Jan. 22, 1935. J. KRELL 1,988,904

ADDRESS PRINTING AND CALCULATING MACHINE

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FIG. 7

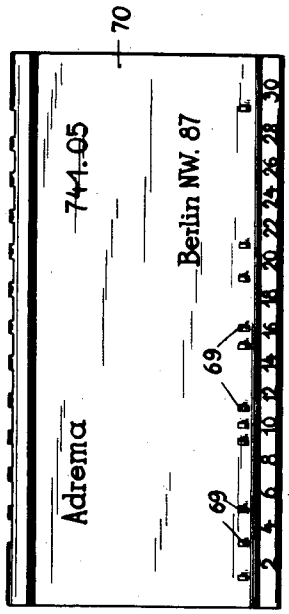


FIG. 5

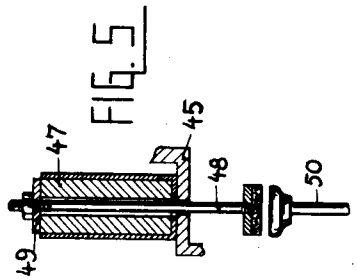
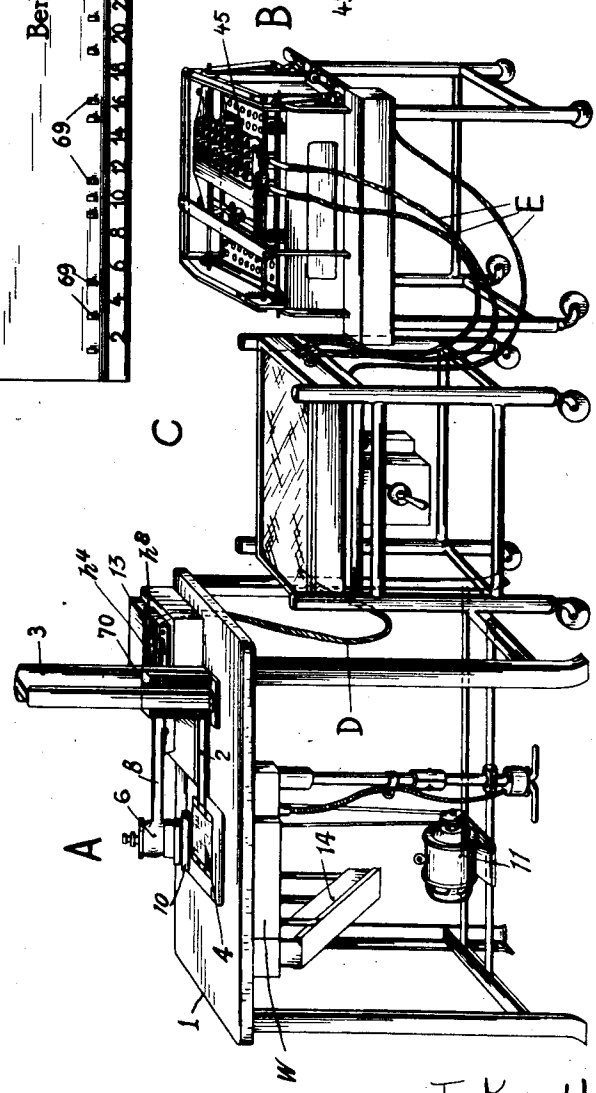


FIG. 1



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ADDRESS PRINTING AND CALCULATING MACHINE

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FIG. 1a

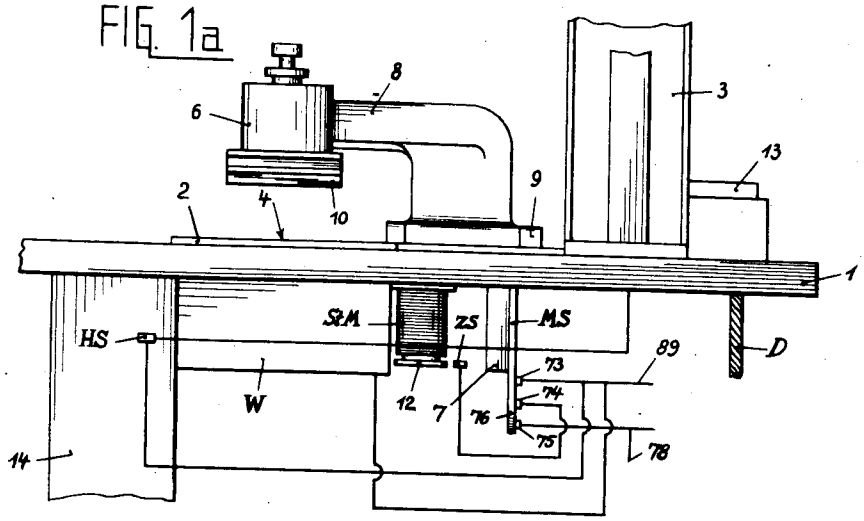
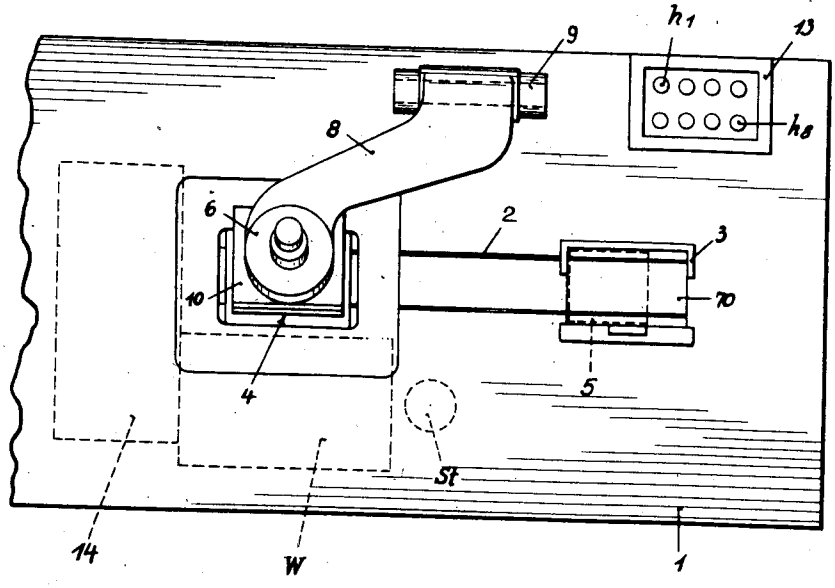


