numerical characters, 0 to 9, and a special character position. A numerical type bar consists of 10 numerical characters, 0 to 9, and a symbol position. The odd-numbered numerical type bars have an asterisk (*) and the even-numbered bars have a credit symbol (CR).

The type bars can be impulsed to list information punched in a card during a list cycle and to print totals during a total cycle. Each type bar, therefore, has two inlet hubs, one to be used for listing, the other to be used for total printing. During each list cycle, the list type bar hubs are connected internally to the type bars. During a total cycle, the list hubs are disconnected automatically, and the total type bar hubs are connected internally to the type bars.

The machine is equipped with a 20″ carriage. A lever is provided for setting the carriage for either single or double spacing. Single spacing is six lines to an inch; double spacing, three lines to an inch.

Listing of Numerical Information

Numerical information can be listed by wiring from the lower brushes representing the card columns where the information is punched to the type bar list entry hubs. Either the alphamerical or the numerical type bars can be used. The type bars selected are determined by the position on the report where the information is to be printed. The alphamerical type bars will print to the left of the numerical type bars.

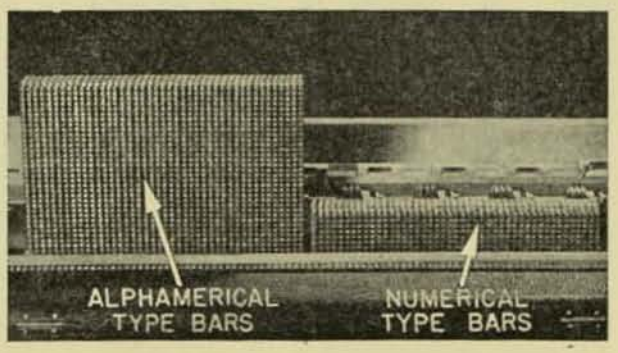
Listing of Alphabetic Information

Alphabetic information can be listed only on the alphamerical type bars. An alphabetic character is punched in a card by combining a zone (12, 11, 0) punch with a numerical (1 to 9) punch. The illustration on page 3 indicates the combination of punching for each character.

In order that a type bar may recognize an alphabetic character, it must receive both the zone and the numerical punch. Each alphamerical type bar has, in addition to the list and total entry hubs, an inlet hub known as a zone magnet hub, which accepts only 12, 11, and 0 impulses.

As in the listing of numerical information, the lower brushes corresponding to the columns punched are plugged to the alphamerical type bar list entry hubs. The upper brushes, reading the same columns punched, are plugged to the alphamerical type bar zone magnet hubs corresponding to the alphamerical list entry hubs used. The upper brush reads the zone punch and zones the type bar so that a particular letter prints on the following cycle when the numerical impulse is read.

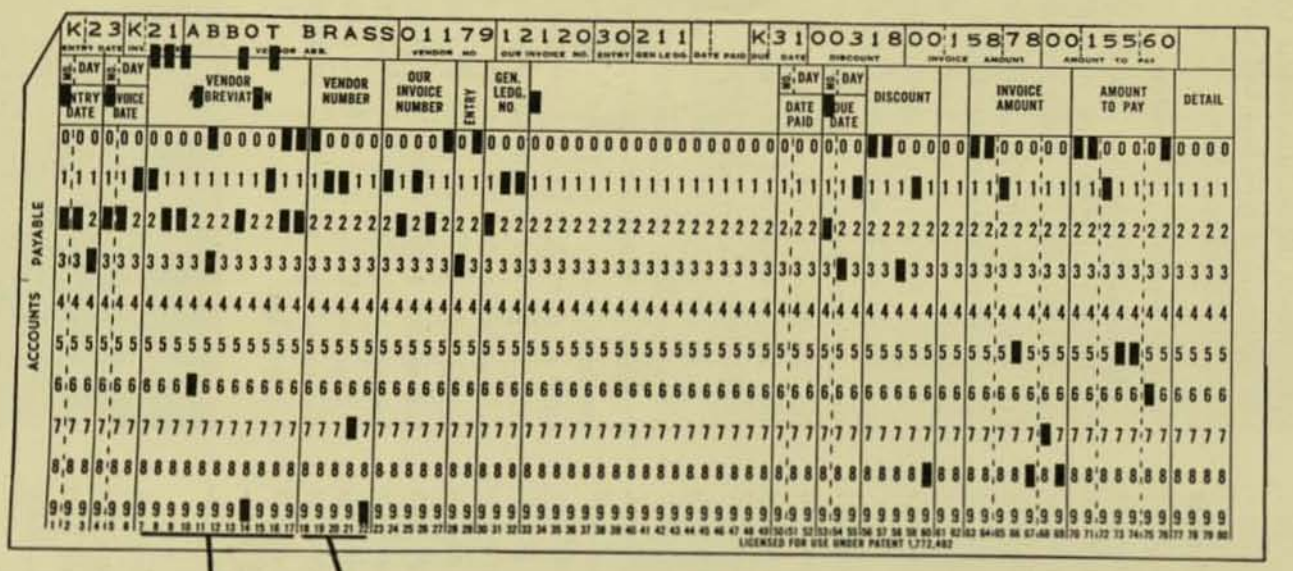
Numerical impulses without zone impulses on the preceding card cycle will print only numerical information.



Type Bars

Listing

Fields	Vendor Abbreviation	Vendor Number
Operation	List	List



CASH REQUIREMENTS STATEMENT

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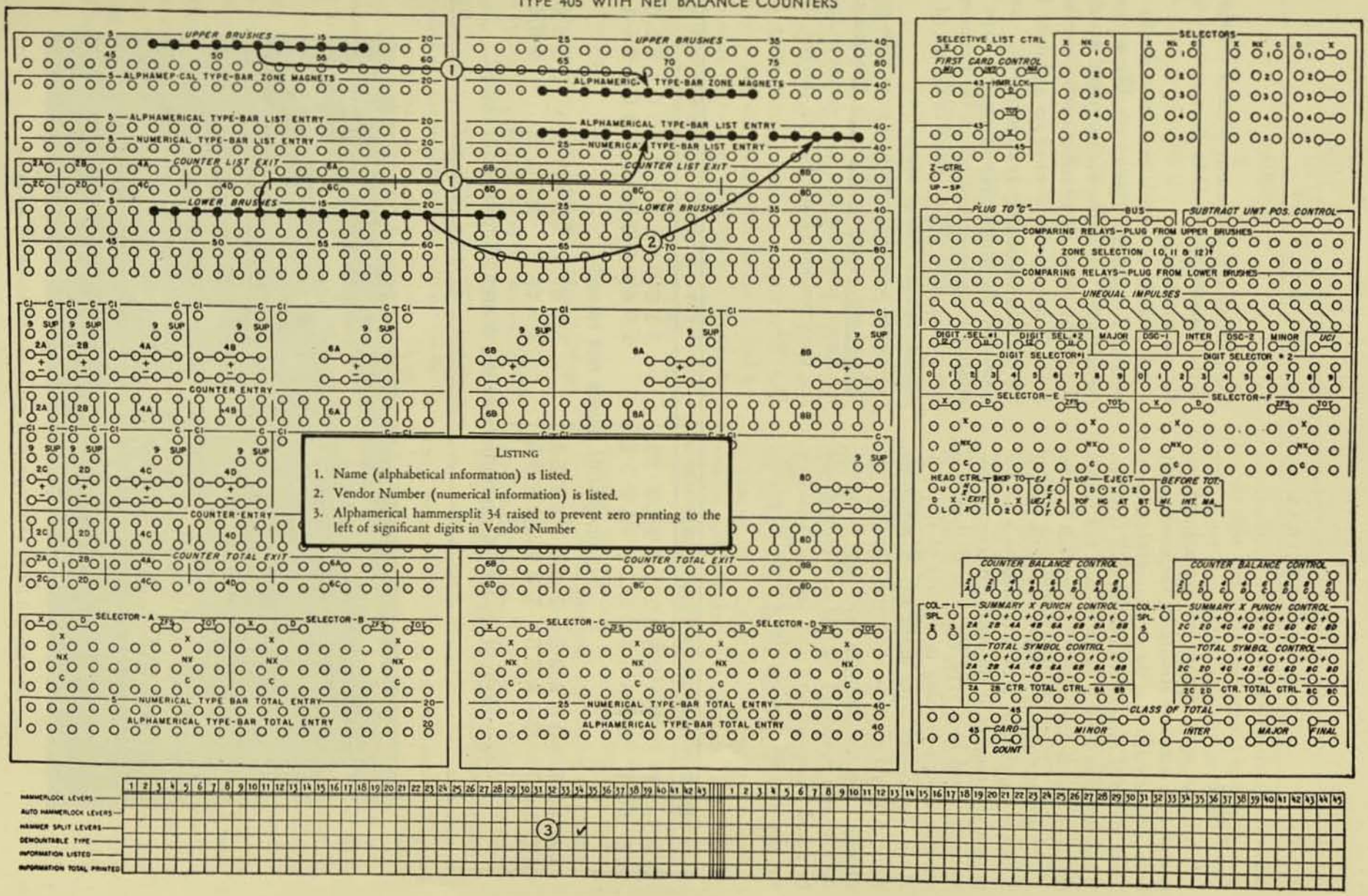
VENDOR ABBREVIATION	VENDOR NUMBER	DUE DATE MO.	DUE DATE DAY	DISCOUNT	INVOICE AMOUNT	AMOUNT TO PAY	TOTAL BY DATE
ABBOT BRASS	1179	12	31	3 18	15878	15560	
ABBOT BRASS	1179	12	31	1 96	9813	9617	
ABRAMS COAL	1180	12	31	8 31	27735	26904	
ABRAMS COAL	1180	12	31	1050	30000	28950	
BARR MACH	3076	12	31	15077	301527	286450	
EL TRUST CO	29521	12	31		5125	5125	
KARTAGE INC	44860	12	31		21875	21875	
LEHIGH COAL	48678	12	31	1384	69178	67794	
MAIZE REF	58091	12	31		11823	11823	
N MILT SUPP	60035	12	31		21415	21415	
N Y GAS EL	61221	12	31		67595	67595	
STATE N Y	[illegible]	12	31		[illegible]	[illegible]	

ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS



LISTING

1. Name (alphabetical information) is listed.
2. Vendor Number (numerical information) is listed.
3. Alphamerical hammersplit 34 raised to prevent zero printing to the left of significant digits in Vendor Number

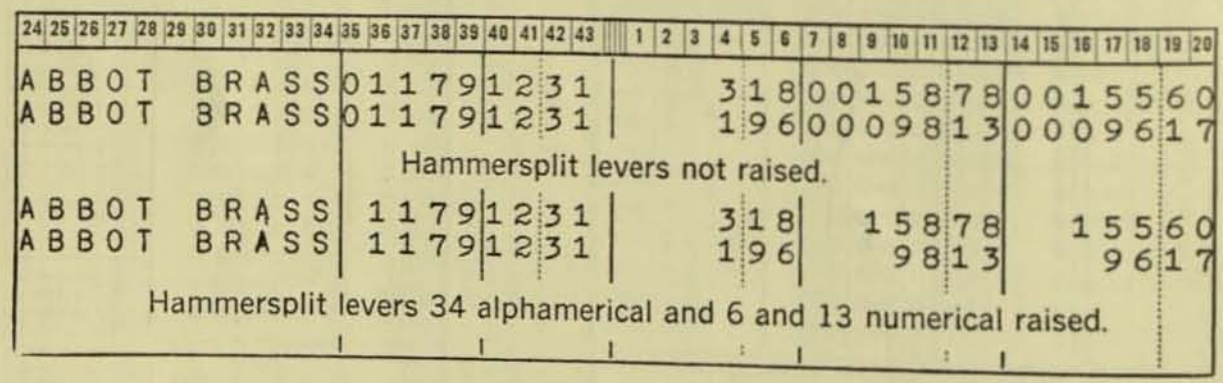
Zero Printing

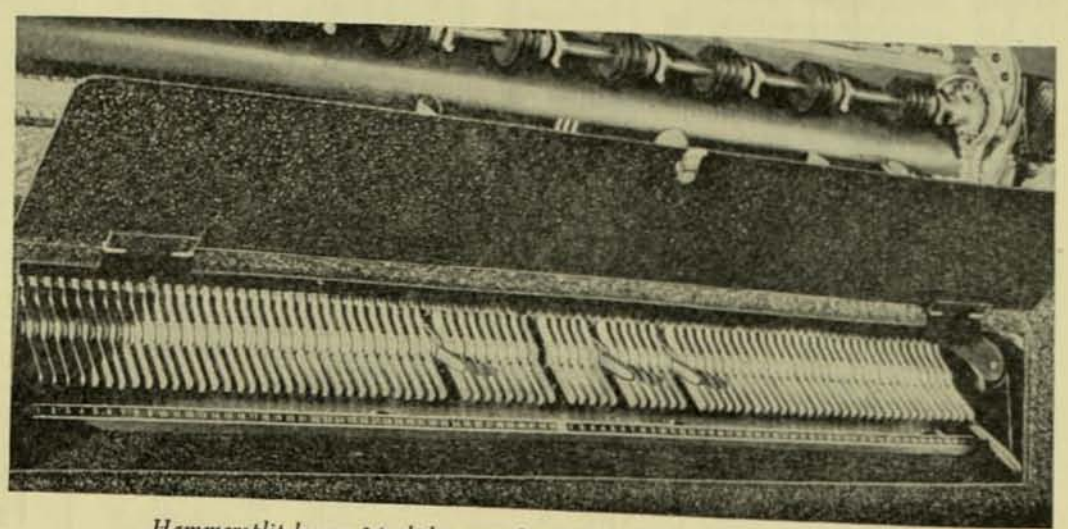
Printing of zeros on both alphamerical and numerical type bars is controlled by the hammersplit levers, also referred to as the zero suppression levers. There are 88 of these levers, one for each type bar. When any zero lever is raised, it does not permit the type bar to the right of it to print a zero.

The alphamerical type bars print zeros only if a zero is punched in a card column or a zero is present in a counter, if the column or counter position is wired to a type bar, and if there is a significant digit printing to the left of the zero. If the unnecessary zeros to the left of significant digits in a field are to be eliminated, the zero suppression levers corresponding to the type bar printing the units position of the field to the left should be raised. A special character can be printed on the alphamerical type bars by a single 12 punch. The printing of this character is under the control of the hammersplit levers in the same way as is the zero position.

It is possible to print a zero on any type bar without a significant digit to the left in one of the following ways: The combinational punch of a "1" and a "0" in a card column will always print a zero, if the type bar is wired for alphabetic listing. A clip, called "left zero carry clip," can be placed on the hammersplit lever of a type bar printing a significant digit and on the hammersplit levers of as many as 6 type bars to the left of this position to cause zero printing.

Unwired numerical type bars print zeros to the right of any significant digit. To eliminate these mechanical zeros, the zero lever corresponding to the units position of the field to the left should be raised.





Hammersplit levers 34 alphamerical and 6 and 13 numerical are raised.

ADDING

Counters

The functions of addition and subtraction are performed by accumulators called counters. The number of counter positions in an Alphabetical Accounting Machine may vary from 32, 44, or 56 to a maximum of 80. The individual counter wheels are grouped in varying capacities as follows:

4 groups of 2 positions
4 groups of 4 positions
4 groups of 6 positions
4 groups of 8 positions

These counter groups are referred to as 2A, 2B, 2C, 2D, 4A, 4B, etc., to 8D. (On Non-Net Balance machines manufactured prior to July 31, 1941, the counter groups are referred to by numbers instead of letters, such as 1 to 2, 25 to 32, and 73 to 80.) The size of the total is not limited by the number of counter positions in a group, for two or more groups not necessarily adjacent may be connected or coupled together to act as a single unit.

Accumulating

There are four basic steps in plugging for accumulation.

(1) *What information is to be accumulated?* The field to be added is connected from the lower brushes to the counter entry hubs. The counter entry hubs are made common to permit the field which is taken into a counter to be taken to another counter. The counter group to be used is determined by the size of the total to be accumulated, for each counter entry hub represents a single counter wheel which can accumulate one position of a total. All the counter wheels of a group function as a unit, and the carryover from one wheel is added to the wheel to the left.

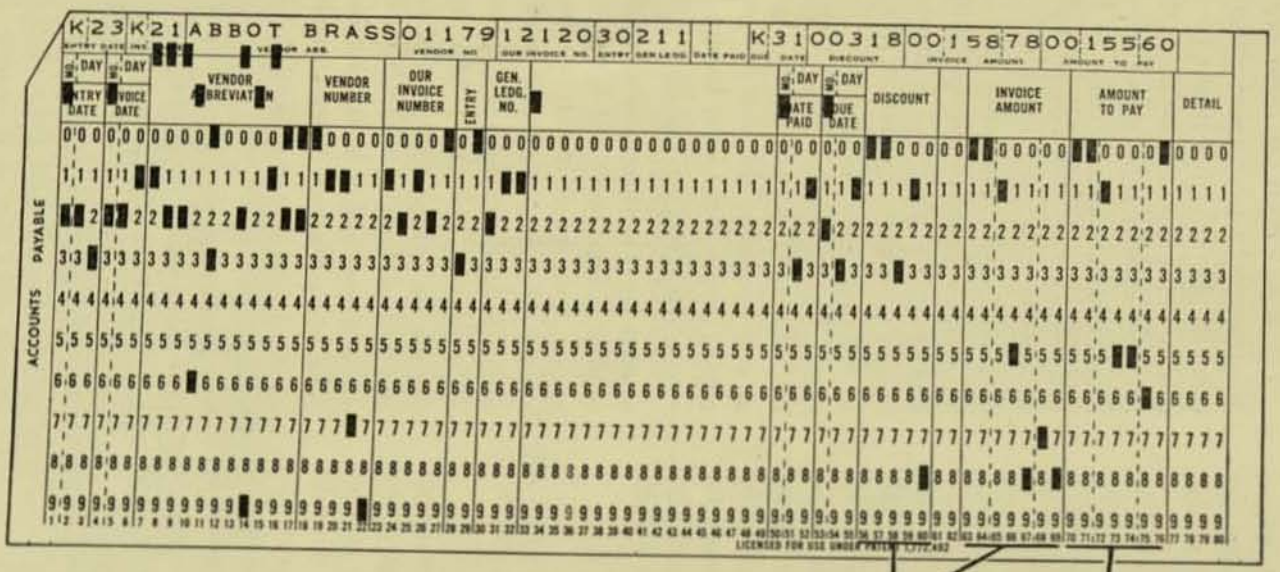
If the capacity of one counter group is not sufficient, another counter may be coupled to the first counter. This is done by connecting the CI (carry impulse) of the first counter to the C (carry) hub of the second counter. This brings the carryover impulse from the last position of the first counter to the first position of the second counter group. The second counter also must be impulsed to add and to clear on the same conditions as the first counter.

(2) *Which cards are to be added, subtracted, or eliminated?* Each counter group has a series of common plus (+) and minus (—) hubs. Whenever the plus hubs are impulsed, the counter will add. An impulse in the minus hubs will cause the counter to subtract. In order to have a counter add every card which goes through the machine, an impulse must enter the plus hub during each card feed cycle. An outlet hub called "plug to C" emits a constant impulse during every card feed cycle. If a "plug to C" is connected to the plus hub of a counter, the counter receives an impulse to add every card which passes through the machine. To add only one type of card in a counter, the "plug to C" impulse would have to be selected so that it reaches the plus hub only when that type of card is at the lower brushes.

(3) *When should the total be printed?* Each counter has a counter total control hub (or plug to class of total hub) which, when impulsed, will restore all the wheels of that counter group to zero. Clearing the counter makes it possible to print the total held by the counter and to restore that counter to normal. The class or total hubs are used to impulse the counter total control hubs. The minor class of total hubs emit impulses whenever there is a minor total cycle; the intermediate class of total hubs, whenever there is an intermediate total cycle; and the major class of total hubs, whenever there is a major total cycle. The minor total prints on a first total cycle; the intermediate and major totals print on a second total cycle. The final class of total hubs emit impulses only when the final total reset key is depressed and the final total switch is ON. The counters are cleared by connecting the proper class of total hubs to the counter total control unit; that is, if counter 8A is to add a major total, the major class of total hub would be used to clear counter 8A. (On Non-Net Balance machines, manufactured prior to July 31, 1941, clearing of counters is done by connecting

Adding

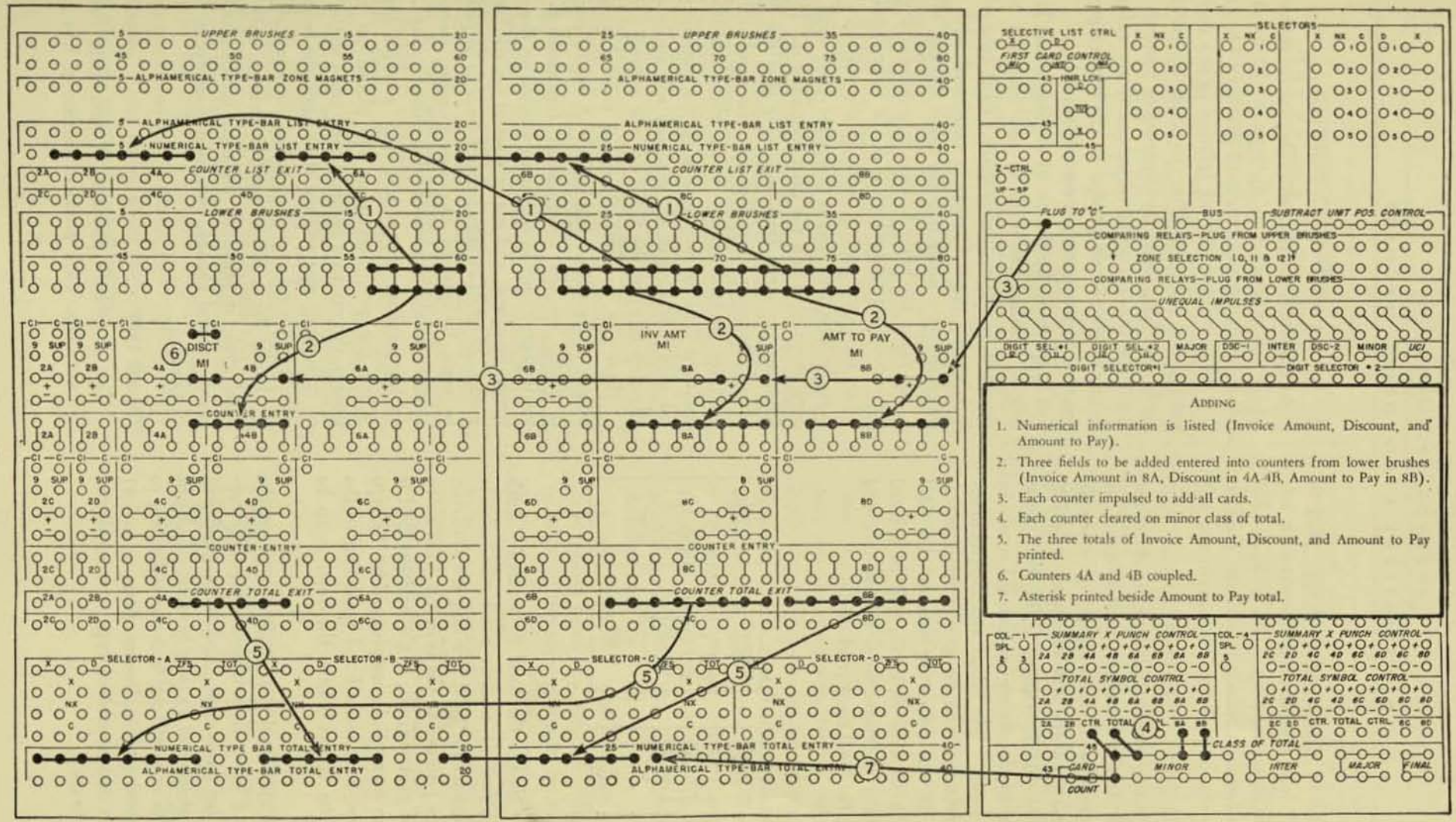
Fields	Invoice Amount	Discount	Amount to Pay
Operation	List; Minor Total	List; Minor Total	List; Minor Total*



CASH DISBURSEMENTS

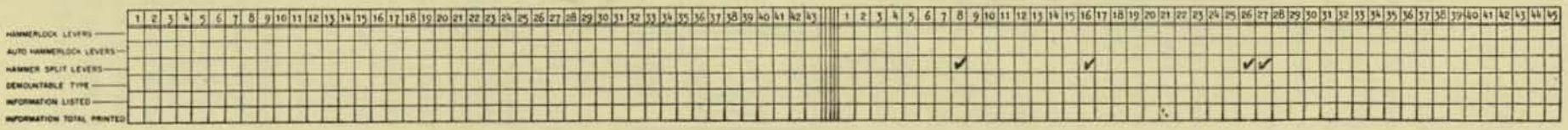
VENDOR ABBREVIATION	CHECK No. VENDOR NO.	CHECK No. DATE NO.	CHECK No. DATE DAY	DEBIT ACCOUNTS PAYABLE	CREDIT DISCOUNT	CREDIT CASH
ABBOT BRASS	1179	12	31	15878	318	15560
ABBOT BRASS	1179	12	31	9813	196	9617
ABRAMS COAL	1180	12	31	27735	831	26904
ABRAMS COAL	1180	12	31	30000	1050	28950
BARR MACH	3076	12	31	301527	15077	286450
EL TRUST CO	29521	12	31	5125		5125
KARTAGE INC	44860	12	31	21875		21875
PHILA	93025	12	31	14190		14190
SAN FRAN	93031	12	31	17864		17864
				1168967	18856	1150111*

ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS



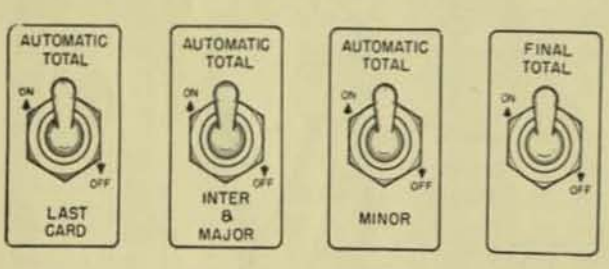
Adding

1. Numerical information is listed (Invoice Amount, Discount, and Amount to Pay).
2. Three fields to be added entered into counters from lower brushes (Invoice Amount in 8A, Discount in 4A-4B, Amount to Pay in 8B).
3. Each counter impulsed to add all cards.
4. Each counter cleared on minor class of total.
5. The three totals of Invoice Amount, Discount, and Amount to Pay printed.
6. Counters 4A and 4B coupled.
7. Asterisk printed beside Amount to Pay total.



the proper class of total impulses to the "plug to class of total" hub representing the extreme left position of the counter group. The "plug to class of total" hub for each remaining counter position is plugged to the hub of the position to the left of it.)

Automatic totals are controlled by the automatic total switches. If the automatic total switches are ON, the machine will automatically go through total cycles and the totals will automatically print. If the total switches are turned OFF, total cycles must be taken by depressing the manual total key illustrated on page 5. The minor and intermediate-major total switches refer to group totals which are discussed in the following section. A final total, that is, a total of all cards, will be printed only by turning the final total switch ON and by depressing the final total reset key.



(4) *Where should the total be printed?* Each counter has a row of counter total exit hubs at which the impulses for total printing are available. These hubs are plugged to the type bar total entry hubs for total printing; i.e., if a 6 position total is expected, then 6 exit hubs are plugged to the type bars. The type bars are selected according to the position on the report where the total is to be printed.

Asterisks may be printed beside a total on the numerical type bars. Each odd-numbered numerical type bar has an asterisk. Each even-numbered numerical type bar has a credit symbol. To print an asterisk, the class of total hub corresponding to the type of total (minor, intermediate, or major) is wired to an odd-numbered type bar, usually to the right of the total.

AUTOMATIC CONTROL

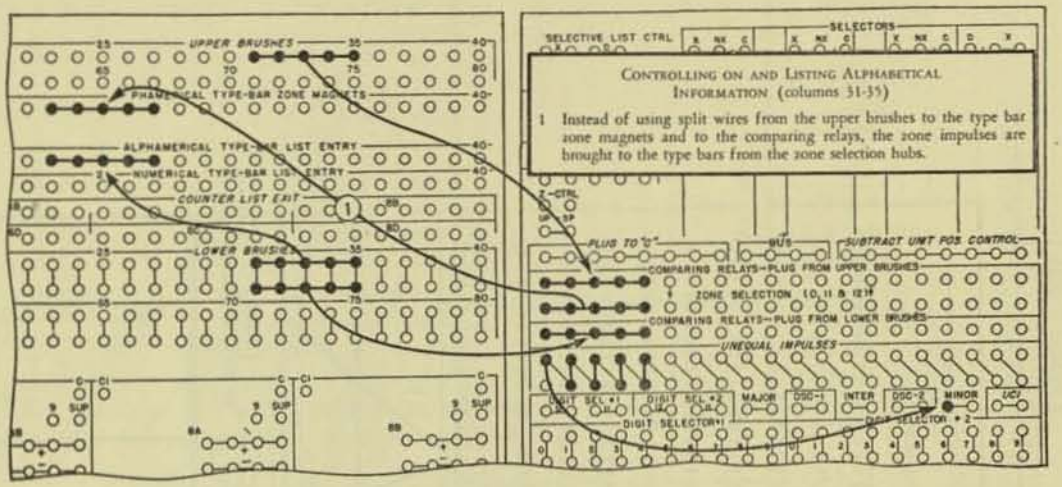
Automatic Control is the function by means of which the machine can distinguish the cards of one classification from those of another. The cards in a single classification are referred to as a control group; for example, after payables distribution cards have been sorted by department number, the cards for one particular department are referred to as a single control group. In the illustration on page 18, Department is a control field.

The machine, by the use of the upper and lower sets of brushes, can read at one time the holes punched in two successive cards. Each card when it is at the upper brushes is compared with the preceding card which is at the lower brushes. When a card passes the lower brushes, it is compared with the succeeding card which is at the upper brushes. Thus, each card passing through the machine, except the first and last, is compared both with the card ahead of it and the card following it. If the fields are the same, thus indicating that the cards are of the same control group, the machine will continue to feed cards. When the punching in one card does not compare with the punching in the card preceding it, the machine will automatically stop to print the totals for the control group.

There can be three classes of control groups: minor, intermediate, and major. A minor control is placed on the classification representing the smallest grouping, intermediate control on the next larger grouping, and major control on the largest group. If totals of sales amount were to be printed by state, by city, by customer number, customer number would be considered a minor group, city an intermediate group, and state a major group. When the proper controls are placed on these groups, the machine automatically stops at the end of each group and will not start until the required number of total cycles are taken automatically or by hand. For a minor control change, only one total cycle is required; on each intermediate or major control change, two total reset cycles must be taken.

Control Unit

Ten or twenty positions of automatic control are available. Each position consists of five hubs.



The top row of hubs are inlets to the comparing relays from the upper brushes. The second row of hubs are outlets for the zone impulses, 0, 11, and 12, which are brought to the top row of hubs. The third row of hubs are inlets for the lower brushes to the comparing relays. The fourth and fifth rows of hubs are common outlets for unequal impulses resulting from the comparison. Each comparing position has two diagonal common hubs for the unequal impulse to facilitate plugging to the control hubs (minor, intermediate, major). Thus, when two or more columns are being compared for control purposes, split wires do not have to be used.

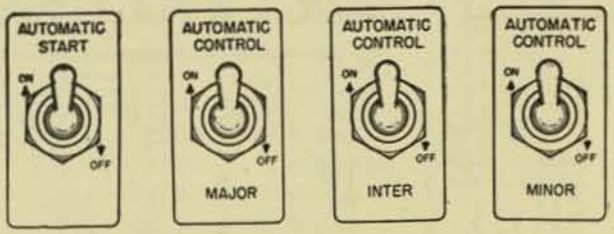
During each card cycle, the readings in both sides of the comparing relays are compared. If the two readings for any comparing position are not identical, an unequal impulse is available in the upper unequal impulse hub of that position and the lower unequal impulse hub diagonally to the right. If the two comparing positions are identical, no impulse is available.

For control on either alphabetic or numerical information, the upper and lower brushes corresponding to the card columns of a control field are plugged to the comparing relays. The unequal outlet hub for each comparing position used is connected to the outlet hub of the position to the left. The extreme left hand upper unequal impulse position or the lower right hand diagonal position is then connected to the minor, intermediate, or major hubs. These hubs, when impulsed, will cause the machine to stop for total cycles.

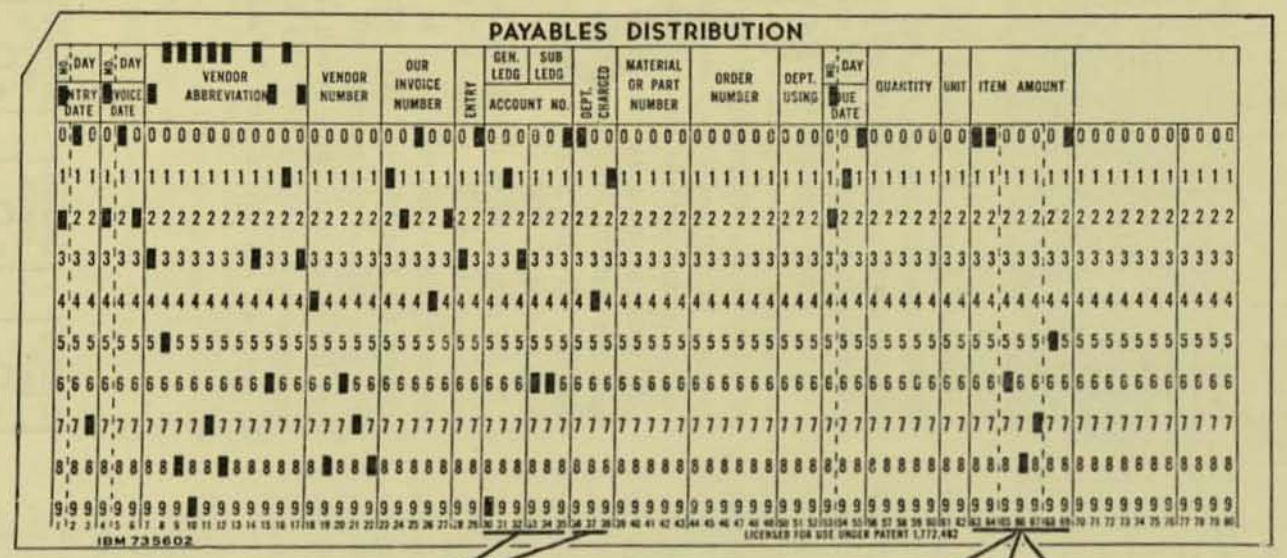
The second row of hubs of the control unit, labelled zone selection (0, 11, and 12), are used only when both controlling on and listing an alphabetic field. In this case, instead of using split wires from the upper brushes to the type bar zone magnets and the comparing relays, the upper brushes are taken to the comparing relays, and the zone impulses, 12, 11, and 0 are taken to the type bar zone magnets from the zone selection hubs.

All classes of automatic control are subject to the automatic control switches. To have any of the controls effective, the corresponding control switches must be ON.

If the automatic total switches are OFF, after each control break the machine will stop. In order to start it, the total cycles must be taken by depressing the manual total key. After the totals have been printed the machine will automatically start if the automatic start switch is ON. If the automatic start switch is OFF, the start key must be depressed in order to start the machine after a total cycle.



