

June 6, 1944.

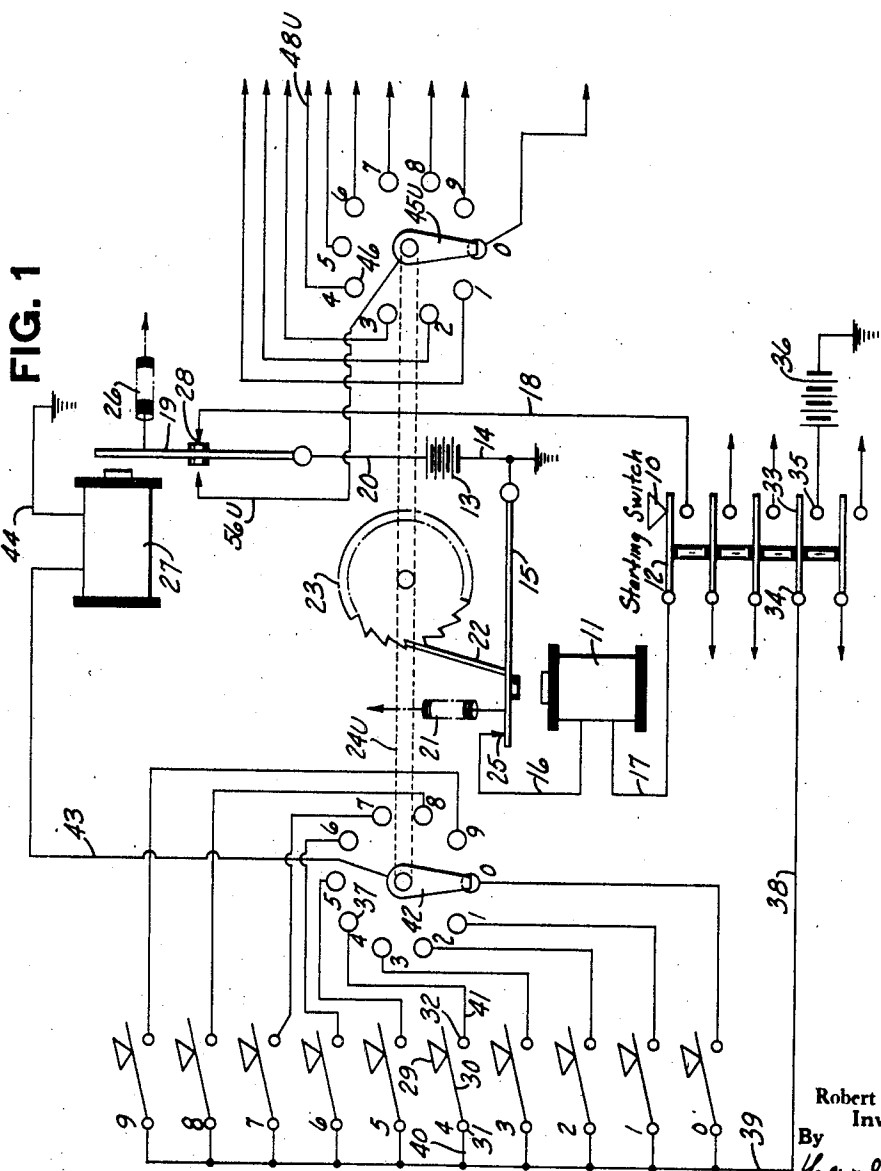
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2,350,454

ZERO ELIMINATION MEANS

Filed June 18, 1942

3 Sheets-Sheet 1



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June 6, 1944.