FIG. 1b



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ADDRESS PRINTING AND CALCULATING MACHINE

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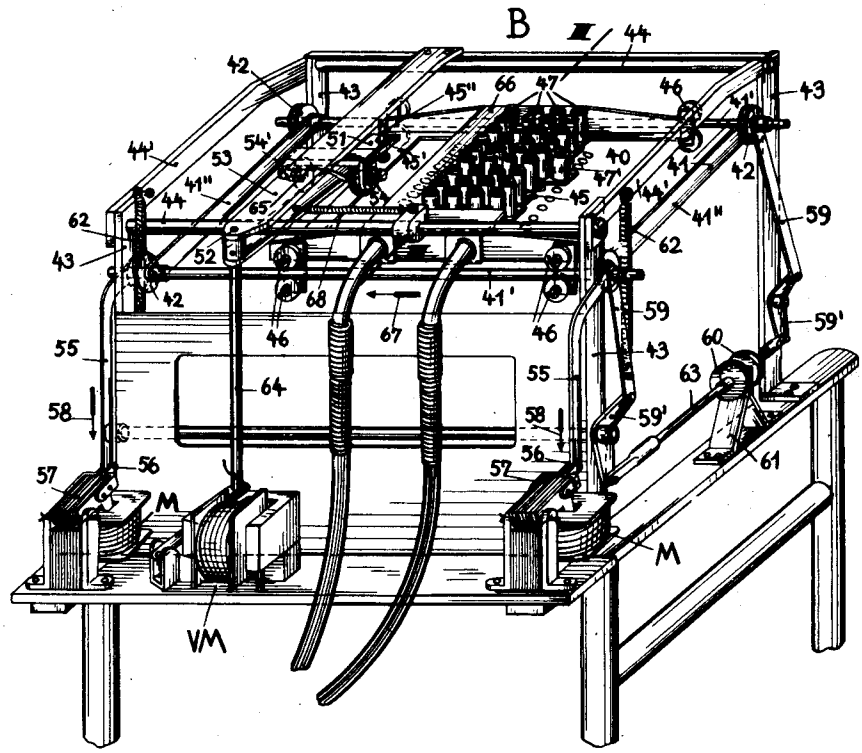


FIG. 3

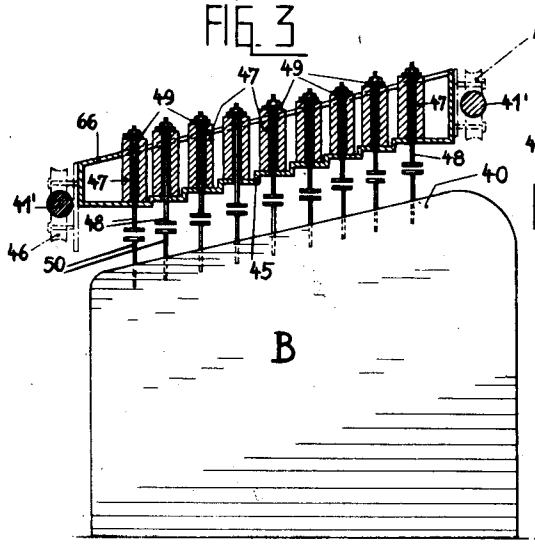
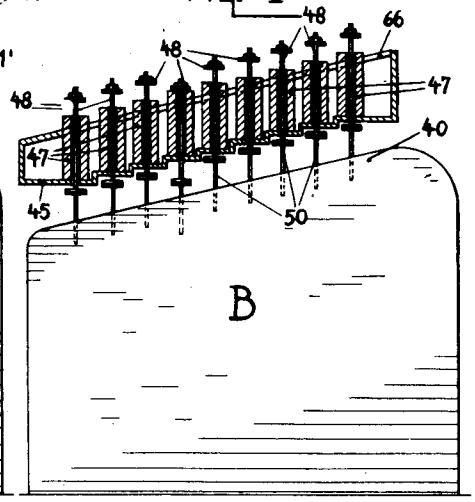


FIG. 4



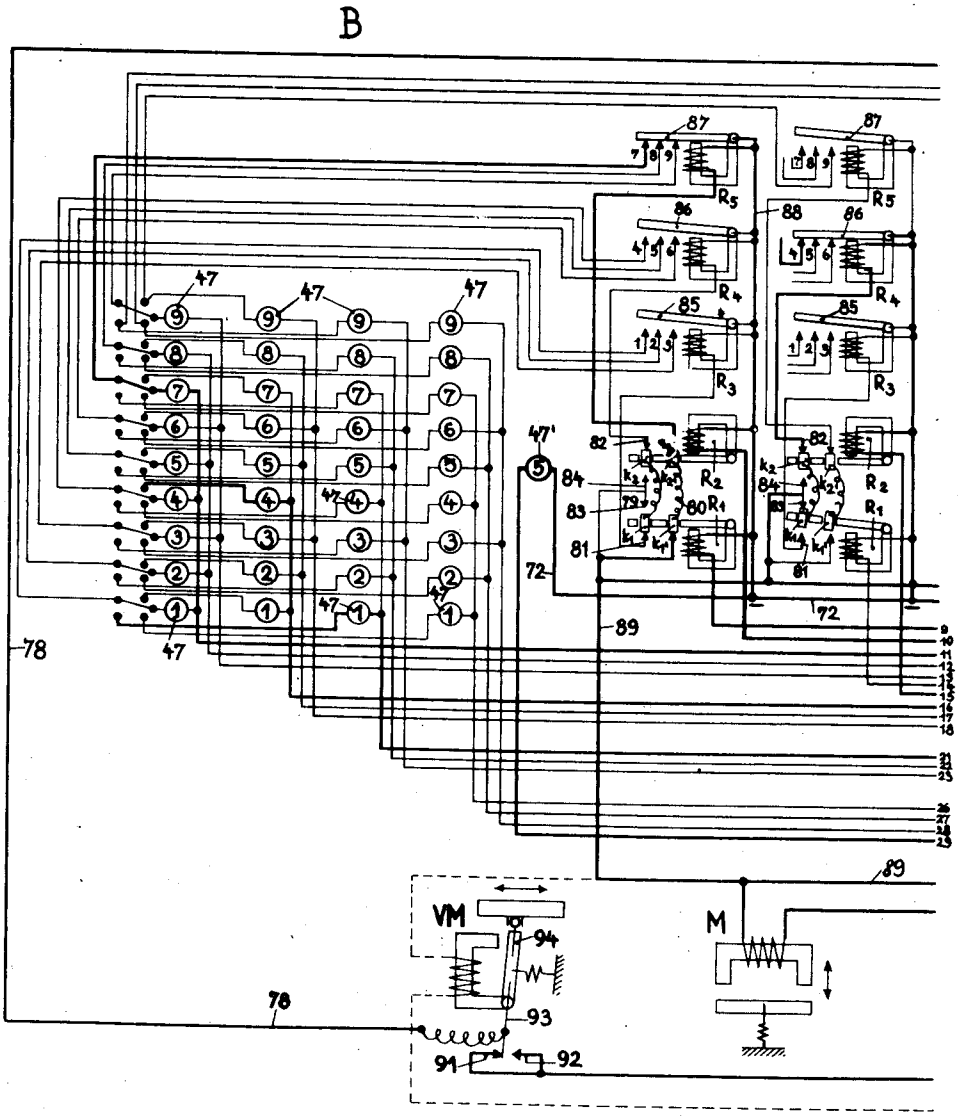
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ADDRESS PRINTING AND CALCULATING MACHINE