Fields	Dept. Charged	Gen. Acct.	Sub. Acct.	Amount by Sub Acct.	Amount by Gen. Acct.	Amount by Dept.
Operation	List; Major	List; Int. Control	List; Minor Control	List; Minor Total	Intermediate Total	Major Total

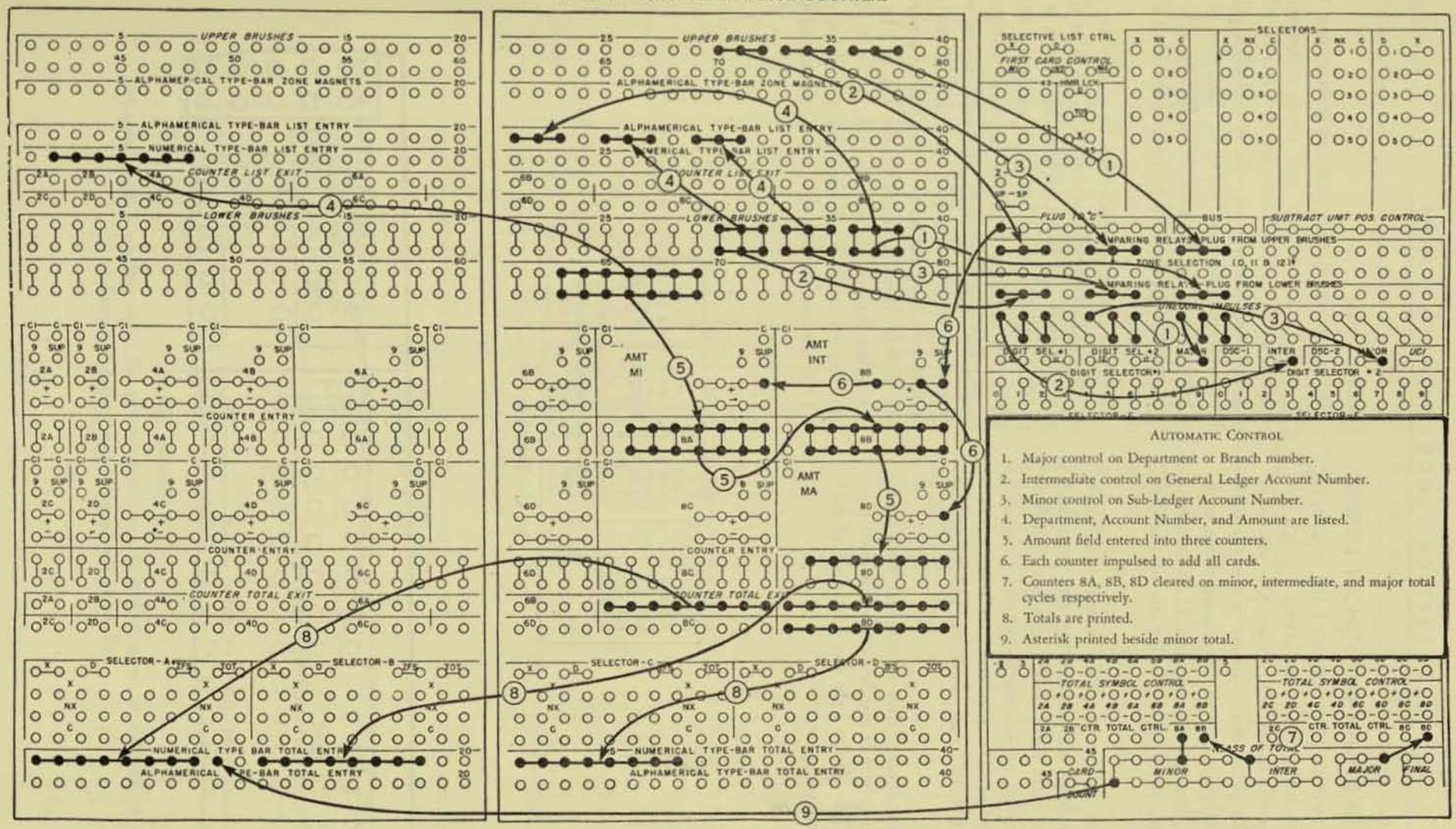


EXPENSE DISTRIBUTION

DATE

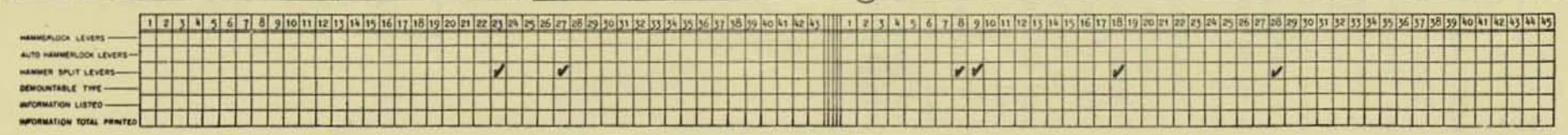
DEPT. OR BRANCH	ACCOUNT No. GEN. LEDG.	ACCOUNT No. SUB. LEDG.	OUR INVOICE NUMBER	DATE MO.	DATE DAY	AMOUNT	AMOUNT BY ACCOUNT	AMOUNT BY DEPT. OR BRANCH
41	913	660	12042	12	07	687 50		
41	913	660	12084	12	14	721 92		
						1409 42*		
41	913	700	12125	12	23	675 95		
						675 95*		
							2085 37	
41	915	760	12086	12	15	2119 50		
						2119 50*		
							2119 50	4204 87
43	913	730	12171	12	31	47 40		

ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS



Automatic Control

1. Major control on Department or Branch number.
2. Intermediate control on General Ledger Account Number.
3. Minor control on Sub-Ledger Account Number.
4. Department, Account Number, and Amount are listed.
5. Amount field entered into three counters.
6. Each counter impulsed to add all cards.
7. Counters 8A, 8B, 8D cleared on minor, intermediate, and major total cycles respectively.
8. Totals are printed.
9. Asterisk printed beside minor total.



ACCUMULATING WITH OR WITHOUT LISTING

There are two basic operations of the Accounting Machine—listing and non-listing—which are controlled by the list switch. When this switch is set to list, the print unit operates for every card cycle, and information can be printed from each card passing through the machine. If the machine is set to list, it is also possible to accumulate totals.

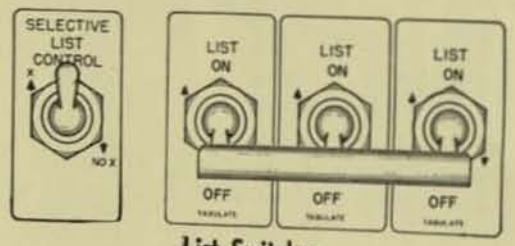
Non-listing refers to the passage of cards through the feed without having the type bars function for each card. When the list switch is OFF and there is no automatic control, there will be no list cycles. The machine can accumulate a total for the entire run of cards and print the total.

When the machine is set to non-list with automatic control, there is one list cycle for each control group. This allows only the first card of each control group to print.

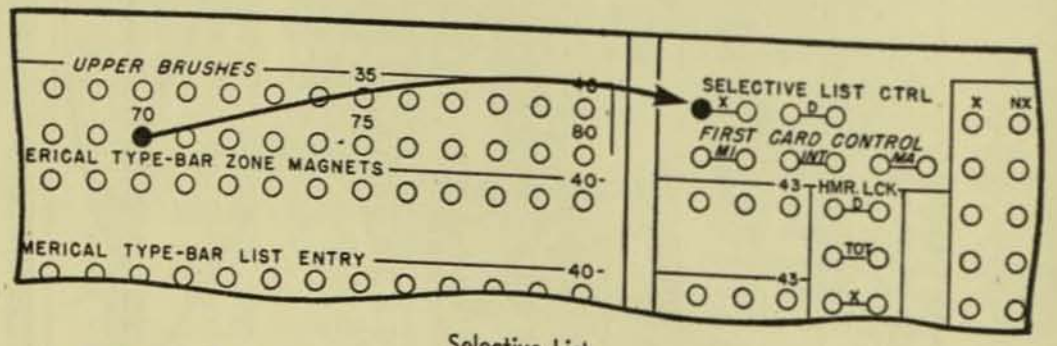
Selective Listing

When the Accounting Machine is set to non-list, the selective list feature can cause distinctively punched cards to list. There are two sets of common hubs for selective list, the X and digit inlets. These hubs may be impulsed from the upper brush to allow the X or digit cards to list. If a lower brush were used, the card following the X or digit card would list.

Selective listing is controlled by a selective list switch. If the switch is turned to X, all X or digit punched cards are listed. When the switch is set to No X, all No X or No-Digit cards are listed. When the machine is wired for both automatic control and selective listing, the first card of each control group will also list, regardless of the distinctive punching for selective listing. In a normal non-listing operation without the use of the selective list feature, the switch must be on X. If it were turned to No X, all the cards would list, giving the effect of having the list switch turned ON.



List Switches



Selective List

In addition to the first card of each control group, all cards with an X in column 70 will list if the Selective List Switch is turned to X.

EXPENSE DISTRIBUTION
BY DEPARTMENT OR BRANCH

DATE

DEPT. OR BRANCH	ACCOUNT No. GEN. LEDG.	ACCOUNT No. SUB. LEDG.	OUR INVOICE NUMBER	DATE MO.	DATE DAY	AMOUNT	AMOUNT BY ACCOUNT	AMOUNT BY DEPT. OR BRANCH
82	431	112	12066	12	10	30000		
82	431	112	12153	12	28	30000		
						60000*		
82	431	113	12066	12	10	15000		
82	431	113	12066	12	10	15000		
82	431	113	12066	12	10	12500		
82	431	113	12153	12	28	15000		
82	431	113	12153	12	28	15000		
82	431	113	12153	12	28	12500		
						85000*		
82	431	114	12066	12	10	5000		
82	431	114	12066	12	10	7500		
82	431	114	12066	12	10	5000		
82	431	114	12153	12	28	5000		
82	431	114	12153	12	28	5000		
82	431	114	12153	12	28	7500		
						35000*		
82	431	520	12149	12	28	36043		
						36043*		
82	431	700	12082	12	14	225		
						225*		
82	431	750	12003	12	01	10000		
						10000*		
82	431	810	12112	12	18	7020		
						7020*		
82	431	850	12043	12	07	2475		
						2475*		
							235763	
82	432	841	12151	12	28	179286		
						179286*		
							179286	415049

Listed Report

EXPENSE DISTRIBUTION
BY DEPARTMENT OR BRANCH

DATE

DEPT. OR BRANCH	ACCOUNT No. GEN. LEDG.	ACCOUNT No. SUB LEDG	OUR INVOICE NUMBER	DATE MO.	DATE DAY	AMOUNT	AMOUNT BY ACCOUNT	AMOUNT BY DEPT. OR BRANCH
82	431	112				60000		
82	431	113				85000		
82	431	114				35000		
82	431	520				36043		
82	431	700				225		
82	431	750				10000		
82	431	810				7020		
82	431	850				2475		
							235763	
82	432	841				179286		
							179286	415049

Non-Listed Report

CONTROL OF COUNTER ACCUMULATION (X DISTRIBUTION)

Thus far, only the principles of simple accumulation, where all the cards which pass through the machine are added, have been explained. When working with several types of cards, it is often necessary to add one type of card, subtract another type, and perhaps eliminate a third type. For example, in a Sales Analysis application, a separate card is usually punched for each sale and each return. The amount of the sale or return, although registered on different cards, would normally be punched in the same card columns. It may be necessary to sort the sales and returns cards together and prepare a report showing the sales, returns, and net sales (sales added and returns subtracted).

In order that the machine may tell the difference between different types of cards, a distinguishing punch is necessary. This is done normally by punching an X in a predetermined column. It is possible to punch a distinguishing digit in a column to perform the same operation. Digit control will be discussed later. Once a card has a control X punch in it, it is possible to direct a counter to add, substract, or eliminate either the X or No X card.

Selectors (X Distributors)

A switch-like mechanism called the selector or X distributor is used to control counter accumulation. The operation is similar to that of a switch on a railroad track which can be used to direct a train to one of two tracks. In the case of the Accounting Machine, the switch is the selector and a "plug to C" impulse becomes the train. The X punch is used to control the switch or selector.

The standard machine has five 3-position selectors. Each selector has two common X pick-up hubs, a D (digit) pick-up hub, and a ZFS pick-up hub. The use of the D and ZFS pick-up hubs is exactly the same as described for class selectors. In addition, each selector consists of three units of three hubs: an X or controlled hub, a No X or normal hub, and a C or common hub. The hubs of each unit represent contact points of a relay.

In each unit of a selector, the C hub is normally connected internally to the No X hub; therefore, an impulse entered in the C hub can come out of the No X hub, or an impulse entered in the No X hub can come out of C. This is called the normal connection and it is controlled by the pick-up hub of the selector. As long as no impulse enters the pick-up hub of a selector, this connection between C and No X will exist in each of the three units of a selector. The pick-up hub of the selector can be impulsed by an X or 12 punch. When the pick-up hub is impulsed, the normal connection in each of the three units of the selector is broken for the next card cycle. Under this condition, the selector is said to be "picked up" or controlled; as a result, the C hubs are connected internally to the X hubs. Therefore, an impulse brought in C can come out of X or an impulse brought in X can come out of C. When a card is at the upper brushes, it is read for the control punch to determine whether that card should be added or subtracted on the following card cycle. The "plug to C" impulse is then selected so that the counters are told to add, subtract, or ignore the card when it gets to the lower brushes. Impulses other than "plug to C" may also be selected or distributed by means of the X selectors.

Counter List

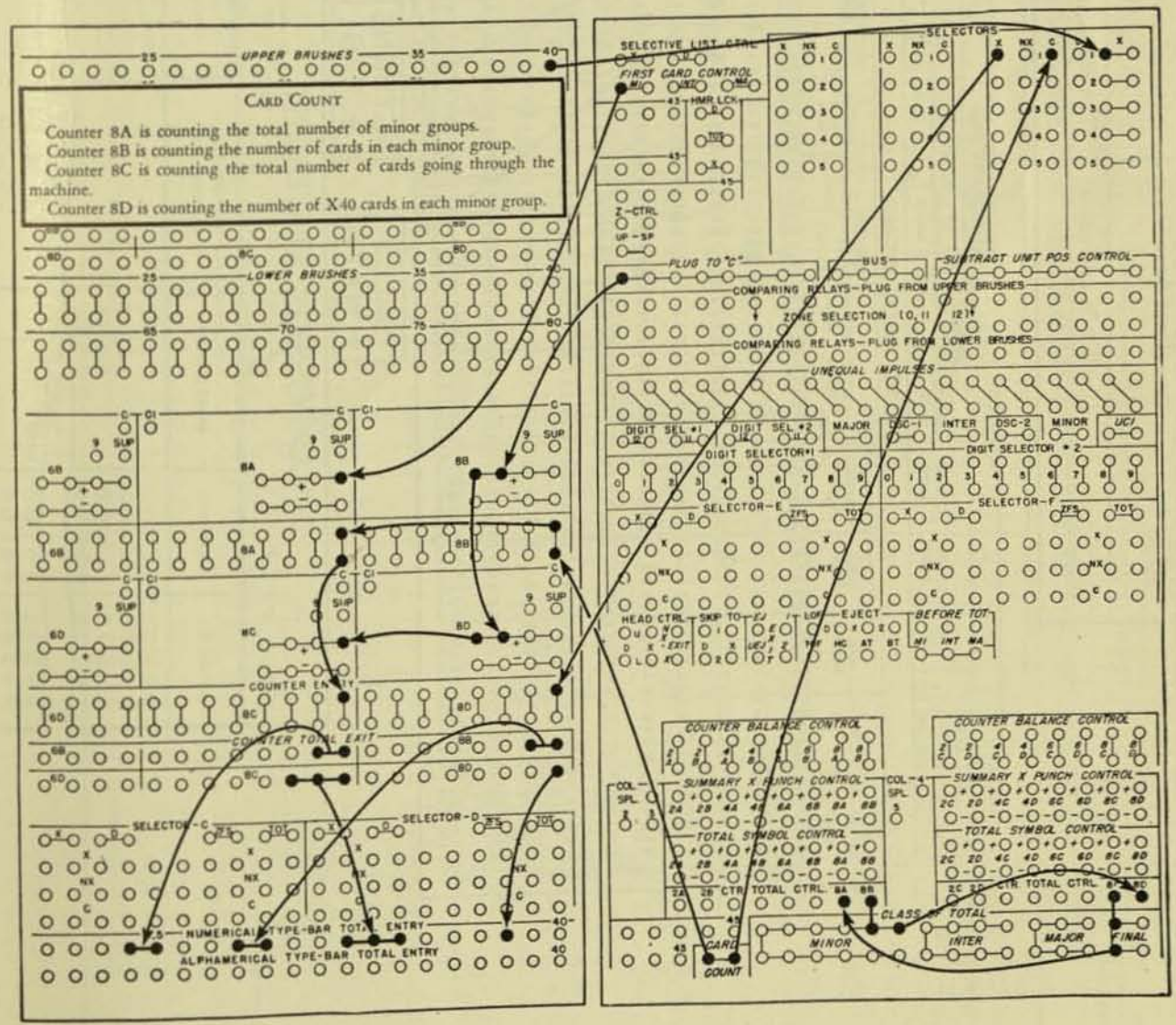
Information which is added or subtracted in a counter may be listed by plugging from the proper counter list exit hubs to the list entry hubs instead of plugging from the lower brushes to the list entry hubs. Only the information which is accumulated in a counter is listed by the counter list hubs. This provides a means for controlling the information which is listed, for if a counter is adding only one type of card, only that type of card will be listed from the counter list exit hubs.

CARD COUNT

The card count hubs make it possible to count the number of cards listed or accumulated, the number of cards in specific groups as identified by X's or No X's, or the number of control groups. The two card count hubs emit a "1" impulse every card cycle. This "1" can be taken directly or indirectly to a counter entry hub to count cards. If a "plug to C" is connected to the + hub of the counter, and the counter is cleared as a final total, a count of the total number of cards passing through the machine can be taken. If the counter + hub is impulsed on a minor first card control impulse, and if the counter is cleared on a final impulse, the counter will accumulate a total of the number of minor control changes. If X or No X cards are to be added, the card count can be distributed through a selector and then taken to a counter entry hub.

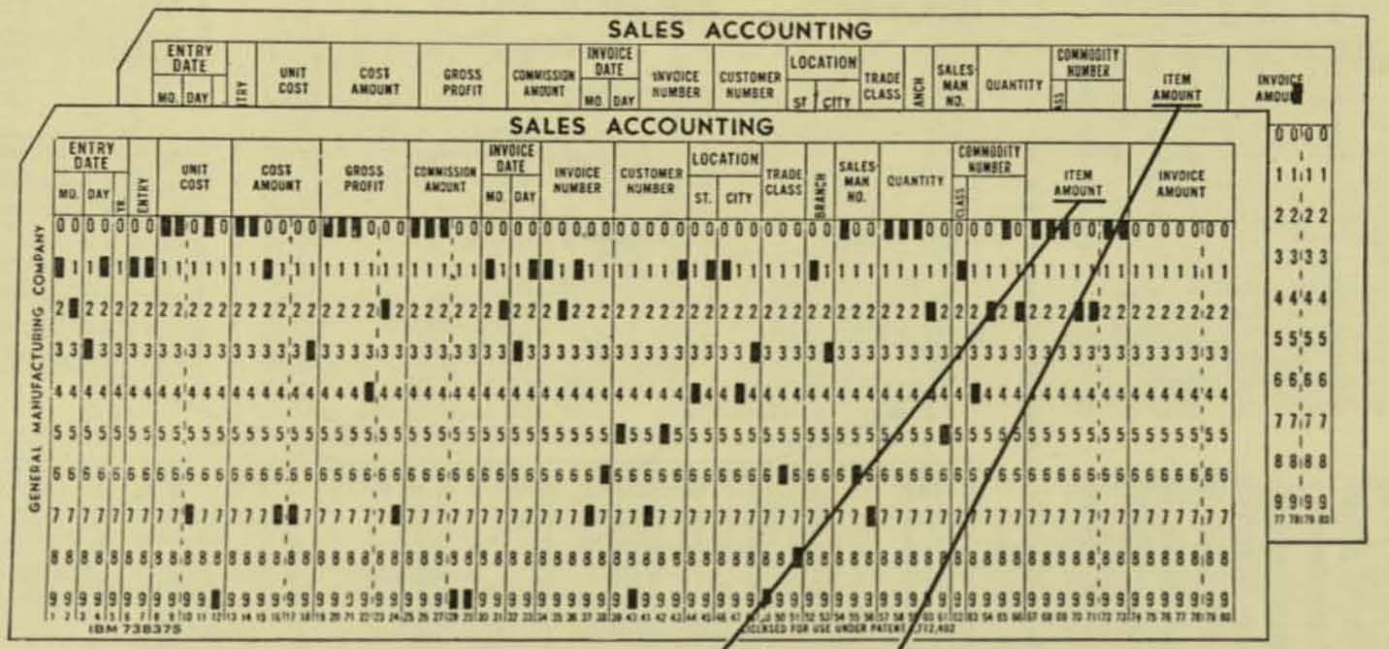
The card count hubs can also be used to list a "1" for a specific type of card. To list a "1" for each X79 card, the card count is plugged to the C hub of a selector which is controlled on column 79. The X hub of the selector is then connected to the type bar list entry hubs.

Note: On some machines, only the right-hand card count hub is active.



Counter Control—X Distribution

Fields	Item Amount (Sales)	Item Amount (Returns)
Operation	List NX78 cards; Minor Total	List X78 cards; Minor Total*



SALES + NX78

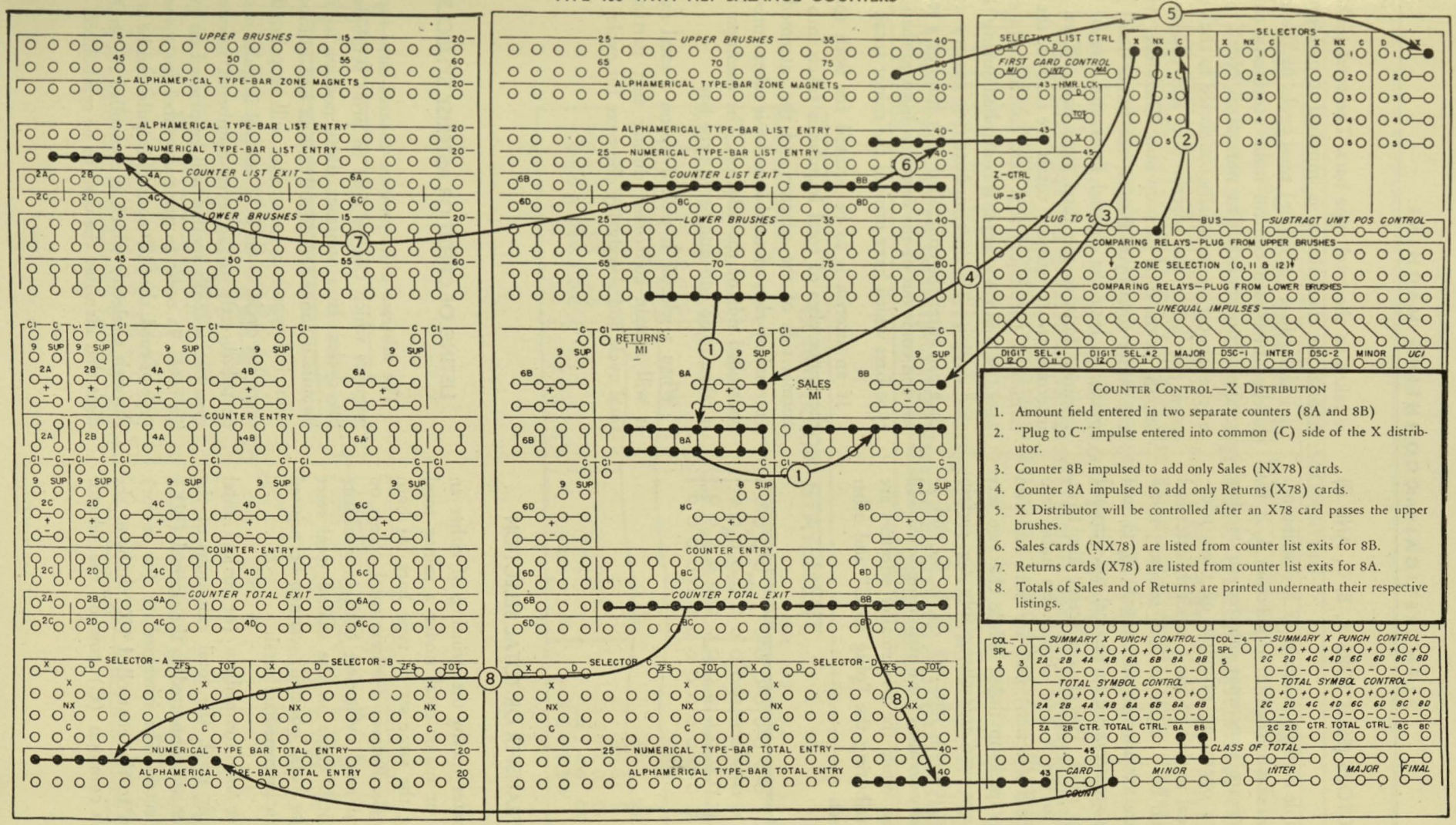
RETURNS + X78

COMMISSION STATEMENT

SALESMAN MACY 67 DATE 12 31

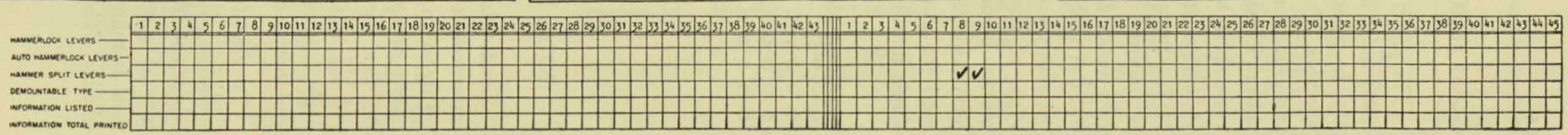
INVOICE NO	COMMODITY	SALES AMOUNT	RETURNS AND ALLOWANCES	COMMISSION AMOUNT
12176	14202	2200		99
12176	14702	8100		365
12176	16102	6885		310
12176	63706	22350		335
99590	35106		23925	718 CR
99590	46106		28650	1146 CR
		762143	52575*	12613*

ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS



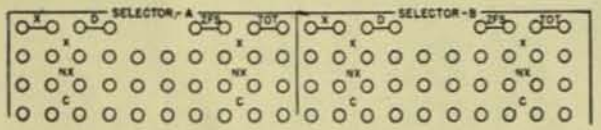
Counter Control—X Distribution

1. Amount field entered in two separate counters (8A and 8B)
2. "Plug to C" impulse entered into common (C) side of the X distributor.
3. Counter 8B impulsed to add only Sales (NX78) cards.
4. Counter 8A impulsed to add only Returns (X78) cards.
5. X Distributor will be controlled after an X78 card passes the upper brushes.
6. Sales cards (NX78) are listed from counter list exits for 8B.
7. Returns cards (X78) are listed from counter list exits for 8A.
8. Totals of Sales and of Returns are printed underneath their respective listings.



CLASS SELECTORS (SELECTORS A, B, C, AND D)

The principle of the 5 selectors or X distributors is expanded in the mechanism of selectors A, B, C, and D which are sometimes referred to as class selectors. The operating principle of these selectors is identical to that of the 5 selectors described above. Instead of 3 units in each selector, however, there are 10 units in selectors A, B, C, and D. The units are arranged in vertical rows instead of horizontal rows. The class selectors also have, in addition to the X and D pick-up hubs, two ZFS (zone field selection) pick-up hubs and two TOT (total) pick-up hubs. While the two sets of selectors are used interchangeably for certain types of distribution, selectors A, B, C, and D most commonly are used for distributing brush and total impulses, while the five smaller selectors are used for distributing the "plug to C" and other single impulses.



TOTAL TRANSFER OR TOTAL SELECTION

Total transfer means the printing of either an intermediate or major total under a minor total by impulsing the same set of type bars for both classes of totals. Because a minor total comes on the first total reset cycle and both intermediate and major totals come on the second total reset cycle, a major total normally cannot be printed underneath an intermediate total.

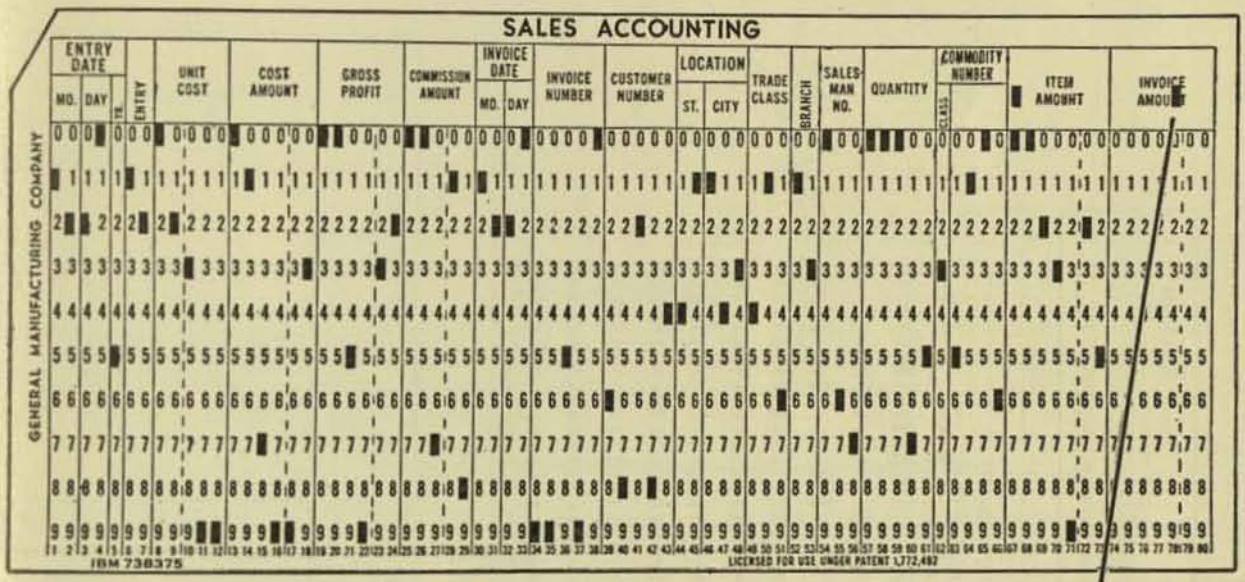
To transfer an intermediate (or major) total under a minor total, the total exit hubs of the minor counter are connected to the normal (NX) row of a selector. The intermediate (or major) total is taken to the controlled (X) hubs of the selector. The common (C) row of the selector is taken to the total type bars. The total pick-up hub of the class selector is impulsed to pick up on an intermediate (or major) total cycle, by the hubs labelled first card control hubs (formerly called total selection hubs). The normal or No X hubs of the selector are internally connected to the common row when the selector does not receive an impulse in the total pick-up hub. Therefore, when the minor total cycle occurs, the minor total impulses go into the normal hubs and out of the common hubs to the total type bars. When the intermediate (or major) totals are cleared, the intermediate (or major) first card control hubs emit impulses, and the selector is controlled during these total cycles. The intermediate (or major) total then can enter the controlled (X) hubs of a selector and come out of the common hubs to the same type bars which have printed the minor total.

If an asterisk is to be printed for both totals, the minor class of total impulse is taken into the normal side of the selector and the intermediate (or major) class of total impulse is taken into the controlled side of the selector. The common hub is taken to an odd-numbered type bar.

When a selector is picked up on a total cycle, it will remain controlled during that particular total cycle and also during the next list cycle.

LISTING OF CREDIT OR ASTERISK SYMBOLS

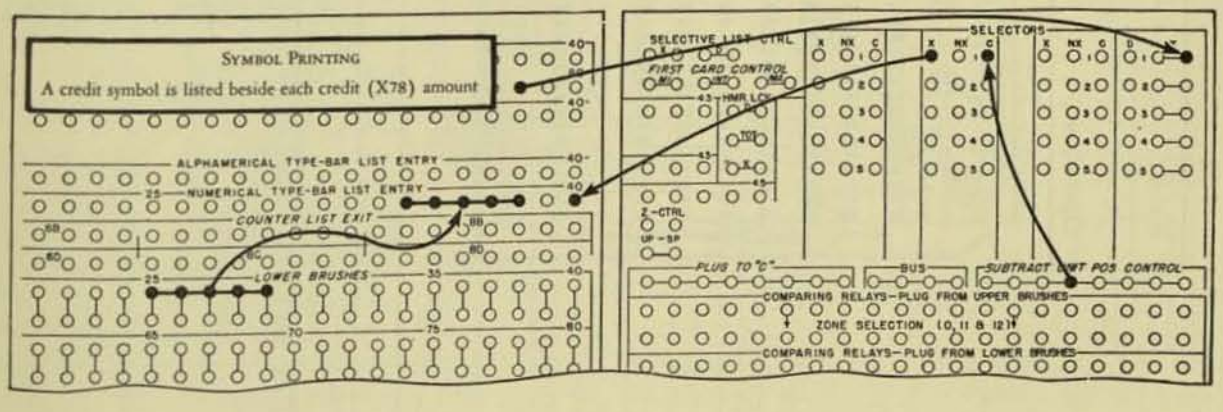
The subtract units position control hubs supply impulses which can be used to print symbols on list cycles. If a subtract units position control impulse is connected directly to an odd-numbered numerical type bar, an asterisk will be printed on every list cycle. If an SUP control impulse is connected directly to an even-numbered numerical type bar, a credit symbol will be printed on every list cycle. In order to print a symbol for a special type of card, the SUP control impulse can be wired through a selector which is controlled by an X or digit that identifies the card to be symbolized.



