

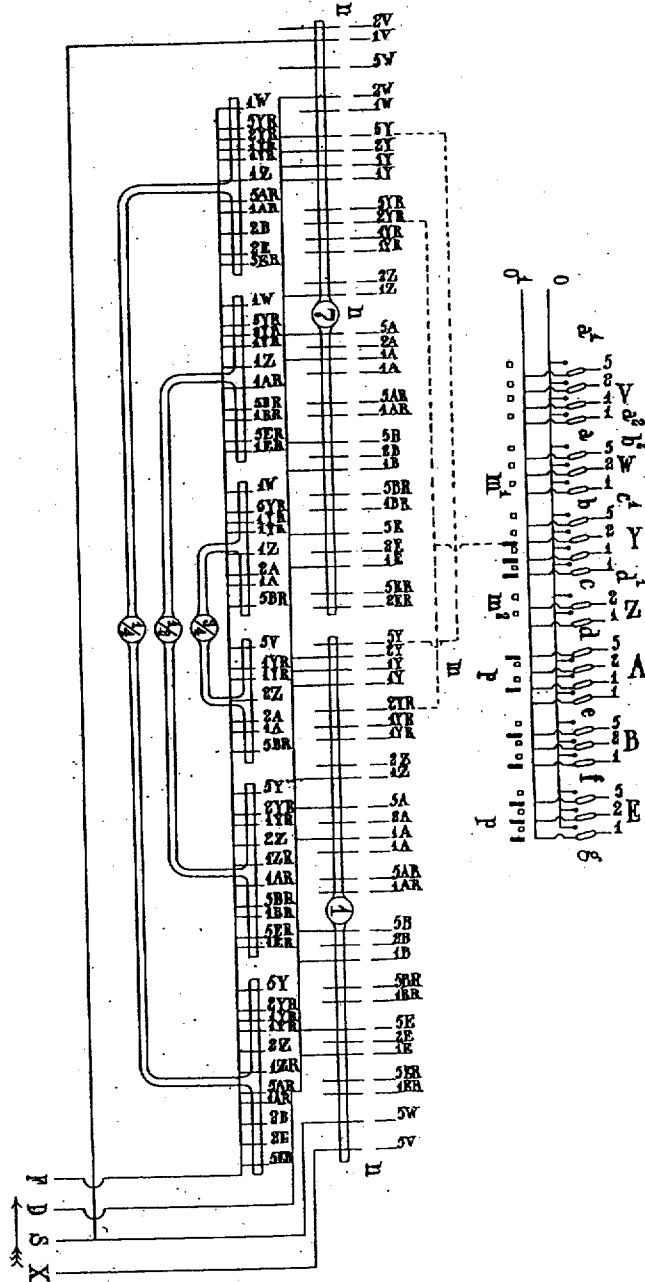
March 25 , 1924.

1,487,704

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COMMUNICATION OF TYPED OR REGISTERED NUMERICAL VALUES TO COMPUTING MECHANISMS

Filed July 9, 1923



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UNITED STATES PATENT OFFICE.

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COMMUNICATION OF TYPED OR REGISTERED NUMERICAL VALUES TO COMPUTING MECHANISMS.

Application filed July 9, 1923. Serial No. 650,504.

To all whom it may concern:

Be it known that I, JAMES MARK MCGINNIS BARR, a citizen of the United States of America, and residing at 68 Victoria Street, London, S. W. 1, England, have invented certain new and useful Improvements in the Communication of Typed or Registered Numerical Values to Computing Mechanisms, of which the following is a specification.

This invention relates to calculating machines in which, when a line of digits is typed or finger keyed, the values of such digits is transferred to the digit receiving devices of the calculating machine, and has for its object to devise improvements in the construction, arrangement, and mode of operation of such machines by which the manipulation of the machine and fulfilment of its proper functions will be greatly facilitated.