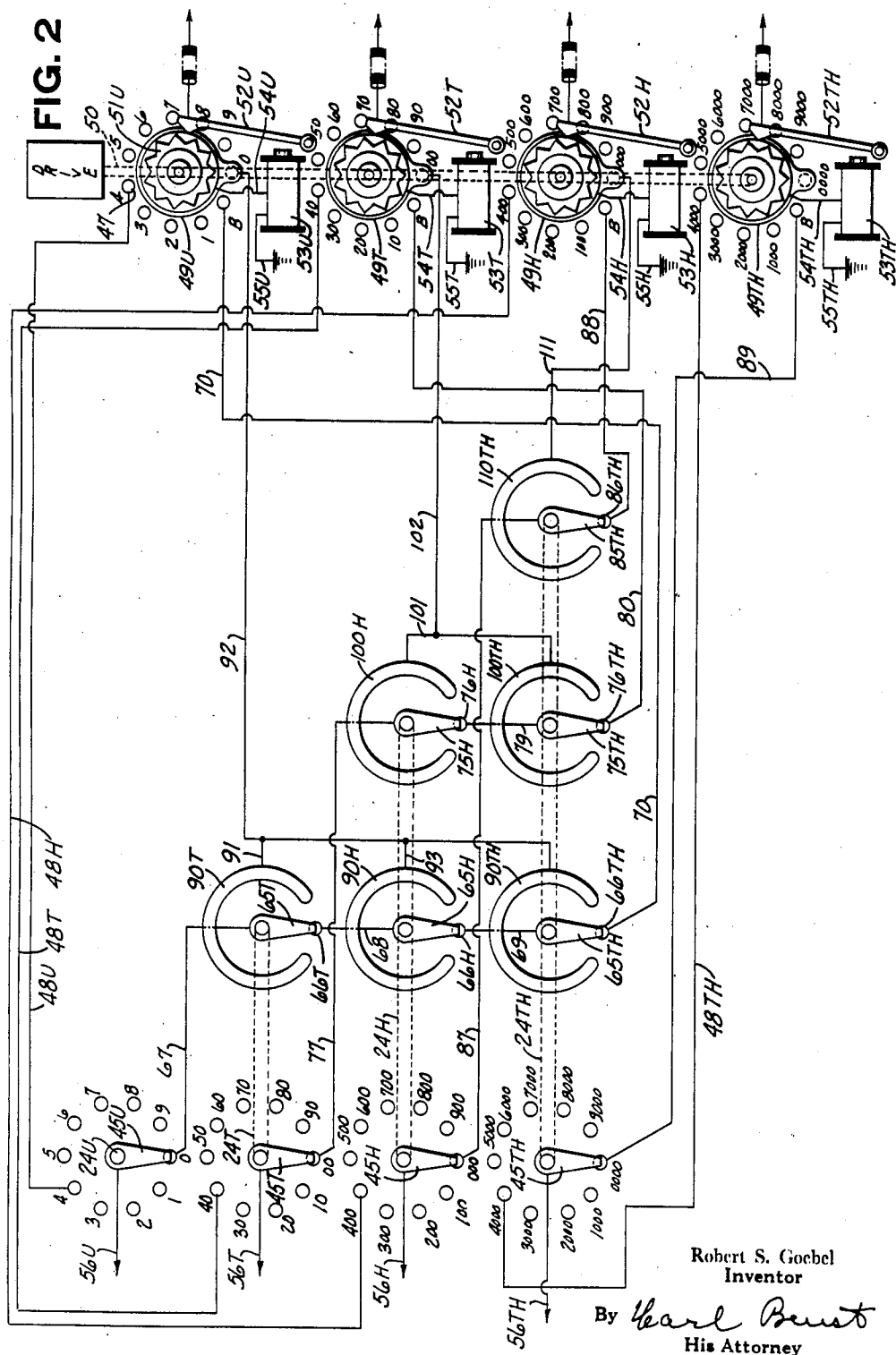
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ZERO ELIMINATION MEANS

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3 Sheets-Sheet 2



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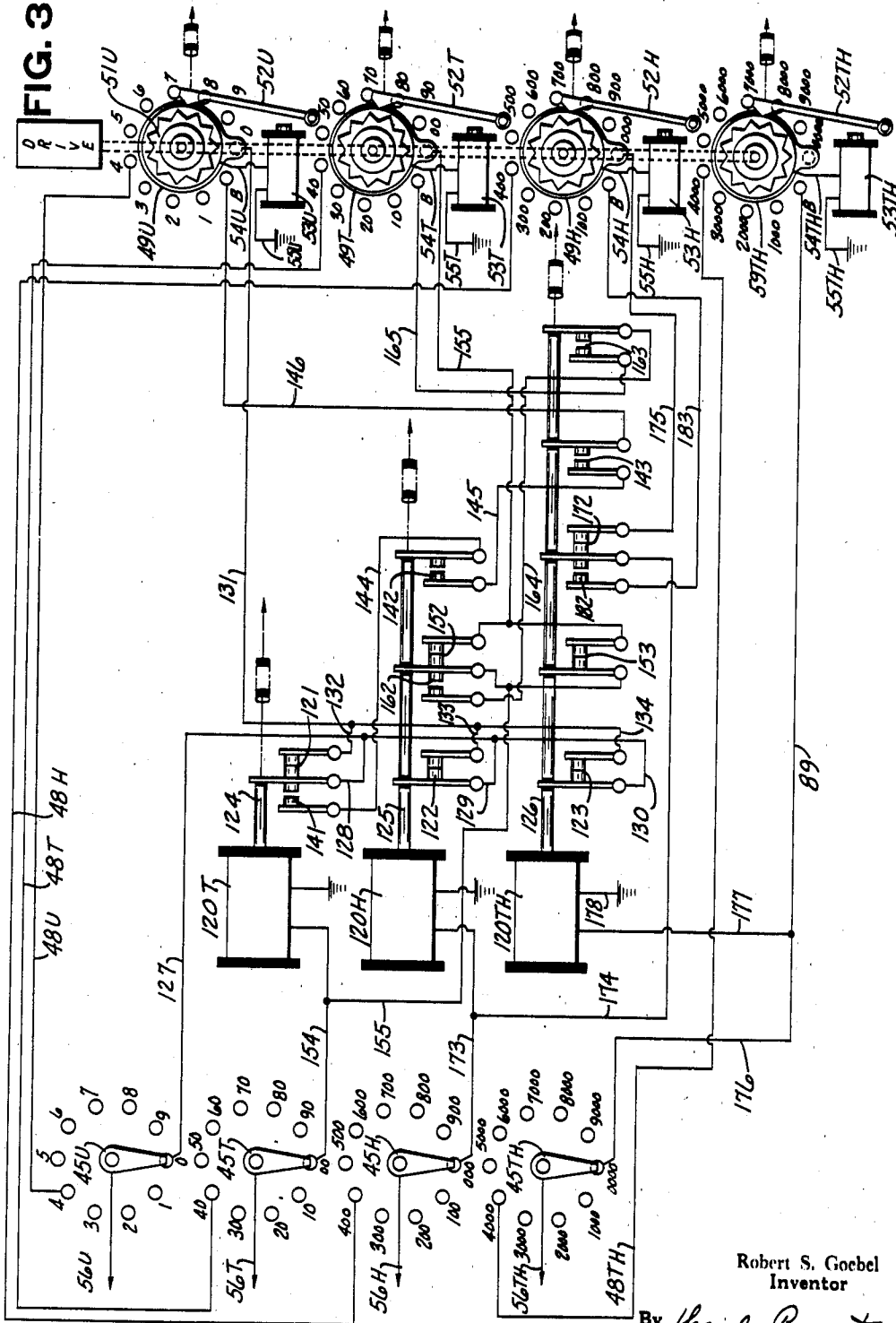
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ZERO ELIMINATION MEANS