COMMISSION STATEMENT

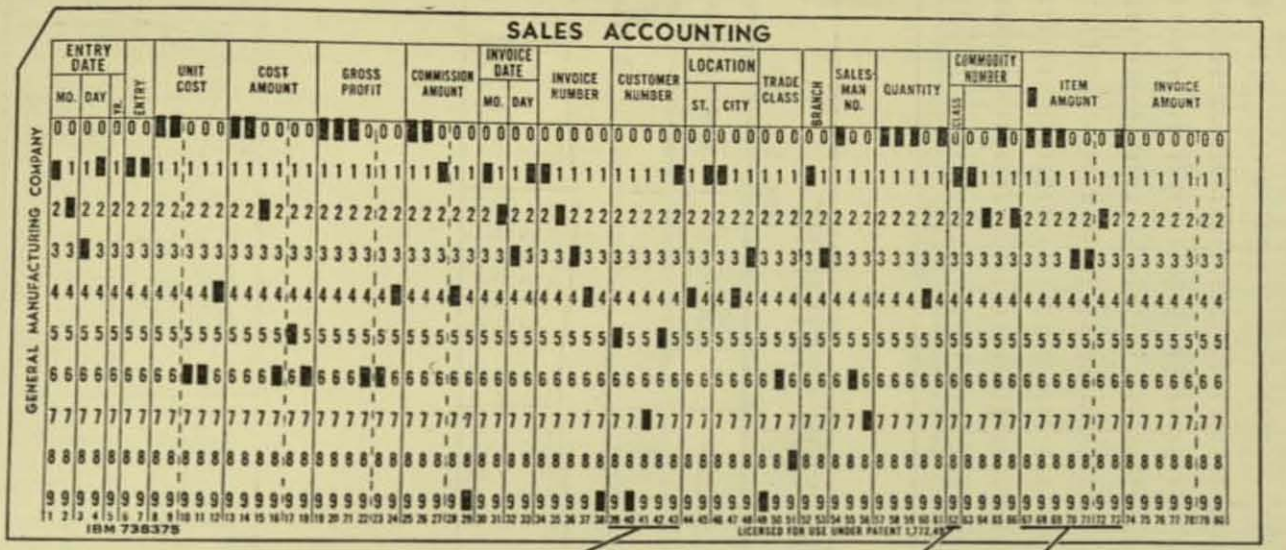
SALESMAN: MACY 67 DATE 12 31

INVOICE NO.	COMMODITY	SALES AMOUNT	RETURNS AND ALLOWANCES	COMMISSION AMOUNT
12176	14202	22 00		99
12176	14702	81 00		3 65
12349	44104	14 04		56
99590	35106		239 25	7 18 CR
99590	46106		286 50	11 46 CR
		762143	525 75*	126 13*



Total Transfer

Fields	Customer No.	Commodity Class	Item Amount
Operation	Indicate; Intermediate Control	Indicate; Minor Control	Minor Total Intermediate Total*

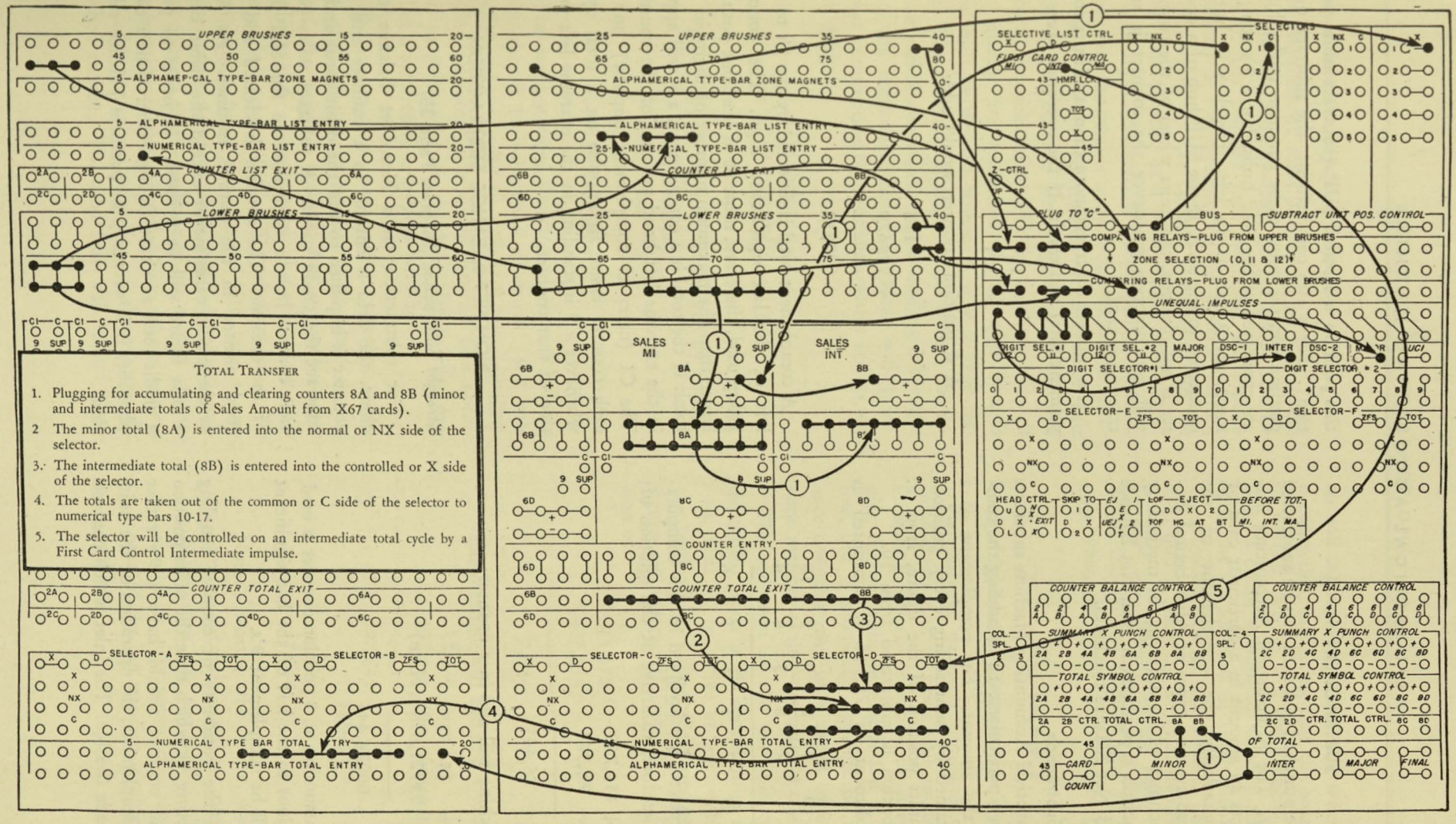


SALES BY CUSTOMER — COMPARATIVE

DATE

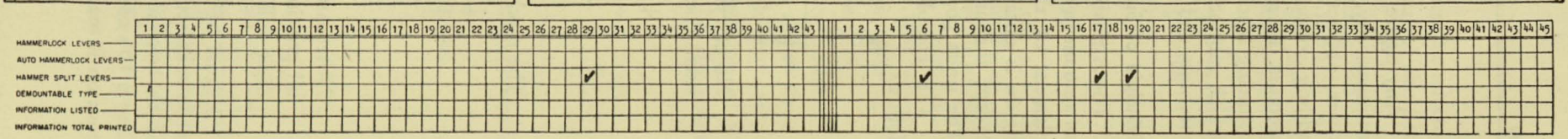
CUSTOMER NAME	CUSTOMER No.	LOCATION STATE	LOCATION CITY	TRADE CLASS	BRANCH	SALESMAN	COMMODITY CLASS	SALES THIS MONTH	SALES YEAR TO DATE	SALES LAST YEAR
NEW MEXICO COMPANY	59751	41	143	968	13	67	1	11801	134810	125323
	59751	41	143	968	13	67	2	14845	14845	
	59751	41	143	968	13	67	3	15028	329031	243208
	59751	41	143	968	13	67	4	2808	184926	140700
	59751	41	143	968	13	67	5	48910	285932	222046
	59751	41	143	968	13	67	6	88470	88470	11404
								181862 *	1038014 *	742681 *
NEWTON PARK AND CO	61043	11	61	417	4	18	1	612	612	
	61043	11	61	417	4	18	2	11740	847952	608208
	61043	11	61	417	4	18	3	11166	147866	122692
	61043	11	61	417	4	18	4	45690	259953	198420
	61043	11	61	417	4	18	5	32850	32850	33103
	61043	11	61	417	4	18	6	242455	356555	140301
								334513 *	1645788 *	1102724 *

ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS



Total Transfer

1. Plugging for accumulating and clearing counters 8A and 8B (minor and intermediate totals of Sales Amount from X67 cards).
2. The minor total (8A) is entered into the normal or NX side of the selector.
3. The intermediate total (8B) is entered into the controlled or X side of the selector.
4. The totals are taken out of the common or C side of the selector to numerical type bars 10-17.
5. The selector will be controlled on an intermediate total cycle by a First Card Control Intermediate impulse.



SUBTRACTION

Any figure punched in a card can be subtracted automatically. The Alphabetical Accounting Machine subtracts an amount in a particular card by adding automatically the complement of the amount. There are two types of Alphabetical Accounting Machines which differ in the method by which subtraction is performed: Non-Net Balance machines and Net Balance machines.

Principle of Subtraction

The Alphabetical Accounting Machine subtracts an amount in a particular card by adding the complement of the amount. The complement of a figure is obtained by subtracting every position, except the units position of the figure, from 9. The units position is subtracted from 10.

The complement of 78,344 is computed as follows:

9	9	9	9	9	9	10
		7	8	3	4	4
9	9	2	1	6	5	6

No carryovers are involved in this computation. Therefore, to arrive at the solution of:

+ 154,789
— 78,344

76,445

The machine will add in a counter:

+ 154,789
+ 99921,656 (Note)

00076,445

Note: Assuming an 8 position counter is used, all positions to the left of the last significant digit will be complement 9's.

Because of the possibility of counter coupling when subtracting, at which time the units position of the second counter should have a 9's rather than a 10's complement, the operation of the units position is made flexible. The inlet which controls this position is labelled SUP (subtract units position). For a 10's complement, the subtract units position control hubs, eight common outlet hubs, are connected to the SUP hubs. For a 9's complement, the 9 hub to the left of each SUP hub is connected to the SUP. If the SUP hub of a counter is not plugged, the units wheel of the counter will not function whenever the counter is subtracting a card.

If a counter subtracts more than it adds, a complement total will result. If the operation were:

+ 154
— 321

A 6 position counter would add:

+ 154
+ 999679

999833

A complement total is detected by the 9's to the left of the last significant digit. The counter group used, therefore, must be at least one position larger than the maximum number of digits in the total. If the total is a complement, a 9 will appear in the extreme left hand position of the counter. The CI (carry or complement impulse) hub of each counter emits an impulse on a total cycle whenever a 9 is standing in the extreme left position of that counter.

NON-NET BALANCE SUBTRACTION

Straight Subtraction (Diagram Page 35)

For subtraction on a Non-Net Balance machine, the field is entered in a counter and the counter is impulsed to add the debit cards and to subtract the credit cards. A subtract units position control hub is connected to the SUP hub of the counter. The counter is cleared and the total printed in the normal manner. As long as the credit cards never exceed the debit cards, a true figure will be printed. In order to print a credit total as a true figure, rather than a complement, it is necessary to perform balance selection.

Balance Selection (Diagram Page 36)

A complement total is detected by a 9 in the extreme left-hand position of the total. The CI hub of the counter used will emit an impulse whenever a 9 is present in this position during a total cycle. If the CI hub is connected to the TOT pick-up hub of a selector, the selector will be controlled whenever a complement 9 appears. Whenever the total is not a complement, the selector will not be controlled. If the total exit hubs of this counter are plugged to the normal hubs of the selector and if the common hubs of the selector are connected to the type bars, a total will be printed whenever it is a true figure. Whenever a complement total occurs, the selector will be controlled; and as nothing is brought into the controlled hubs, no total will print. Upon examination of a problem where credits exceed debits:

1256 Sales
— 1389 Returns

The answer is manually calculated by doing:

+ 1389 Returns
— 1256 Sales

— 133 Net Sales

The computation, therefore, is one of adding what should be subtracted (Returns) and subtracting what should be added (Sales) and identifying the total as a credit figure. This operation as performed on the Non-Net Balance machine is referred to as balance selection.

The amount field is entered in a second counter, and this second counter is impulsed to add what the original counter has subtracted (the credits) and subtract what the original counter has added (the debits). To subtract on a 10's complement basis, the counter SUP hub is connected to a subtract units position control hub. The counter total exit hubs of the second counter are brought to the controlled hubs of the selector (in addition to the plugging of the selector described above). The total from this second counter will reach the type bars only when the selector is controlled, indicating that the total of the first or normal counter is a complement. In order to print a credit symbol to identify the credit balance, the proper class of total hub is wired into a controlled hub of the selector, and the common hub is wired to an even-numbered numerical type bar, usually to the right of the total. Thus, the symbol impulse gets to the type bar only when the credit total is to be printed.

NET BALANCE

Straight Subtraction (Diagram Page 37)

Net balance counters eliminate the need for balance selection to print true credit totals, thus increasing effective machine capacity. The plugging for net balance subtraction is described below, but it should be remembered that net balance counters may be plugged to operate in the same manner as non-net balance counters.

The operation of the net balance counters is dependent upon a 9's complement rather than a 10's; that is, to arrive at a complement, all of the positions including the units position of the figure are subtracted from 9. To do the operation of:

15,478
— 7,834

7,644

The machine will add in a 6 position counter;

15,478
992,165 (9's complement)

(1) 007,643
1 (Note)

7,644

Note: Because the units position has its complement calculated on the basis of a 9 rather than 10, the total is 1 less than it should be. To adjust the total, the carry-over of the last position is added to the units position.

To subtract, the field is entered in a counter which is impulsed to add the debit cards and subtract the credit cards. The counter is cleared on the proper class of total impulse. Because a 9's complement is employed, the SUP hub of the counter is plugged to the 9 hub. To adjust the units position, the CI (carry impulse) is plugged to the C (carry) hub of the same counter. This method of plugging is satisfactory if no credit total is expected. Should a credit balance unexpectedly occur, the total printed would be a 9's complement figure and, therefore, one less than an actual complement total. In any case if there is any chance of a credit total, this condition can be avoided if plugging for balance conversion is used.

Balance Conversion (Diagram Page 38)

In a net balance counter, as in a non-net balance, a 9 standing in the extreme left hand position of the counter is evidence of a complement balance. Therefore, it is important that if a complement balance might occur, the counter used be one position larger than the maximum number of digits in the total. If at the end of a group of cards the credits do exceed the debits, the CI hub will detect the complement 9. The CI hub is connected to the counter balance control hub corresponding to the counter used. When a CI "9" impulse enters the counter balance control hub, the complement total standing in the counter will be converted automatically into a true credit figure before total printing. A machine cycle, termed a conversion cycle, is required for this operation. The counter total exit hubs can be plugged directly to the total type bars and a true figure always will be printed. The common counter balance control hub must be plugged to the C hub of the counter to maintain units position adjustment.

In order to print a symbol to identify a credit total, the total symbol control hubs are used. Each counter has a + and — symbol hub; if the machine has gone through a conversion cycle for a counter, indicating a credit balance, the — hub will emit an impulse. If the total is a positive balance, the + hub emits an impulse. To identify a credit total, the — hub of the proper counter total symbol control is plugged to an even-numbered numerical type bar. To print an asterisk beside a debit total, the + hub of the symbol control is plugged to an odd-numbered numerical type bar. If an asterisk is to be printed beside every total (debit or credit), the proper class of total hub is plugged to an odd-numbered numerical type bar.

Principle of Net Balance Conversion

A 9's complement total in a Net Balance counter is automatically converted into a true figure by the CI 9 impulse which enters the counter balance control unit on a total cycle. Whenever a complement 9 impulse enters this control unit, a conversion cycle will take place before total printing. The conversion cycle takes 0.4 seconds in an 80-150 speed machine or 0.75 seconds in an 80-80 speed machine. The conversion is accomplished by adding the conversion factor to each complement digit in the total. The conversion factor is that number which, when added to a number, gives the complement of the original number. Therefore, if the conversion factor is added to a number which is a complement, the result will be a true credit figure. The conversion factor is added to each counter position independently, at the same time, and no carryover occurs.

Counter Wheel Standing at:		Conversion Factor		Digit Which is Complement of Original Figure
0	+	9	=	9
1	+	7	=	8
2	+	5	=	7
3	+	3	=	6
4	+	1	=	5
5	+	9	=	4
6	+	7	=	3
7	+	5	=	2
8	+	3	=	1
9	+	1	=	0

No carryovers are involved in this computation. In the operation:

+1256 Sales
−1389 Returns
———
− 133 Net Sales

The machine adds in a 6 position counter:

1256
998610
———
999866

The conversion cycle takes place, adding:

999866
+111377 (Conversion factor)
———
000133 CR

(No carryover in conversion addition.)

The conversion cycle does not occur arbitrarily at every control change. Conversion cycles result only when one or more counters to be cleared on that total cycle contain complement totals. During a minor control change, intermediate, major, or final counters do not cause conversion cycles even though they contain negative totals. Therefore, the speed of the machine is not affected by Net Balance counters except when conversion is necessary.

Zero Balance on Net Balance Counters

If a counter is added debits and subtracting credits which balance to zero, a conversion cycle is required; in the operation:

+6538 Sales
−6538 Returns
———
0000

The machine adds in a 6 position counter:

6538
993461
———
999999

The complement 9 calls for a conversion cycle:

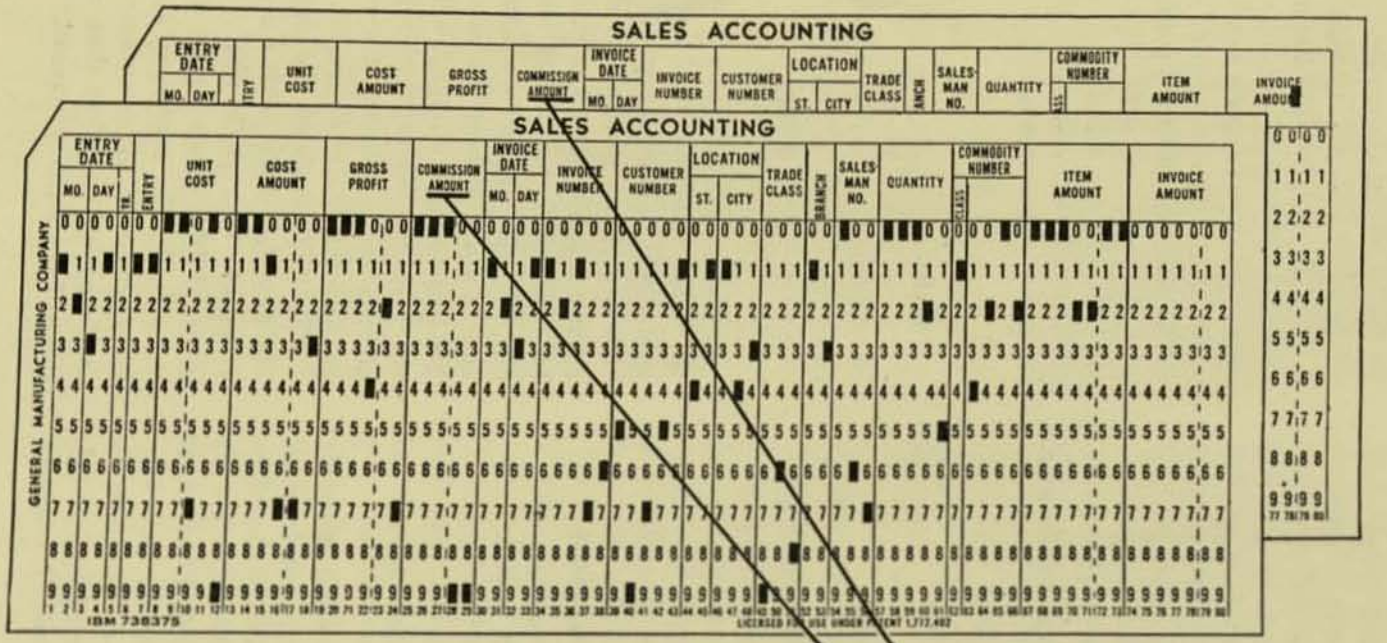
999999
111111 (Conversion factor)
———
000000

If the symbol control has been plugged from the — hub to an even-numbered type bar, a credit symbol will be printed opposite the zero balance. If it is necessary to eliminate this condition, the counter impulsing should be changed so that debits are subtracted and credits are added. In this case, all debit balances are actually credit totals and all credit balances are actually debit totals. The credit symbol, therefore, will be plugged from the + symbol hub to an even-numbered numerical type bar. In this case, a zero balance will not be identified by a credit symbol.

The disadvantage of this plugging arises from the fact that debit totals normally occur more frequently than credit totals. In this operation a normal debit always requires a conversion cycle. As a result, the conversion cycles required for every debit total will occur more frequently than in the normal operation; thus, the total time required for any run is increased.

Subtraction

Fields	Commission Amount
Operations	List; Minor Total* (Add Sales, subtract Returns) CR symbol beside Returns amounts and negative totals.



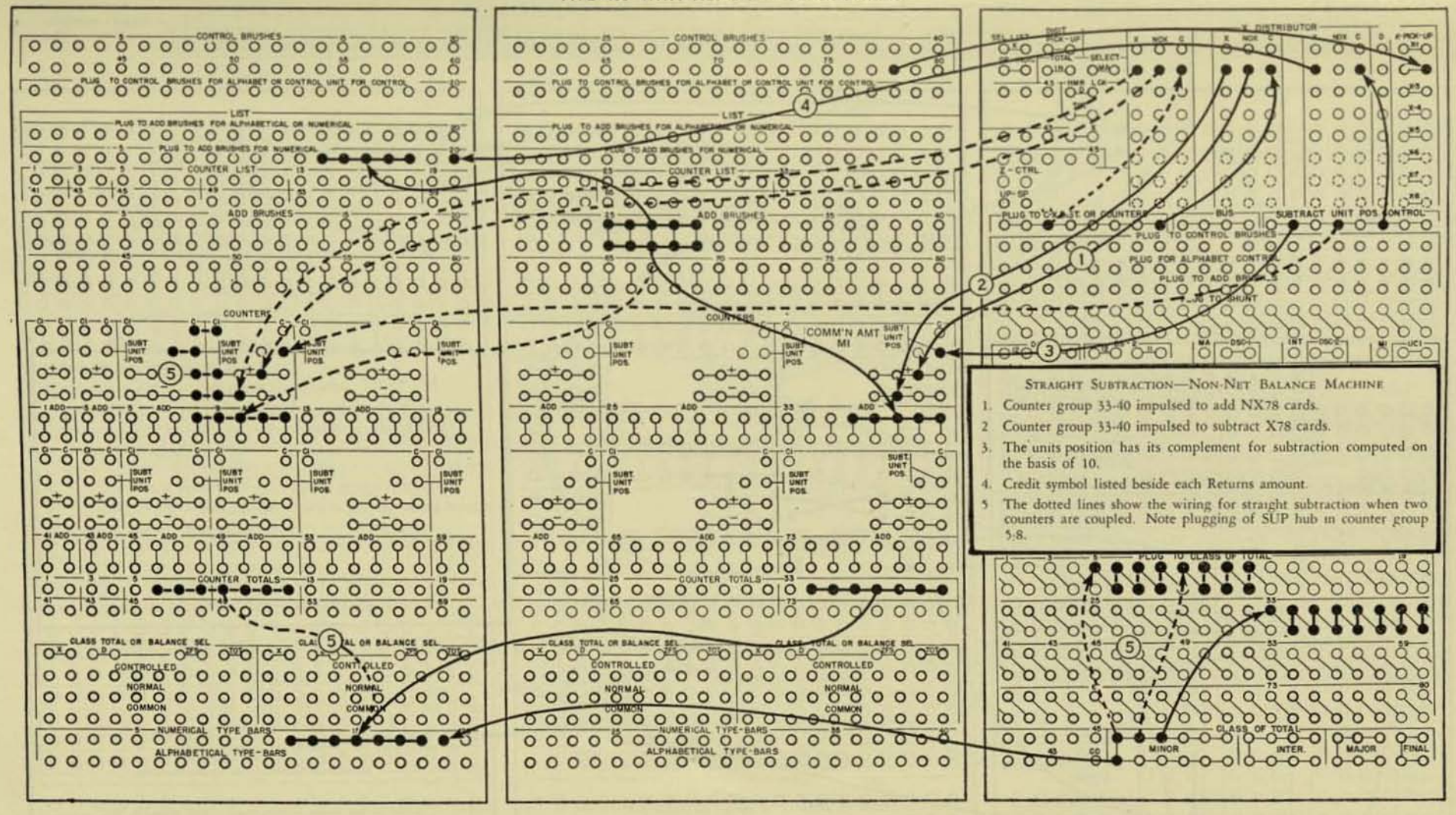
ADD NX; SUBTRACT X

COMMISSION STATEMENT

SALESMAN. MACY 67 DATE 12 31

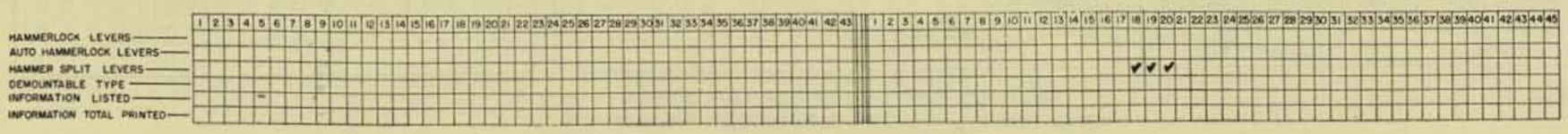
INVOICE NO	COMMODITY	SALES AMOUNT	RETURNS AND ALLOWANCES	COMMISSION AMOUNT
12176	14202	22 00		99
12176	14702	81 00		365
12176	16102	68 85		310
12176	63706	223 50		335
99590	35106		239 25	718 CR
99590	46106		286 50	1146 CR
		7621 43	525 75*	1261 3*

ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS

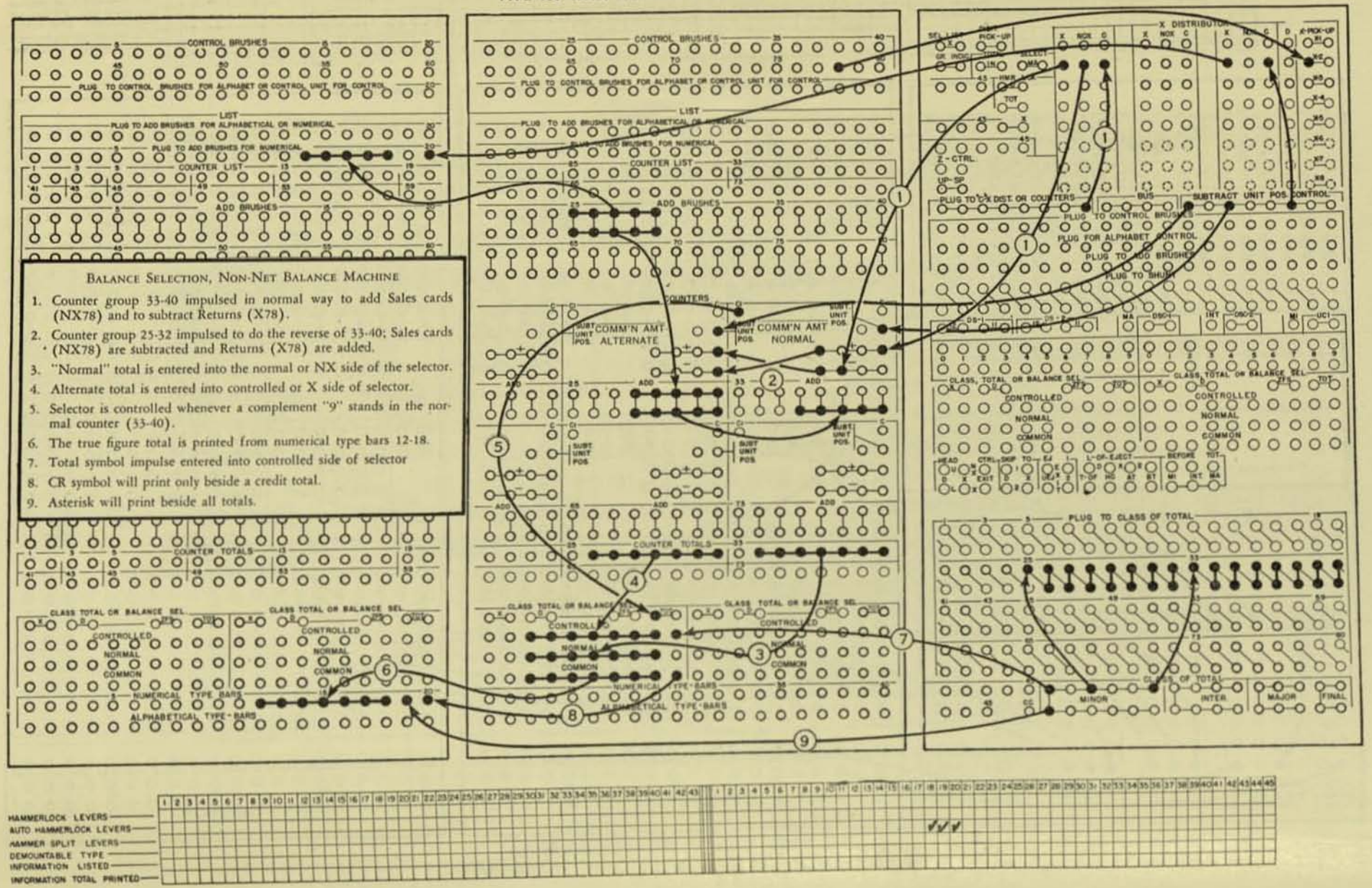


STRAIGHT SUBTRACTION—NON-NET BALANCE MACHINE

1. Counter group 33-40 impulsed to add NX78 cards.
2. Counter group 33-40 impulsed to subtract X78 cards.
3. The units position has its complement for subtraction computed on the basis of 10.
4. Credit symbol listed beside each Returns amount.
5. The dotted lines show the wiring for straight subtraction when two counters are coupled. Note plugging of SUP hub in counter group 5-8.



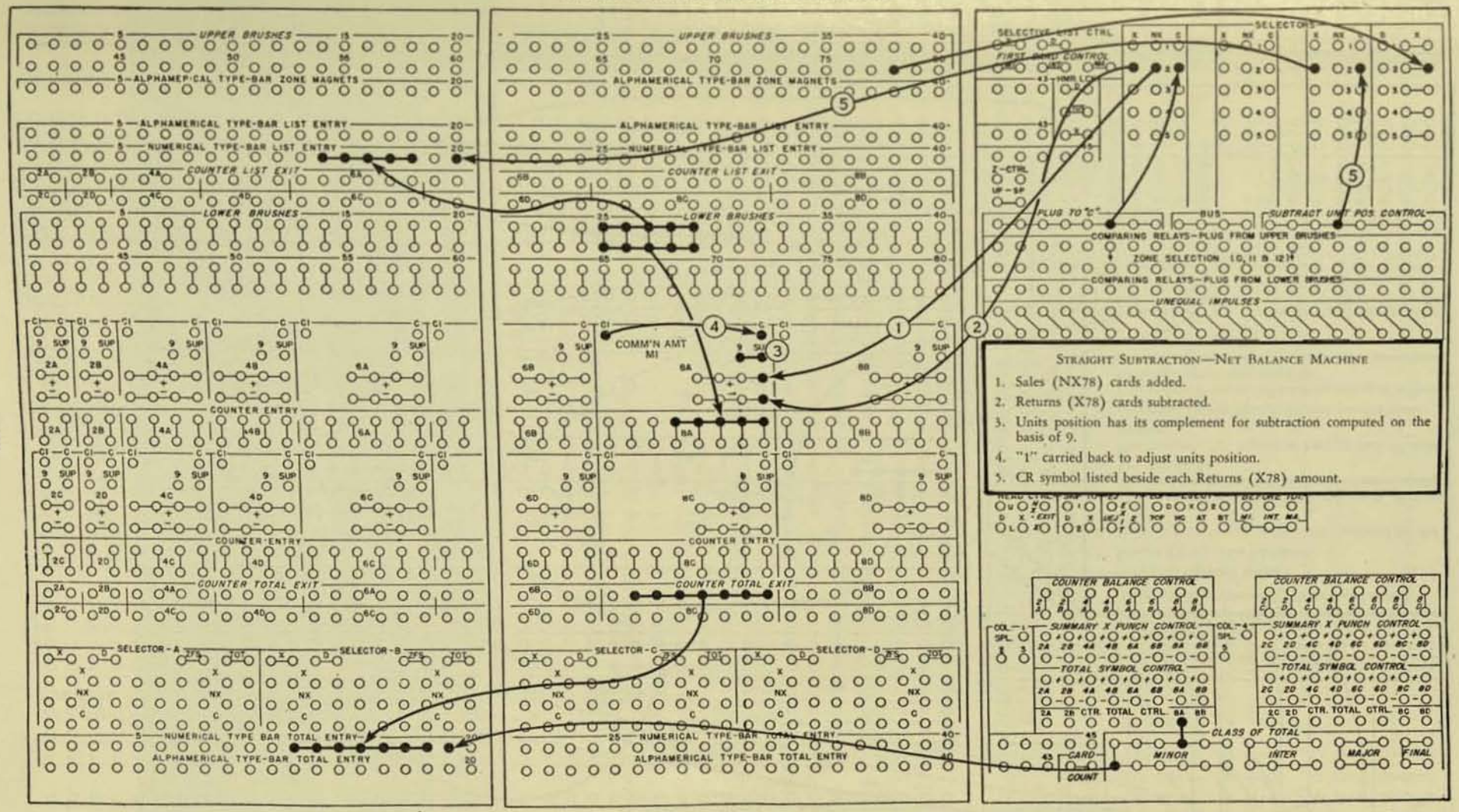
ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NON-NET BALANCE COUNTERS



Balance Selection, Non-Net Balance Machine

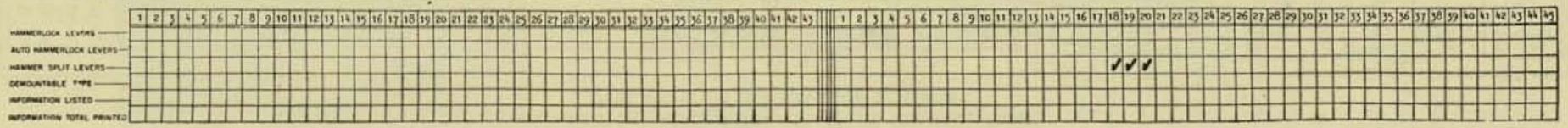
1. Counter group 33-40 impulsed in normal way to add Sales cards (NX78) and to subtract Returns (X78).
2. Counter group 25-32 impulsed to do the reverse of 33-40; Sales cards (NX78) are subtracted and Returns (X78) are added.
3. "Normal" total is entered into the normal or NX side of the selector.
4. Alternate total is entered into controlled or X side of selector.
5. Selector is controlled whenever a complement "9" stands in the normal counter (33-40).
6. The true figure total is printed from numerical type bars 12-18.
7. Total symbol impulse entered into controlled side of selector
8. CR symbol will print only beside a credit total.
9. Asterisk will print beside all totals.

ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS

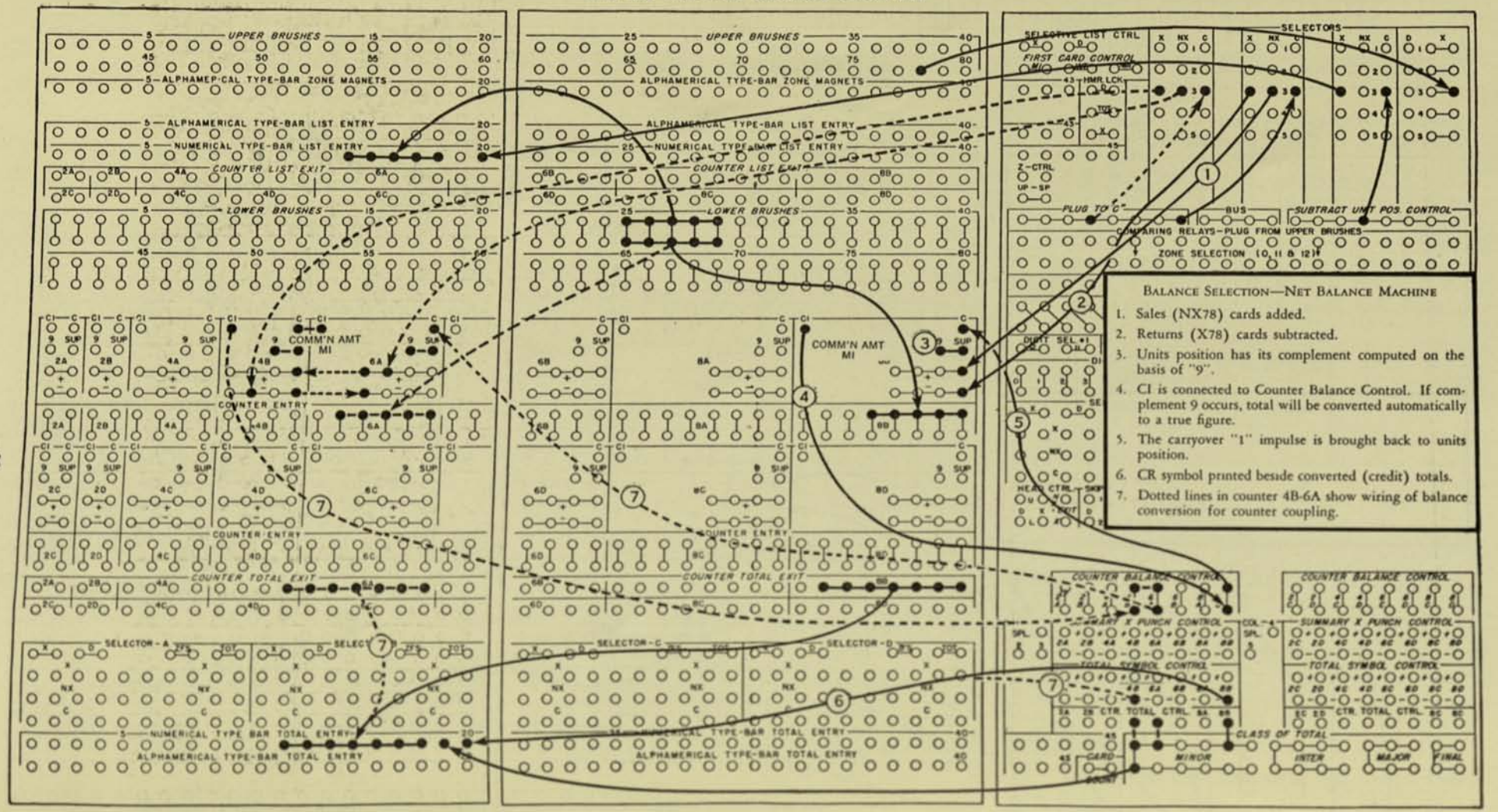


Straight Subtraction—Net Balance Machine

1. Sales (NX78) cards added.
2. Returns (X78) cards subtracted.
3. Units position has its complement for subtraction computed on the basis of 9.
4. "1" carried back to adjust units position.
5. CR symbol listed beside each Returns (X78) amount.