The invention consists in a calculating machine of the type referred to provided with mechanism intermediate of the keys and the computing devices adapted to receive the digit values and to hold the same for any predetermined length of time so that the operator may be enabled to view the line for possible corrections before allowing the transference of the digit values by such intermediate devices to the counters or computing devices.

The invention also consists in a calculating machine of the type referred to having means for converting the typed digits into a different system of numbers (such, for example, as a decimal system) before transference to the counters or computing mechanism.

The invention also consists in a calculating machine of the above character in which means are provided to enable a key for any given digit to operate to return to normal position and thus cancel the effect of any devices operated by a previously depressed key in order that the digit values set up by one key may be suitably modified by the operation of a subsequent key.

The invention also consists in other details and arrangements hereinafter described or indicated.

The accompanying drawing illustrates diagrammatically one convenient arrange-

ment of mechanism in accordance with my invention.

In carrying my invention into effect in one convenient manner as, for example, in its application to an electrically operated calculating machine I provide means upon the machine for enabling any digit values to be finger keyed thereon or printed thereby as, for example, I may provide a special bank of keys or I may combine with the machine a typewriter having keys, and although only five of such keys are shown in the drawing (representing respectively the values 7, 1, $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$) it will be understood that the keys may be of any suitable number and that the machine may be adapted for the conversion of any system of discrete numbers into any desired system of other numerics.

In the particular example illustrated I have considered only the conversion of sterling pence into the equivalent decimal values of sterling pounds and the letters V W Y Z A B E are taken to represent the positions of numbers after the decimal point. Thus, for example, 7 pence is .0291666 of a pound and the decimal value in accordance with the system of notation given above would be represented thus:—

V	W	Y	Z	A	B	E
0	2	9	1	6	6	6

Each key is associated with a number of contacts and for the sake of simplicity I provide the keys with groups of contacts representing the values 5 2 1 1 since from this group of values any value from 0 to 9 can be built up but in some cases the group of contacts may be reduced where, for example, it is found by the predetermined calculations necessary for the machine that a certain key never requires a number higher than a certain value in a particular decimal position.

The arrangement is such that when a key is depressed for a particular carriage position of the typing machine or for any other factor determining denomination of the key depressed such key completes contacts which energize electromagnets actuating some or other of the switches *a b c d e f* and *g* for the decimal positions V W Y Z A B E according to the predetermined

decimal value of the particular key depressed. For example, taking the key 7 representing 7 pence this would set up on the switches the value 0 2 9 1 6 6 6 and such switches would close circuits to suitable ball release mechanisms or other devices so that when the circuits were made live the counters or computing mechanisms corresponding to the decimal positions V W Y Z A B E would receive respectively 0, 2, 9, 1, 6, 6, 6, balls or other devices determining the positions of the counters or computing mechanisms to represent the values so given.

When dealing with pence keys in a sterling machine it is obvious that the decimal value given by the particular pence key depressed may have to be modified if such pence key is followed by a key representing a fraction of a penny, and I therefore arrange the pence key to be latched in position until the machine has determined whether the depression of such key is to be followed by the depression of a fraction key.

The corresponding pence circuits are connected together and to suitable return contacts for returning the V W Y Z A B E switches, the arrangement being such that if the depression of such key is followed by the depression of a fraction key some or all of the switches set by the pence key are returned, thus cancelling the effect of the depression of such key and a new set of values is set up on the switches for subsequent transference to the counters or computing mechanisms. For example, the depression of the key denoting 7 pence sets up on the switches the values 0 2 9 1 6 6 6 and this value would be subsequently transferred to the computing mechanisms if the depression of the key were not followed by the depression of a fraction key. Assuming, however, that the $\frac{1}{2}$ key is subsequently depressed so that the value required is that of $7\frac{1}{2}$ pence the operation of such key returns the values given by the preceding 7 pence key and replaces such values by the value .0312500, which is the decimal value of $7\frac{1}{2}$ pence.