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3 Sheets-Sheet 3

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ZERO ELIMINATION MEANS

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5 Claims. (Cl. 101—99)

This invention relates to a means associated with a printing mechanism in which a plurality of type carriers are set for printing data and in which it is desired at times to suppress the printing of certain characters on the type carriers; for example, to suppress the printing of zeros in all orders to the left of the highest significant order when the data being recorded are numbers.

The principal object of the invention is to provide a means for suppressing the printing of certain characters, which means is controlled collaterally with the setting of the type carriers, but not directly thereby.

Another object of the invention is to provide an electrically controlled means for differentially setting type carriers and electric circuits independent of said electrically controlled means to suppress printing of zeros or other data.

A specific object of the invention is to provide a zero-suppressing means for controlling the setting of type carriers, including type carriers adjustable by an independent power source; means to arrest the type carriers in a selected position; and separate circuits for controlling the arresting means to cause all the type carriers to the left of the highest significant order to be arrested in a blank position and all the type carriers to the right of a significant order in which no number is to be printed to be arrested in a zero position.

With these and incidental objects in view, the invention includes certain novel features of construction and combinations of parts, the essential elements of which are set forth in appended claims and a preferred form or embodiment of which is hereinafter described with reference to the drawings which accompany and form a part of this specification.

Of said drawings:

Fig. 1 is a diagrammatic view of one group of data-setting devices, the machine-operating means, and one unit of the data distributing means.

Fig. 2 is a diagrammatic view showing the data-distributing means for four groups of data, together with the data-suppressing means.

Fig. 3 is a diagrammatic view of a modified form of the mechanism illustrated in Fig. 2.

In general

The invention is shown applied to an accounting machine and particularly to the amount keys therefor, and, as illustrated, is arranged for

controlling the setting of zeros and the suppression of the setting of zeros.

Fig. 1 illustrates a single bank of keys, which for convenience is designated the "units order," and this bank of keys is shown at the left of the figure. Each key is connected to a distributor having a rotor actuated step by step by an oscillating relay. When the rotor reaches an energized contact in the distributor, the circuit through the oscillating relay is broken and a circuit is established through another distributor (Fig. 2), the latter being operated by the same oscillating relay which rotates the aforementioned rotor, so that the two rotors always move the same extent. The second rotor establishes a circuit through a type carrier arresting relay to arrest the type carrier in a position as determined by the key depressed in the key bank, when a significant digit is set up thereon. If, however, a zero is set up on the key bank, then the second-named rotor establishes a circuit through the type carrier relay, by way of selecting switches, so that the type carrier will be arrested either in its zero position or in its blank position, depending on whether a digit is set up on the higher order banks, so that zeros are printed only in the orders in which they are needed to print the number set up on the keyboard.

Fig. 3 shows a modified form of circuit for selecting the zero and blank printing positions of the type carriers. In this form, a system of relay-operated switches is employed in lieu of the second-named distributors in the first-mentioned form of the invention.

Detailed description

Only one bank of keys is shown in Fig. 1, and this bank will be referred to as the "units bank" for convenience in describing the invention. Any number of banks of keys can be used, four banks being illustrated in Figs. 2 and 3. Each of these four banks of Figs. 2 and 3 is controlled by a means such as that illustrated in Fig. 1.

To start the machine operating, a motor bar 10 is depressed, which closes a circuit through relay 11 by closing switch 12. This circuit is established from the power source 13, through wire 14, armature 15, wire 16, relay 11, wire 17, switch 12, wire 18, armature 19, and wire 20, back to the source of power. When this circuit is closed, the relay 11 attracts its armature against the power of a spring 21 connected thereto. Mounted on the armature 15 is a ratchet pawl 22 coacting with a ratchet wheel 23 secured on

a shaft 24U. When the armature 15 is lowered upon energization of the relay 11, the ratchet pawl drops behind an advance tooth of the ratchet wheel preparatory to rotating the latter.