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FIG. 6



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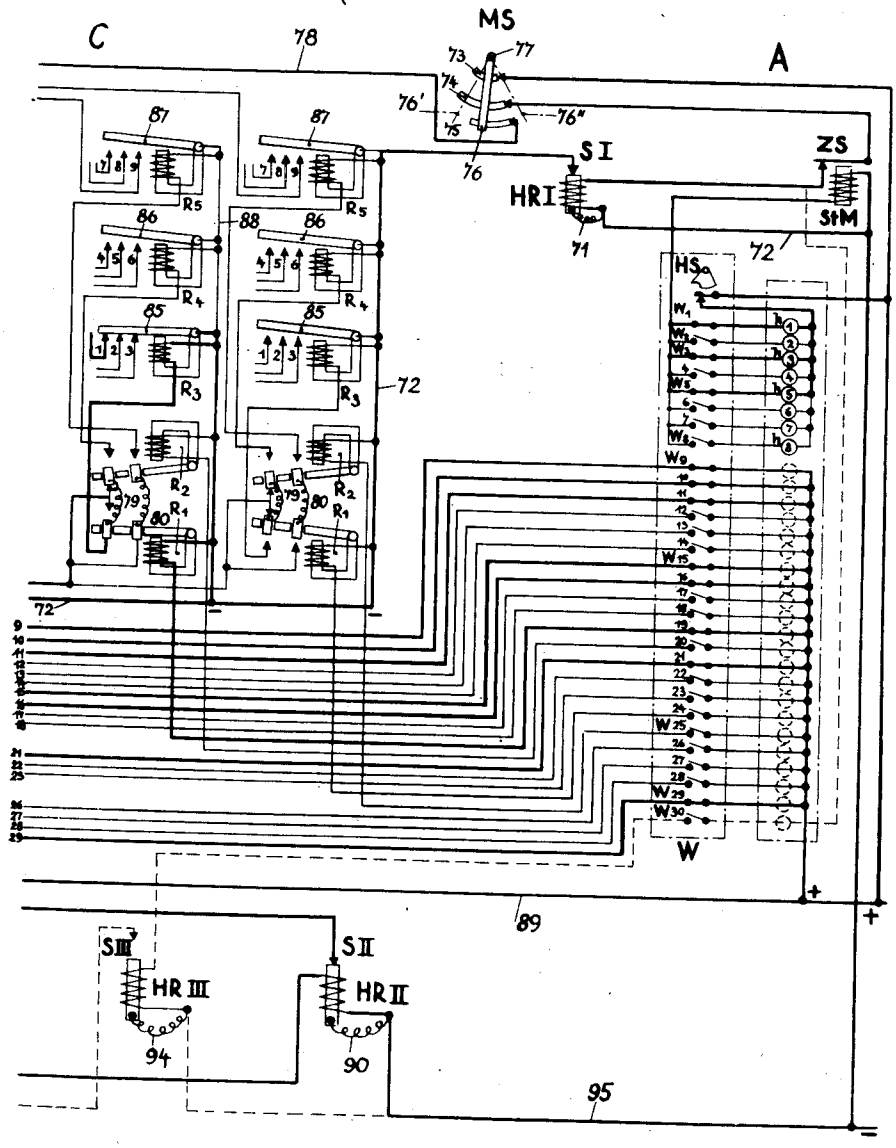
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FIG. 6a