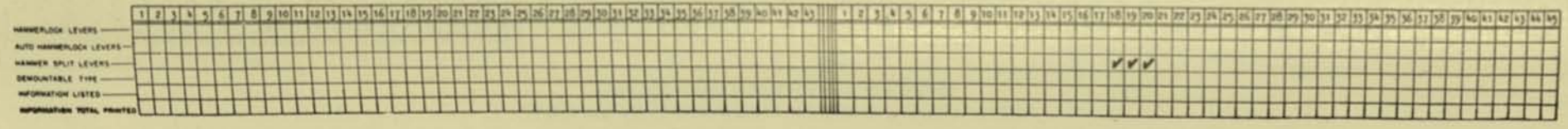


ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS



Balance Selection—Net Balance Machine

1. Sales (NX78) cards added.
2. Returns (X78) cards subtracted.
3. Units position has its complement computed on the basis of "9".
4. CI is connected to Counter Balance Control. If complement 9 occurs, total will be converted automatically to a true figure.
5. The carryover "1" impulse is brought back to units position.
6. CR symbol printed beside converted (credit) totals.
7. Dotted lines in counter 4B-6A show wiring of balance conversion for counter coupling.



HAMMERLOCK LEVERS

Each type bar on the Alphabetical Accounting Machine is equipped with two hammerlock levers; a short lever which is the one to the right, and a long lever which is the one to the left.

The short hammerlock lever, when raised, prevents the type bar from printing either on a list or total cycle.

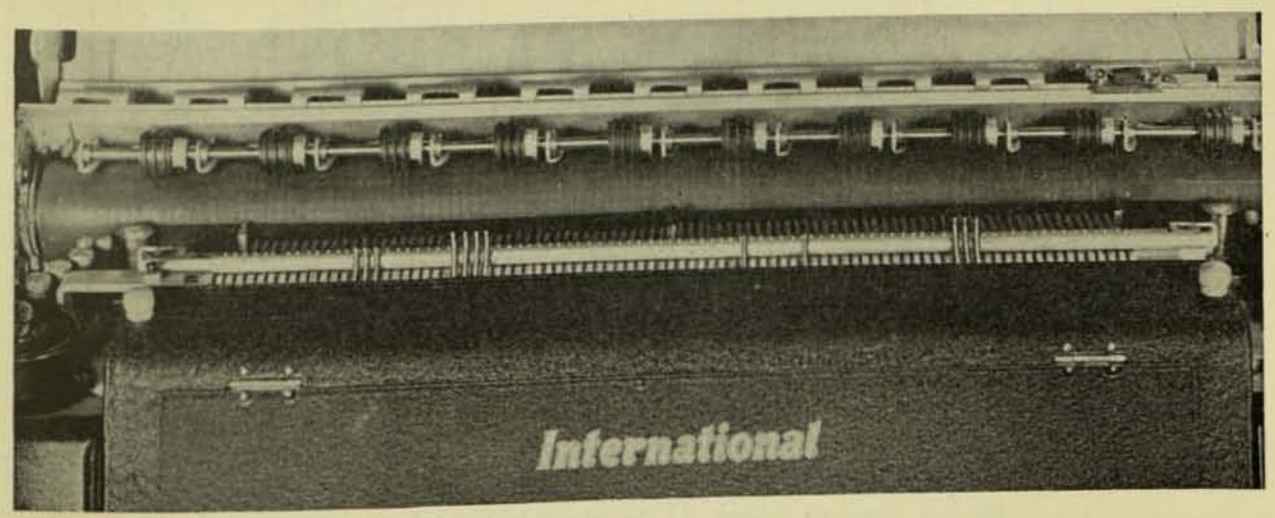
The long or automatic hammerlock lever, when raised, controls the printing of the type bar on list cycles. Totals will always print, regardless of the setting of the long hammerlock levers, but information wired to list from the type bars can be suppressed for specific cards. The action of the long hammerlocks is controlled by the control panel wiring and by the hammerlock switch. The long hammerlock levers have one general function: to suppress the listing of all, or any part, of the information on particular cards. It is used to prevent over-printing of listing and totals which occurs when a machine is changed from list to non-list without a change in control panel wiring, and to suppress the repetitive printing beyond the first card of a control group (group indication).

Hammerlock Control of Listing

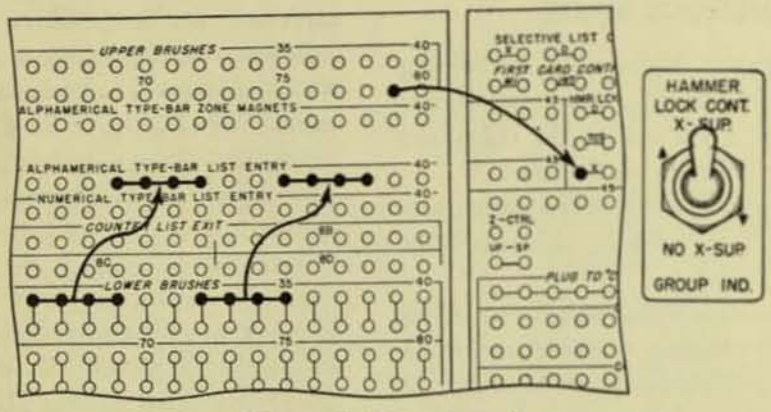
The long or automatic hammerlocks can be used to allow information to be listed from certain cards and not from others. The long hammerlock levers corresponding to the type bars where the information is to be listed (or suppressed) are raised. The cards to be listed (or those not to be listed) are distinguished by a control X punch. The upper brush X column is connected to the hammerlock X pick-up hub. If information from X cards is to be listed, the hammerlock switch should be turned to No X SUP (Suppression). If No X cards are to be listed, the switch should be turned to X SUP. In this operation, if the machine is set to list, the platen will advance for each list cycle of the machine, regardless of whether or not information is printed.

A Change from List to Non-list

When a panel is plugged for listing and it is to be used for non-listing, it is necessary to prevent over-printing of the first card listing of quantitative information and total printing. This is done either by removing the list wires for the quantitative field or by raising the long hammerlock levers corresponding to the type bars where the over-printing will occur. The hammerlock switch is turned to No X SUP and *no* plugging of the hammerlock control unit is necessary. (If the hammerlock control unit is plugged from a MI first card control hub, the hammerlock switch would be turned to X SUP.)



Hammerlock Levers



Hammerlock List Control

Information in columns 26-29 is to be listed from No X 79 cards only. The long hammerlock levers for Alphamerical type bars 29-32 are raised. The Hammerlock Unit is plugged from the upper brush and the Hammerlock Switch is turned to X SUP. The information from columns 32-35 is listed in the normal manner.

DEDUCTION REGISTER

EMPLOYEE NAME	EMPL. No. DEPT	EMPL. No. CLOCK	DEDUCTION CODE	DEDUCTIONS
FRED ACKERLY	1	13	215	50
FRED ACKERLY	1	13	314	75
FRED ACKERLY	1	13	573	500
				625 *
MILTON CARGIN	1	100	334	35
MILTON CARGIN	1	100	414	50
				85 *

DEDUCTION REGISTER

EMPLOYEE NAME	EMPL. No. DEPT	EMPL. No. CLOCK	DEDUCTION CODE	DEDUCTIONS
FRED ACKERLY	1	13	215	688 *
MILTON CARGIN	1	100	334	85 *
GERALD DRISCOLL	1	145	215	138 *
			334	85 *
			334	65 *
			215	180 *
			334	85 *
			215	138 *
			334	85 *
			334	85 *
			334	135 *
			215	150 *
			215	700 *
			334	135 *
			414	50 *

DEDUCTION REGISTER

EMPLOYEE NAME	EMPL. No. DEPT	EMPL. No. CLOCK	DEDUCTION CODE	DEDUCTIONS
FRED ACKERLY	1	13		625
MILTON CARGIN	1	100		85
GERALD DRISCOLL	1	145		135
JOSEPH DUHLMEIER	1	150		85
CLEMENT EDWARDS	1	170		65
PATRICK EGGLESTON	1	175		100
WILLIAM FRISBIE	1	220		85
SOCRATES GLEZEN	1	230		165
BERT GRAHAM	1	245		85

Change from List to Non-List

The first report shows a listing. The same cards are used for the second report but the machine is changed to non-list. No change was made in the plugging and overprinting occurred. The third non-listed report is made when the proper long and short hammerlocks are raised. The long hammerlocks, when raised, will prevent overprinting in the deduction column, and the short hammerlocks, when raised, will prevent printing in the deduction code column and the asterisk in the deduction column.

GROUP INDICATION

Group indication is listing the information only from the first card of a control group. In a listing operation, normally, the indicative information is listed repetitively from every card in the control group. This repetitive listing can be suppressed by one of three methods:

1. Counter List Control
2. Hammerlock Control
3. Class Selector

Indication cards for each group, sorted in ahead of detail cards, can be indicated in any of the three methods from a significant X or digit punching in the indication card.

Counter List Method

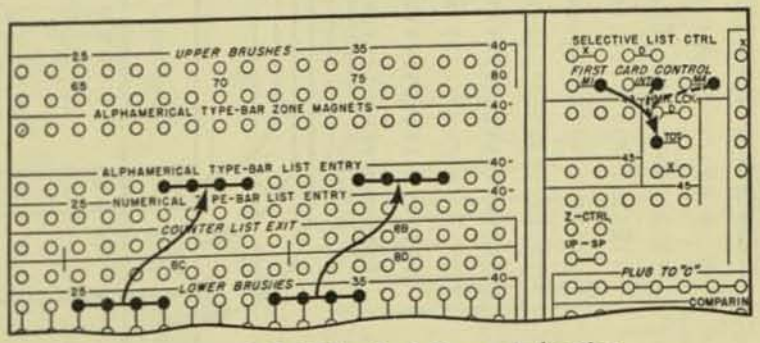
The counter list method of group indication can be used for indicating on minor, intermediate, and major control changes. To indicate minor control changes, the field to be indicated is wired to a counter, and the corresponding counter list hubs are wired to the list type bars. The counter is cleared on a minor class of total impulse and the minor first card control hub is used to impulse the counter to add the first card of each minor group. The minor first card control hubs emit impulses during the minor total cycles and on the first list cycle following a minor total cycle. Therefore, they can be used to impulse a counter to add the first card of a minor control group. The intermediate or major hubs emit impulses only during the intermediate or major total cycles and, therefore, cannot be used for counter impulsing. However, a counter can be controlled on an intermediate or major first card feed cycle by plugging a "plug to C" impulse through one position of a class selector which is controlled on a first card intermediate or major impulse. The counter is cleared on an intermediate or major class of total impulse.

Hammerlock Control

The hammerlock control method of group indication can be used for indicating only the first card of minor, intermediate, or major control groups. The field is wired directly to the type bar list entry hubs from the lower brushes. The long hammerlocks corresponding to the list type bars are raised. The first card control hub corresponding to the control group for which indication is to take place is wired into the total pick-up hub of the hammerlock unit. The hammerlock switch then is set to No X Suppress (Group Indicate).

Class Selector Method

The class selector method of group indication can be used for indicating only the first card of minor, intermediate, or major control groups. The field to be listed is wired from the lower brushes to the common hubs of a selector. The controlled hubs of the selector are wired to the type bar list entry hubs. The total pick-up hub of the selector is impulsed from the proper first card control hub. Once impulsed on a total cycle, the selector is controlled for the next list cycle, thus allowing printing of the first card of each control group.

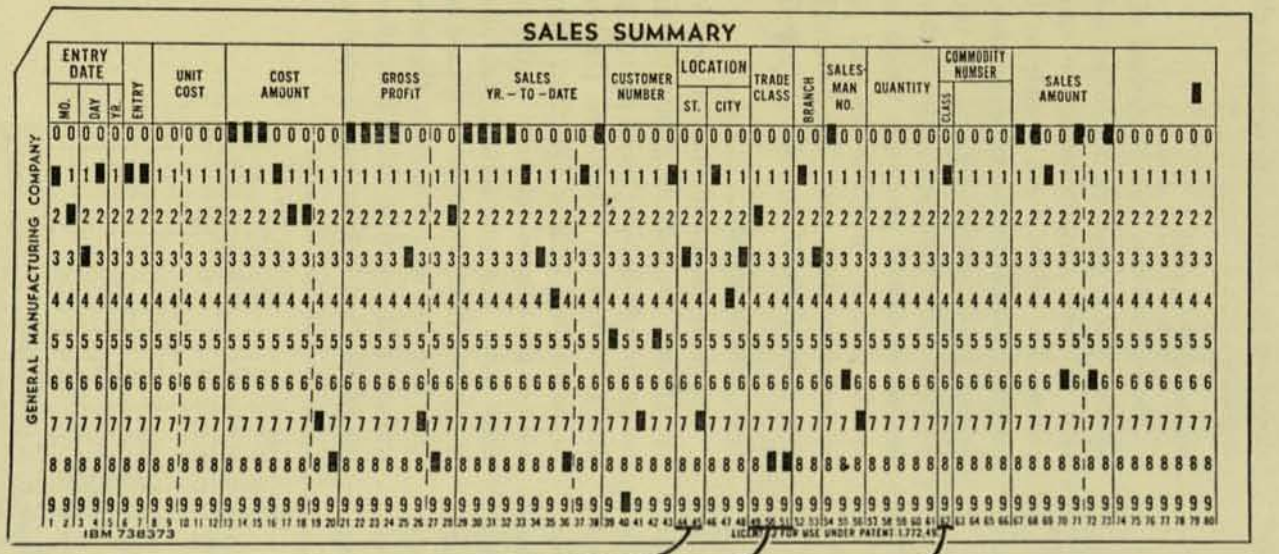


Hammerlock Method of Group Indication

Information in columns 25-28 *and* 32-35 *is to be group indicated. Long hammerlock levers for alphamerical type bars* 28-31 *and* 35-38 *are raised. Hammerlock control is for the first card of each minor group. For group indication on intermediate or major groups, the Intermediate or Major First Card Control hubs, as indicated by the dotted lines, are substituted.*

Group Indication

Field	State	Trade Class	Commodity Class
Operation	Major Control; Gr. Ind., Class Selector	Intermediate Control; Gr. Ind., Hammerlock	Minor Control; Gr. Ind., Counter List

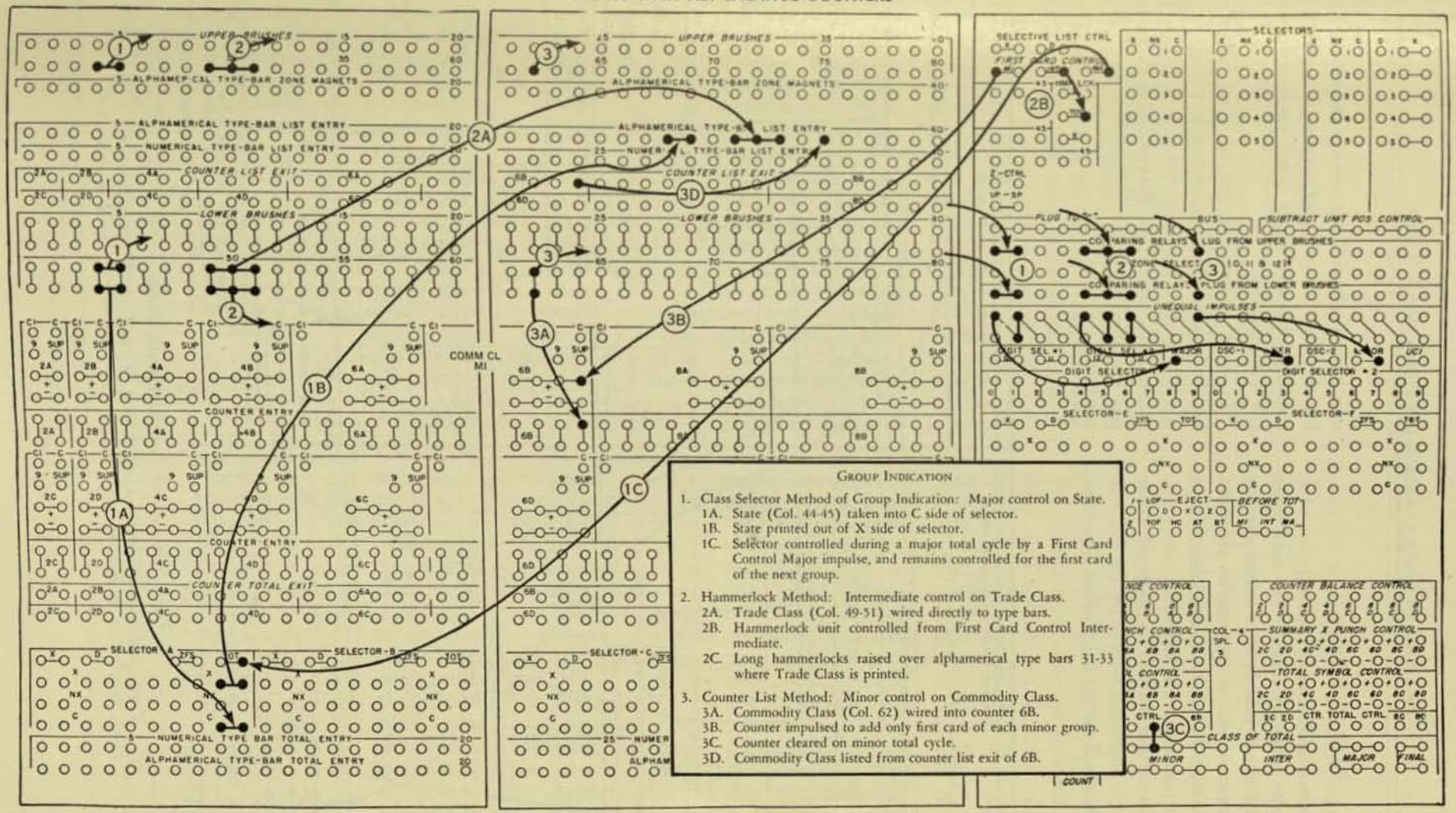


SALES BY STATE

DATE_____

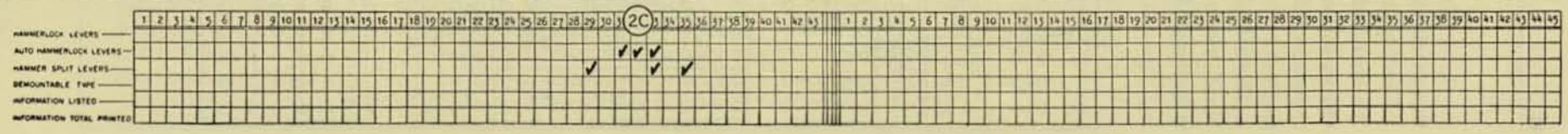
STATE	TRADE CLASS	COMM CLASS	SALES AMOUNT	COST AMOUNT	GROSS PROFIT	SALES AMOUNT BY STATE	COST AMOUNT BY STATE	GROSS PROFIT BY STATE
37	288	1	16060	12278	3782			
			10003	8020	1983			
			26063 *	20298 *	5765 *			
		2	52758	41137	11621			
			52758 *	41137 *	11621 *			
			78821 *	61435 *	17386 *			
	300	1	9604	7389	2215			
			29295	22545	6750			
			38899 *	29934 *	8965 *			
			38899 *	29934 *	8965 *	117720	91369	26351
40	686	1	21781	17452	4329			
			32750	25595	7155			

ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS



Group Indication

1. Class Selector Method of Group Indication: Major control on State.
   - 1A. State (Col. 44-45) taken into C side of selector.
   - 1B. State printed out of X side of selector.
   - 1C. Selector controlled during a major total cycle by a First Card Control Major impulse, and remains controlled for the first card of the next group.
2. Hammerlock Method: Intermediate control on Trade Class.
   - 2A. Trade Class (Col. 49-51) wired directly to type bars.
   - 2B. Hammerlock unit controlled from First Card Control Intermediate.
   - 2C. Long hammerlocks raised over alphamerical type bars 31-33 where Trade Class is printed.
3. Counter List Method: Minor control on Commodity Class.
   - 3A. Commodity Class (Col. 62) wired into counter 6B.
   - 3B. Counter impulsed to add only first card of each minor group.
   - 3C. Counter cleared on minor total cycle.
   - 3D. Commodity Class listed from counter list exit of 6B.



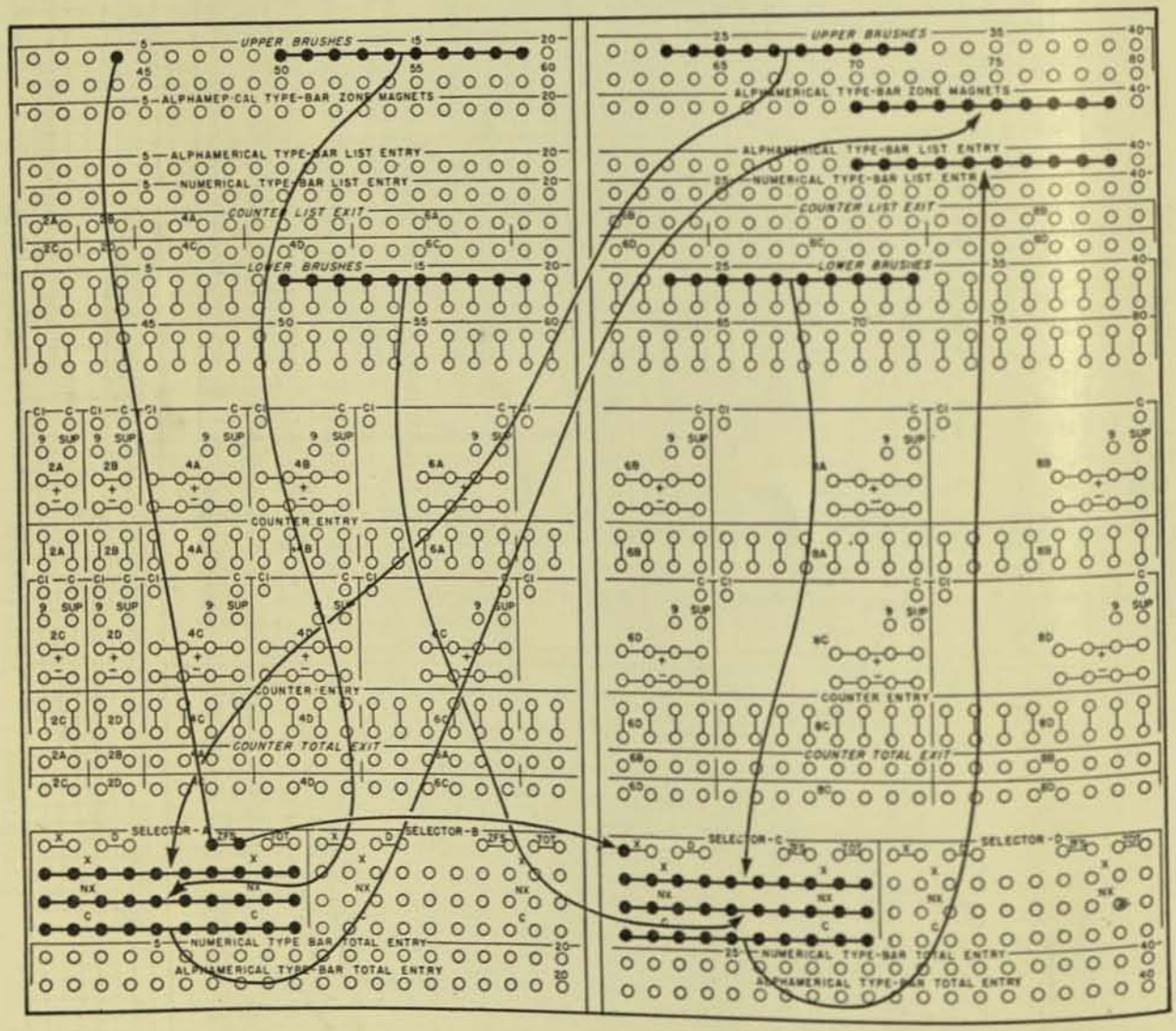
FIELD SELECTION

Numerical Information (Diagram Page 47)

Field selection is the selection of one field from one card and another field from a second card to add in the same counter or to print on the same type bars. One of the two cards must have a distinguishing X punch in some column.

The field on the No X cards is connected to the No X row of a selector; the field on the X cards is connected to the X row of the selector. The common hubs of the class selector are connected to the list entry or counter entry hubs. The selector is controlled from an upper brush position in which the X is punched.

In some applications, one of three fields may have to be selected to accumulate in a single counter. This is done by using two class selectors. Two of the cards must have distinguishing X punches and the third card be distinguished by a No X condition.



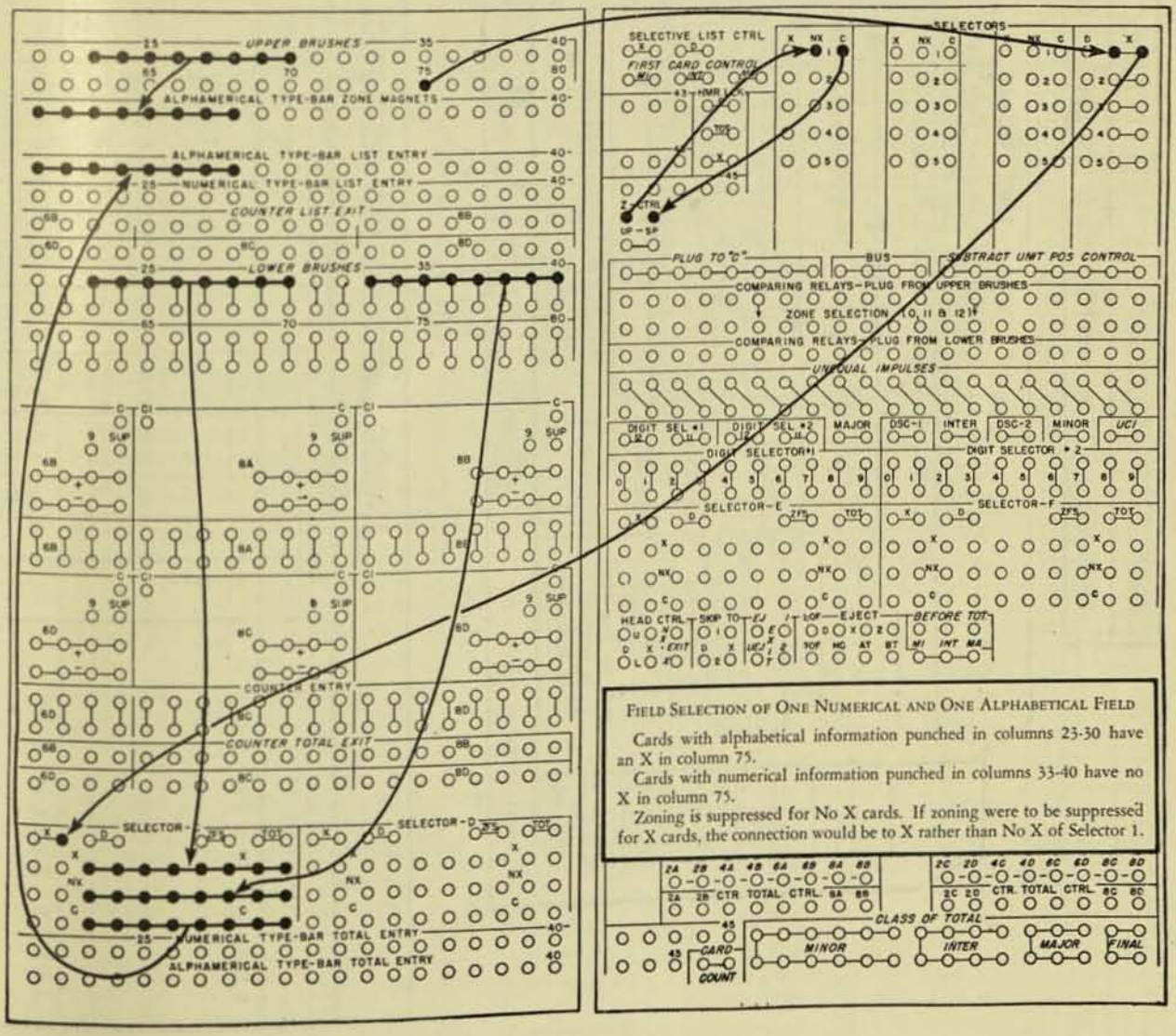
Field Selection of Two Alphabetic Fields

Cards punched in columns 23-32 *have a "9" and an "X" in column* 4.
Cards punched in columns 10-19 *do not have a "9" or an "X" punch in column* 4.

Field Selection of Alphabetic Information

1. *Zone Field Selection*

If two alphabetic fields are involved in field selection, the zone punching, as well as the numerical punching, must be selected. As the zone impulses must be selected while the card is at the upper brushes, an X control of the selector would be too late to select all of the zone punching. The ZFS (zone field selection) hubs on class selectors allow a selector to be picked up on the same card cycle, before the zero position of the card is read. A 9, 8, 7, 6, or 5 impulse taken into the ZFS hub from the upper brushes accomplishes this. The selector will then drop out at the end of the card cycle. A 9 punch is preferable because it allows more time between the signal and the pick-up of the selector. To facilitate plugging, the card which has the control 9 punch also should have a control X punch. Therefore, in the illustration on page 44, the upper brushes of the 9 card are connected to the controlled hubs of a selector, and the field of the No-9 card is connected to the normal hubs of a selector. The common hubs of the selector are connected to the type bar zone magnet hubs. The lower brushes also must be wired through another class selector in the same manner as for numerical field selection. The X in the 9 card operates this selector.



FIELD SELECTION OF ONE NUMERICAL AND ONE ALPHABETICAL FIELD

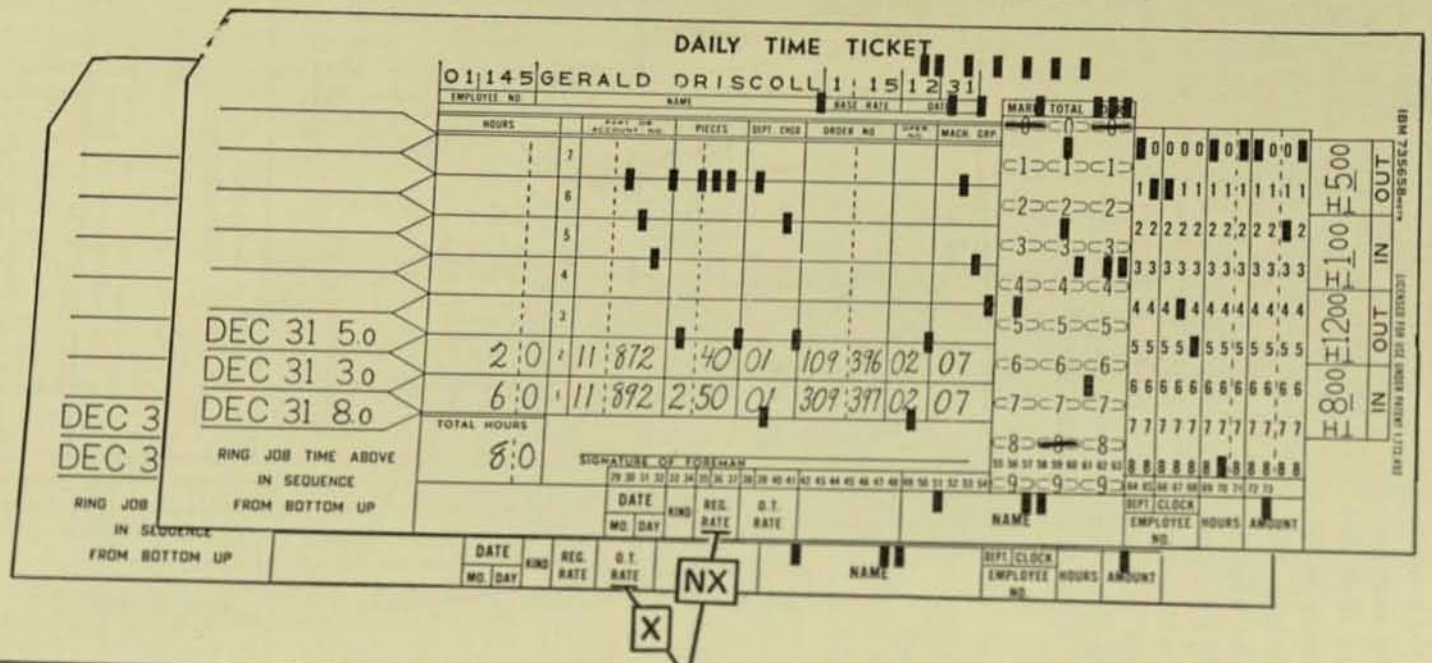
Cards with alphabetical information punched in columns 23-30 have an X in column 75.

Cards with numerical information punched in columns 33-40 have no X in column 75.

Zoning is suppressed for No X cards. If zoning were to be suppressed for X cards, the connection would be to X rather than No X of Selector 1.