Lowering of the armature 15 breaks the circuit just described at the contact 25, thus deenergizing the relay 11 and permitting the spring 21 to restore the armature 15 to its original position, shown in Fig. 1, which movement again closes the circuit through relay 11, provided the circuit is not opened by movement of the armature 19. Thus the shaft 24U is moved step by step by the armature 15 and the ratchet device 22-23, each step of movement of the shaft 24U equaling a one-twentieth rotation thereof.

As pointed out above, the step-by-step rotation of the shaft 24U continues until the circuit through the relay 11 is opened by movement of the armature 19, which is normally held in the position shown by a spring 26. The circuit through relay 11 is opened by energizing relay 27, which attracts the armature 79 to open the above circuit at the point 28. When the relay 11 is deenergized, the shaft 24U comes to rest.

The energization of the relay 27 is controlled by the amount keys 29, each one representing a different digit, from 1 to 9, and zero. If, for example, it is desired to enter the amount "4," the corresponding key 29 is depressed, which operates a switch blade 30 to electrically connect the terminals 31 and 32. Connected to the motor bar 10 is a switch member 33, which, upon operation of the motor bar 10, bridges the terminals 34 and 35 to connect them electrically. The switch member 33 thus closes a circuit from the source of power 36 and a contact 35, by means of wires 38, 39, and 40, terminal 31, switch 30, terminal 32, and wire 41. When, during the rotation of the shaft 24U, a rotor 42 thereon comes into contact with the terminal 37, a circuit through the relay 27 is completed by the rotor 42 and the wires 43 and 44. This energizes the relay 27 and attracts the armature 19 to open the circuit through relay 11 to arrest further rotation of the shaft 24U. Thus it is apparent that the rotor 42 and the shaft 24U are arrested in a position commensurate with the value of the key depressed.

Also secured to the shaft 24U is a rotor 45U, which wipes over and makes contact with terminals 46 as the shaft 24U is rotated step by step by relay 11. In their step-by-step movement, the rotors 42 and 45U simultaneously contact terminals 37 and 46, respectively, of the given value. Thus, in the example used above, when the rotor 42 comes to rest on the "4" terminal 37, the rotor 45U comes to rest on the "4" terminal 46. The "4" terminal 46 is connected to a terminal 47 by a wire 48U (see Figs. 2 and 3). The terminal 47 is associated with a rotatable contact member 49U connected to a type carrier mounted on a continuously rotating shaft 50. The type carrier is connected to the shaft 50 by a friction connection of any well-known kind.

Rigidly connected to the type wheel is an aligner wheel 51U, which is contacted by the end of an armature 52U, when a relay 53U is energized, to thereby arrest the type carrier in a selected position.

The contact member 49U is electrically connected to one side of the relay 53U by a wire 54U, the other side being connected to ground by a wire 55U.

The relay 53U is energized to arrest the type wheel in the "4" position when the contact mem-

ber 49U reaches the terminal 47, when the rotors 42 and 45U rest on the "4" terminals 37 and 46, respectively. When these conditions exist, the following circuit is closed:

5 The circuit is closed from the power source 13, through wire 20, armature 19, wire 56U, rotor 45U, terminal 46, wire 48U, terminal 47, rotatable contact member 49U, wire 54U, relay 53U, and wire 55U to ground.

10 Thus the armature 52U is attracted to arrest the type carrier in a position corresponding to the value of the key 29 which was depressed.

The above circuits are duplicated for each bank of keys for setting the type carriers associated with the respective banks of keys for setting the digits "1" to "9" inclusive. Separate controls are provided to control the printing of zeros, so that they will be set on the printing line only when needed; that is, only to the right of the highest significant digit.

Zero suppressing circuits

The relay 53U is controlled by special circuits to arrest the type carriers either in a zero position, in which position a zero is set up to be printed, or in a blank position, depending upon the amount set up on the keyboard. Various examples will be used in the description of these circuits, the first example being an operation in which all the zero keys 29 are depressed. In this example, the type carriers will all be arrested in their blank positions, so that nothing will be printed.

When a zero key 29 is depressed in each of the key banks, the rotors 45U, 45T, 45H, and 45TH are arrested in the zero positions, in which they are illustrated in Fig. 2. The shafts 24T, 24H, and 24TH have rotors 65T, 65H, and 65TH, respectively, secured thereto. These rotors are so located on their respective shafts that they engage contacts 66T, 66H, and 66TH, respectively, when the shafts are arrested in zero positions as illustrated in Fig. 2. When this condition occurs, and when the relay 27 (Fig. 1) is energized to rock its armature 19, the circuit for arresting the units type carrier is as follows:

From the source of power 13, wire 20, armature 19, wire 56U, rotor 45U, wire 61, rotor 65T, contact 66T, wire 68, rotor 65H, contact 66H, wire 69, rotor 65TH, contact 66TH, wire 70, to the contact "B" for the units order type carrier, rotatable contact member 49U, wire 54U, relay 53U, and wire 55U to ground.

Thus, when the contact member 49U in the units order engages the "B" contact, the armature 52U is attracted by the relay 53U to arrest the type carrier in the blank position.