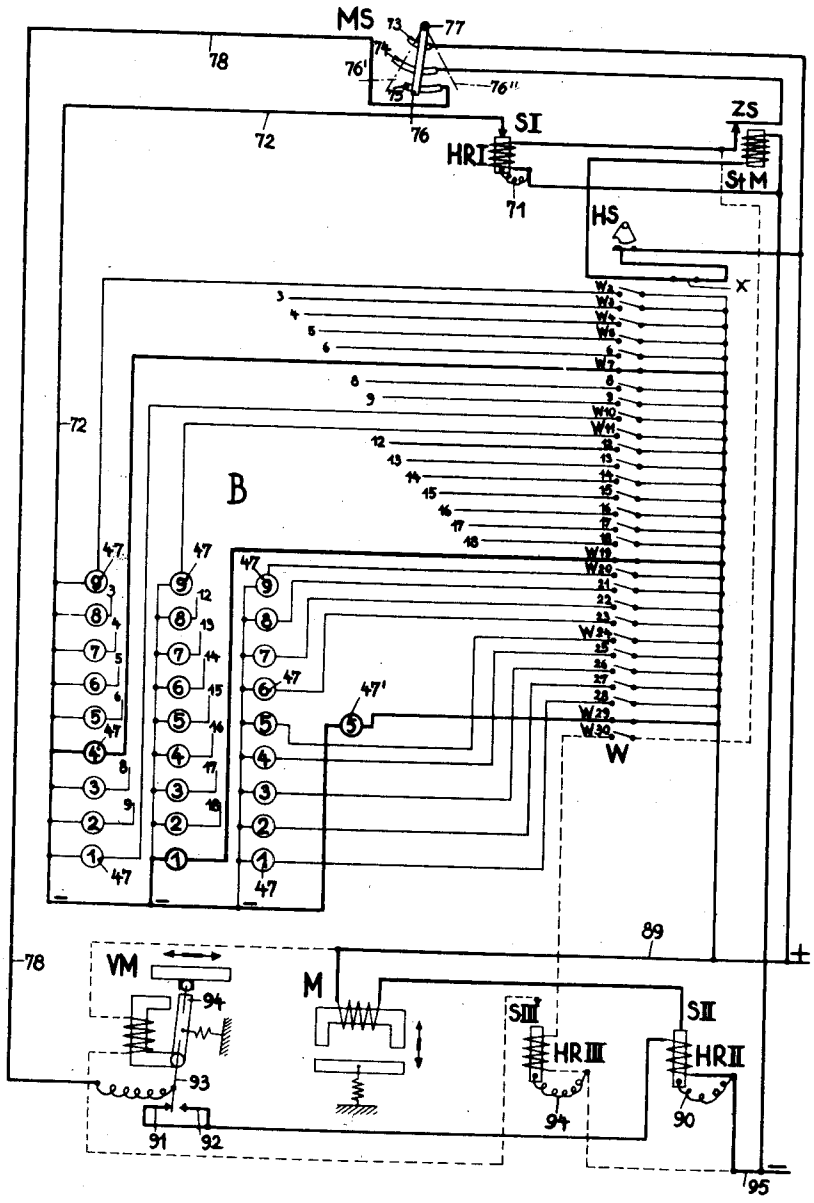
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ADDRESS PRINTING AND CALCULATING MACHINE

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FIG. 8



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Patented Jan. 22, 1935 1,988,904

UNITED STATES PATENT OFFICE

1,988,904

ADDRESS PRINTING AND CALCULATING MACHINE

Joseph Krell, Berlin-Zehlendorf, Germany

Application August 20, 1931, Serial No. 558,382
In Germany December 6, 1930

8 Claims. (Cl. 235—92)

My invention relates to an address-printing and calculating machine of the general design shown and described in my prior patent of the United States, 1,876,970, September 13, 1932, for "Address-printing and calculating machine".

Machines of this type may be used not only for printing addresses on envelopes, and for printing lists of addresses, and similar purposes, but also for compiling accounts, for printing debit notes, receipts, or the like.

A machine as described in my said prior patent comprises a printing and a calculating unit, the calculating unit being equipped with operating mechanism of the usual kind and the machine further comprises a selector or multiple selector switch. This selector is adapted to be controlled by the printing plates which are fed through the printing unit and has contacts adapted to be operated by the printing plates, a circuit connected to every contact in the selector, and an electromagnet in every circuit for operating a key of the calculating unit.

It is important for the operation of machines of this type, that for every calculation which is performed, the electro-magnets for operating the keys of the calculating unit should be selected and excited before the keys are operated. It is an object of my invention to provide means for accomplishing the selection and excitation of the electromagnets before the subsequent operation of the keys.

To this end I arrange a switch which will be referred to as the "machine switch" and is equipped with contacts arranged to first make the circuits of the electromagnets, and thereupon to make the circuit of means by which the armatures of the electromagnets are moved into active position with respect to the keys of the calculating unit. I further provide a controlling magnet or switch under the control of the selector, for admitting current to the machine switch only if a plate is printed.

It is another object of my invention to provide an arrangement in which fewer selector switches than electro-magnets are required. Normally, a set of nine keys and nine electromagnets for operating them, are required for every decimal of the calculating unit. In order to control a given number of electromagnets, say, the normally provided nine electromagnets, by a lesser number of selectors, I provide a set of relays, conductors extending from the selectors to the individual relays, and switching means in the relays which are connected to the electromagnets.

It is still another object of my invention to provide improved means for operating the calculating unit. To this end, I provide a carriage for operating the keys of the calculating unit whose width is less than the width of the keyboard, and on this carriage I provide means including electromagnets and their armatures for operating the keys of the calculating unit. I further provide means for shifting the carriage, and for lowering it, with respect to the calculating unit, with circuits extending from the selector or multiple switch to the electromagnets on the carriage and to the means for shifting, and the means for lowering the carriage.

I am not limited to any particular type or system of operation with regard to the selector switches in the printing unit, nor am I limited to any particular design of calculating machine.

In the accompanying drawings a machine embodying my invention is illustrated by way of example. I have shown a printing unit in which the printing plates or other equivalent means which are included by the term "printing plates", are moved through the machine in succession and in their longitudinal direction, and in which a multiple switch of old type, having a plurality of switching elements placed side by side, is arranged at the selecting station below the guide for the printing plates, its elements being controlled by projections at one edge of the lower face of the printing plates. The multiple or selector switch is controlled by a switch which will be referred to as the "main switch" and is operated automatically by the printing unit as soon as a printing plate arrives in position above the multiple switch.

In the drawings

Fig. 1 is a perspective illustration of the printing unit, the calculating unit, and a set of relays intermediate the two units,

Fig. 1*a* is an elevation,

Fig. 1*b* is a plan view of the table of the printing unit,

Fig. 2 is a perspective illustration showing the calculating unit with its carriage on a larger scale,

Figs. 3 and 4 are sections on the line III—III in Fig. 2, showing the carriage in its initial and in its active position, respectively,

Fig. 5 is an axial section of one of the electromagnets on the carriage,

Fig. 6 is a diagram taken with Fig. 6*a* showing the connections for a machine having a set of relays,

Fig. 7 is an elevation of a printing plate, viewed from below, and

Fig. 8 is a diagram of connections for a machine without relays.

Referring now to the drawings, and first to Fig. 1, A is the printing unit, being an address printing machine of any suitable type, B is the calculating unit, C is a set of relays, and D and E are cables connecting, respectively, the printing unit to the relays, and the relays to the calculating unit. Each unit has a frame of its own, and so has the set of relays, the cables D and E being preferably detachable.