It will be understood that for any particular machine the values to be given by the various keys for the various denominations must be pre-arranged and the contacts arranged accordingly so that each key 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, for example, will be similarly provided with contacts to produce the respective decimal values for these figures and also to produce in combination with $\frac{1}{2}$, $\frac{1}{4}$, etc. the modified decimal values in the manner described.

In the drawing, the R signifies return so that, for example, while 5 Y represents the switch operating the release of five balls to the counter denoting the digit 5 in the third place of decimals 5 Y R denotes a

circuit designed to return the 5 Y switch and so on for the other series of references given.

The references F D S X represent respectively the carriage positions for fractions of pence, units of pence, units of shillings and tens of shillings and the arrow denotes the direction of movement of the distributor brush or other device, the position of which depends upon the particular denomination required, the arrangement being such that current flows through the X conductor in the position for tens of shillings, through the S conductor in the position for units of shillings, through the D conductor in the position for units of pence and through the F conductor in the position of fractions of pence.

In the example shown, the key contacts are indicated by the gaps *n* in the lines marked 2 V, 1 V, 5 W, 2 W, 1 W, etc. and such contacts are connected to their respective relays operating the switches *a b c d e f* and *g*. Thus, as shown by the dotted lines *m* all the 5 Y contacts are connected to the relay *m'* actuating the 5 switch *c'* in the Y group of switches. Similarly, all the 2 Z contacts would be connected to the relay *m''* actuating the 2 switch *d'* in the Z group of switches, and so on throughout the series.

All the unit keys of the machine make their contacts direct, that is to say, when any unit key is depressed the contacts *n* are closed for that particular key and the corresponding switches *a b c*, etc. for that key moved over to the left from the position shown in the figure, as the current passes through one or other of the conductors F D S X as determined by the carriage position as above described. Thus, for example, seven shillings is .35 of one pound, so that if the key 7 is depressed when the carriage is in position S denoting units of shillings, it will be seen that current passes through 2 V, 1 V and 5 W to move over the switches *a'*, *a''* and *b''* so that the circuits controlled by these switches are completed through to suitable electromagnetic devices adapted to release corresponding numbers of balls to counters. That is to say, when current passes through the conductor *o*, the ball release mechanism will be actuated to pass 3 balls to the V counter and 5 balls to the W counter, so that the counters will show 35. Again, if the seven key is depressed in the carriage position D denoting units of pence, the contacts 2 W, 5 Y, 2 Y, 1 Y, 1 Y, 1 Z, 5 A, 1 A, 5 B, 1 B, and 5 E, 1 E, are closed to establish connection with the relays actuating the 2 switch in the W group, the whole of the switches of the Y group, 1 switch of the Z group and the 5 and 1 switches of the A, B and E groups respectively, so

that when current is passed through the conductor *o*, the values 0, 2, 9, 1, 6, 6, 6, are released to the counters and this value is shown thereon.

As stated above, however, when a pence key is depressed, it is temporarily latched in case the value may have to be altered by subsequent depression of a fraction key, for which purpose the fraction keys do not make contact direct, but through the units keys. Take for example, the value 7½ pence. It has been shown that when the 7 pence key is depressed, the values set on the switches *a b c* etc. is 0 2 9 1 6 6 6. However, 7½ pence is .0312500 of a pound, and hence this value must be set up on the switches and subsequently delivered to the counters. This means that when the halfpenny key is depressed, 1 W switch must be moved over, 5 Y, 2 Y and 1 Y switches must be returned to the normal position, leaving only 1 V set up, 1 Z must be set up, 1 A must be returned, and 5 B, 1 B and 5 E, 1 E also returned. It will be seen from the figure that these conditions are satisfied by depression of the halfpenny (½) key, if such key completes the contacts, 1 W, 5 Y R, 2 Y R, 1 Y R, 1 Z, 1 A R, 5 B R, 1 B R, 5 E R and 1 E R, the reference R denoting return as above referred to. For such fraction keys the carriage is in the position for current to pass through the conductor F in order to energize the relays of the switches to be set by such keys. The conductor *o'* is for subtraction, it being evident that if the switches are operated as above described for the normal key values, the switches *a b c d e*, etc. which have not been moved will represent the supplements of such key values (or difference between each of such key values and 9) and the subtraction may be effected by the addition of the supplements as is known.