The tens wheel is arrested in the blank position in a similar manner. Secured to shaft 24H is a rotor 75H, and secured to the shaft 24TH is a rotor 75TH. When zeros are set on the hundreds and thousands order key banks, the rotor 75H is arrested when in engagement with a contact 76H, and the rotor 75TH is arrested when in engagement with a contact 76TH. When the condition exists, a circuit is closed through the relay 53T of the tens bank to arrest the tens type carrier in the blank position.

The circuit through the relay 53T will be completed from rotor 45T, through wire 77, rotor 75H, contact 76H, wire 79, rotor 75TH, contact 76TH, wire 80, contact "B" in the tens order, contact member 49T, wire 54T, relay 53T, and wire 55T, to ground. Thus the tens type carrier is arrested in the blank position.

The hundreds order type carrier is also set in a blank position by a similar means. The rotor 45H in the hundreds order is connected to a rotor 85TH secured to shaft 24TH. When zeros are set on the keyboard in the example assumed, the circuit is closed from rotor 45H, through wire 87, rotor 85TH, contact 86TH, wire 88, "B" contact in the hundreds order, contact member 49H, wire 54H, relay 53H, and wire 55H to ground.

The rotor 45TH in the thousands order is connected directly to the "B" contact in the thousands order by a wire 89, so that, where the capacity of the machine is limited to four banks, a blank is printed in the thousands order, when no digit 1 to 9 is set up on the thousands order key bank.

The next example assumed in describing the zero suppressing circuits is one in which a digit is set up in the tens order key bank; for example, "40." In this example, the shaft 24T will be arrested when the rotor 45T reaches the fourth position; that is, the contact indicated by "40" in Fig. 2. When the shaft 24T reaches this position, the rotor 65T is in a corresponding position, in which position it will be in engagement with a contact ring 90T, and therefore the connection with the contact 66T will be opened. For this reason, the rotor 45U will no longer be in circuit with the "B" contact associated with the units order type carrier. On the other hand, the rotor 45U is connected in circuit with the "0" contact associated with the units type carrier, so that a zero is presented to the printing line in the units order. The circuit for obtaining this result is from the rotor 45U, through wire 67, rotor 65T, contact ring 90T, and wires 91 and 92 to the "0" contact in the units row, contact member 49U, wire 54U, relay 53U, and wire 55U to ground.

The "4" is set on the tens type wheel in the same manner as that described above, through wire 48T to the "4" contact associated with the tens type carrier.

The hundreds type carrier is set to its blank position, since the rotor 45H remains in the zero position shown in Fig. 2. In this order, the rotor 45H is connected to a rotor 85TH by wire 87, and the rotor 85TH is connected to the "B" contact in the hundreds order by contact 86TH and wire 88.

The "thousands" order rotor 45TH is connected direct to the "B" contact associated with the thousands type carrier by wire 89 in the manner explained above.

The next example assumed is one in which "400" is set up on the keyboard. In this example, the circuit to the "B" contact, associated with the units order type carrier, is broken when the hundreds rotor 65H is moved to the fourth position, wherein this rotor contacts ring 90H. The ring 90H is connected to wire 92 by a wire 93. Therefore, during the assumed operation, the type carrier in the units order is arrested in the "0" position by a circuit from the rotor 45U, wire 67, rotor 65T, wire 68, rotor 65H, ring 90H, wires 93 and 92, "0" contact in the units order, contact member 49U, wire 54U, relay 53U, wire 55U, to ground.

When the rotor 45H in the hundreds order is arrested in the "4" position, a rotor 75H, connected to shaft 24H, is arrested in a corresponding position, thus bringing the rotor 75H into contact with a ring 100H. The ring 100H is connected to the "00" contact associated with the

tens order type carrier by wires 101 and 102. Therefore, in the example assumed—that is, setting up "400" on the keyboard—the tens type wheel is arrested in the zero position by a circuit from the rotor 45T, wire 77, rotor 75H, ring 100H, wires 101 and 102, "00" contact associated with the tens type carrier, contact member 49T, wire 54T, relay 53T, wire 55T, to ground.

The hundreds type carrier is arrested in the "4" position by the circuit established by rotor 45H, through contact "400," wire 48H, contact "400" associated with the hundreds type carrier, contact member 49H, wire 54H, relay 53H, wire 55H, to ground.

The thousands order type wheel is arrested in the blank position in the same manner as that described before, through wire 89 and relay 53TH.

Another example assumed in describing the circuit is one in which "4000" is set on the keyboard. The shaft 24TH has an additional rotor 85TH secured thereon. When the amount "4000" is set up on the keyboard, the three rotors 65TH, 75TH, and 85TH are arrested in the position corresponding to the position of the rotor 45TH, which at this time is resting on the contact "4000." This setting of the rotors breaks the circuit from rotor 45U to the "B" contact associated with the units type carrier at the point 66TH and connects the "0" contact associated with the units type carrier to the rotor 45U through ring 90TH and wire 92. The "0" contact associated with the tens order type carrier is connected to the rotor 45T through ring 100TH and wire 102. The "0" contact associated with the hundreds order type carrier is connected to the rotor 45H through ring 110TH and wire 111. The type wheel in the thousands order is arrested in the "4" position by a circuit established through rotor 45TH, contact "4000," wire 48TH, contact member 49TH, wire 54TH, relay 53TH, wire 55TH, and ground.