The arrangement of the members forming part of the printing unit A will now be described with reference to Figs. 1*a* and 1*b*. A more detailed description of its electrical equipment will be given with reference to the diagram Fig. 6.

On the table 1 of the printing unit, a track 2 is provided. The printing plates 70 one of which is illustrated on a larger scale in Fig. 7, are piled in a hopper 3 on the table 1 from which the track 2 extends to the printing station 4. The plates 70 descend in the hopper 3 by gravity and are moved toward the printing station 4 along the track 2 by a slide 5 (Fig. 1*b*) to which reciprocating movement is imparted by any suitable means, not shown. A printing head 6, with a platen 10, is arranged at one end of a printing arm 8 which is mounted to oscillate on the table 1 in a bearing 9 (Figs. 1*a* and 1*b*) and has a downward extension 7. Oscillating movement is imparted to the printing arm 8 from a motor 11 through suitable mechanism which has not been illustrated as it forms no part of the present invention.

The feed slide 5 moves in time with the oscillation of the printing arm 8 and pushes the printing plates 70 along the track 2 until they arrive at the printing station 4 below the platen 10 where they are either printed or skipped and finally the plates are discharged into a collector 14.

The arrangement of the mechanical parts of the printing unit is similar to that described in my prior Patent 1,816,733 for "Printing machine", July 28, 1931, and the electrical equipment also includes a switch board 13 on the table, with a set of hand switches *h*1 to *h*8 which may be push buttons. The electrical equipment below the table includes a multiple selector switch W (Figs. 1*a* and 1*b*) which may be designed like the multiple-switch unit A in the prior Patent 1,816,733 or in any other suitable manner, and is arranged below the printing station 4. The printing plates 70 have lugs 69 for operating the individual selective switches, or selector switching elements, *w*1 to *w*30, as shown in Fig. 6. The showing in Fig. 6 is diagrammatic and the parts are not shown in the relative positions they really assume below the table 1. The electromagnet *St*M for controlling the printing operation of the machine, so as to print certain plates, and to skip others, is provided as in the said prior patents. When the controlling magnet *St*M attracts its armature 12, the plate will be printed. The mechanism by which this is effected has not been illustrated as it forms no part of the present invention. It is so designed that the platen 10 on the printing arm moves with the printing arm and is not placed into its active position while the electromagnet *St*M is not excited, and the plate or plates, at the printing station 4 is skipped while, when the electromagnet *St*M is excited, it attracts its armature 12 which thereupon arrests a part of the mechanism, causing the platen 10 to move into printing position and to print the plate, or plates, at the printing station 4. Such mechanism is fully described in my prior Patent 1,700,803, filed Oct. 15, 1926, for "Addressing machine and similar printing machine".

The main switch referred to is shown at HS and is connected to the push buttons or hand switches *h*1 to *h*8 in the switch board 13 and to a circuit 89. A machine switch MS is operatively connected to the downward extension 7 of the printing arm 8. The contacting member 76 of the machine switch MS cooperates with three contacting strips 73, 74 and 75. The strip 73 is connected to the circuit 89, the strip 74 is connected to a switch ZS which is under the control of the controlling magnet *St*M, and the strip 75 is connected to a circuit 78. The connections will be fully described with reference to Fig. 6, as Figs. 1*a* and 1*b* serve only for showing the arrangement of the electrical and other equipment on the table 1 of the printing unit.

Referring now to Figs. 2, 3, and 4, the key board 40 of the calculating unit B, with its keys 50, is equipped with uprights 43 at its four corners which are connected by transverse stays 44 and side stays 44'. The transverse stays 44 may be of circular cross section. 42 are rollers or wheels which are adapted to run on the inner edges of the uprights 43 and support a rectangular frame consisting of transverse bars 41' which, like the transverse stays 44, may be of circular cross section, and side bars 41''. 45 is the carriage referred to which is equipped with rollers or wheels 46 to run on the transverse bars 41'.

The carriage 45 comprises a front and a rear plate, each with a pair of rollers 46 at both ends, a bridge 66, and a bar 45' extending from the front to the rear plate. The base of the carriage 45 is stepped as shown in the sections Figs. 3 and 4, and the bridge 66 is straight and held at its front and rear ends by the front and rear plates of the carriage. Mounted on the stepped base of the carriage 45 with their upper ends projecting beyond the bridge 66 are the electromagnet coils 47, each with an armature 49 on top, and a push rod 48 extending through a space in the axis of the coil for operating one of the keys 50, as best seen in Fig. 5, with a circular plate at the lower end.

In the example illustrated the carriage 45 is equipped with four rows of nine electromagnets 47, and an extra magnet 47' at the right of the last row at the right and in line with the "5" key of the unit decimal. The magnets of the other rows are above the "1" to "9" keys of the decimals of the calculating unit.

53 is a bearing plate which extends across the frame at the upper ends of the uprights 43 in parallel to its side stays 44' and is secured to the transverse stays 44. 64 is a vertical shaft which is mounted to turn in a bearing 52 at the front end of the bearing bridge 53 at its upper end and operatively connected to the armature of a carriage-shifting magnet VM at its lower end so that the shaft is turned when the magnet VM attracts its armature. 51 is a carriage-shifting lever the boss of which is seated on the shaft 64 below the bearing bridge 53, and 45'' is a pin on the bar 45' of the carriage which is adapted to be engaged by the forked end of the lever 51. 54 and 54' are adjustable checks for the lever 51 on the bearing bridge 53. It will be understood that the carriage 45 is shifted when the shaft 64 is turned.

Means for holding the frame 41', 41'' on which the carriage 45 is mounted to run with its rollers

46, in its uppermost position include springs 62 which are secured to the side stays 44' links 59 which are pivoted to the bars 41' at their upper ends, and bell-crank levers 59' to which the lower ends of the links are connected. The lower ends of the springs 62 are attached to the links 59. Means for lowering the carriage 45 against the action of the springs 62 include carriage-lowering magnets M, M at the sides of the unit B, armatures 57, and links 55 connected to the armatures at 56 with their lower ends, and to the front transverse bar 41' with their upper ends. The downward movement of the frame 41', 41'' with the carriage 45 is limited by a link 63 which connects the free ends of the bell-crank levers 59', a pair of stop plates 60 on the link, and a fixed stop 61 on the unit B.