Field Selection

Field	Reg. Rate	O.T. Rate
Operation	List from NX76 cards	List from X76 cards

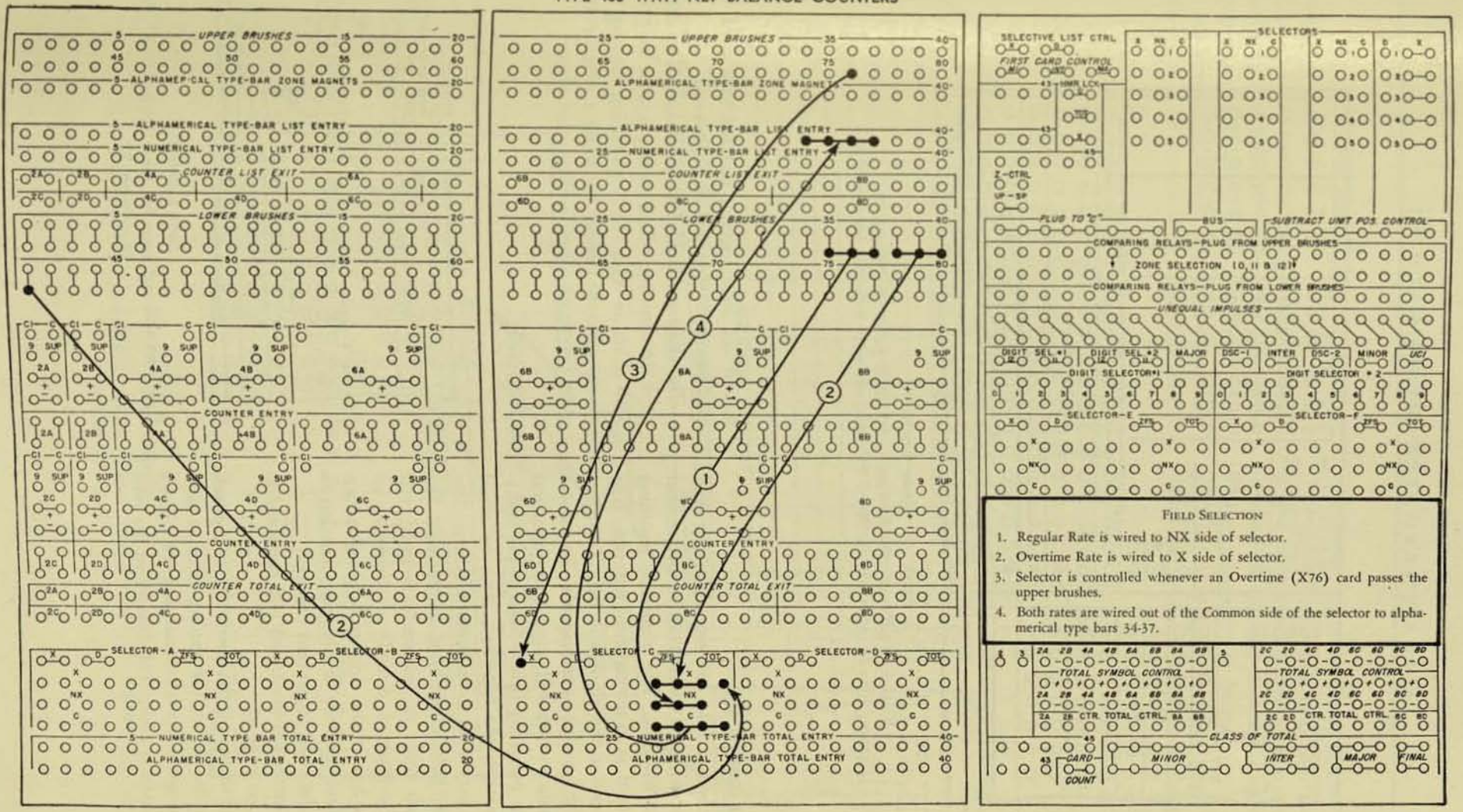


LABOR DISTRIBUTION REGISTER

DATE _____

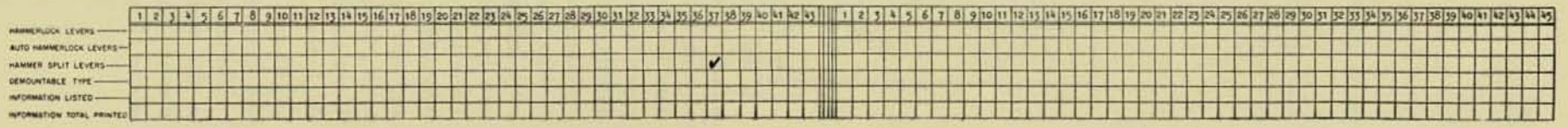
EMPLOYEE NAME	EMPL. NO. DEPT.	EMPL. NO. CLOCK	DATE MO	DATE DAY	ENTRY	RATE	PART No.	OPER.	ORDER No.	HOURS	LABOR COST
GERALD DRISCOLL	1	145	12	31	51	1 15					
	1	145	12	31	51	1 15	11872	2	109396	8 0	9 20
	1	145	12	31	51	1 15	11892	2	309397	2 0	2 30
	1	145	12	31	52	1 725				6 0	6 90
	1	145	12	31	51	1 725	11872	2	109396	2 0	3 45
										2 0	3 45
										10 0*	12 65*
JAMES DUHLMEIER										10 0*	12 65*
	1	150	12	31	51	65					
	1	150	12	31	51	65	12067	3	409399	8 0	5 20
	1	150	12	31	52	975				8 0	5 20
										2 0	1 95

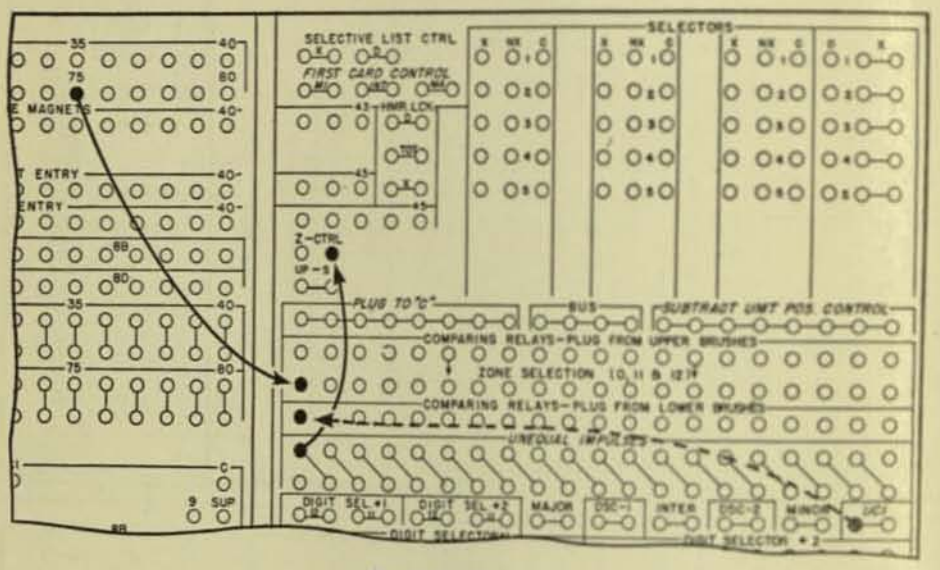
ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS



Field Selection

1. Regular Rate is wired to NX side of selector.
2. Overtime Rate is wired to X side of selector.
3. Selector is controlled whenever an Overtime (X76) card passes the upper brushes.
4. Both rates are wired out of the Common side of the selector to alphamerical type bars 34-37.





Zone Control

Type bars will not zone for cards with an X punch in column 75.
If zoning is to be suppressed for No X 75 cards, add wire indicated by dotted line.

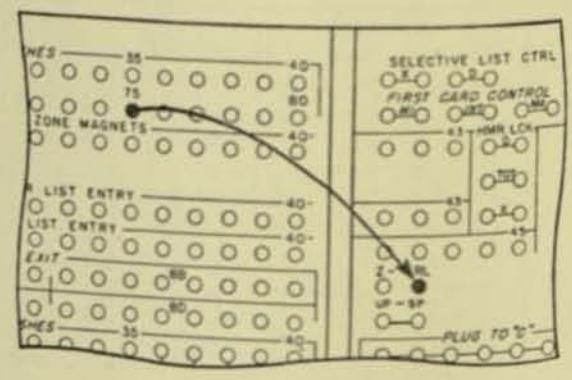
2. *Zone Control*

If one numerical field and one alphabetic field are to be selected, zone control can be used instead of zone field selection. The numerical punching must be selected as in normal field selection. The upper brushes for the alphabetic field are wired directly to the type bar zone magnets. To prevent zone interference which will occur if the numerical card has zero punching in the field of the alphabetic information, the type bars must be zoned only for the card with the alphabetic information. There are two hubs in the zone control unit. The left-hand hub emits an impulse each card cycle and may be connected, directly or through a selector, to the hub to the right to suppress zoning. There are three methods of plugging impulses to the hub on the right to prevent zoning.

The first method is illustrated and explained in the diagram on page 45.

The second method is the control by a 12 punch in the cards for which the zoning is to be suppressed. The upper brush representing the column of the 12 punch is connected directly to the inlet hub of the zone control, and for each card with a 12 punch, zoning will be suppressed.

The third method of zone control is to distinguish the cards for which zoning is to be suppressed with either an X or No X punching. Zoning then can be controlled either by using a selector or by using a comparing unit as illustrated above.



Zone Control

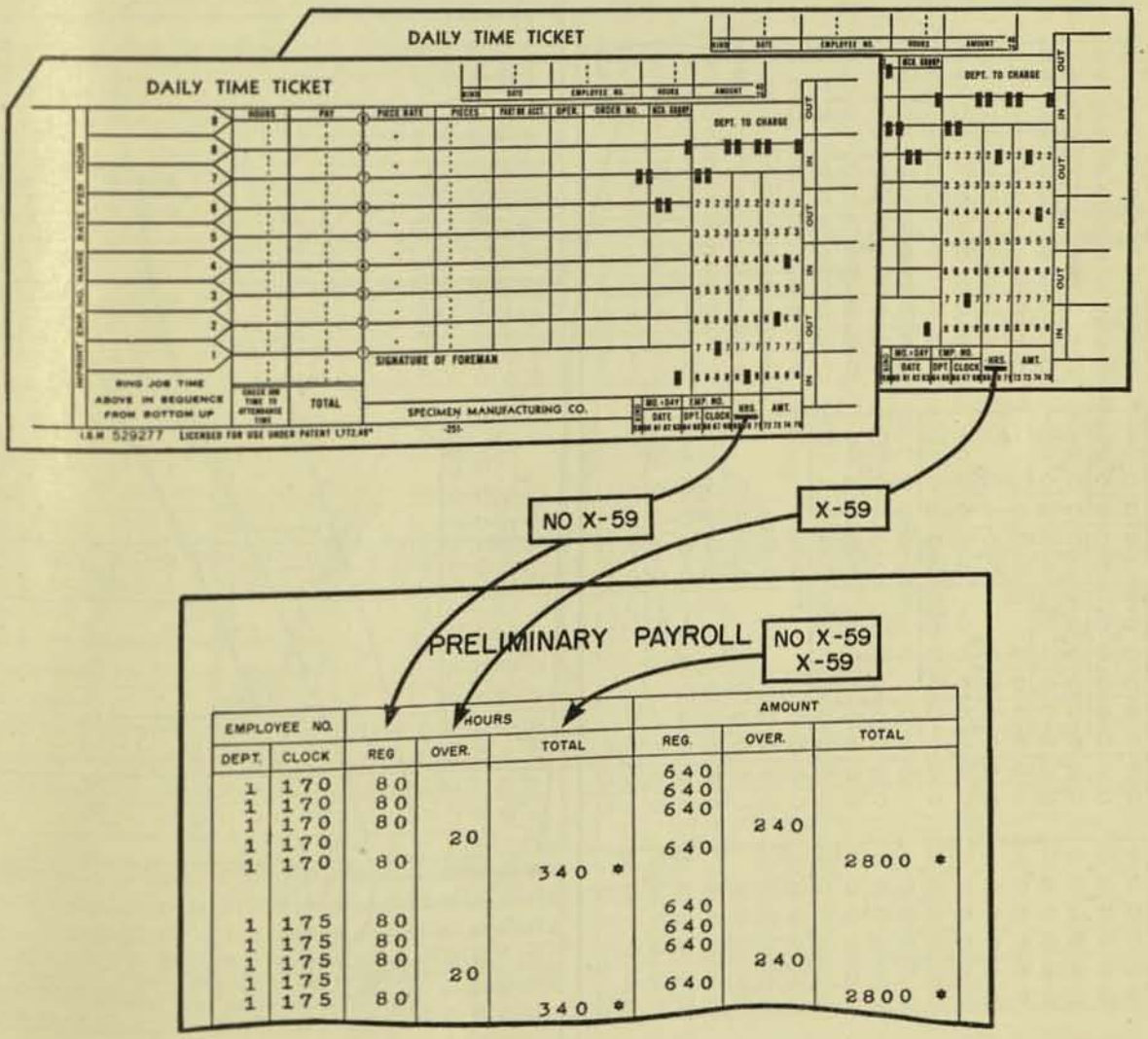
Type bars will not zone for cards with a "12" punch in column 75.

CLASS SELECTION

Numerical Information

Class selection refers to the operation by which a field, which is punched in the same columns on several types of cards, is taken to different counters or different type bars or eliminated entirely. Class selection to a counter is accomplished by X distribution, i.e., the selection of the "plug to C." This allows the machine to add the field of X cards in one counter and the same field punched in No X cards in another counter, or eliminate either type of transaction as desired.

If the information is to be listed rather than added, the problem is one of class selection to the



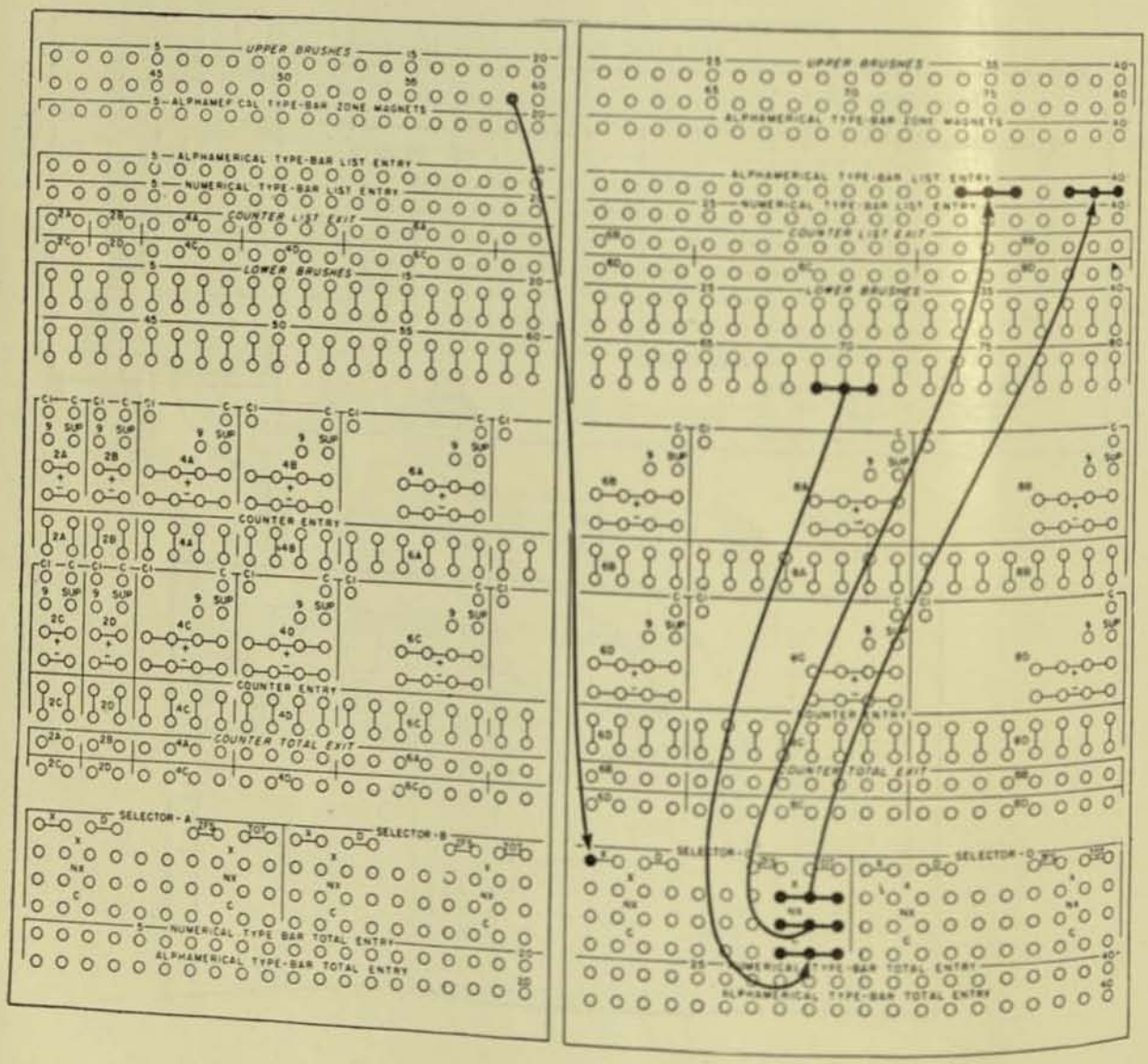
Class Selection

The same columns (69-71) on two different cards print in two different places on the report.

list type bar hubs. This operation can be performed with the use of a class selector. The field to be selected, which is punched in the same columns on all the cards, is entered in the common hubs of a class selector. The No X hubs are connected to the list type bar hubs where No X cards are to be listed. The X hubs are connected to the type bars where X cards are to be listed. The selector is controlled by the X column upper brush.

If the information is to be listed and added, the counter list exit hubs are wired to the type bar list entry hubs. A class selection function exists between the counter entry hubs and counter list exit hubs, controlled by the impulse that actuates that counter.

It is possible to do three-way class selection by using two selectors and two different control X punches.



Class Selection

Information from columns 69-71 on X 59 cards is listed from type bars 38-40.
Information from columns 69-71 on No X 59 cards is listed from type bars 34-36.

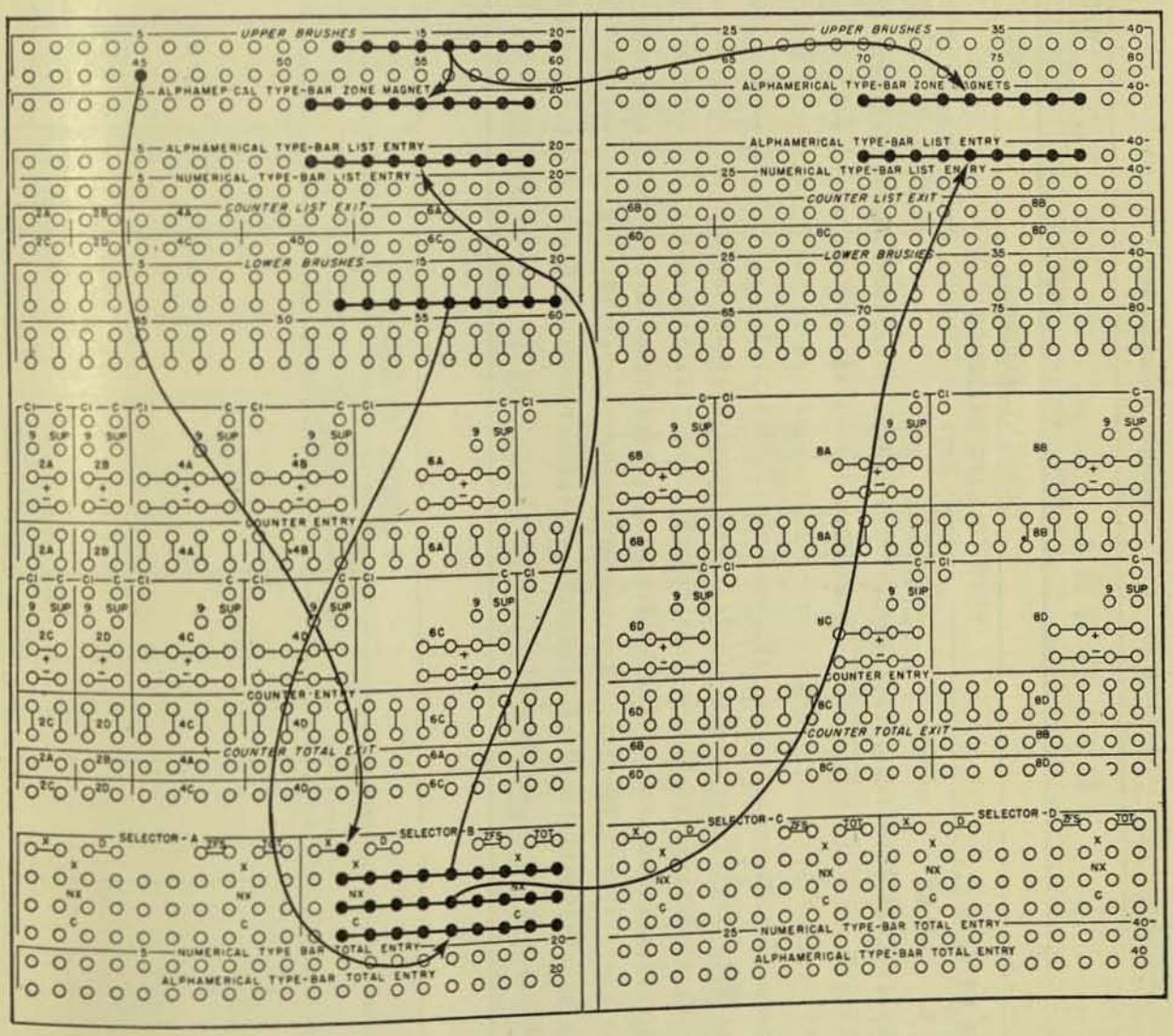
Class Selection of Alphabetic Information

Alphabetic information, as well as numerical information, can be class selected. The lower punching is selected in the normal manner and the alphabetic field is brought to both sets of zone magnets by split wires. If the alphamerical type bars do not have special symbols, zoning the type bars without bringing numerical impulses to them does not cause any printing. Therefore, only the numerical impulses must be selected.

MULTIPLE X DISTRIBUTION

Very often more than two types of cards are used in making up a report. If each type is distinguished from the others by a different combination of X or digit punching, a counter can be impulsed to add or subtract just one or several of the many types of cards.

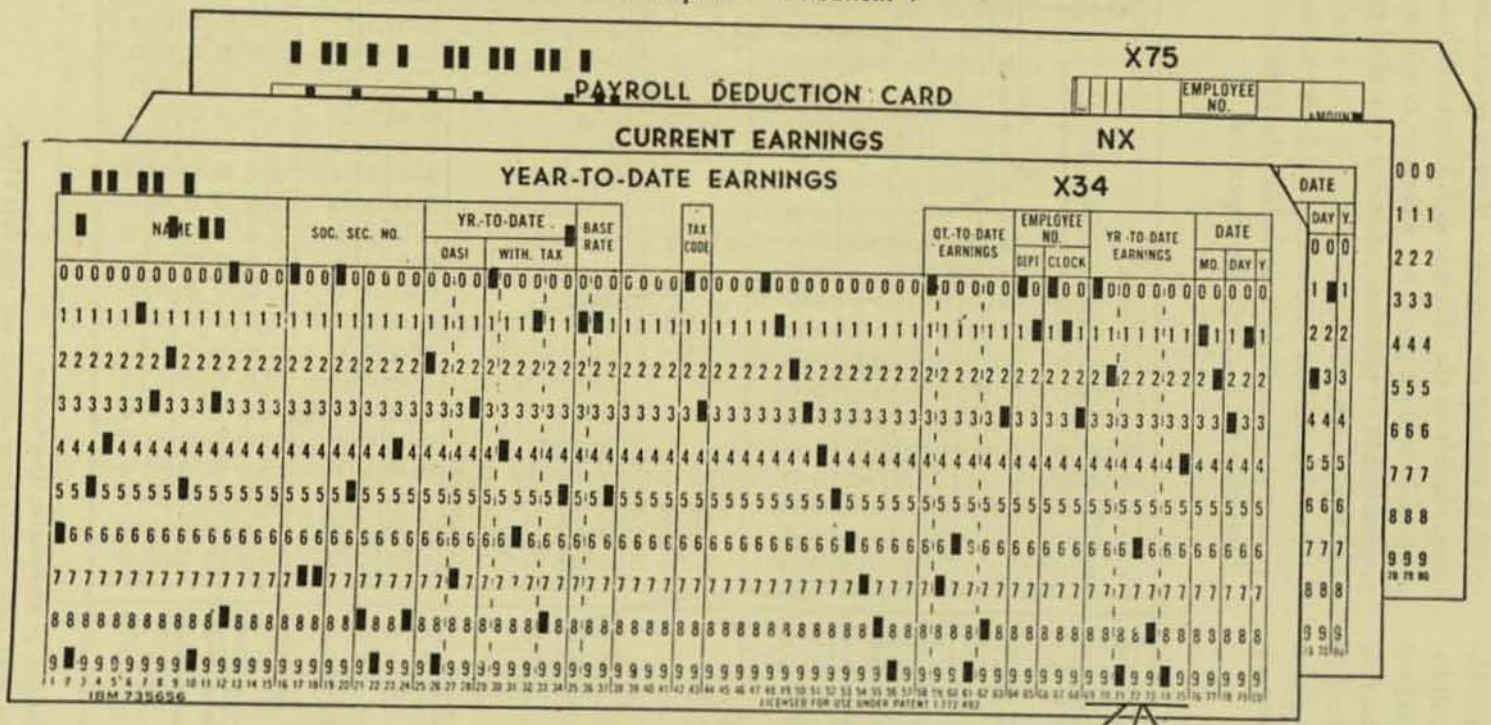
Two illustrations in the control of counter impulsing are presented. In each case, the illustration shows only the X distribution operation.



Class Selection of Alphabetic Information

Information in columns 12-20 *on X* 45 *cards is listed from alphamerical type bars* 11-19.
Information in columns 12-20 *on No X* 45 *cards is listed from alphamerical type bars* 30-38.

Multiple X Distribution: I



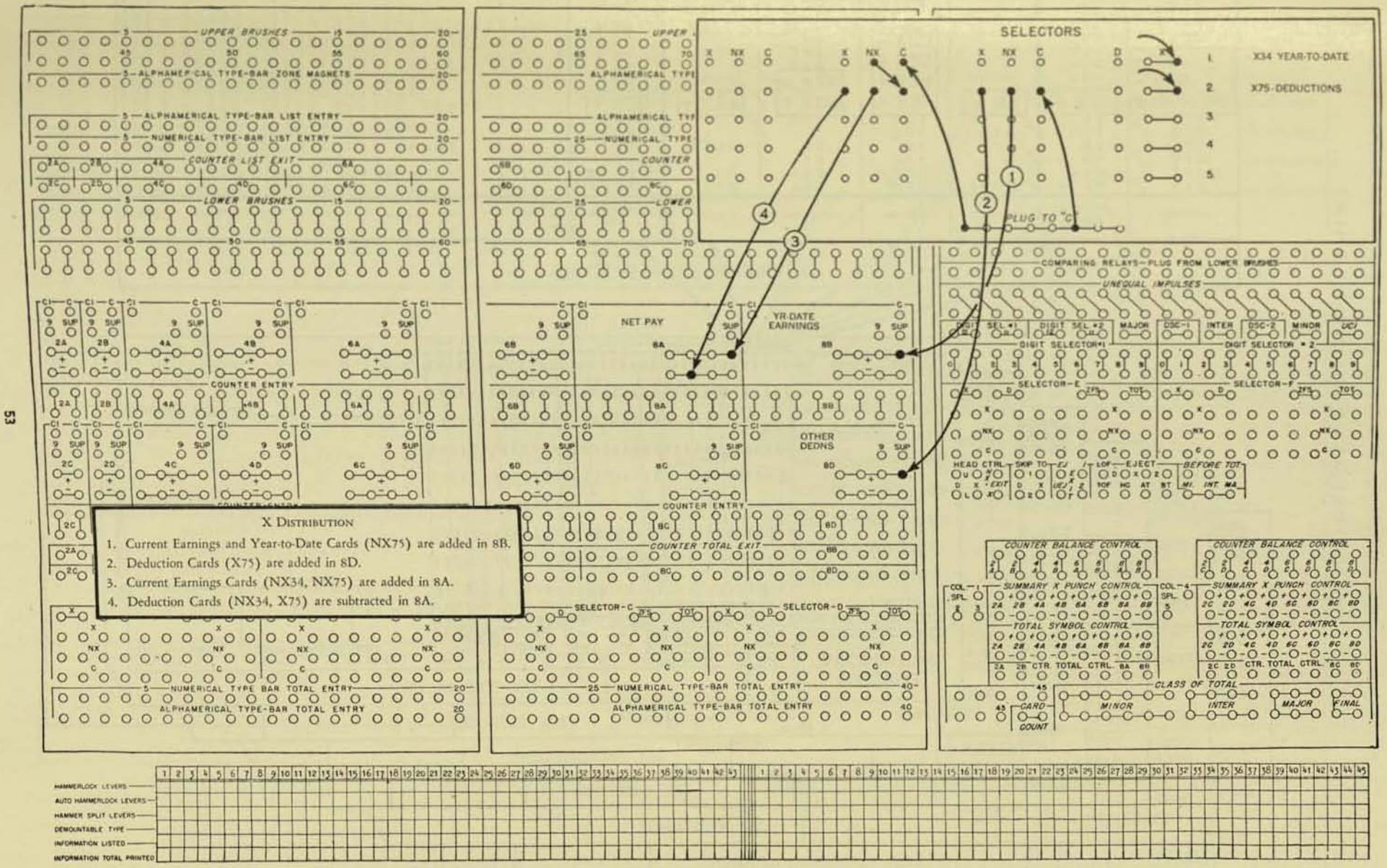
PAYROLL REGISTER

DATE _____

NAME / DESCRIPTION	EMPL. NO. DEPT.	EMPL. NO. CLOCK	TAX CODE	DAYS	BASE RATE	HOURS REGULAR	HOURS OVERTIME	CURRENT GROSS EARNINGS	DEDUCTIONS O.A.S.I.	DEDUCTIONS WITH. TAX	DEDUCTIONS OTHER	CURRENT NET PAY	YEAR TO DATE EARNINGS	YEAR TO DATE O.A.S.I.	YEAR TO DATE WITH. TAX
FRED ACKERLY	1	13	3		115						50				
WELFARE FUND											75				
GROUP INS															
ADVANCE											500				
WAR BOND											209				
MILTON CARGIN	1	100	3	5	80	400		4600	46	360	834	3360	296894	2973	46185*
SAVINGS											50				
GERALD DRISCOLL	1	145	4	5	115	400	20	3440	34	110	50	3246	191991	1922	23950*
WELFARE FUND											50				
SAVINGS											50				
WAR BOND											5				
				5		400	20	4945		230	+X75 −X75	+ NX75	0	3000	42140*

+NX34 +NX75

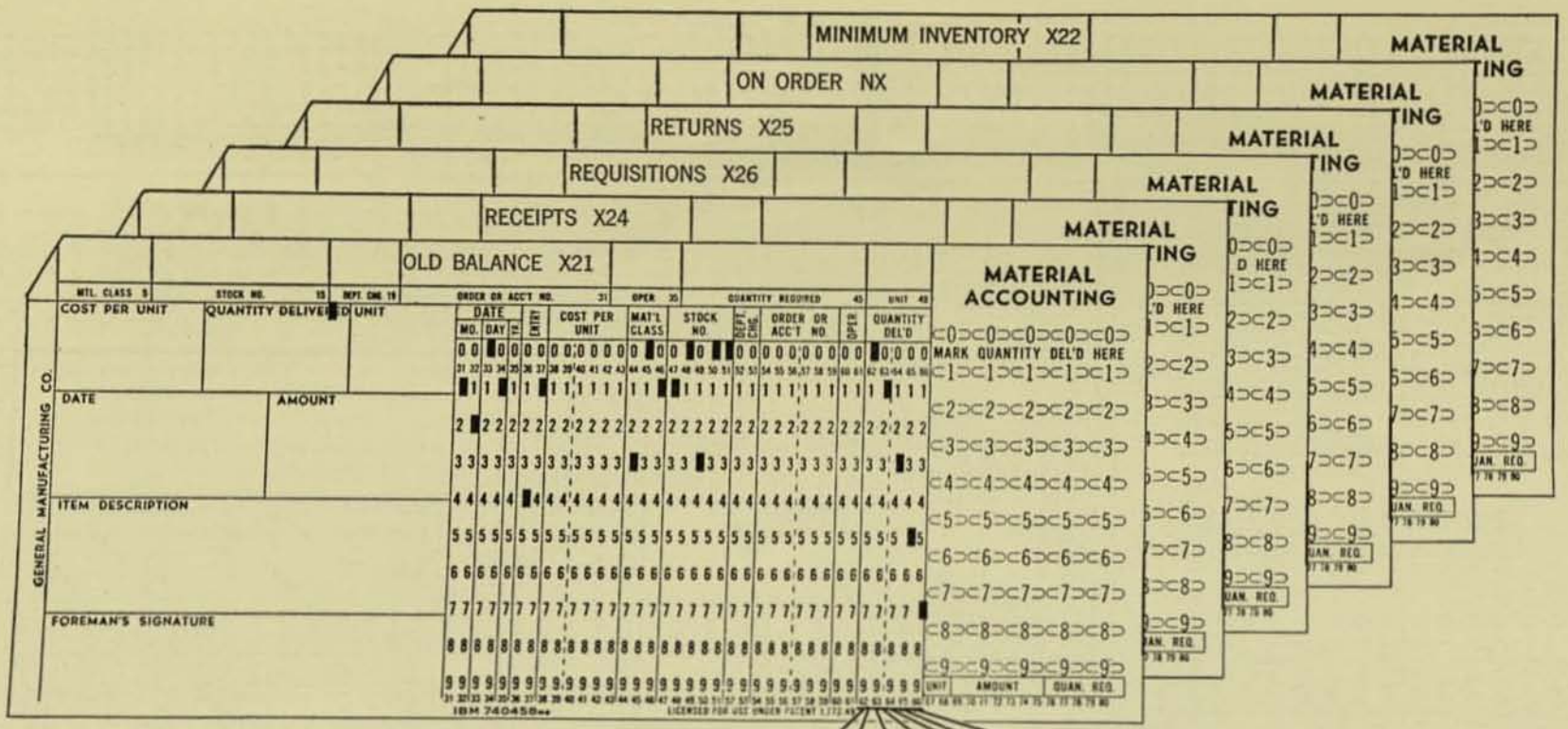
ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS



X Distribution

1. Current Earnings and Year-to-Date Cards (NX75) are added in 8B.
2. Deduction Cards (X75) are added in 8D.
3. Current Earnings Cards (NX34, NX75) are added in 8A.
4. Deduction Cards (NX34, X75) are subtracted in 8A.

Multiple X Distribution: II

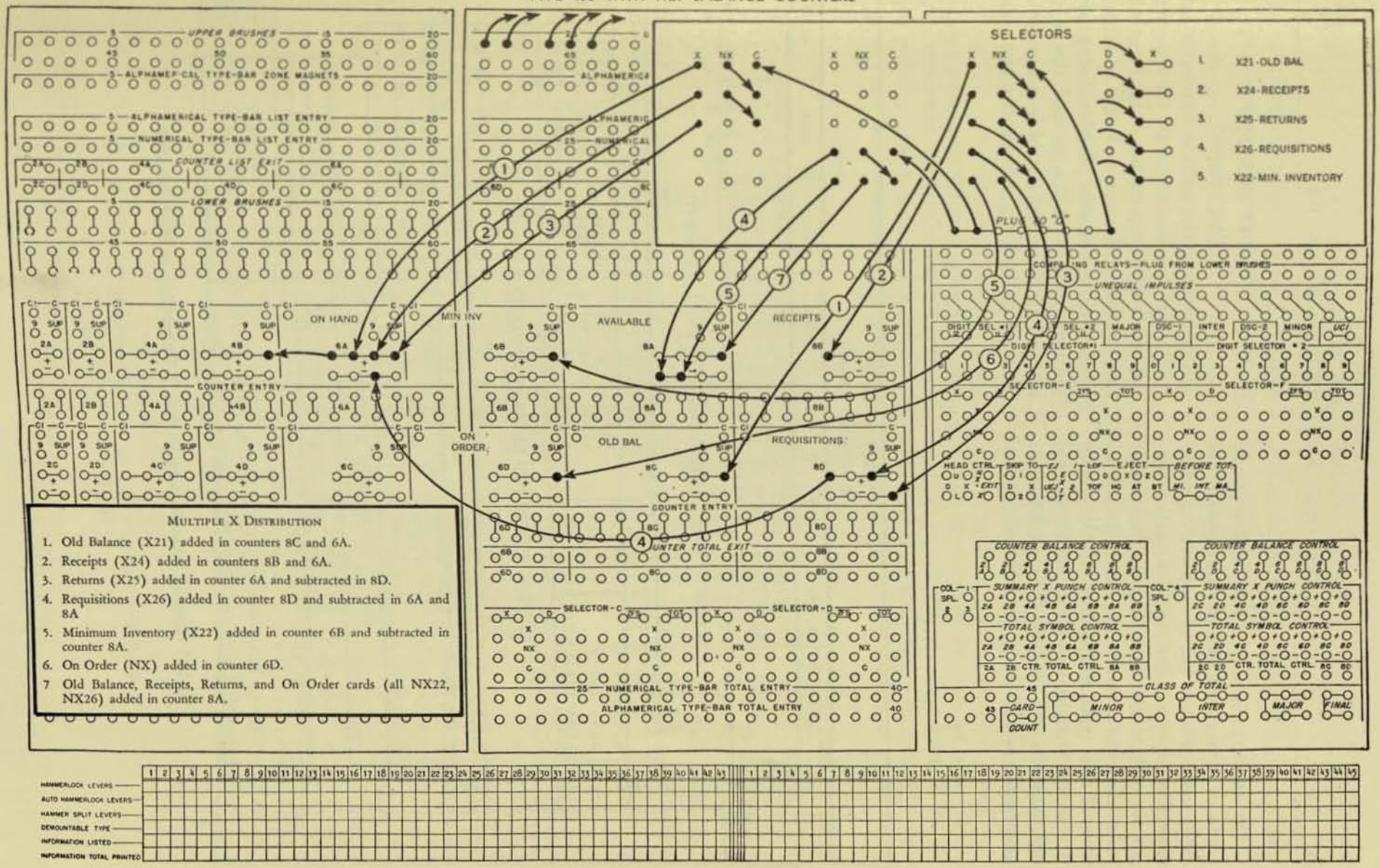


STOCK STATUS SUMMARY

MATERIAL	STOCK No.	DESCRIPTION	OLD BALANCE	RECEIPTS	REQUISITIONS	ON HAND	ON ORDER	MINIMUM INVENTORY	AVAILABLE
301	10300	BRASS ROD	1357	345	967	735	3000	3100	635
301	20400	SOFT BRASS ROD	1130	66	786	410		760	350CR
301	29648	C D BRASS	637		13	624		81	543
301	30623	H H CLOCK BRASS	60	100	66	94		73	21
301	35369	BRASS DISC	186			186	250	215	221
301	38942	BRASS TUBING	923		500	423		37	386
301	40732	HARD SPRING BRASS	+X21	+X24	+X26 −X25	+X21 +X24 +X25 −X26	+NX	+X22	+NX22,26 −X26 −X22
301	41693	BRASS PINION							
301	50800	EXTRUDED BRASS	260	500	210		1000	786	
301	52634	BERYLLIUM COPPER	475					225	
301	60900	BRONZ TUBING	270	500	347			274	
305	10005	ALUMINUM CASTING	4210		60			295	3855
305	20012	ALUMINUM ALLOY CAST	455	5304	710	5049		322	4727
305	20023	BRASS CASTING		2000	373	1627		32	1595
305	30023	BRONZ ALLOY CASTING	243	81	15	309	500	400	409
305	40834	HARD BRONZ CASTING	560	500	72	988		160	828
305	47263	BRASS FORGING	347			347		69	278

ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL

TYPE 405 WITH NET BALANCE COUNTERS



Multiple X Distribution

1. Old Balance (X21) added in counters 8C and 6A.
2. Receipts (X24) added in counters 8B and 6A.
3. Returns (X25) added in counter 6A and subtracted in 8D.
4. Requisitions (X26) added in counter 8D and subtracted in 6A and 8A
5. Minimum Inventory (X22) added in counter 6B and subtracted in counter 8A.
6. On Order (NX) added in counter 6D.
7. Old Balance, Receipts, Returns, and On Order cards (all NX22, NX26) added in counter 8A.