From the above description it becomes clear that the zero key of each bank of keys normally controls the setting of the type carrier associated therewith to be arrested in a blank position, and that this control is modified to set up a zero when a digit other than zero is set up on any higher order type carrier. This result is obtained by routing the current from the lower order control units to a blank setting control, through a distributor associated with each higher order, which distributors are connected in series, and when any one of the distributors of the series is moved out of zero position, the current is routed through another route to control setting of a zero in said lower order. Certain wires have been omitted for simplicity in the illustration.

Modified form

A modified form of zero-suppressing means is illustrated in Fig. 3. In this form, the digits 1 to 9 are set up in the same manner as that described above; that is, the circuits 48U, 48T, 48H, and 48TH are connected to the type carrier arresting means in a like manner.

In the modified form, the arresting of the type carriers in the blank or zero positions is controlled by a system of relay-operated switches, which switches route the current from the distributor rotors 45U, 45T, 45H, and 45TH to the type carrier arresting relays 53U, 53T, 53H, and 53TH, respectively. These relay-operated switches are provided in lieu of the series of distributors shown in Fig. 2. The control

over the energization of the relays shown in the modified form is such that, if all the relays of higher denomination than a particular order are energized, the type carrier of the said particular order will be arrested in its blank position. If less than all of said higher order relays are energized, the type carrier in said particular order will be arrested in its zero position.

In the illustrative application of the invention, four denominational orders are shown. In this application, three relays 120T, 120H, and 120TH are provided, one associated with the "tens" bank of keys, one associated with the "hundreds" bank of keys, and one associated with the "thousands" bank of keys.

Units order type carrier setting control

The control for setting the units type carrier includes two sets of three switches, one set being connected in parallel and the other set being connected in series. The set of switches which are connected in parallel control the type carrier so that it is arrested in zero position, and the set of switches which are connected in series control the type carrier so that it is arrested in its blank position. The "zero" controlling switches are closed when the relays are deenergized, and the "blank" controlling switches are open when the relays are deenergized. The energization of each one of the three relays opens one switch of each set and closes one switch of the other set. Therefore, to prevent a zero from being set up for printing in the units order, all three relays must be energized to open the three switches connected in parallel and to close the three switches connected in series. Each relay is energized only when a zero is set up in the key bank associated therewith. Therefore, if any one of the three relays is not energized due to a digit 1 to 9 being set up on one or more of the orders higher than the units order, a zero will be set up by the units order type carrier.

The means for obtaining the above results includes switches 121, 122, and 123, which are connected to armatures 124, 125, and 126, respectively, in such relationship thereto that the switches 121, 122, and 123 are all closed when the relays are deenergized. Also, these three switches are connected in parallel with each other and are in series with the "0" contact cooperable with the rotor 45U and the "0" contact cooperable with the contact member 49U. A wire 127 is connected to one side of each of the three switches 121, 122, and 123 by leads 128, 129, and 130, respectively, and to the zero contact of the units order rotor 45U. The other sides of the said switches are connected to a wire 131 by leads 132, 133, and 134, respectively. The wire 131 connects the switches to the "0" contact in the type carrier arresting distributor.

Also operated by the armatures of the relays 120T, 120H, and 120TH are switches 141, 142, and 143, respectively, which switches are open when the respective relays are deenergized and are closed when said relays are energized. The three switches 141, 142, and 143 are connected to each other in series by wires 144 and 145, and one side of switch 143 is connected to the "B" contact of the type carrier arresting distributor by a wire 146. Also, one side of the switch 141 is connected to the "0" contact cooperable with the rotor 45U by the leads 128 and 127.

When the three relays 120T, 120H, and 120TH

are all energized, which occurs when a zero key 29 is set in the three higher order banks of keys, the three relays 120T, 120H, and 120TH are energized to open switches 121, 122, and 123 and to close switches 141, 142, and 143. This interrupts the circuit from rotor 45U to the "0" contact in the type arresting distributor and closes a circuit from said rotor 45U to the "B" contact in said type arresting distributor. The last-named circuit is from the rotor 45U, through wires 127 and 128, switch 141, wire 144, switch 142, wire 145, switch 143, wire 146, "B" contact, contact member 49U, wire 45U, relay 53U, wire 55U to ground. This energizes the relay 53U when the blank position of the units type carrier is in the printing position. Thus, when all the relays 120T, 120H, and 120TH are energized upon depression of zero keys 29 in the three higher order banks of the keyboard, and a zero key is depressed in the units bank, no zero will be set up for printing in the units order.

However, if one or more of the relays 120T, 120H, or 120TH are not energized, because a digit 1 to 9 is set up on the keyboard, then at least one switch 121, 122, or 123 will be held closed and at least one switch 141, 142, or 143 will be held open, and then the circuit to the "0" contact will remain closed and the circuit to the "B" contact is opened, and the setting of a "0" on the units type carrier will result.

In the latter case, a circuit will be closed from the rotor 45U, through wire 127 to whichever switch 121, 122, or 123 remains closed, thence through wire 131 to the "0" contact, contact member 49U, wire 54U, relay 53U, wire 55U, to ground. This circuit will energize the relay 53U at the proper time to arrest the type carrier in the units order in the zero position.