In operation, certain electromagnets 47 are excited as will be described below and retain their armatures 48, 49. When the magnets M are excited they pull down the links 55 as indicated by the arrows 58 and the carriage 45 is lowered, the armatures of the excited electromagnets 47 depressing the keys 50 below them, as shown for the fourth electromagnet in Fig. 4. The armatures of the non-excited electromagnets do not act on the keys, their plates 49 remaining in position while their coils are lowered with the carriage 45. At the same time as the keys are operated an actuating key (if any) which is not shown, may be operated which thereupon in the usual manner causes the calculating unit B to operate. When the calculating operation has been performed the electromagnets 47, 47' and the carriage-lowering magnets are de-energized and the springs 62 return the carriage 45 to its initial position, Fig. 3, in which all armatures rest on the tops of their coils.

If it is desired that the electromagnets on the carriage should move into line with a higher decimal the carriage-shifting magnet VM is excited before the carriage-lowering magnets M, M, and this is also done by the multiple switch of the printing unit. When the shifting magnet is energized the carriage is moved to the left, arrow 67, until the lever 51 strikes the check 54'. 68 is a spring for pulling back the lever and the carriage when the shifting magnet VM is de-energized, until the lever strikes the check 54.

Referring now to Fig. 6, only one magnet M for lowering the carriage 45 is shown for the sake of simplicity. The push buttons or hand switches $h1$ to $h8$ are shown in the immediate vicinity of the elements $w1$ to $w30$ of the multiple selector switch W, while in fact, as shown in Figs 1*a* and 1*b*, the switch board 13, with the hand switches $h1$ to $h8$, and the selector switch W, are spaced apart for a considerable distance on the table 1.

The main switch HS which, as described with reference to Figs. 1*a* and 1*b*, is arranged on the printing unit A in addition to the multiple selector switch W, is closed automatically by the mechanism of the printing unit A, when a printing plate 70 arrives above the elements $w1$ to $w30$ of the multiple selector switch W, and the controlling magnet StM which is provided in machines having means for skipping certain printing plates and is excited if a plate to be printed arrives at the selecting station. In the present instance, it has been assumed that the first eight selector switching elements $w1$ to $w8$ control the skipping of the plates as determined by closing hand switches $h1$ to $h8$. The hand switches $h1$ to $h8$ and the selector switching elements $w1$ to $w8$ are in parallel circuits which are all connected to the positive terminal + of the system across the main switch HS, and to the negative terminal − across the control magnet StM. If a printing plate 70 closes a selector switching element w corresponding to a hand switch which has been cut in, or holds it closed after the main switch HS has been closed, the control magnet StM is energized and causes the printing plate to be printed, as will be understood by those skilled in the art.

Assume that the hand switches h at 1, 3, and 5 are closed, and that a printing plate 70 is at the selector station which closes the selector elements 1, 3, and 5 so that the control magnet StM is energized. It closes an auxiliary switch ZS which is in the circuit of the machine switch MS, which is automatically operated by the mechanism of the printing unit, and of an auxiliary relay HRI. This relay controls a switch SI which if closed connects the negative terminal of the system to the negative wire 72 across the branch 71. The negative wire 72 extends through the system of relays C.

The machine switch MS as described with reference to Figs 1*a* and 1*b*, is equipped with three contacting strips 73, 74, 75 and a contacting member 76 mounted to rock about a pivot 77. The machine switch MS is so connected to the printing arm 8 that its member 76 is in its final position 76' at the left, or beyond, when the printing arm is elevated, and moves into the final position 76'' at the right as the printing arm descends. The two strips 73, 74 are in the system which is controlled by switch ZS while the strip 75 is connected to the wire 78 and the shifting magnet VM.

The selector switching elements $w9$ to $w30$ are all connected to the positive terminal of the system, and the wires from the elements are partly taken to the relay set C and partly to the electromagnets 47, 47' which in Fig. 6 are marked with the numerals of the keys 50 to which they are allotted.

As mentioned, the relay set C permits controlling the nine magnets 47 in each row by five selector elements as will now be described with reference to the highest decimal. The magnets 1 to 9 of the row representing the highest decimal are controlled by the five selector elements $w9$ to $w13$. The element 11 is connected to the magnets 1, 4, and 7, the element 12 to the magnets 2, 5, and 8, and the element 13 to the magnets 3, 6, and 9. The calculating unit illustrated has no keys for "0", the naughts being calculated automatically by the unit.

The elements 9 and 10 are connected to wires extending to the first relay unit. The set C contains four units each including five relays R1 to R5. Each of the relays R1 and R2 controls a double switch having the contacts $k1$, $k1'$, and $k2$, $k2'$, respectively. The contacts $k1$ and $k2$ are connected by a wire 79, and the contacts $k1'$ and $k2'$ are connected by a wire 80. The contacts $k1$ and $k2$ are combined with fixed contacts 81, 82 and with one more contact 83, 84 intermediate the contacts $k1$, $k2$, the contacts 83, 84 being connected to a wire 89. The three other relays of each unit are connected with switches 85 and contacts 1, 2, 3, 86 and contacts 4, 5, 6, and 87 and contacts 7, 8, 9, respectively, for the allotted decimals. The five relays of each unit are connected to wire 72 by wires 88. The opposite terminal of R1 is connected to selector element $w9$, and that of R2 to selector element

$w10$, the other terminal of R3 being connected to the mating contact of contact $k1$, the other terminal of R4 being connected to the mating contact of $k2$, and the other contact of R5 being connected to the mating contact of $k2'$. The mating contact of $k1'$ is connected to the positive wire 89 and the double contact 83, 84 is also connected to this wire.

The carriage-lowering magnets M, M, here shown as a single magnet, are also connected to the positive wire 89 and to the negative terminal by a switch SII and a branch 90. The switch SII is controlled by an auxiliary relay HRII which is connected to the negative terminal at one end and to contacts 91, 92 at the carriage-shifting magnet VM at the other end. 93 is a switching lever which is normally engaged with contact 91 and is connected to the wire 78 extending to the strip 75 of the machine switch MS. The switching lever 93 is controlled by an armature 94 of the magnet VM. The magnet VM is connected to the positive terminal directly and to the negative terminal across a switch SIII and a branch wire 94. The switch SIII is controlled by an auxiliary relay HRIII which is connected to the selector element $w30$ at one terminal and to the negative wire 95 at the other terminal.