The effectiveness with which reports can be produced through the medium of multiple X (or digit) distribution is seen in the following report illustrations in which pertinent information relative to each classification is spread horizontally across the report. Accounting and statistical reports of these types, prepared by the Alphabetical Accounting Machine, are widely used, for they add significance to such analyses. Different X's or digits identify each of the factors within the reports.

DIGIT SELECTOR
(Not Standard)

A digit selector can perform two functions. It can be used as a control device for transmitting and separating digit punching in a column of the card to control operation of the selectors, the hammerlock mechanism, selective listing or the automatic carriage. It can be used also to print automatically information which is not punched in the cards. Each digit selector has two common

SALES SUMMARY
BY COMMODITY CLASSES
PERIOD

BRANCH No.	BRANCH NAME	CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	NET SALES
30	ATLANTA	28000	6750	11000	10070	13000	4202	73022
60	BOSTON	522700	135000	16595	353140	20321	126300	1174056
70	BUFFALO	48600	60425	6000	41698	7135	21325	185183

CURRENT PERIOD AND CUMULATIVE SALES SUMMARY
PERIOD

SALESMAN No.	SALESMAN NAME	CURRENT PERIOD SALES	CURRENT PERIOD RETURNS	CURRENT PERIOD NET	TO DATE SALES	TO DATE RETURNS	TO DATE NET
181	ARTHUR CASE	6750	2640	4110	188003	9020	178983
532	JOHN COREY	24575	2000	22575	300310	4000	296310
1374	GEORGE NELSON	36480	15198	21282	413075	23408	389667

CURRENT PERIOD AND CUMULATIVE EXPENSE BUDGET
PERIOD

DEPARTMENT No.	DEPARTMENT NAME	CURRENT PERIOD EXPENSE	CURRENT PERIOD BUDGET	CURRENT PERIOD VARIANCE	TO DATE EXPENSE	TO DATE BUDGET	TO DATE VARIANCE
81	RECEIVING	201562	205000	3438CR	2026500	2250000	223500CR
82	RAW MATERIAL	403575	396300	7275	4053700	4275000	221300CR
83	PLANNING	624700	610000	14700	7271700	6825000	446700

FINISHED STOCK REPORT
WEEK ENDING

DESCRIPTION	STOCK OR PART No.	SALES YEAR TO DATE	SALES MONTH TO DATE	UNFILLED ORDERS	STOCK ON HAND	DUE FROM FACTORY	REMARKS
RIGID FORK OFFSET	14702	17510	8010	990	20515	4570	
SQ SOCKET RIGID	16102	10015		1985	1090	12160	
EXT SHANK WITH BRK	17203	20980	5000	1020	22517	4000	
SQ SHANK RIGID	21103	9642	1005		15503	900	

Typical "Spread" Reports using Multiple X Distribution or Digit Selection

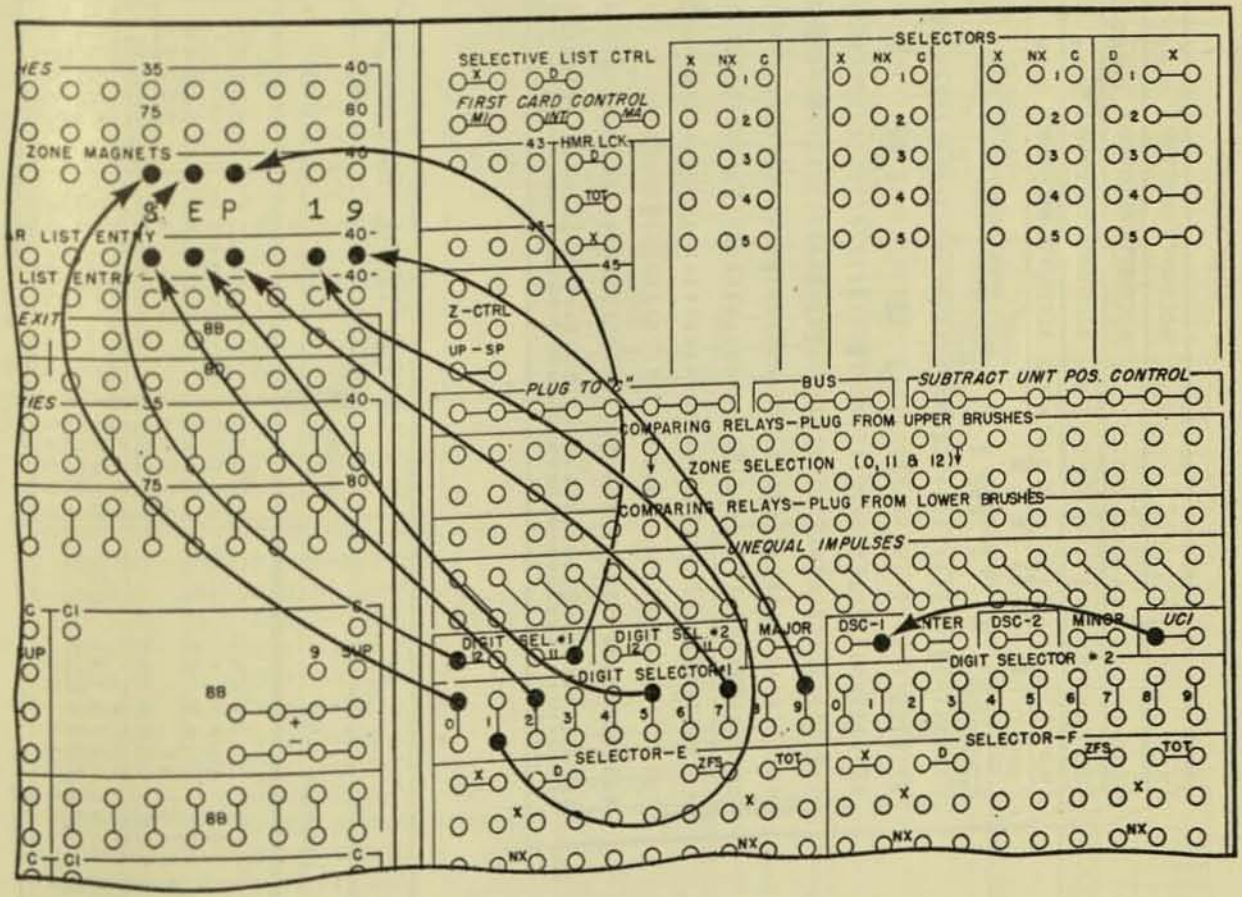
control hubs labelled DSC (digit selector common) and 12 pairs of digit outlet hubs, 9 through 12.

Digit Selector as a Control Device

The use of a digit selector makes it possible to eliminate spread X's and concentrate the control punching in one column. Each card is distinguished by a different digit. Thus, 12 classes of cards can be distinguished by different digits in the same column. The upper brush of the control column is connected to the DSC hub. Then, if a selector is to be controlled by a 5 in this column, one of the "5" hubs of the digit selector is wired to the digit pick-up hub of the selector. If a "plug to C" is taken into the C hub of the selector, an impulse will come out of the X hub of the selector only when there is a 5 punched in the particular column. If the X hub is wired to a counter, only "5" cards will be added.

Digit Selector as an Emitter

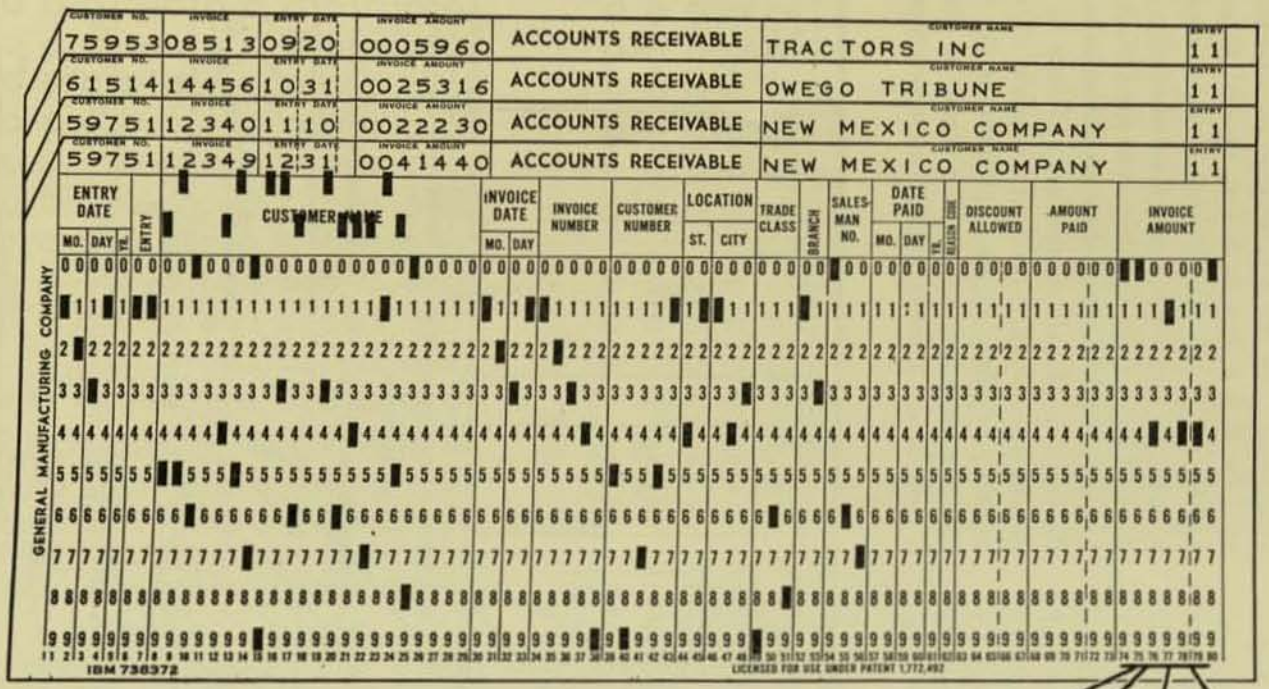
If a UCI (upper control impulse) hub is wired to the DSC hub, during each card cycle a series of impulses enter the digit selector corresponding to the 9, 8, 7, 6, 5, 4, 3, 2, 1, 0, 11, and 12 card positions. Thus, as a card is being read for each position, an impulse is emitted automatically by the UCI hub. These impulses enter the DSC hub and may be taken out of the digit outlet hubs of the selector. This allows numbers or letters to be printed automatically for each list cycle of the machine, by plugging the digit hubs to the list type bars as shown below. This operation often is used for the automatic dating of report forms.



Digit Emitting

The date "Sep 19" is automatically listed every list cycle from alphamerical type bars 35, 36, 37, 39, 40.

Digit Selection

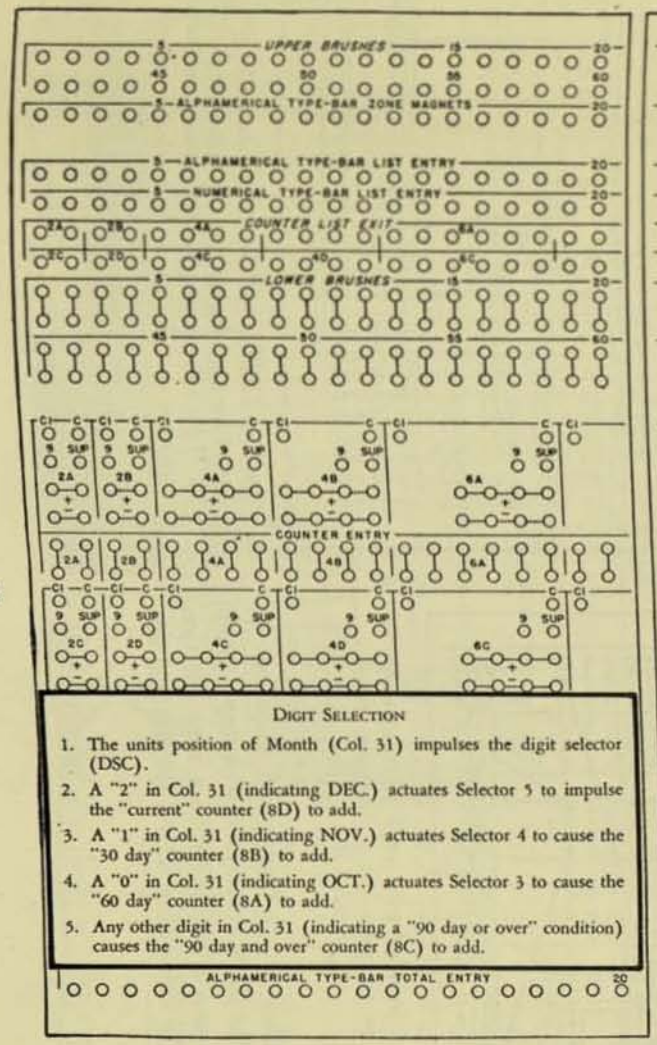


AGED TRIAL BALANCE

DATE

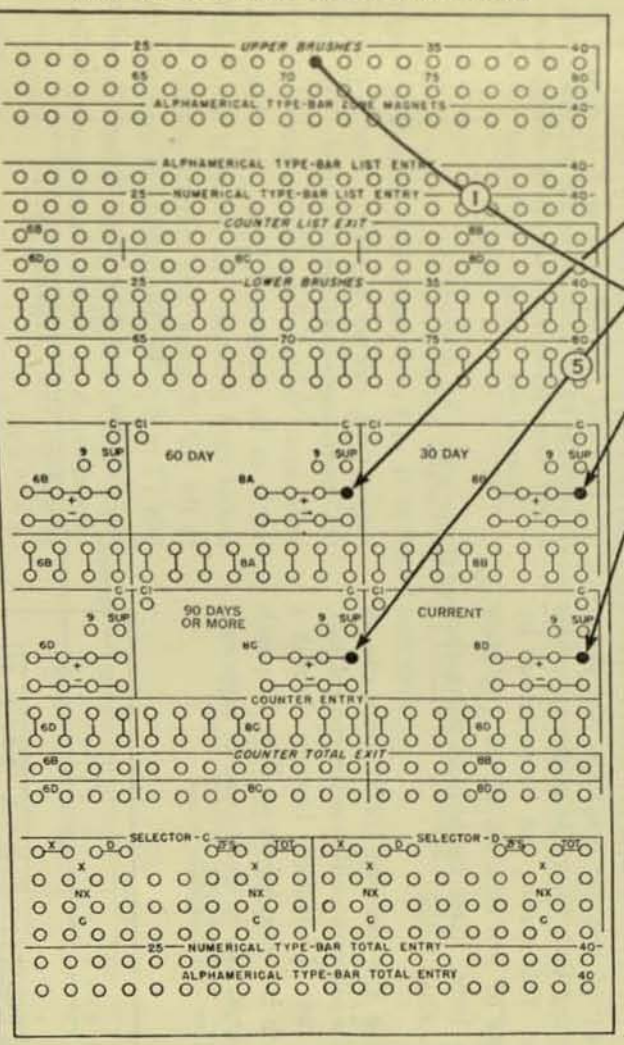
CUSTOMER NAME	CUSTOMER No.	TOTAL	CURRENT	30 DAY	60 DAY	90 DAY
NEW MEXICO COMPANY	59751	204413	182183	22230		
NEW MILTON SUPPLY	60035	88694		88694		
NEWTON PARK AND CO	61043	106046	106046			
OWEGO TRIBUNE	61514	244710	74235	124559	45916	
J C PEARCE COMPANY	62159	66668	+2-Col. 31	+1-Col. 31	+0-Col. 31	+No 0, 1 or 2
ROCK ROYAL BRASS	63436	50849				
SANBORN INDUSTRIAL CO	66273	82300	82300			
SEASHELL PETROLEUM	68284	52304	52304			
SOUTHERN SPEAC CO	69345	63076	63076			
TRACTORS INC	75943	5960				5960

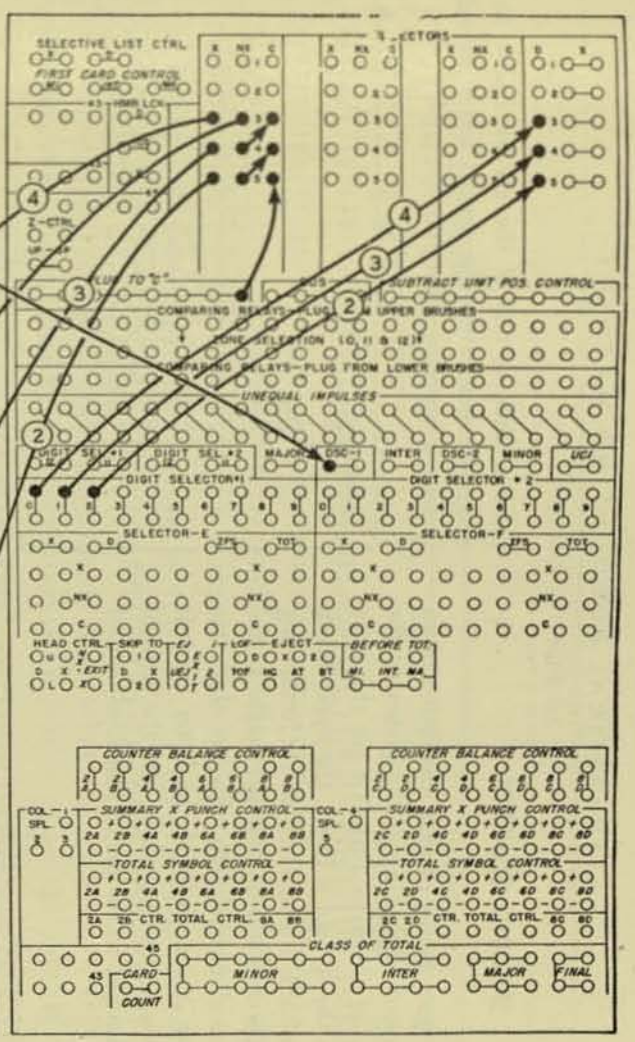
ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS

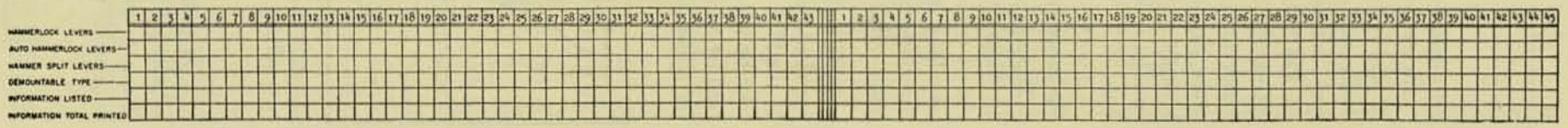


Digit Selection

1. The units position of Month (Col. 31) impulses the digit selector (DSC).
2. A "2" in Col. 31 (indicating DEC.) actuates Selector 5 to impulse the "current" counter (8D) to add.
3. A "1" in Col. 31 (indicating NOV.) actuates Selector 4 to cause the "30 day" counter (8B) to add.
4. A "0" in Col. 31 (indicating OCT.) actuates Selector 3 to cause the "60 day" counter (8A) to add.
5. Any other digit in Col. 31 (indicating a "90 day or over" condition) causes the "90 day and over" counter (8C) to add.







SPACING CONTROL

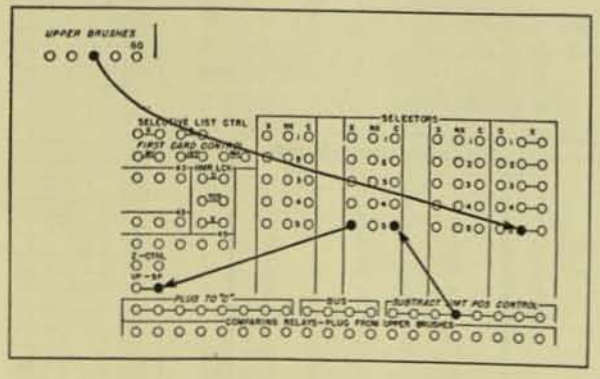
Extra Space

An extra space before or after the listing of an X card is caused by spacing of the platen on the down stroke of the type bars. To get the extra space before the X card is listed, the upper brush for the X column is connected to the comparing relays, and the unequal impulse is brought to the major first card control hub. To get the extra space after an X card is listed, the lower brush is brought to the comparing relays, and the unequal impulse is brought to the major first card control hub.

Up-Space Suppression

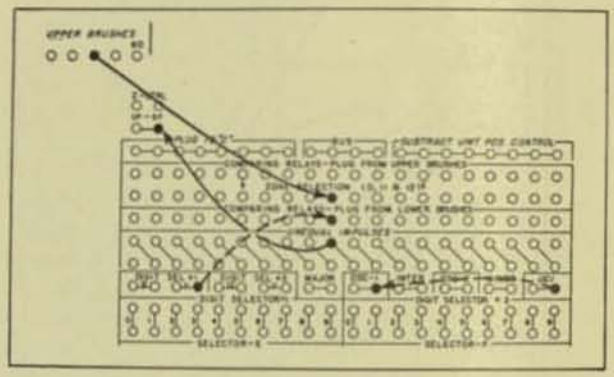
During normal machine operation, the platen advances during each list cycle as the type bars rise to print. This spacing can be suppressed by impulsing one of two common UP-SP (up-space suppression) hubs. Three methods of using these hubs are described below:

1. Either of the common UP-SP hubs can be impulsed by a subtract units position control hub. If the SUP control impulse is brought through a selector which is controlled on an X or 12 punch read by an upper brush, spacing can be suppressed for either X or No X cards.



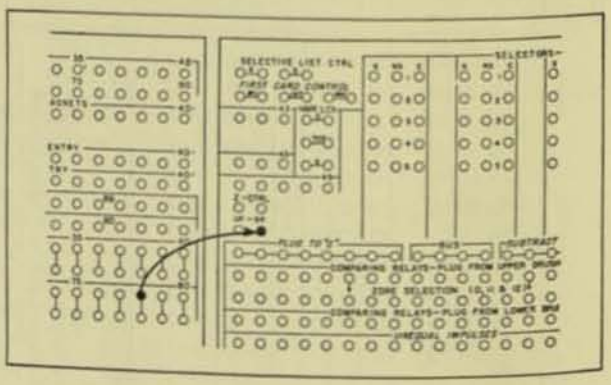
Each card punched with an X in column 78 will list on the same line as the card which preceded it.

2. A position of the comparing relays can be substituted for the selector unit. The upper brush X or 12 column is connected to a zone selection position in the comparing relays; the unequal impulse is taken to one of the UP-SP hubs. In the diagram below, when the dotted wires are added, spacing is suppressed for No X cards.

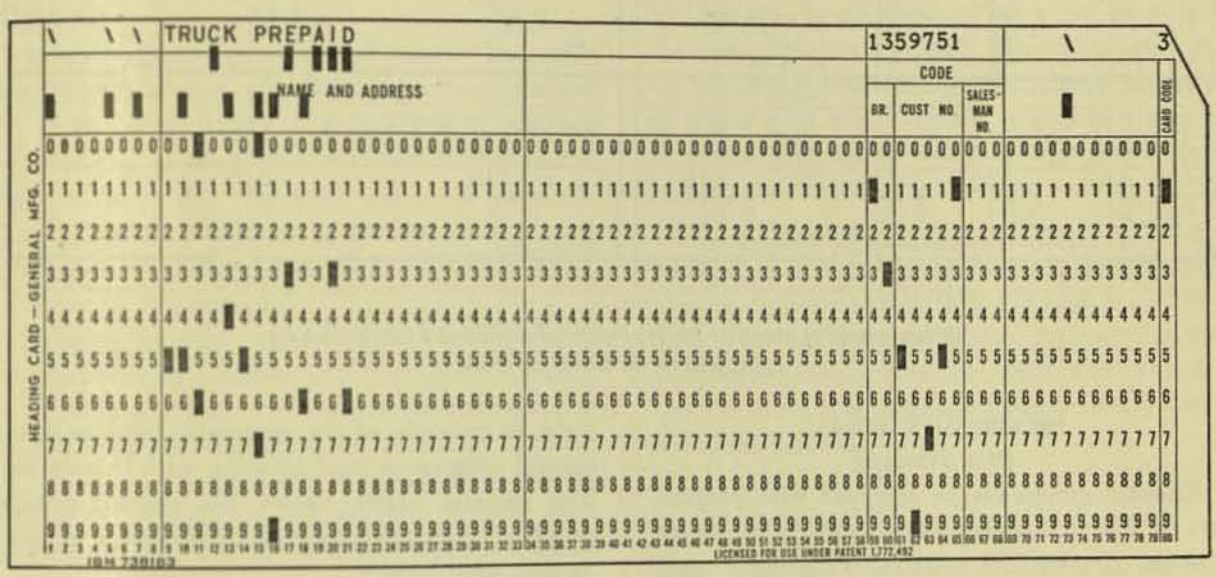


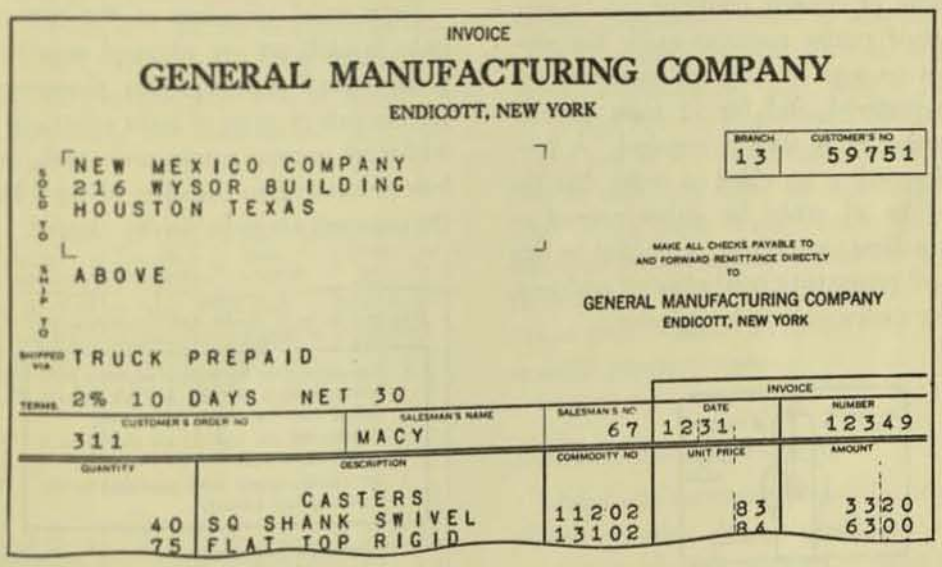
Each card punched with an X in column 78 will list on the same line as the preceding card. If the dotted wires are added, the conditions are reversed and spacing is suppressed for No X cards.

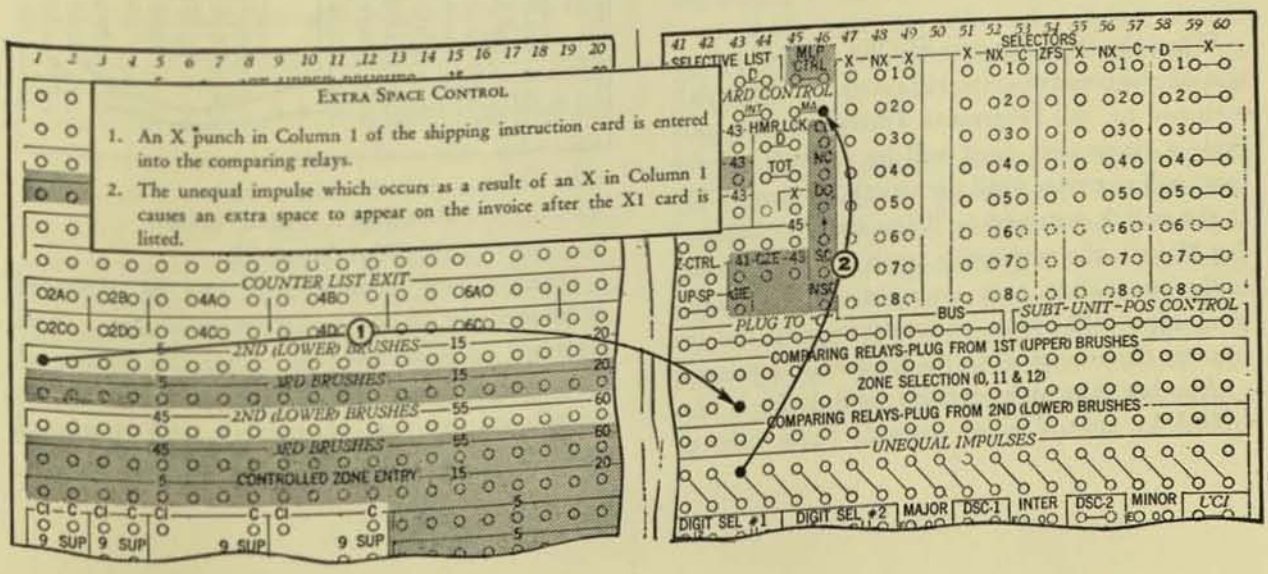
3. If an 8 or 9 punch is to be used for suppressing spacing, neither a selector nor a position of the comparing relays need be used. The upper or lower brush is used, depending upon whether spacing is to be suppressed before or after the controlled card is listed. The brush is wired directly to the UP-SP hubs. The column should not contain a 7 or 6 punch because either may affect spacing. Punches from 5 through X have no effect on the device. A 12 punch causes spacing to be suppressed on the following cycle.

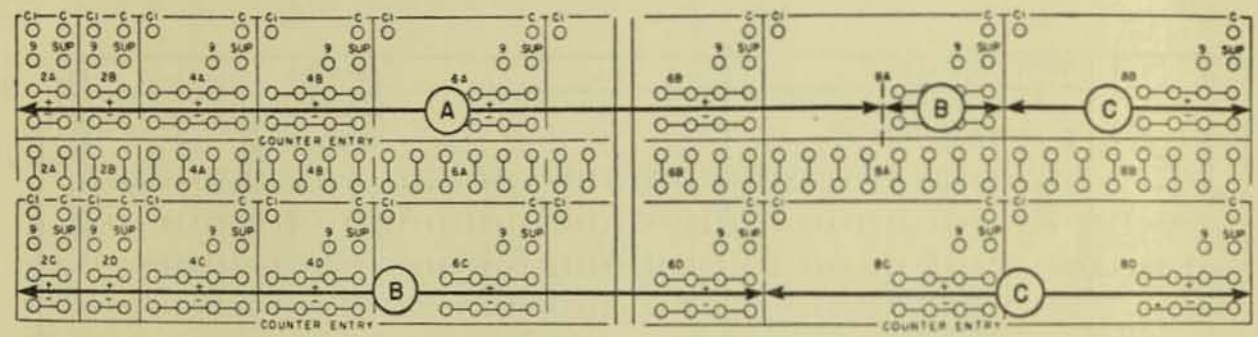


Each card with a "9" or "8" in column 78 will list on the same line as the card which preceded it. If the column may contain other punching, a column split device or digit selector usually must be used.


TRUCK PREPAID
1359751
3
NAME AND ADDRESS
CODE
BR.
CUST NO
SALES-MAN NO.
CARD CODE
HEADING CARD — GENERAL MFG. CO.
IBM 720103
LICENSED FOR USE UNDER PATENT 1,777,492


INVOICE
GENERAL MANUFACTURING COMPANY
ENDICOTT, NEW YORK
BRANCH 13
CUSTOMER'S NO 59751
SOLD TO
NEW MEXICO COMPANY
216 WYSOR BUILDING
HOUSTON TEXAS
SHIP TO
ABOVE
MAKE ALL CHECKS PAYABLE TO AND FORWARD REMITTANCE DIRECTLY TO
GENERAL MANUFACTURING COMPANY
ENDICOTT, NEW YORK
SHIPPED VIA TRUCK PREPAID
TERMS 2% 10 DAYS NET 30
CUSTOMER'S ORDER NO 311
SALESMAN'S NAME MACY
SALESMAN'S NO 67
INVOICE DATE 12 31
INVOICE NUMBER 12349
QUANTITY
DESCRIPTION
COMMODITY NO
UNIT PRICE
AMOUNT
40 SQ SHANK SWIVEL CASTERS 11202 83 33 20
75 FLAT TOP RIGID 13102 84 63 00

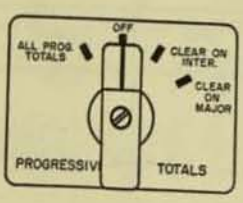

EXTRA SPACE CONTROL
1. An X punch in Column 1 of the shipping instruction card is entered into the comparing relays.
2. The unequal impulse which occurs as a result of an X in Column 1 causes an extra space to appear on the invoice after the X1 card is listed.
COUNTER LIST EXIT
2ND (LOWER) BRUSHES
3RD BRUSHES
CONTROLLED ZONE ENTRY
9 SUP
SELECTIVE LIST
SELECTORS
PLUG TO
BUS
SUBT-UNIT-POS CONTROL
COMPARING RELAYS-PLUG FROM 1ST (UPPER) BRUSHES
ZONE SELECTION (0, 11 & 12)
COMPARING RELAYS-PLUG FROM 2ND (LOWER) BRUSHES
UNEQUAL IMPULSES
DIGIT SEL #1
DIGIT SEL #2
MAJOR
DSC-1
INTER
DSC-2
MINOR
UCI



Arrangement of counters for Progressive Total Device Controlled by plugging on the Control Panel.