Thus, when a digit is set up on the higher order key banks, a zero will be set up on the units order type carrier, and when no digit is set up on the higher order key banks, a blank will be set up on the units order type carrier.

Tens order type carrier setting controls

The tens order type carrier is controlled for zero printing in the same manner as described for controlling the setting of the units order type carrier, except that, in the case of the tens order, there are only two controlling switches in each of the two sets of switches instead of three. This is due to the fact that there are only two higher orders disclosed herein.

The controls for setting the tens order type carrier include switches 152 and 153 connected in parallel, the switch 152 being opened under control of the relay 120H in the hundreds order, and the switch 153 being opened under control of the relay 120TH in the thousands order, respectively. If neither of these two higher order relays is energized, the switches 152 and 153 remain closed, with the result that a circuit is closed by rotor 45T through wires 154 and 155, switches 152 and 153, wire 155, "0" contact in the tens type carrier control distributor, contact member 49T, lead 54T, relay 53T, wire 55T to ground. Energization of the relay 53T when the contact member 49T is on the "00" contact arrests the type carrier in the zero position.

If only one of the relays 120H or 120TH remains deenergized, then this circuit to the "00" position will be maintained by whichever switch 152 or 153 remains closed.

However, if both relays 120H and 120TH are energized, then both switches 152 and 153 are

opened, and therefore the circuit from the rotor 45T to the "00" contact in the tens type carrier setting control distributor is opened. Energization of both relays 120H and 120TH closes two switches 162 and 163, respectively. Closing these latter two switches closes a circuit between the rotor 45T and the "B" contact in the tens order type carrier control distributor. This circuit is from the rotor 45T, wires 154 and 155, switch 162, wire 164, switch 163, wire 165, "B" contact in the tens type carrier control distributor, contact member 49T, wire 54T, relay 53T, wire 55T to ground. Thus, when both relays 120H and 120TH are energized, and when the rotor 45T is on the "0" contact, the relay 53T will arrest the type carrier in the tens order in the blank position. Thus a blank is set up in the tens order whenever zeros are set in the tens, hundreds, and thousands orders.

Hundreds order type carrier setting control

The hundreds order type carrier is controlled for zero printing in a similar manner under control of a single relay 120TH in the thousands order. When the relay 120TH is not energized—that is, when a digit 1 to 9 is set up in the thousands order key bank—a switch 172 will remain closed. In this event, a zero is set up on the hundreds order type carrier if the rotor 45H is stopped at zero, and a circuit is closed to the relay 53H. This circuit is from the rotor 45T, through wires 173 and 174, switch 172, wire 175 to the "000" contact in the hundreds order type carrier control distributor, wire 54H, relay 53H, and wire 55H to ground.

When a zero is set up in the thousands order key bank, the relay 120TH is energized by a circuit from the rotor 45TH, wires 176, 177, relay 120TH, and wire 178 to ground. Energization of the relay 120TH attracts the armature 126 to open switch 172 and close a switch 182. When this occurs, a circuit is closed between the rotor 45H and the "B" contact in the hundreds order type carrier control distributor. This circuit is from the rotor 45H, wires 173, 174, switch 182, wire 183, "B" contact in the hundreds order type carrier control distributor, contact member 49H, wire 54H, relay 53H, wire 55H to ground.

Thousands order type carrier setting control

The type carrier in the thousands order is adjusted in the same manner as in the case of the first form described above; that is, the "0000" contact is connected to the "B" contact in the type carrier setting control distributor directly through wires 89 and 176, and the digits are set up through the wires 56TH. No zero is set up in this order, as illustrated herein, because it is the highest order disclosed.

Thus, by controlling the energization of the relays 120T, 120H, and 120TH from the keys on the keyboard, zeros are printed only when necessary, and the zeros are suppressed when they are unnecessary to record data.

While the form of the invention herein shown and described is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to the form or embodiments herein disclosed, for it is susceptible of embodiment in various forms all coming within the scope of the claims which follow.

What is claimed is:

1. In a zero-suppressing mechanism, the combination of type carriers for setting digits zero

and "1" to "9" and blank; means to rotate the type carriers; a separate electromagnetic means associated with each type carrier; an arresting means operated by each electromagnetic means to arrest an associated type carrier in a selected position; contacts representing digits from zero, "1" to "9," and blank connectable to each electromagnetic means; a differential means associated with each type carrier each having contacts representing digits from 0 to 9; a circuit between the zero contact of each differential means and the zero contact associated with each electromagnetic means, said last-named circuit including a set of switches arranged in parallel and operable under control of the differential means of next higher order; and a circuit between the zero contact of each differential means and the blank contact associated with each electromagnetic means, the last-named circuit including a set of switches arranged in series and operable under control of the differential means of higher order, said sets of switches being operable to close a circuit through an electromagnetic means to arrest type carriers in zero only when one higher order differential means is set to represent a digit "1" to "9," and to selectively arrest the type carriers in blank position when all higher order differential means are set to represent zeros.