The switches *a b c d*, etc. are associated with return relays such as are indicated at *p*, and such relays may be actuated to move all switches to the normal position as shown in the figure when current is passed there-through by the operation of the distributor brush or by means of a key or otherwise.

It is to be understood that I have described the invention in terms of sterling pence values and then conversion into equivalent decimal values of sterling pounds only for the sake of clarity and illustration but that conversions by the above means will in my invention be made from any desired system of numerics into any other or any discrete system of numbers which is the dictionary definition of such numbers as shillings and pence may be so converted.

It is to be understood that the operations may be performed by purely mechanical means without the use of electromagnets although the latter form a preferred method.

The keys may carry tooth combs representing the chords of digit values described and so mechanically exert pressures or tensions in particular positions thus operating the required motions to communicate the digits as aforesaid.

Claims.

1. In a calculating machine, a series of groups of switches each group corresponding to a predetermined position in the decimal system of notation; each switch corresponding to a predetermined digit, electromagnets for operating said switches, a plurality of electric circuits associated with said electromagnets, a plurality of finger keys controlling said electric circuits, each key being designated by a digit, and means whereby the denomination of the key may be varied, so arranged that the depression of a key will cause the operation of predetermined switches which correspond to the decimal equivalent of the digit and denomination.

2. In a calculating machine, a plurality of finger keys, each designated by a digit, means for varying the denominational effect of such keys, a plurality of electric circuits controlled by the operation of the said keys, electromagnets associated with said circuits, switches operated by the said magnets, each switch corresponding to a predetermined decimal fractional value, and means whereby the operation of a finger key operates switches which constitute the decimal equivalent of the digit on the finger key in the denomination desired.

3. In a calculating machine means for converting shillings and pence into the equivalent decimal fractional value of pounds sterling comprising a finger key, a plurality of electric switches operated by said key, a plurality of electric circuits associated with said switches, and means whereby some of the said circuits are caused to be energized by the operation of the key when the key designates pence and other circuits when the said key designates shillings.

4. In a calculating machine means for converting shillings, pence and fractions thereof into their equivalent decimal fractional value of pounds sterling, comprising a plurality of finger keys, each key being designated by a digit, a plurality of switches, each switch corresponding to a predetermined fractional value of pounds sterling, means controlled by said keys for selectively operating said switches, and means whereby the selection of the switches is varied with the denomination of the finger key.

5. In a calculating machine means for converting shillings and pence into the equivalent decimal fractional value of pounds sterling comprising a plurality of finger keys, a plurality of switches, each

switch corresponding to a predetermined decimal fractional value of pounds sterling, means comprising electrical circuits and electromagnets for selectively operating said switches by the operation of the finger keys, and means whereby the denominational value of the finger keys may be varied and the selective operation of the switches is varied.

6. In a calculating machine means for converting shillings and pence into the equivalent decimal fractional value of pounds sterling comprising a finger key, a plurality of switches operated by said key, a plurality of electric circuits associated with said switches, means whereby some of said circuits are caused to be energized by the operation of said key when the key designates pence and other circuits when said key designates shillings, electromagnets in said circuits, and a plurality of switches operated by said electromagnets.

7. In a calculating machine means for converting shillings and pence into the equivalent decimal fractional value of pounds sterling comprising a plurality of switches, each corresponding to a predetermined decimal value, electromagnets for operating said switches, a plurality of electric circuits associated with said electromagnets, a plurality of finger keys controlling said electric circuits, each key being designated by a digit, and means whereby said keys may be used as shilling keys or pence keys interchangeably.

In testimony whereof I have signed my name to this specification.

JAMES MARK MCGINNIS BARR.