The electromagnet 47' above the "5" key of the unit row is connected to the element $w29$ at one end and to the negative wire 72 at the other so that the magnet 47' is energized when the switch SI and the element $w29$ are closed.

Assume now that a printing plate having projections 69 at 1, 3, 5, 9, 10, 11, 15, 16, 19, 21 and 29, as shown in Fig. 7, arrives at the printing station 4 above the elements $w1$ to $w30$ of the multiple selector switch W at the printing unit and the hand switches $h1$, $h3$ and $h5$ are closed. A printing plate having projections as described represents the figure 741.05. If this plate is printed the figure 741.05 is added to the amount already in the calculating unit. When the plate has come to rest above the elements $w1$ to $w30$ of the selector switching elements of the multiple selector switch W the elements bearing the numerals of the projections 1, 3, 5, etc. are closed after the main switch has closed, as shown in Fig. 6. Closing the selector elements $w1$, $w3$, $w5$ supplies current to the controlling magnet StM as the hand switches $h1$, $h3$, and $h5$ are closed, and the plate is printed. The excitation of the controlling magnet StM closes the switch ZS and the auxiliary relay HRI is supplied with current, closing the switch SI, as in the elevated position of the printing arm 1 the switching member of the machine switch MS connects the strips 73 and 74 in the position 76'. The auxiliary HRI now closes the switch SI.

The following circuits are now established with reference to the highest decimal, for counting "700": Positive terminal, selector switching element $w9$, relay R1, wires 88, 72, switch SI, negative terminal; positive terminal, selector switching element $w10$, relay R2, wires 88, 72 switch SI, negative terminal. Both relays R1 and R2 of the highest decimal in the set C are excited, their switches are attracted and the contacts $k1$, $k1'$ and $k2$, $k2'$ assume the position shown in Fig. 6. A circuit is now established from the positive terminal, wire 89, contact $k1'$, wire 80, contact $k2'$, relay R5 to negative wire 88. This causes the arm 87 which is also connected to the wire 88, to assume the closing position shown. A circuit is now established from the positive terminal, the selector element $w11$, electromagnet 7 of highest decimal, arm 87, negative wires 88, 72, switch SI, to the negative terminal, and the electromagnet of key 7 is excited. At the same time the magnet 4 in the next lower, and the magnet 1 in the last decimal before the decimal point are excited as well as the magnet 5 in the unit position. In the second decimal only the relay R2 of this decimal is excited across the selector element 15 and in consequence the relay R4 is excited and the magnet 4 of this digit is also excited, being connected to the selector element $w16$, also closed. In the relays of the third decimal a circuit is closed across the closed selector element $w19$ by the relay R1 and in consequence the relay R3 is excited, causing the closing of the circuit through the electromagnet 1 of the corresponding decimal, as shown, as the electromagnet 1 of this decimal is connected to the, also closed, selector element $w21$. In the relays for the last decimal the relays R1 to R5 remain open as no corresponding selector element is closed, and no electromagnet is supplied with current. This is correct as there is a "0" after the decimal point which is automatically calculated.

The electromagnet 47' of the last decimal is supplied with current, the selector element $w29$ being closed, and all electromagnets representing the figure 741.05 are excited. Obviously all electromagnets are excited together and immediately when the printing arm 1 begins to descend. As it descends the switching member of the machine switch MS moves into the full-lines position and this, while the circuits which have been made, remain unaltered, establishes the following circuit: Positive terminal, contact 75, wire 78, contact 93, 91, auxiliary relay HRII, negative terminal, exciting the auxiliary relay HRII and closing switch SII. The consequence is the establishing of a circuit through the carriage-lowering magnets M, switch SII, wire 90, 95 to the negative terminal and operating the keys 50 of the calculating unit in the manner described. As the strip 75 is only connected to the positive terminal after the electromagnets 47 have been excited, the carriage 45 can be lowered only after the magnets corresponding to a given figure have been excited, and their armatures have moved into active position.

As only a single electromagnet 47' is provided in the last decimal for the numeral "5" only figures may be added which have a "0" or "5" in the last digit which is sufficient for a system of the decimal type, for instance, one mark at 100 pfennig, as in the German system. The numerals therefore only indicate 0 and 5 pfennig, but no intermediate values. If nine electromagnets were provided for the last decimal another relay unit would be required with four more selector elements in a machine for adding numerals at five digits. In a selector switch having thirty elements only four elements would be available for selecting the printing plates to be printed which is hardly enough for many operations.

It will be understood from the above description that either the relay R1 or the relay R2 is excited so that either one electromagnet for each of the keys 1, 2, and 3, or for the keys 4, 5, and 6, is excited, or that both relays R1 and R2 are excited, in which case one electromagnet for the keys 7, 8, and 9 will be excited.

If a printing plate arrives at a point above the multiple selector switch W which printing plate in addition to other operating means 69, has one of them at the point "30", it will close also

the selector switching element $w30$, closing the circuits shown in dotted lines in Fig. 6. A circuit is now established from the positive terminal across the element $w30$, auxiliary relay HRIII, and to the negative terminal at the same time as the circuits through the key magnets 47, 47'. Relay HRIII closes the switch SIII and makes connection of the carriage-shifting magnet VM to the positive terminal through wire 89, and to the negative terminal across switch SIII and wires 94 and 95. The shifting magnet VM now displaces the carriage 45 for one decimal to the left, arrow 67 in Fig. 2, as described, and the magnet 47' is now above the "5" key of the second decimal, and furthermore, for instance, the electromagnets of the fifth decimal come in line with the keys of the sixth decimal. If the printing plate in Fig. 7 had the member 30 it would correspond to 7410.50, and this amount would be added in the calculating unit. The electromagnets 47, 47' are excited at the same time as the shifting magnet VM and only then, as described, the auxiliary relay HRII is excited across the contact 75 and the magnets M are excited for lowering the carriage 45.

In order to make sure that the auxiliary relay HRII is excited only after the shifting magnet VM has attracted its armature 94 and has shifted the carriage 45 in the direction 67, the contact 91, 93 is broken when the shifting magnet VM begins to attract its armature and the auxiliary relay HRII is only connected to the wire 78 across contact 92 when the armature 94 has been fully attracted, the contact lever 93 getting into connection with the contact 92.