2. In a zero-suppressing mechanism, the combination of type carriers for setting digits zero and "1" to "9" and blank; means to rotate the type carriers; a separate electromagnetic means associated with each type carrier; an arresting means operated by each electromagnetic means to arrest an associated type carrier in a selected position; contacts representing digits from zero, "1" to "9," and blank connectable to each electromagnetic means; a differential means associated with each type carrier each having contacts representing digits from 0 to 9; a circuit between the zero contact of each differential means and the zero contact associated with each electromagnetic means, said last-named circuit including a set of switches arranged in parallel and operable under control of the differential means of next higher order; and a circuit between the zero contact of each differential means and the blank contact associated with each electromagnetic means, the last-named circuit including a set of switches arranged in series and operable under control of the differential means of higher order, said sets of switches being operable to close a circuit through an electromagnetic means to arrest the type carriers in zero only when one higher order differential means is set to represent a digit "1" to "9," and to selectively arrest the type carriers in blank position when all higher order differential means are set to represent zeros, said sets of switches so connected in sets that when a switch of one set is closed a switch of the other set is opened in each digit order, so that when one switch of the set arranged in series is open said circuit is open, and when one switch of the switches arranged in parallel is opened when said circuit remains closed.

3. In a zero-suppressing mechanism, the combination of type carriers for setting digits zero and "1" to "9" and blank; means to rotate the type carriers; a separate electromagnetic means associated with each type carrier; an arresting means operated by each electromagnetic means to arrest an associated type carrier in a selected position; contacts representing digits from zero "1" to "9," and blank connected to each electro-

magnetic means; a differential means associated with each type carrier each having contacts representing digits from 0 to 9; a circuit between the zero contact of each differential means and the zero contact associated with each electromagnetic means, said last-named circuit including a set of switches arranged in parallel and operable under control of the differential means of next higher order; a circuit between the zero contact of each differential means and the blank contact associated with each electromagnetic means, the last-named circuit including a set of switches arranged in series and operable under control of the differential means of higher order, said sets of switches being operable to close a circuit through an electromagnetic means to arrest type carriers in zero only when one higher order differential means is set to represent a digit "1" to "9," and to selectively arrest the type carriers in blank position when all higher order differential means are set to represent zeros, said sets of switches so connected in sets that when a switch of one set is closed a switch of the other set is opened in each digit order, so that when one switch of the set arranged in series is open said circuit is open, and when one switch of the switches arranged in parallel is opened said circuit remains closed; and electromagnetic means to control the operation of the sets of switches, one electromagnetic means provided for each order higher than the units order.

4. In a zero-suppressing mechanism, the combination of type carriers for setting digits zero and "1" to "9" and blank; means to rotate the type carriers; a separate electromagnetic means associated with each type carrier; an arresting means operated by each electromagnetic means to arrest an associated type carrier in a selected position; contacts representing digits from zero, "1" to "9," and blank connectable to each electromagnetic means; a differential means associated with each type carrier each having contacts representing digits from 0 to 9; a circuit between the zero contact of each differential means and the zero contact associated with each electromagnetic means, said last-named circuit including a set of switches arranged in parallel and operable under control of the differential means of next higher order; a circuit between the zero contact of each differential means and the blank contact associated with each electromagnetic means, the last-named circuit including a set of switches arranged in series and operable under control of the differential means of higher order, said sets of switches being operable to close a circuit through an electromagnetic means to arrest type carriers in zero only when one higher order differential means is set to represent a digit "1" to "9," and to selectively arrest the type

carriers in blank position when all higher order differential means are set to represent zeros, said sets of switches so connected in sets that when a switch of one set is closed a switch of the other set is opened in each digit order, so that when one switch of the set arranged in series is open said circuit is open, and when one switch of the switches arranged in parallel is opened said circuit remains closed; electromagnetic means in each order higher than the units order; and connections operated by each electromagnetic means to operate a pair of switches in each circuit connected with each type carrier arresting means of next higher order.

5. In a zero-suppressing mechanism, the combination of type carriers for setting digits zero and "1" to "9" and blank; means to rotate the type carriers; a separate electromagnetic means associated with each type carrier; an arresting means operated by each electromagnetic means to arrest an associated type carrier in a selected position; contacts representing digits from zero, "1" to "9," and blank connectable to each electromagnetic means; a differential means associated with each type carrier each having contacts representing digits from 0 to 9; a circuit between the zero contact of each differential means and the zero contact associated with each electromagnetic means, said last-named circuit including a set of switches arranged in parallel and operable under control of the differential means of next higher order; a circuit between the zero contact of each differential means and the blank contact associated with each electromagnetic means, the last-named circuit including a set of switches arranged in series and operable under control of the differential means of higher order, said sets of switches being operable to close a circuit through an electromagnetic means to arrest type carriers in zero only when one higher order differential means is set to represent a digit "1" to "9," and to selectively arrest the type carriers in blank position when all higher order differential means are set to represent zeros, said sets of switches so connected in sets that when a switch of one set is closed a switch of the other set is opened in each digit order, so that when one switch of the set arranged in series is open said circuit is open, and when one switch of the switches arranged in parallel is opened said circuit remains closed, said sets of switches being of the rotor type and each switch having a stationary contact and a wiping rotor cooperable with the stationary contact; and connections between the differential means and the rotors to operate each differential means and its associated switch rotor in synchronism.

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