PROGRESSIVE TOTALS
(Not Standard)

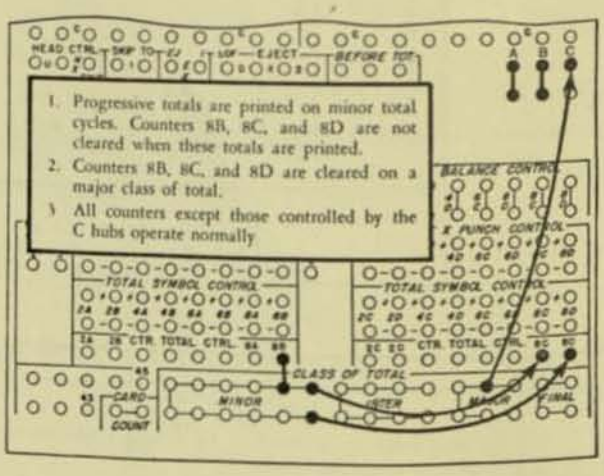
Counter groups can be equipped with progressive total devices, which allow a total to be printed without clearing the counter. Progressive totals for any number of counter positions can be supplied in units of twelve positions each. For progressive totals on any 12 counter positions, one relay unit is required, and for 12 more counter positions, another relay unit is required. A progressive total switch is provided in order that the counters may be set easily for either normal or progressive totalling operations. One dial switch may control all progressive total counter positions, or a switch for each unit may be supplied.



When the switch is turned OFF, normal operation of the counter units will occur. If the switch is turned to "All Progressive Totals," at each total cycle a progressive total will be printed and the total will not reset until the switch is turned OFF. If the switch is turned to "Clear on Intermediate" (or Major), the progressive totals will be automatically reset after each intermediate (or major) total cycle. The class of total plugging for the counter determines when the total will be printed.

Another type of progressive total device is controlled by control panel wiring. Three pairs of hubs, to the right of the automatic carriage hubs, control progressive total printing with this device. The diagram above shows the counter-groups which are controlled by each of the pairs of progressive total hubs.

For normal operation of the counters, the two hubs in each set are plugged together. For progressive total printing, this plugging is removed for the pair or pairs of hubs affecting the counters which are to print progressive totals, and the upper hub is wired from the class of total hub on which the counters are to be finally cleared.



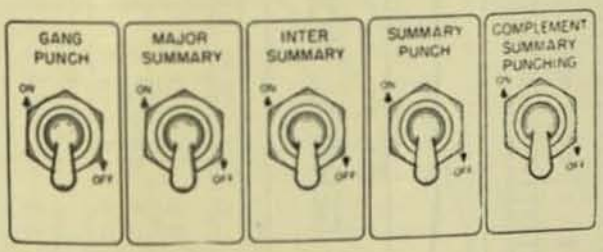
SUMMARY PUNCHING
(Not Standard)

Total or new balance cards can be produced simultaneously with report preparation. These summary cards are used to reduce the volume of cards in the current file in order to speed up the compilation of the accounting and statistical analyses.

Operation

In a summary punching operation, the summary punch is attached to the Accounting Machine by the connector cable. The Accounting Machine accumulates as usual until a change occurs in the control for which the totals are to be punched. The Accounting Machine then stops, and does not print or reset until the punching of the summary card has been completed.

Because the only connection between figures in the Accounting Machine and the summary punch is through a counter, any information which is to be summary punched must be entered in a counter. Indicative information is taken to a counter which is impulsed to add the first card of each control group. The MI first card control impulse is used to control the counter impulsing for minor groups. This operation is similar to group indication by the counter list method. Intermediate and major control information can also be summary punched by impulsing the counter as for group indication.



Switches

The Accounting Machine is equipped with several switches which are used in summary punching operations. The summary punch switch must be ON for all summary punching operations. This switch makes both units (Accounting Machine and punch) function together. It is the only summary punch switch which should be ON when summary punching minor totals. When intermediate or major totals are to be summary punched, the intermediate or major summary punch switch also must be ON. These switches govern the totals to be transferred to cards. The machine may be made operative for the major, the intermediate, or the minor totals, but never for more than one class of total in any one operation. If the Accounting Machine is to be used without the summary punch, these switches should be OFF. When these switches are ON, the Accounting Machine cannot be started unless cards are fed into the summary punch. If cards run out of the summary punch feed hopper, the Accounting Machine will stop.

When summary punching with a Net Balance machine, it is desirable sometimes to punch complement balances rather than the true credit figures. This can be accomplished by turning the complement summary punch switch ON; this delays the conversion cycle until the summary cards have been punched.

Summary X Punch Control Hubs

The summary X punch control hubs on the Net Balance machines are used to identify either debit or credit summary cards with an X punch. The impulse from the + or — hub is plugged from the proper counter summary X punch control hub to any one of the 5 column split inlet hubs. These column split inlet hubs are connected by the summary punch cable to the column split hubs on the summary punch control panel. The corresponding column split on the summary punch control panel can be used to punch an identifying X in the credit or debit summary cards.

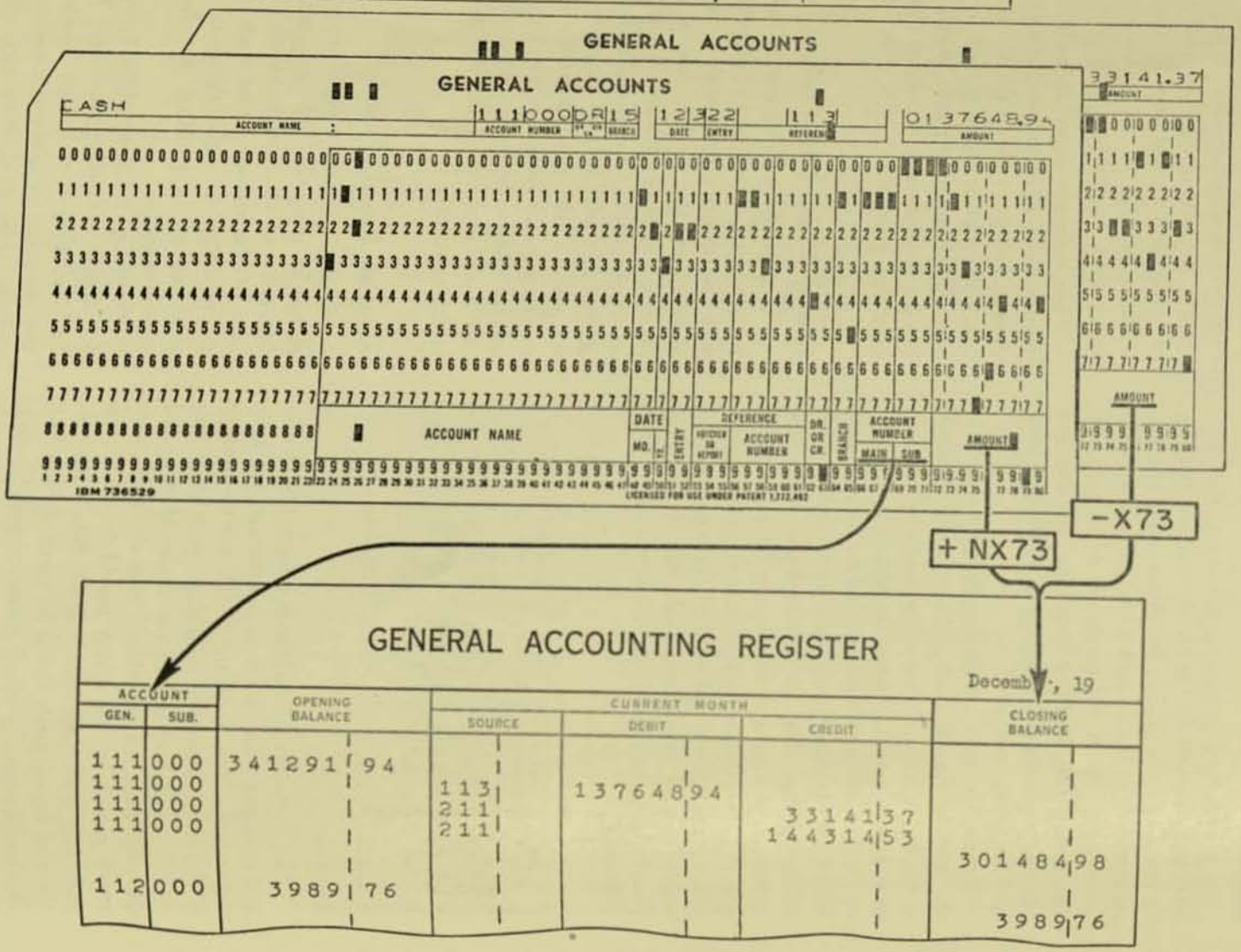
Alphabetic Summary Punching

Alphabetic summary punching may be accomplished by using the alphabetic summary punching device, which is attached to eight counter positions of the machine. One such device permits the punching of eight alphabetic positions. A maximum of 32 positions may be obtained, in groups of eight.

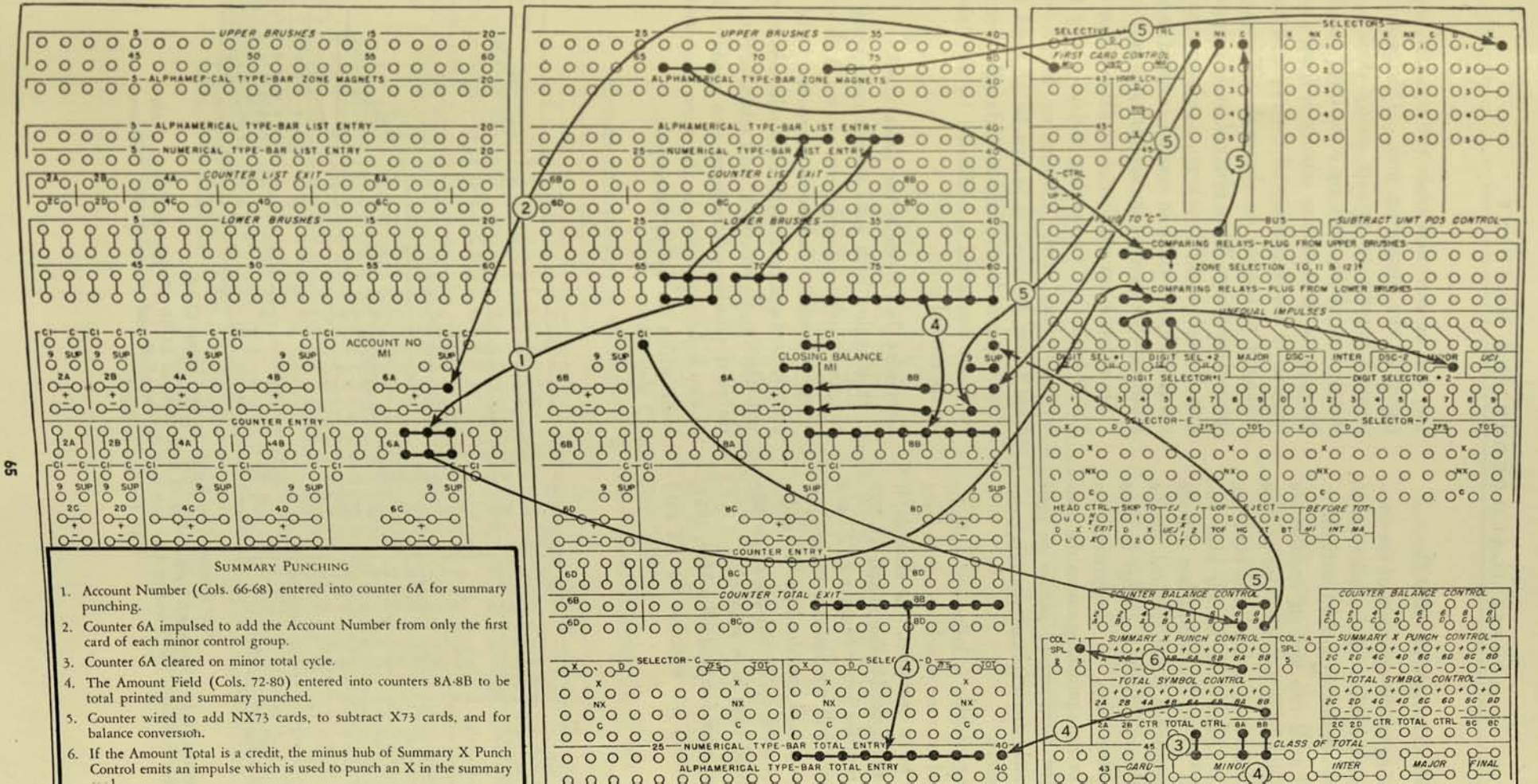
The plugging does not differ from that required for normal summary punching. The alphabetic field is plugged from the lower brushes to the counters equipped for alphabetic summary punching, and the outlets of these counters on the summary punch are plugged to the desired card columns. A switch on the Accounting Machine controls the device and permits normal operations when turned OFF.

Summary Punching

Field	Account No.		Closing Balance
	Gen.	Sub.	
Operation	List; Minor Control Summary Punch	List	Minor Total; Summary Punch



ALPHABETICAL ACCOUNTING MACHINE CONTROL PANEL
TYPE 405 WITH NET BALANCE COUNTERS



Summary Punching

1. Account Number (Cols. 66-68) entered into counter 6A for summary punching.
2. Counter 6A impulsed to add the Account Number from only the first card of each minor control group.
3. Counter 6A cleared on minor total cycle.
4. The Amount Field (Cols. 72-80) entered into counters 8A-8B to be total printed and summary punched.
5. Counter wired to add NX73 cards, to subtract X73 cards, and for balance conversion.
6. If the Amount Total is a credit, the minus hub of Summary X Punch Control emits an impulse which is used to punch an X in the summary

USES OF COMPARING RELAYS

An understanding of the operation of the comparing relays makes possible their application to other than normal automatic control functions.

During a card cycle two separate impulses are available from each control position. One of these is used to signal differences in numerical punching ("9" through "1"), the other for the zone impulses ("11" and "12"). No comparison is made on zero. Zero comparison is not required, since a control change always includes a change in some punching other than zero. A disagreement in either numerical or zone punching causes the position in which the disagreement occurs to emit impulses immediately from its corresponding unequal impulse outlets.

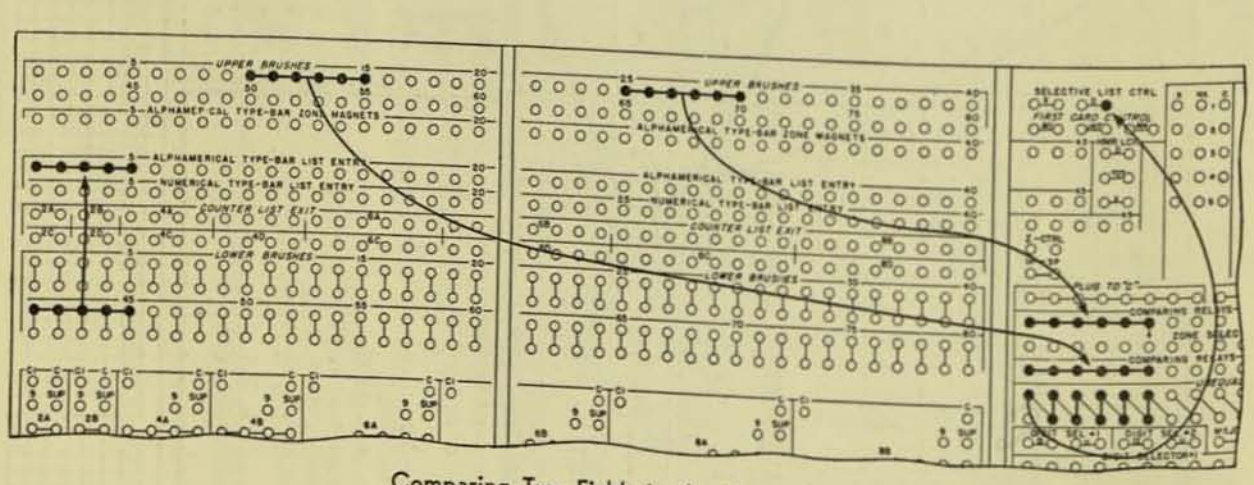
Each comparing position is influenced only by the first numerical or zone punching encountered during each part of its operation. For example, if the card passing the upper brushes contains a "7" and the card passing the lower brushes a "7" and also a "6," the unit will not indicate an unequal condition. Had one card contained an "8" and a "7" and the other card a "7" only, a single unequal impulse would have been emitted.

On all machines manufactured after May, 1939, selectors, hammerlock, and selective list (X card list) can be energized from the unequal impulse outlets of the comparing unit. This permits an unequal impulse to actuate many devices previously controllable only by X or digit punching. Plugging to these devices usually is from unequal impulses to the D pick-up of the required device, causing it to operate on the cycle following the unequal condition. When plugged to the comparing unit through its ZFS pick-up, a selector may be energized by a change in control in time to select other impulses received during the *same* card cycle.

On all machines with serial numbers above 405-11000 both the "Comparing Relays—Plug from Upper Brushes" and "Comparing Relays—Plug from Lower Brushes" hubs can be plugged from either upper or lower brushes, although they normally are connected as indicated by the labeling on the control panel.

Comparing Two Fields in the Same Cards

By plugging both sides of the comparing unit to upper brushes, a comparison of two fields within a card is possible. Failure to compare can be used on machines equipped with digit selection to energize selectors, hammerlock, and selective list. This makes it possible to compare two amount fields or two indication fields in the same card and list items which are not in agreement.



Comparing Two Fields in the Same Cards

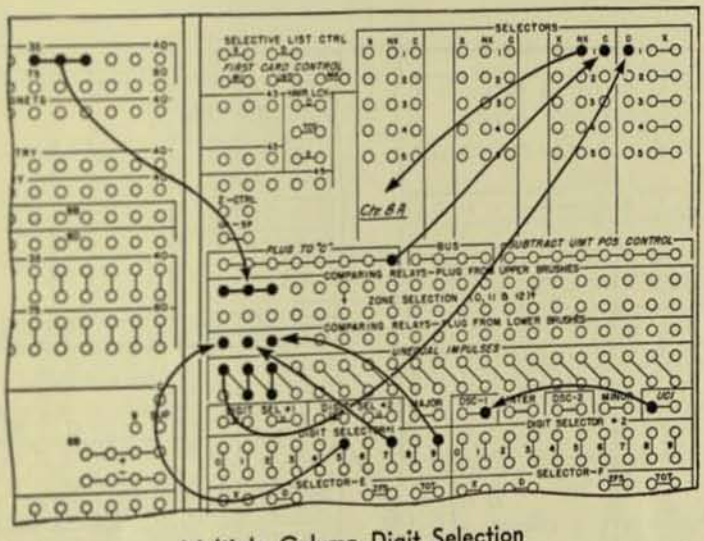
Columns 10-15 (Payments) are compared with columns 25-30 (Payments Due); if they do not compare, the Selective List hub will be impulsed and Account No. (columns 41-45) will be listed.

Multiple Column Digit Selection

Multiple column digit selection can be performed on a machine equipped with a digit selector. In the illustration, counter 8A is to add only the cards of Account No. 579. The digit selector is used to set up the control impulses 5, 7, 9, which compare with the Account Number field read by the upper brushes. Whenever a card does contain the Account No. 579, the selector will not be controlled, because no unequal impulse is available; therefore, the counter receives an impulse to add only cards of control number 579.

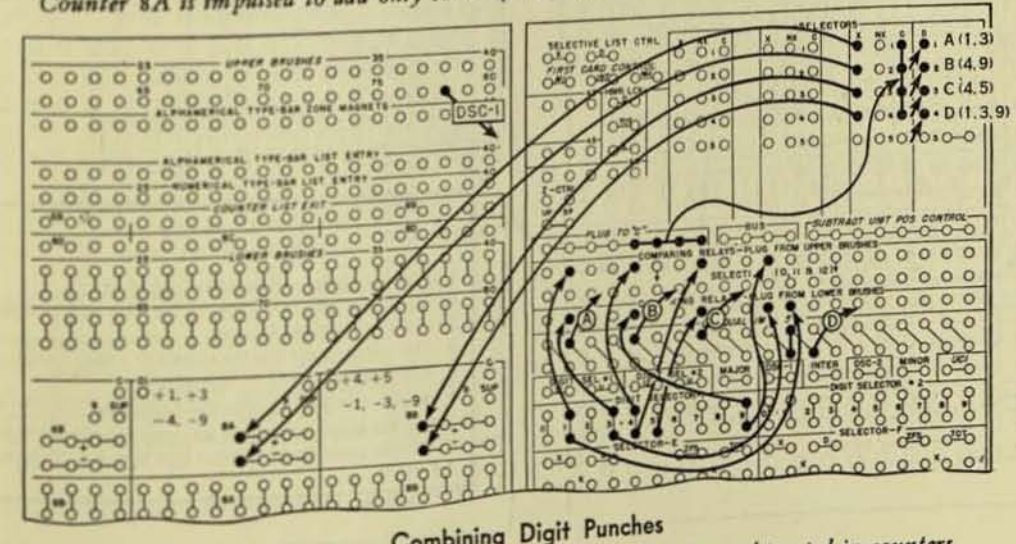
Combining Digit Punches

In some problems involving addition and subtraction of different types of cards identified by digit punching, many X-selectors are normally used. By the use of the comparing relays and a digit selector the X-selector capacity required can be reduced. If two or more digit impulses are taken to the comparing relays, an unequal impulse resulting from any one of these digit punches can be used to control the selector. In the illustration, four selectors are controlled by different combinations of digit punches in column 78.



Multiple Column Digit Selection

Counter 8A is impulsed to add only cards of Account No. 579, punched in columns 35-37.



Combining Digit Punches

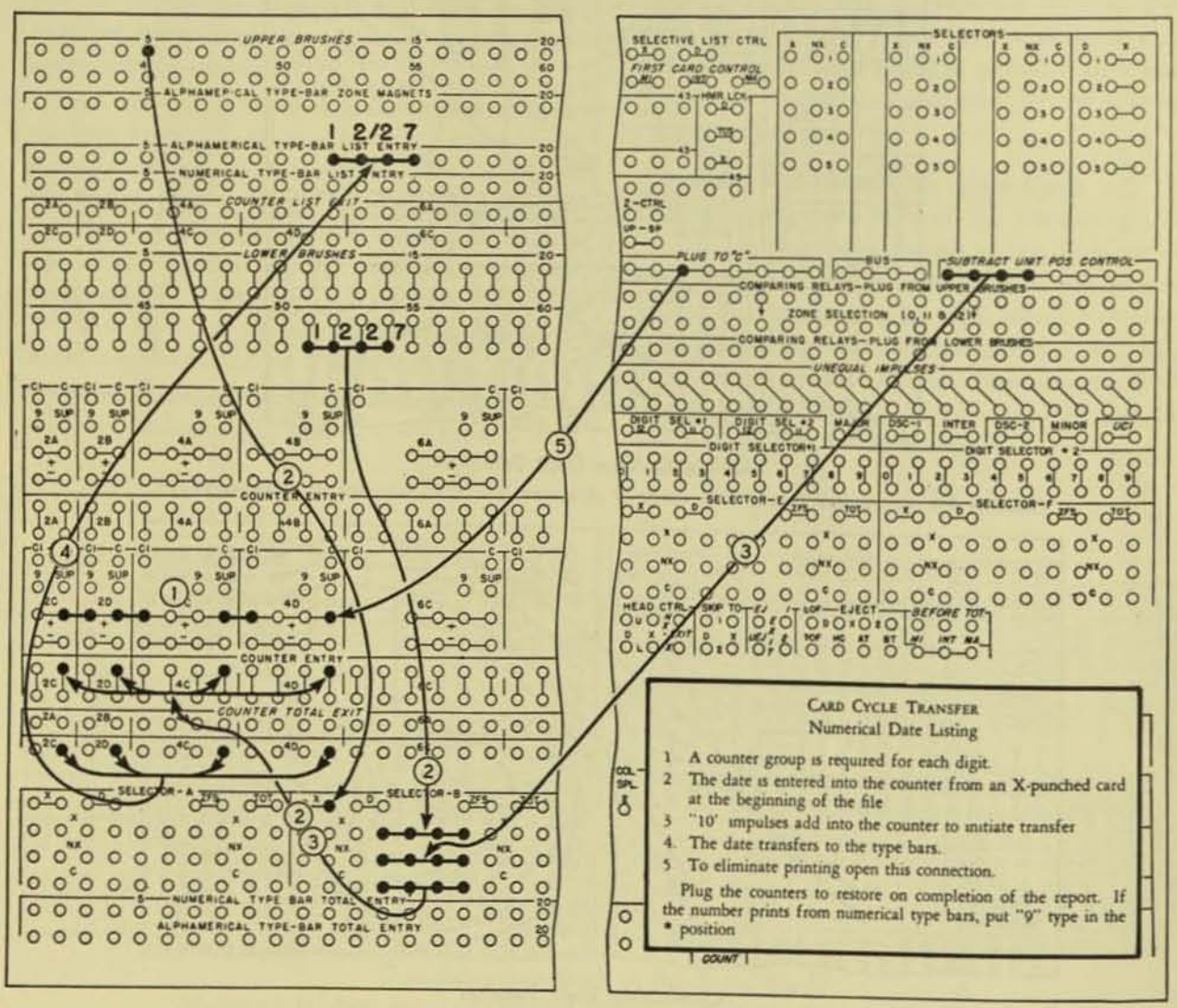
Cards punched 1, 3, 4, 5, or 9 in column 78 will be added or subtracted in counters 8A and 8B as indicated.

CARD CYCLE TRANSFER

Amounts may be printed from counters while cards are feeding. By utilizing this fact, reports requiring crossfooting, serial number listing (page numbering) and date printing, may be written on the Accounting Machine.

The above operations are performed by causing a counter to transfer, on a card feed cycle, the amount stored in it. The amount is made available at the total exit hubs by adding 10's (from subtract units position control hubs) on a card cycle when nothing is being added or subtracted in the counter. This card cycle, during which no adding takes place in the counters involved in the transfer, may be obtained by inserting a blank "trailer" card at the end of each group, or by making use of master cards already in the file.

This amount may be transferred to another counter, to list type bars, or to the comparing

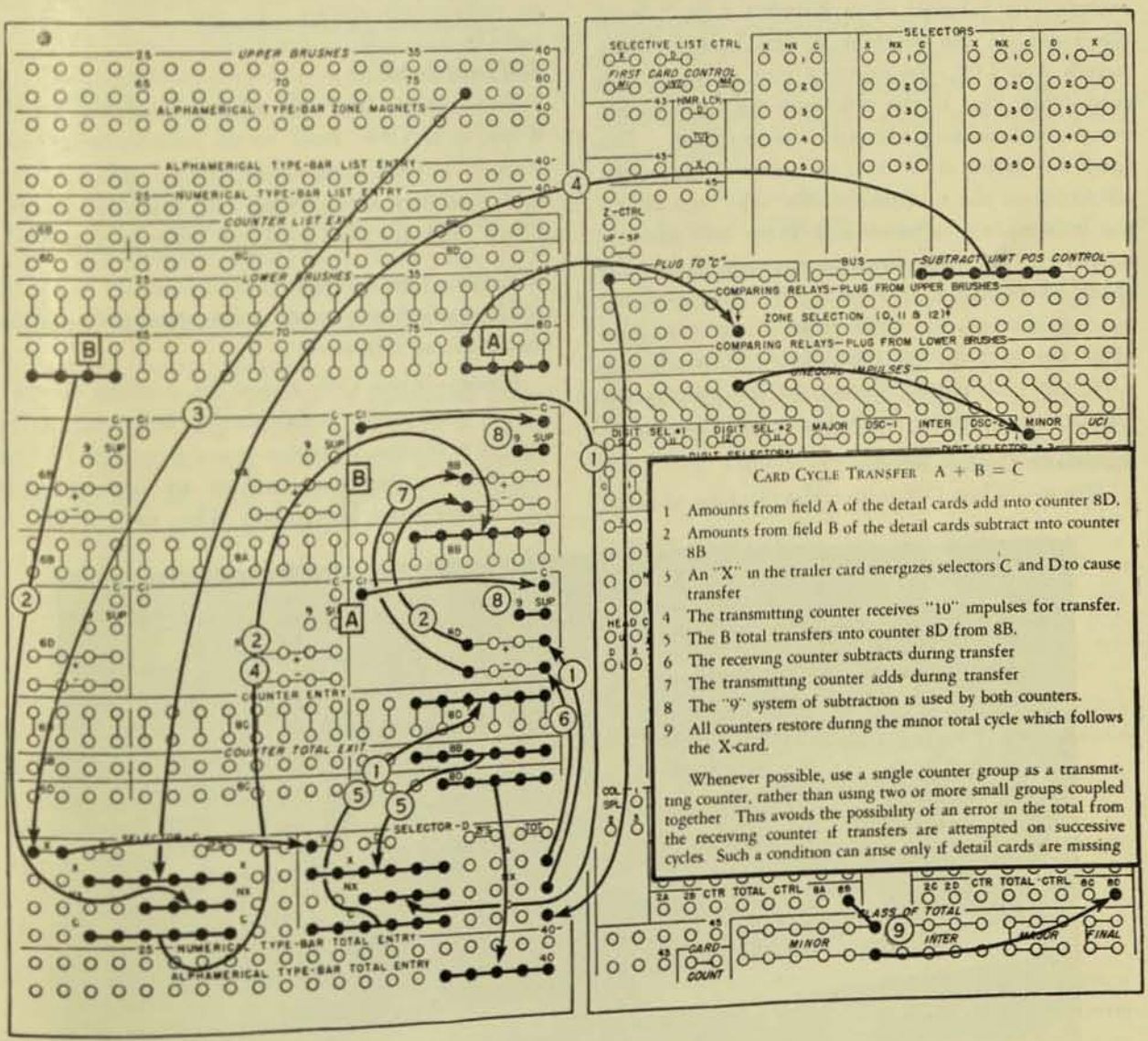


unit. If the amount is to be transferred to another counter, the receiving counter must be subtracting on the transfer cycle. The amount transfers into the receiving counter as a complement because the receiving counter is subtracting.

An amount which is to be added to the receiving counter must be in the transmitting counter as a minus amount. Therefore, to perform A+B=C, A would be subtracted into the transmitting counter in order to be transferred to the B counter.

The amount in the transmitting counter is destroyed by the transmitting operation. The diagram below illustrates the A + B = C operation.

The diagram on page 68 illustrates the transfer of a date from a counter to the list type bars, on machines not equipped with digit selectors.



CARD CYCLE TRANSFER A + B = C

1. Amounts from field A of the detail cards add into counter 8D.
2. Amounts from field B of the detail cards subtract into counter 8B
3. An "X" in the trailer card energizes selectors C and D to cause transfer
4. The transmitting counter receives "10" impulses for transfer.
5. The B total transfers into counter 8D from 8B.
6. The receiving counter subtracts during transfer
7. The transmitting counter adds during transfer
8. The "9" system of subtraction is used by both counters.
9. All counters restore during the minor total cycle which follows the X-card.

Whenever possible, use a single counter group as a transmitting counter, rather than using two or more small groups coupled together. This avoids the possibility of an error in the total from the receiving counter if transfers are attempted on successive cycles. Such a condition can arise only if detail cards are missing

SWITCHES

The switches are located at the left end of the machine directly above the control panel. The functions of each switch are described below:

List Switch

There are three switches which control the listing and non-listing operations. The three switches are normally connected with a bar so that all three are set either ON or OFF. The bar may be removed, however, and the switches set individually to perform some special spacing operations. The switches are referred to as Number 1 to 3 from the front of the machine to the back. When switch 1 is ON, the printing unit operates each card cycle; that is, the type bars rise to print for every card passing through the machine. The speed for listing is 80 cards per minute. The platen advances on the upstroke of the type bars before the information is listed. The paper will advance one, two, or three lines as determined by the space lever setting. If switch 2 is ON, the platen will advance on the downstroke of the type bars after the minor total reset cycle. If switch 3 is ON, the platen will advance on the upstroke of the type bars before the minor total is printed.

Automatic Control Switches

Minor—When ON, causes the machine to break control (stop feeding cards) at every change in the minor control group. When it is OFF, minor control groups are not recognized by the machine.

Intermediate—When ON, causes the machine to break control at every change in the intermediate control groups. When it is OFF, intermediate control groups are not recognized by the machine.

Major—When ON, causes the machine to break control at every change in the major groups. When it is OFF, major control groups are not recognized by the machine.

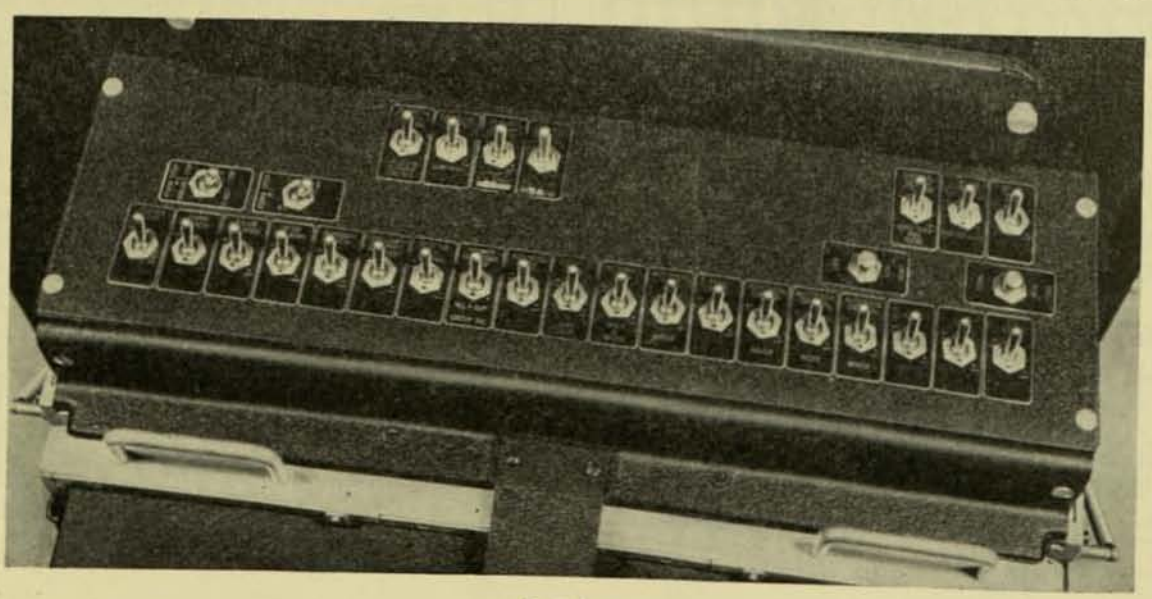
Final Total Switch

This switch is used only when taking final totals. When it is OFF, final totals cannot be taken; when it is ON, final totals can be taken if the final total key is depressed. In any case, to get a final total, the final total key must be depressed.

Automatic Total Switches

These switches are used to take total cycles automatically, as follows:

Minor—When ON, causes the machine to take a total cycle automatically whenever there is a change in minor control group. When OFF, causes the machine to stop at each minor control change. The total cycle is



Switches

suspended and must be taken by depressing the manual total key.

Intermediate or Major—When OFF, causes the machine to stop at each intermediate or major control change, and suspends the total cycle until it is taken manually. When ON, causes the machine to take the second total cycle automatically whenever there is an Intermediate or Major control break. In any case, Intermediate or Major total cycle is preceded by a Minor total cycle.

Last Card—When ON, causes the machine to take a total cycle automatically after the last card passes through the machine. When OFF, suspends this cycle; the total must be taken by hand.

Automatic Start Switch

This switch, when ON, causes the machine to start automatically after total cycles. If it is turned OFF, the machine stops after the total cycle and has to be started by depressing the start key.

Hammerlock Control Switch

This switch is used only when control of hammerlocks is employed. When it is turned to No X SUP or Group Indicate, the printing of all No X cards (or all but first card of control groups) is suppressed. When it is turned to X SUP, the printing of X cards (or the first card of control group) is suppressed.

Selective List Switch

If the selective list device is used when non-listing, the switch is set to X or No X, depending upon whether, in addition to the first card of each control group, the X or the No X cards are to be listed. When non-listing and the selective list feature is not being used, the selective list switch must be turned to X. If it were turned to No X, all the cards would be listed, thus actually giving the effect of having list switch 1 turned ON.

List and Total Non-Print Switches

These switches are used for running cards out of a machine without printing on the form or on the platen. When the list non-print key is depressed, all cards in the feed run out of the machine without listing, automatic controlling, or spacing of the form. If the purpose is to clear the machine, the total non-print switch is depressed to reset all counters which are wired to clear, including the final total if the final total switch is ON. The type bars rise and the form advances a single space, but no printing occurs. When both switches are used to clear the machine, the list non-print switch should be depressed first so that the counters are not cleared before the cards are run out of the feed.