After the operation of the calculating unit B has been performed by the lowering magnets M the member 76 of the machine switch MS moves into the position 76'' in which the machine switch is open, de-energizing the relays HRI, HRII and, under certain conditions, HRIII, as well as all relays in the set C. All electromagnets 47, 47', the lowering magnets M and the shifting magnet VM are also de-energized and the springs 62 and 68 return the carriage 45 into its initial position.

It is obvious that the described system may also be applied to machines without skipping means, that is, machines in which all printing plates fed through the machine, are printed. In such a machine the magnet StM and the switch ZS are dispensed with and the machine switch MS is in the circuit from the positive to the negative terminal together with the relay HRI.

The cables D at the printing unit A are preferably made detachable so that the printing unit may be operated like a normal address-printing machine. With consideration of this the printing unit is equipped with the switches shown in dotted lines in Fig. 6 which are permanently short-circuited when the calculating unit is operated from the address-printing unit.

The switches, relays and electromagnets shown in Fig. 6 are illustrated diagrammatically only and in fact will be designed in any suitable manner.

Fig. 8 shows a diagram of connections without the relay set C. Here nine selector switching elements w of the multiple switch W are connected to the nine electromagnets 47, of each decimal row while the extra magnet 47' is connected to the selector element $w29$. In this system numerals at four digits may be added having a "0" or "5" as the last digit, for instance, from 0 to 99.95 marks.

All printing plates may be printed in the system Fig. 8, or it may be equipped with skipping means. In the present instance a switch X is provided which the operator controls by a handle or a pedal, the switch X replacing a selector switching element and a hand switch, for instance, $w1$ and $h1$ in Fig. 6. Fig. 8 shows the switch X closed so that a printing plate arriving at the multiple selector switch W is printed. Let this plate have the figure 41.05 and that it operates the elements W7, W19, and W29, making the circuits shown in heavy lines through the electromagnets 47 and 47', after switch SI has been closed as described above. Otherwise the system in Fig. 8 is operated exactly like the system in Fig. 6 so that its operation need not be described.

The means for shifting and lowering the carriage 45, magnets VM and M, are provided in the system Fig. 8 and connected exactly as in Fig. 6. VM is excited when the selector element $w30$ is closed. If the plate with the figure 41.05 had in addition the member 30, its amount would be 410.50.

Obviously the shifting magnet VM may be dispensed with in both systems Fig. 6 and Fig. 8, if not required.

I am not limited to the decimal system but may employ calculating machines of any other systems.

I claim:

1. A combined address-printing and calculating machine comprising separate printing and calculating units, a multiple selector switch on said printing unit under the control of printing plates, means including electromagnets and their armatures for operating said calculating unit, means for moving said operating means into active position with respect to said calculating means, circuits extending from said multiple switch to said electromagnets and to said moving means, a machine switch having contacts which are so arranged as to first make the circuits of said electromagnets, and then the circuit of said moving means, and a switch controlled by said multiple switch so as to admit current to said machine switch only if a plate is printed.

2. A combined address-printing and calculating machine comprising separate printing and calculating units, a multiple selector switch on said printing unit under the control of printing plates, means including electromagnets and their armatures for operating said calculating unit, means for moving said operating means into active position with respect to said calculating means, circuits extending from said multiple switch to said electromagnets and to said moving means, a machine switch having contacts in the circuits of said electromagnets, a relay adapted to make said circuits, a switch connected to said machine switch for controlling said relay, and contacts under the control of said machine switch for making the circuit of said moving means.

3. A combined address-printing and calculating machine comprising separate printing and calculating units, a multiple selector switch on said printing unit under the control of printing plates, means including electromagnets and their armatures for operating said calculating unit, means for moving said operating means into active position with respect to said calculating means, circuits extending from said multiple switch to said electromagnets and to said moving means, a machine switch having two contacts in the circuit of said electromagnets, a third contact,

a relay in the circuit of said third contact, and a switch under the control of said relay in the circuit of said moving means.

4. A combined address-printing and calculating machine comprising separate printing and calculating units, a multiple selector switch on said printing unit under the control of printing plates a keyboard on said calculating unit, a carriage of less width than said keyboard, means including electromagnets and their armatures on said carriage for operating said calculating unit, means for shifting and means for lowering said carriage with respect to said calculating unit, and circuits extending from said multiple switch to said electromagnets and said shifting and lowering means.

5. A combined address-printing and calculating machine comprising separate printing and calculating units, a multiple selector switch having selector switching elements under the control of printing plates on said printing unit, means including electromagnets and their armatures for operating said calculating unit, a set of relays, conductors extending from said selector-switching elements to said relays, and switching means in said relays which are so connected to said electromagnets that a given number of electromagnets are controlled by a lesser number of selector switch units.

6. A combined address-printing and calculating machine comprising separate printing and calculating units, a multiple selector switch having selector switching elements under the control of printing plates on said printing unit, means including electromagnets and their armatures for operating said calculating unit, circuits extending from said selector switching elements to said electromagnets, and relays in said circuits including five relays per decimal row of electromagnets, means for exciting the third relay upon exciting the first relay, means for exciting the fourth relay upon exciting the second relay, and means for exciting the fifth relay upon exciting the first and second relays, and switches in the third, fourth, and fifth relays for connecting groups of three electromagnets to a return circuit.

7. A combined address-printing and calculating machine comprising separate printing and calculating units, a multiple selector switch having selector switching elements on said printing unit under the control of printing plates, means including electromagnets and their armatures for operating said calculating unit, a set of relays subdivided into relay groups, with control and other relays in each group, conductors extending from said selector-switching elements to said relays, and a switch in each control relay cooperating with two contacts which are connected to each other in pairs and adapted to cooperate with fixed contacts connected to the said electromagnets and to circuits of the other relays in the set, respectively.

8. An address-printing and calculating machine comprising separate printing and calculating units, a multiple selector switch on said printing unit under the control of printing plates, a carriage, means including electromagnets and their armatures on said carriage for operating said calculating unit, means for displacing said carriage with respect to said calculating unit, and circuits extending from said multiple switch to said electromagnets and to said carriage-displacing means.

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