Hopper Stop Switch

This switch, when OFF, permits the last card to feed through the machine and control totals to print after the last card; when it is ON, the last card stops before leaving the hopper so that additional cards can be added without printing totals between groups.

SWITCHES
(Not Standard)

Complement Summary Punch Switch

This switch is installed only on Net Balance machines. When it is ON, credit totals are punched as complement figures, because the conversion cycle is delayed until after the summary cards have been punched. To summary punch true credit figures, the switch should be turned OFF.

Summary Punch Switch

The summary punch switch is turned ON for all summary punching operations. When not summary punching, it must be turned OFF.

Summary Punch Intermediate Switch

This switch is turned ON if intermediate totals are to be summary punched; otherwise, it should be turned OFF.

Summary Punch Major Switch

This switch should be turned ON if major totals are to be summary punched; otherwise, it should be turned OFF.

Gang Punch Switch

This switch, when ON, allows the summary punch to be used independently without using the Alphabetical Accounting Machine. For any operation on the Alphabetical Accounting Machine, this switch must be turned OFF.

UPPER BRUSHES—outlets for impulses originating from punched holes in cards; used for zoning alphamerical type bars, comparing, and picking up control X punches.

ALPHAMERICAL LIST ENTRY—inlets for 0-9 impulses for alphabetical or numerical listing

LOWER BRUSHES—outlets for impulses originating from punched holes in cards, used for listing, comparing, or accumulating

SUP—Subtract Unit Position—inlet hub for Subtract Unit Position Control "hot 10" or for "hot 9" impulse; it is used only when counter subtracts

"9"—Outlet for "hot 9" impulse each card cycle

COUNTER ENTRY—inlet hubs for information to be accumulated in counter

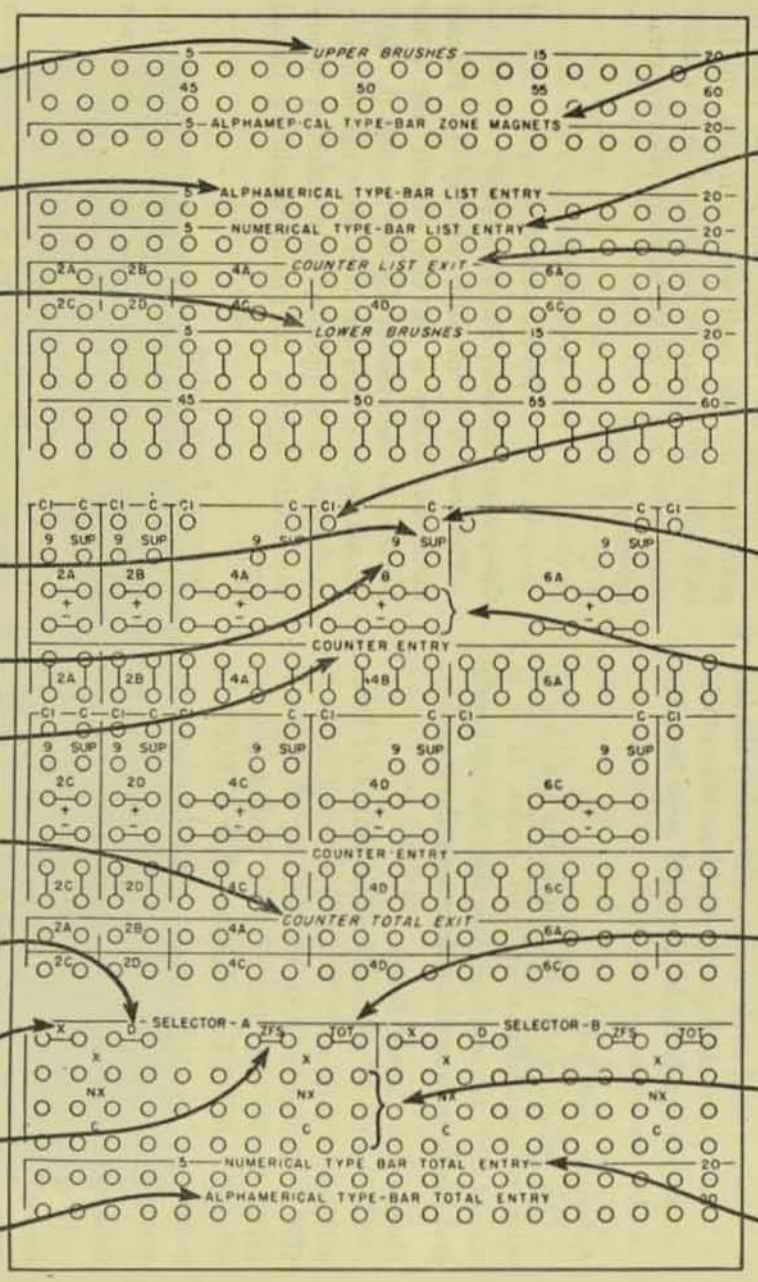
COUNTER TOTAL EXIT—outlet hubs for totals accumulated in counter Usually wired to total type bar hubs.

D—Digit inlet hub—accepts any digit impulse (9, 8, etc. through 12) to control selector on next card cycle.

X—accepts X or 12 impulses to control selector on next card cycle

ZFS—Zone Field Selection—accepts any digit impulse to control the selector on the *same* card cycle

ALPHAMERICAL TYPE BAR TOTAL ENTRY—accepts impulses on total cycles only for total printing.



ZONE MAGNETS—inlets for 0, 11, and 12 impulses to zone type bars.

NUMERICAL LIST ENTRY—inlets for 0-9 impulses for numerical listing

COUNTER LIST EXIT—outlets which emit impulses on card feed cycles for information which is accumulated in corresponding counters

CI—Carry or Complement Impulse—outlet for "1" carryover when adding or subtracting. Also, when total printing, emits an impulse to energize selectors or cause conversion when a "9" stands in last position of the counter

C—Carry Inlet—inlet for carry impulse "1" when adding; also carry-back of "1" for units position correction when subtracting with 9's complements.

+ hubs—inlets to cause counter group to add
− hubs—inlets to cause counter group to subtract

TOT—Total hub—accepts impulse to control selector on total cycle. Selector stays energized for first card cycle after total Used for total transfer, group indication, and balance selection

C, NX, and X—Common, Normal, and Controlled—represent contact points on relay. When selector is not controlled, C and NX are connected; when selector is controlled, C and X are connected

NUMERICAL TYPE BAR TOTAL ENTRY—accepts impulses on total cycles only for total and symbol printing

FIRST CARD CONTROL—used to control hammerlocks and selectors.

MI—Minor emits constant impulse during total cycles and first card list cycle after Total cycle. Can be used to control counter accumulating.

INT—Intermediate emits impulse indicating Intermediate Total cycle

MA—Major emits impulse indicating Major Total cycle. Also accepts impulse for extra downstroke space of type bars.

Intermediate and Major cannot be used to control addition and subtraction in counters. Used to energize selectors on corresponding total cycles

HMR LCK—Inlets to control long hammerlocks on the following card cycle; impulsed on

X—X or 12 impulses.

TOT—First card control impulses

D—any digit impulse

Plug to "C"—outlet for constant impulse available every card cycle.

UNEQUAL IMPULSES—outlets for unequal impulses when the corresponding positions do not compare

DSC—Digit Selector Common—accepts all impulses from the column to which it is plugged and distributes them to respective positions 0-12

COUNTER BALANCE CONTROL—accepts "9" impulse for conversion of complement totals

SUMMARY X PUNCH CONTROL

\+ hubs emit impulses to be wired to column split for summary punching X on debit summary card.

— hub is the same for credit summary cards.

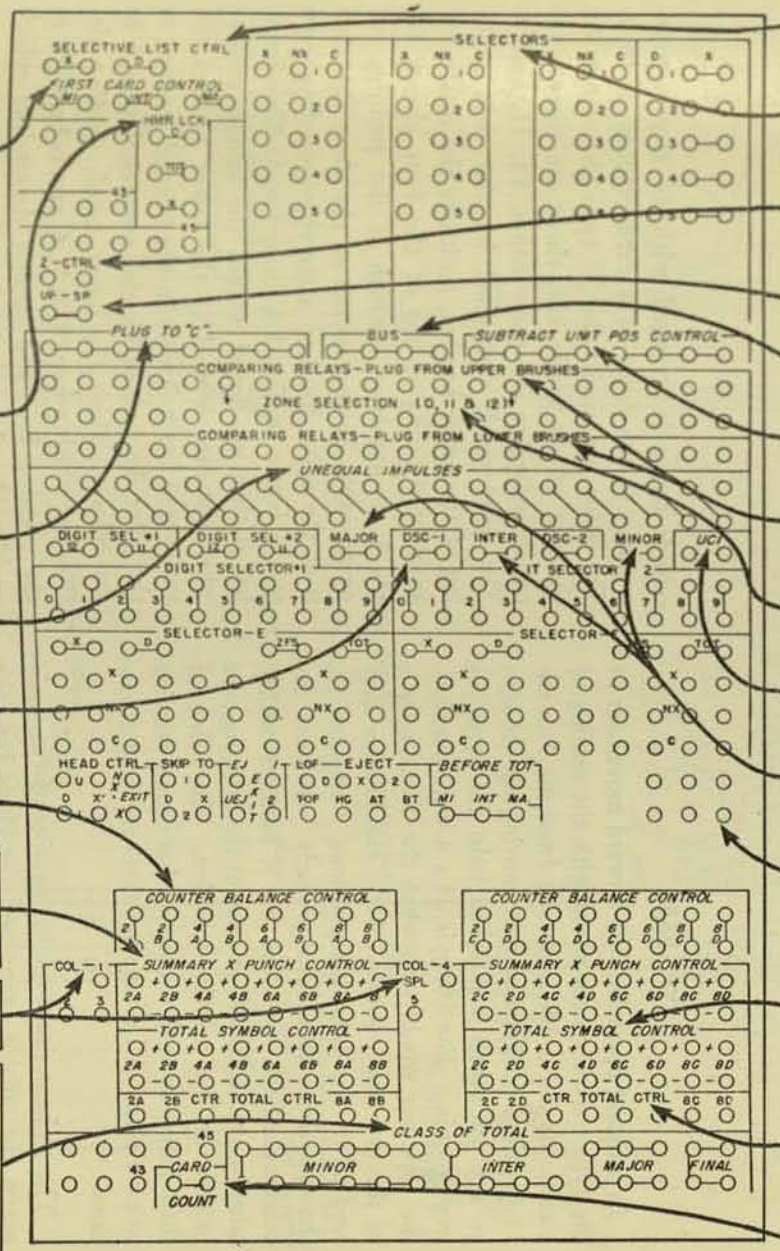
COL SPL 1, 2, 3, 4, 5—inlets to column splits on summary punch board.

CLASS OF TOTAL

MINOR—emits "10" impulses to clear counter and print symbols on Minor total cycle.

INTER—emits "10" impulses to clear counter and print symbols on Intermediate total cycle.

MAJOR—emits "10" impulses to clear counter and print symbols on Major total cycle.



SELECTIVE LIST—inlets, when impulsed, cause listing on the next card cycle of cards which would normally add only

SELECTORS—same as selectors A, B, C and D

Z CTRL—left hub emits impulses to be used for suppression of zoning; right hub accepts impulses to suppress zoning of type bars

UP-SP—accept impulse to suppress spacing

BUS—4 common hubs to eliminate split wiring.

SUBTRACT UNIT POS. CONTROL—emits "10" impulses every card feed cycle

COMPARING RELAYS—inlets to comparing relays from upper or lower brushes

ZONE SELECTION—emits 0, 11, 12 impulses brought to comparing relay position directly above it

UCI—Upper Control Impulse—outlet for impulse at each card position, 9 through 12.

MAJOR, INTER, MINOR—inlets for unequal impulses; they stop card feeding to allow total cycles.

PROGRESSIVE TOTAL—when plugged together, cause normal counter clearing; when left unplugged, make progressive totals effective.

TOTAL SYMBOL CONTROL

— hub emits "10" impulse for symbol printing with credit total.

\+ hub emits "10" impulse for symbol printing with debit total.

CTR TOTAL CTRL—Counter Total Control—inlets to clear counter wheels and allow the counter total exit hubs to emit impulses.

CARD COUNT—outlet for "1" impulse every card cycle

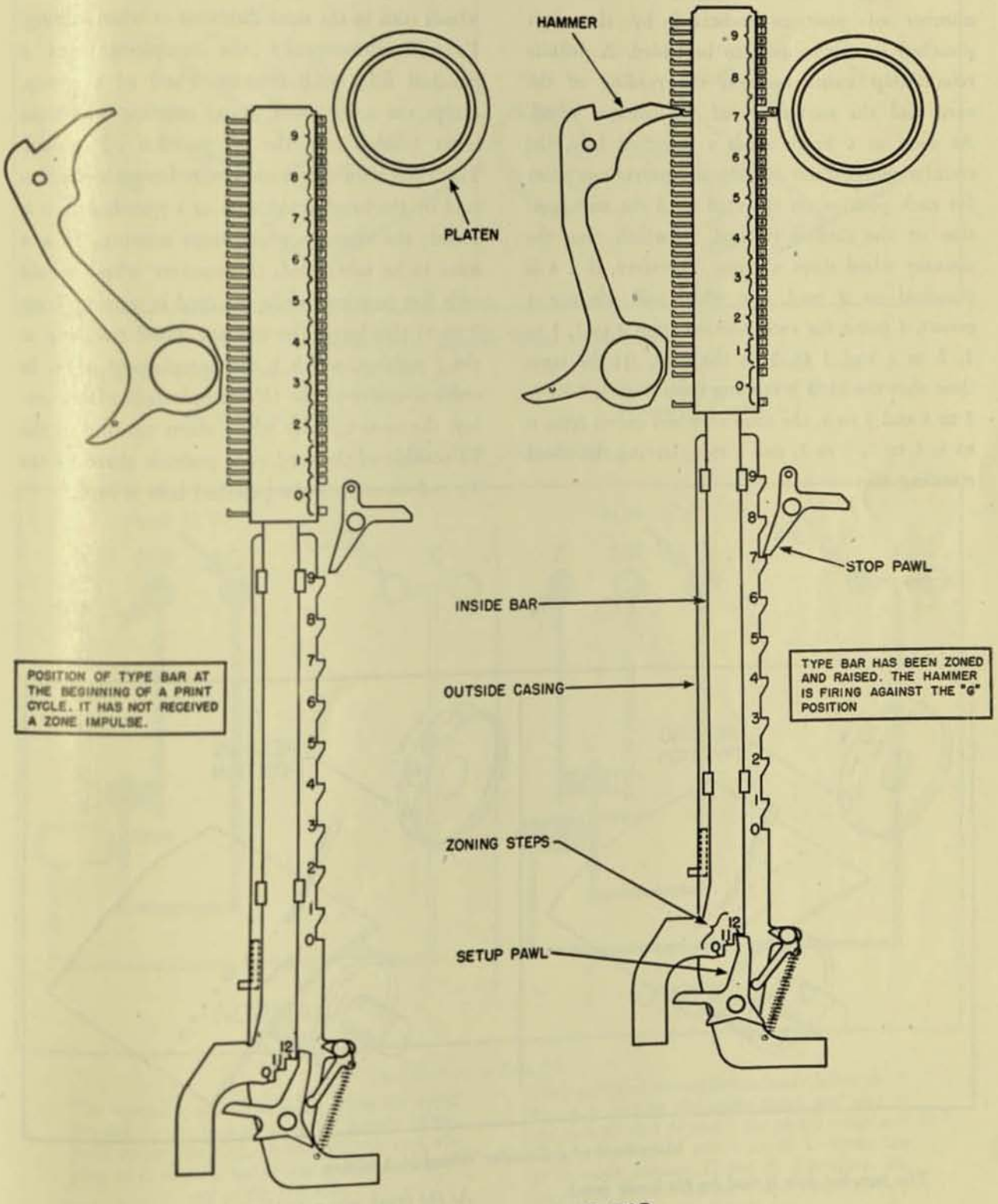
OPERATING PRINCIPLES

This section presents for reference purposes additional explanation and illustrations of the operating principles by which certain functions of the Alphabetical Accounting Machine are accomplished.

TYPE BARS

In a listing operation, the upward movement of the type bars is synchronized with the reading of a card. As the brush is reading from the 9 to the 12 position, the type bars are moving up. As soon as a brush senses a punched hole, the type bar stops moving. For example, if a 4 were punched, the type bar would stop when the 4 character is at the printing position. After the brushes have read all of the punching positions, 9 through 12, the type bars have been properly positioned for printing. Each type bar has a hammer which, when moved forward, pushes out the printing type located at the printing position. The firing of these hammers against the type bar causes printing to take place. All of the hammers are fired at one time.

The alphamerical type bar consists of two main parts; the outside casing and the inside bar. The outside casing is arranged with 10 steps corresponding to the digits of a card column, 9 to 0. The inside bar carries the 37 type characters. At the base of the inside bar, there are three steps corresponding to the three zones, 12, 11, and 0. The setup pawl, controlled by the zone reading of the upper brushes, positions the inside bar within the casing at one of the four places, 12, 11, 0, or numerical (which is the position for no zoning). Zoning occurs at the time the card is at the upper brushes, after the preceding card at the lower brushes has been listed. The inside bar is then positioned within the casing so that when the card is read at the lower brushes the entire type bar unit rises in the normal manner to the point determined by the numerical punch in the column. Thus, the lower brush reading determines which group, 9, 8, 7, 6, etc. is brought to the printing line, and zoning determines which position of each group is selected to print.



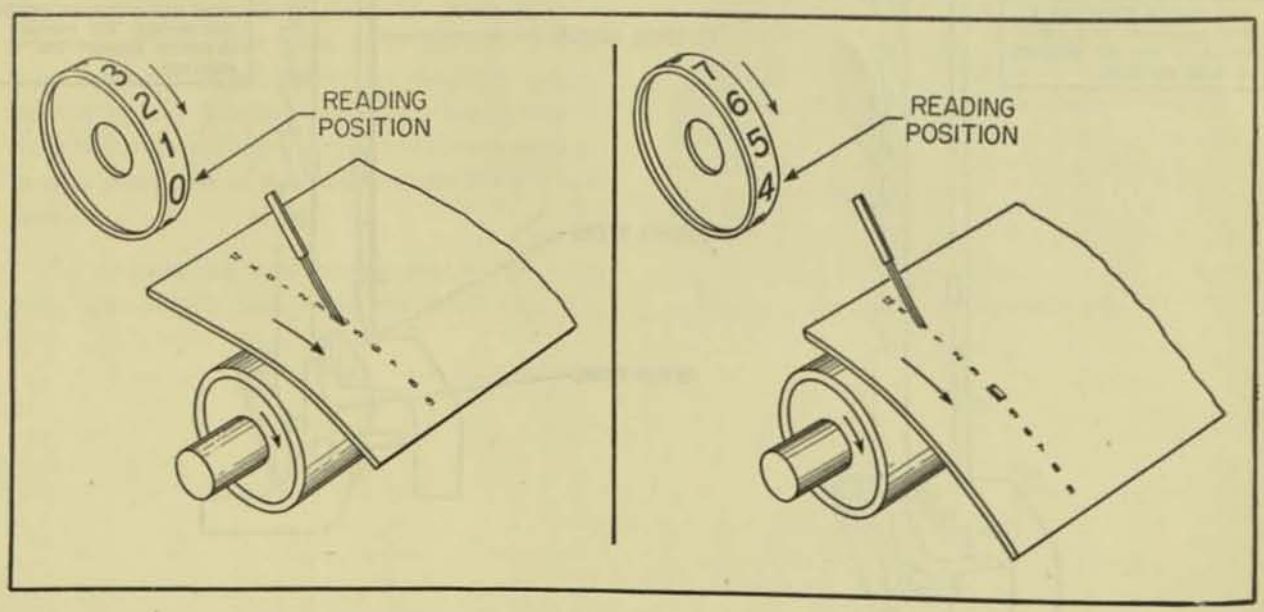
ALPHAMERICAL TYPE BAR

ADDITION

In adding, the counter wheel must advance the number of positions indicated by the digit punched in the column to be added. A definite relationship exists between the reading of the card and the movement of the counter wheel. As soon as a brush reads a punched hole, the counter wheel starts moving and moves one point for each position on the card until the zero position of the card is reached, at which time the counter wheel stops moving. Therefore, if a 4 is punched on a card, the wheel will advance 4 points, 1 point for each position from 4 to 3, 3 to 2, 2 to 1 and 1 to 0 on the card. At the same time that the card is moving from 4 to 3, 3 to 2, 2 to 1 and 1 to 0, the counter wheel moves from 0 to 1, 1 to 2, 2 to 3, and 3 to 4, leaving the wheel standing at 4.

SUBTRACTION

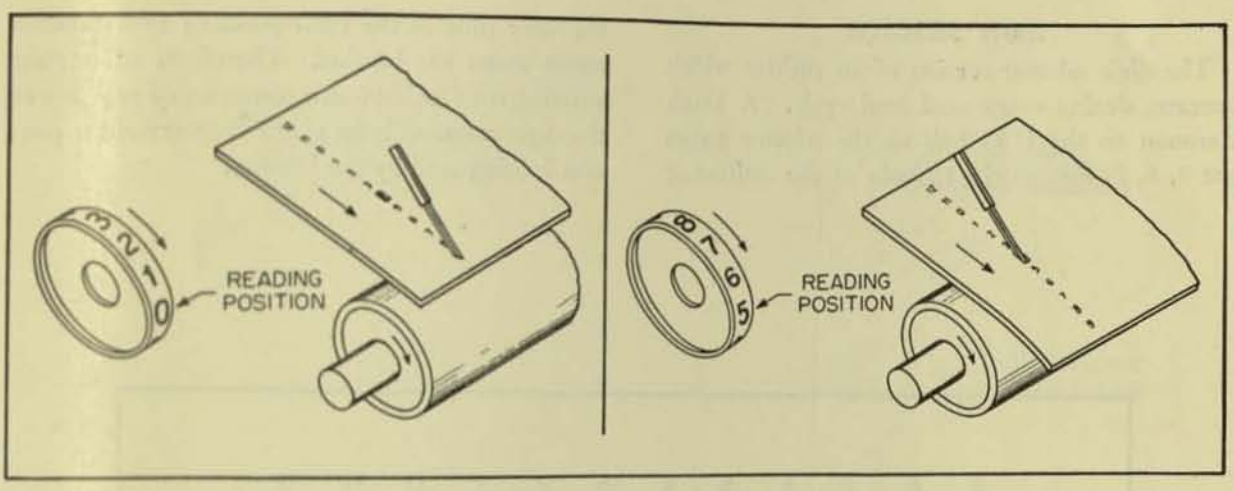
When performing subtraction, the counter wheels turn in the same direction as when adding. To add automatically the complement of a punched field, each counter wheel of a group, except the units wheel, starts rotating when the lower brushes read the 9's position of a card. The wheel then moves one point for each position read by the brushes. As soon as a punched hole is sensed, the counter wheel stops moving. If a 4 were to be subtracted, the counter wheel would turn five positions while the card is moving from 9 to 4; this leaves the counter wheel standing at the 5 position, which is the complement of 4. In order to arrive at the 10's complement of a number, the units counter wheel starts turning at the 10 position of the card (one position ahead of the 9) and turns until the punched hole is read.



Movement of a Counter Wheel in Addition

The punched hole is read by the lower brush.

As the brush moves to the 0 position in the card, the counter wheel moves to the "4" position.

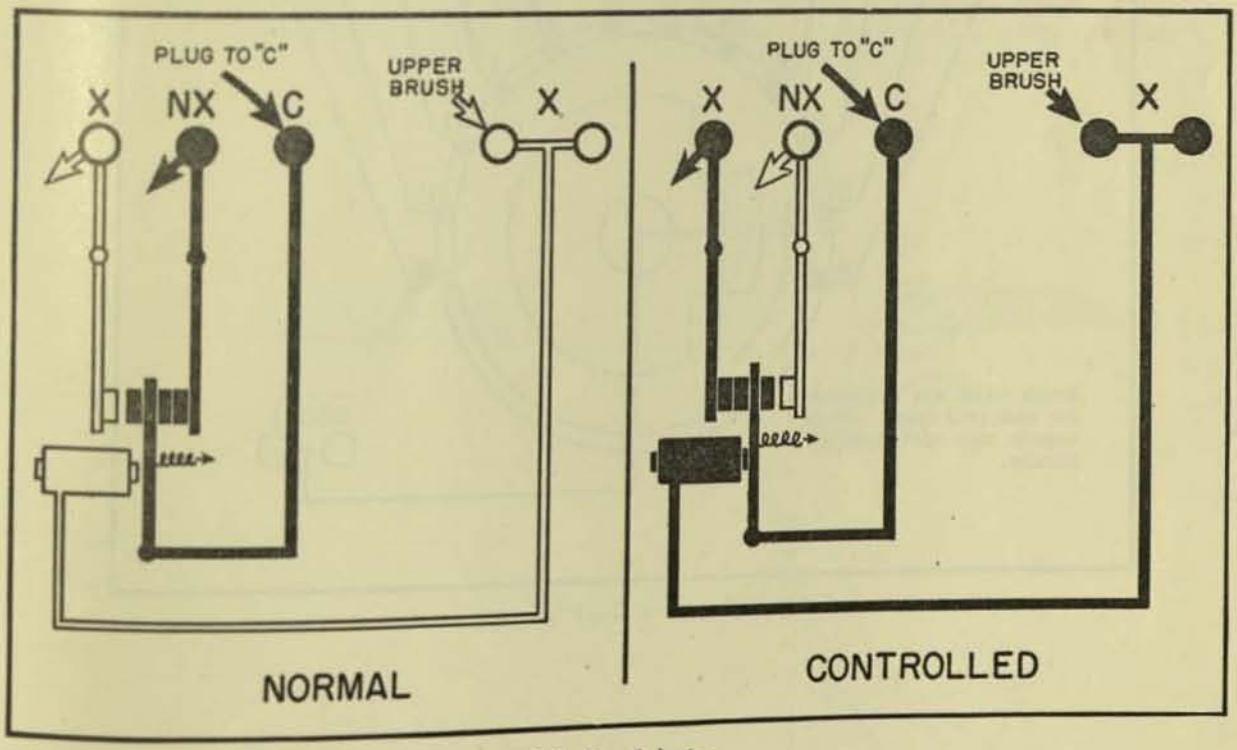


Movement of a Counter Wheel in Subtraction

This wheel represents any except the units position of the counter. As the 9 position is read, the wheel is engaged.

The wheel moves until the brush reads the punched position, thereby arriving at the complement of 4, which is 5.

SELECTOR OPERATION



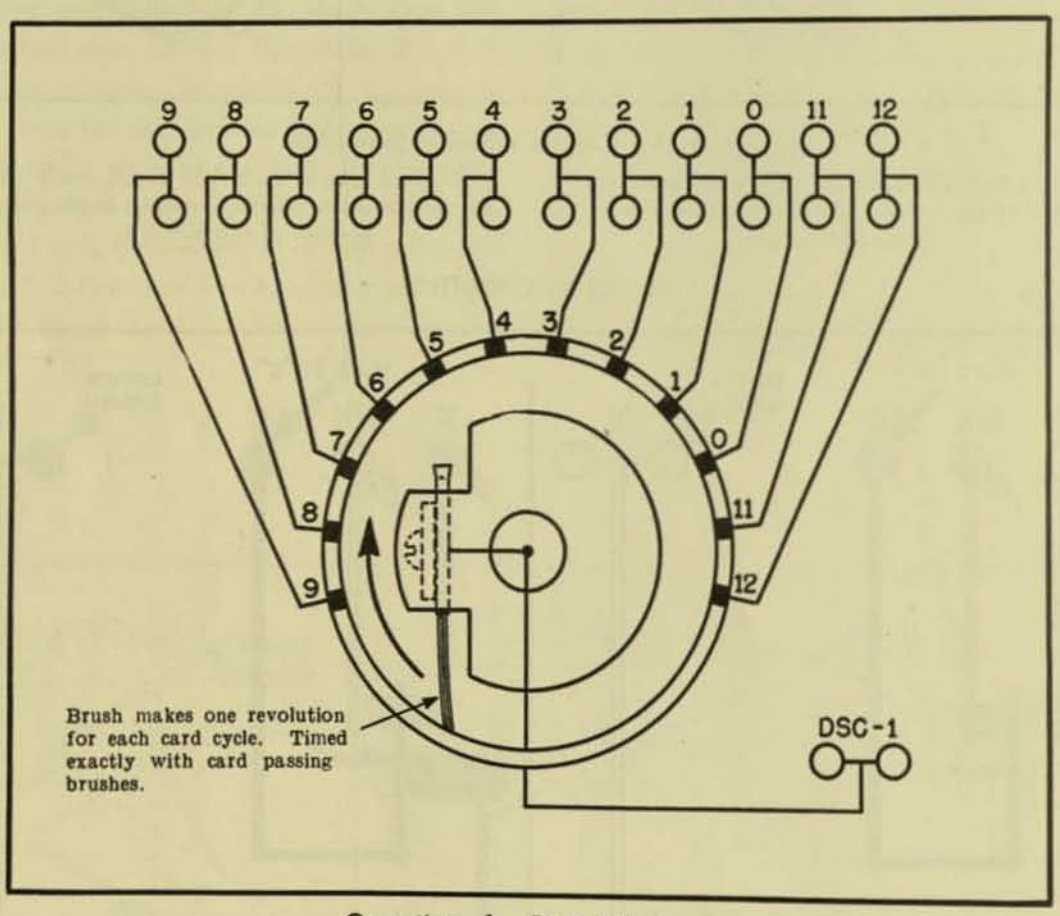
One Unit of a Selector

The normal connection exists when the upper brushes do not pick up on an X punch; no impulse enters the pick-up hub. In this case, the plug to C impulse enters the C hub and comes out of the NX hub.

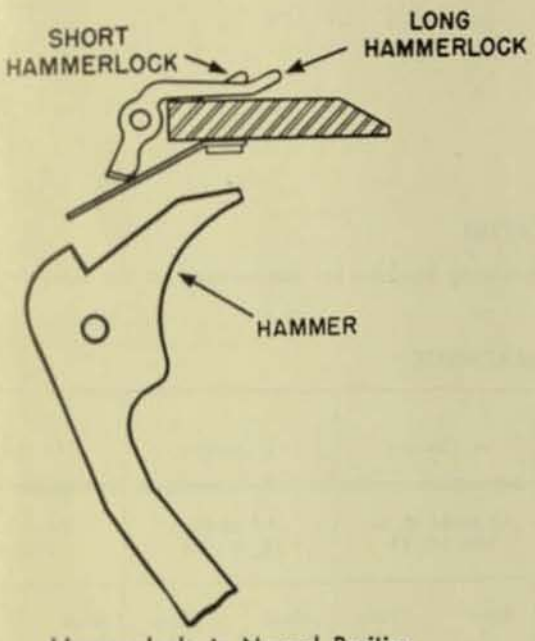
The controlled connection is made when an X punch is read by the upper brush and sent to the pick-up hub. It enters the pick-up hub and energizes a magnet which causes a connection to be made between C and X. Therefore, the plug to C impulse enters C and comes out of the X hub.

DIGIT SELECTOR

The digit selector consists of an emitter which operates during every card feed cycle. A brush common to the DSC hub of the selector passes the 9, 8, 7, etc., to the 12 hubs of the emitter at the same time as the corresponding card position passes under the brushes. Therefore, an impulse entering the DSC hub can come out of any one of the digit common hubs as the corresponding position is being read by the brushes.

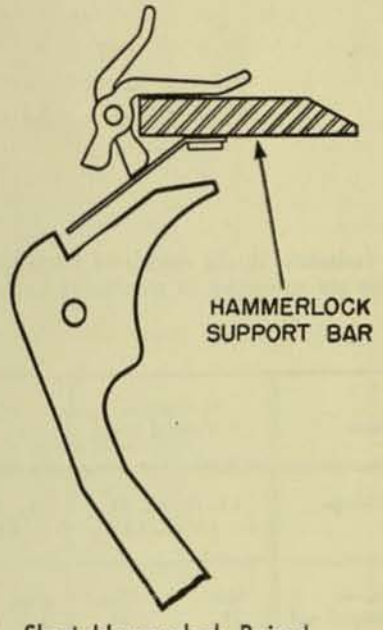


Operation of a Digit Selector



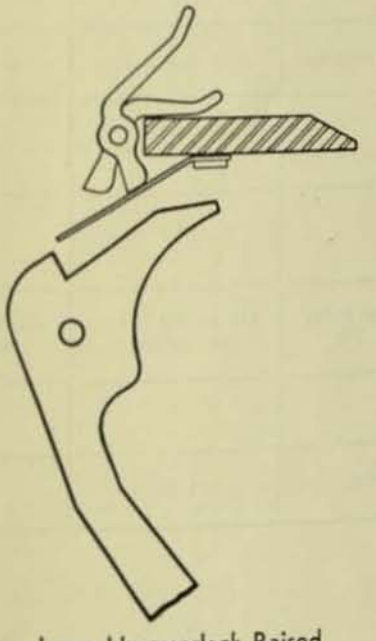
Hammerlocks in Normal Position

Hammer will fire and printing will take place.



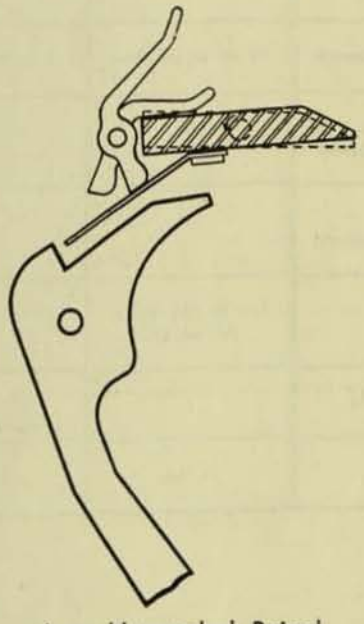
Short Hammerlock Raised

Hammer cannot fire and no printing can take place on list or total cycles.



Long Hammerlock Raised

Support bar is in normal position and hammer can still fire.



Long Hammerlock Raised

Support bar has moved to prevent hammer from firing. On list cycles the movement of the support bar is controlled by plugging the hammerlock unit and setting the hammerlock switch.

CAPACITIES

The variations in the models of the Alphabetical Accounting Machine are summarized in the following chart. The models are compared in relation to counter capacity.

TYPE OF MACHINE

Features	*32 Counters (+ Control Only)*	*32 Counters (+ and —)*	*44 Counters*	*56 Counters*	*80 Counters*
Counter Groups	2A, 2B, 4A, 4B, 6A, 6B, 8A	2A, 2B, 4A, 4B, 6A, 6B, 8A	All except 8B, 6C, 6D, 8C, 8D	All except 8B, 8C, 8D	All counter positions
Type Bars:— Alphamerical and Numerical	Alph. 25 / Num. 30	Alph. 25, 25, 43, 43 / Num. 30, 45, 30, 45	Alph. 25, 25, 43, 43 / Num. 30, 45, 30, 45	Alph. 25, 25, 43, 43 / Num. 30, 45, 30, 45	Alph. 25, 25, 43, 43 / Num. 30, 45, 30, 45
Speed:— Listing / Non-Listing	80 (or) 80 / 80 150	80 (or) 80 / 80 150	80 (or) 80 / 80 150	80 (or) 80 / 80 150	80 (or) 80 / 80 150
Automatic Control	10 or 20 positions	10 or 20 positions	10 or 20 positions	20 positions	20 positions
Selectors A, B, C, D (Class Selectors)	0	1	2	4	4
Selectors (X Distributors)	5	5	5	5	5
Current	110 or 220 Volts; AC or DC	110 or 220 Volts; AC or DC	110 or 220 Volts; AC or DC	110 or 220 Volts; AC or DC	110 or 220 Volts; AC or DC
Control Panels	1	1	1	2	2
Reset Time	.75 Sec.	.75 Sec.	.75 Sec.	.75 Sec.	.75 Sec.

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