July 31, 1956 C. LAVILLE ET AL 2,756,823

TRANSDUCER FOR ACTUATING A CARD-PUNCHING MACHINE OR THE LIKE FROM A RACK COMPUTER OR THE LIKE

Filed Oct. 23, 1952

2 Sheets-Sheet 1

Fig.1

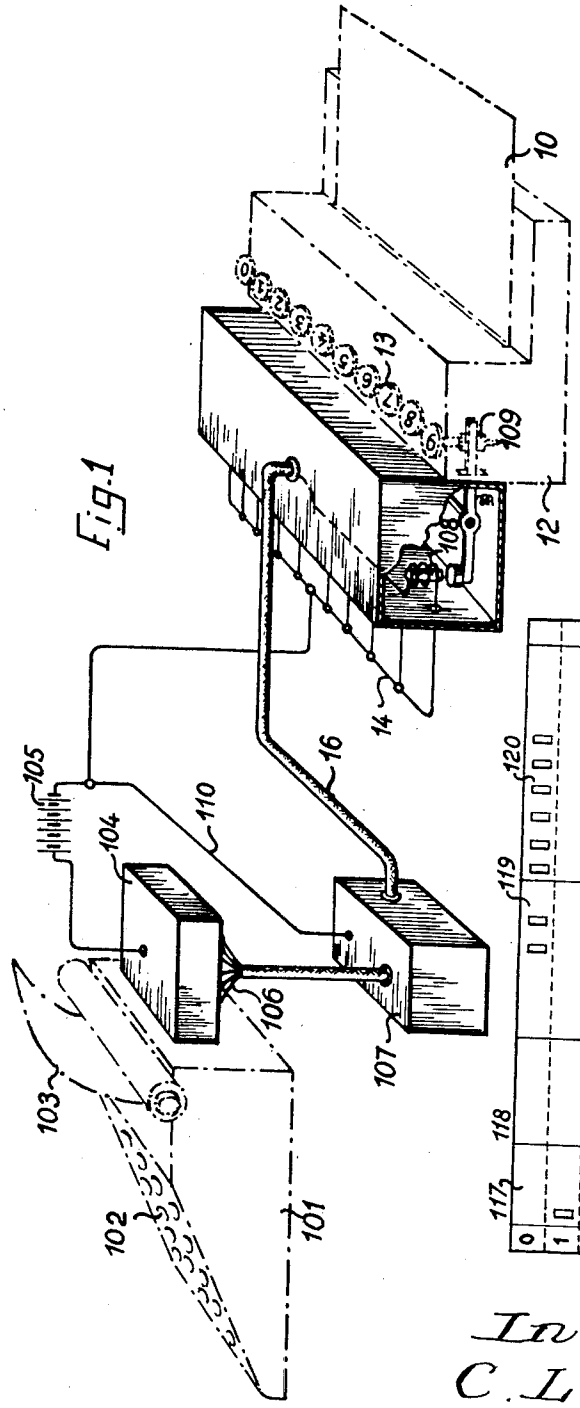
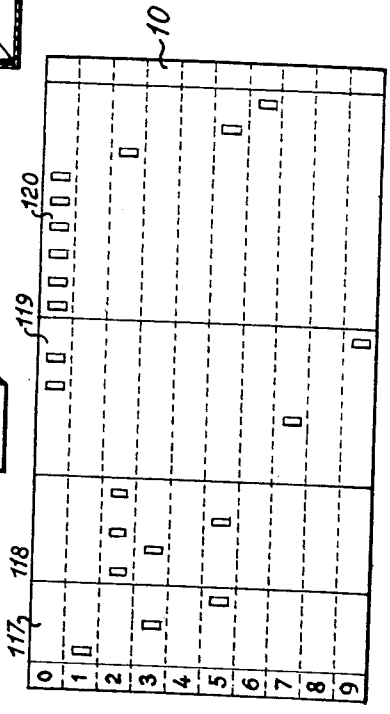


Fig.2



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2 Sheets-Sheet 2

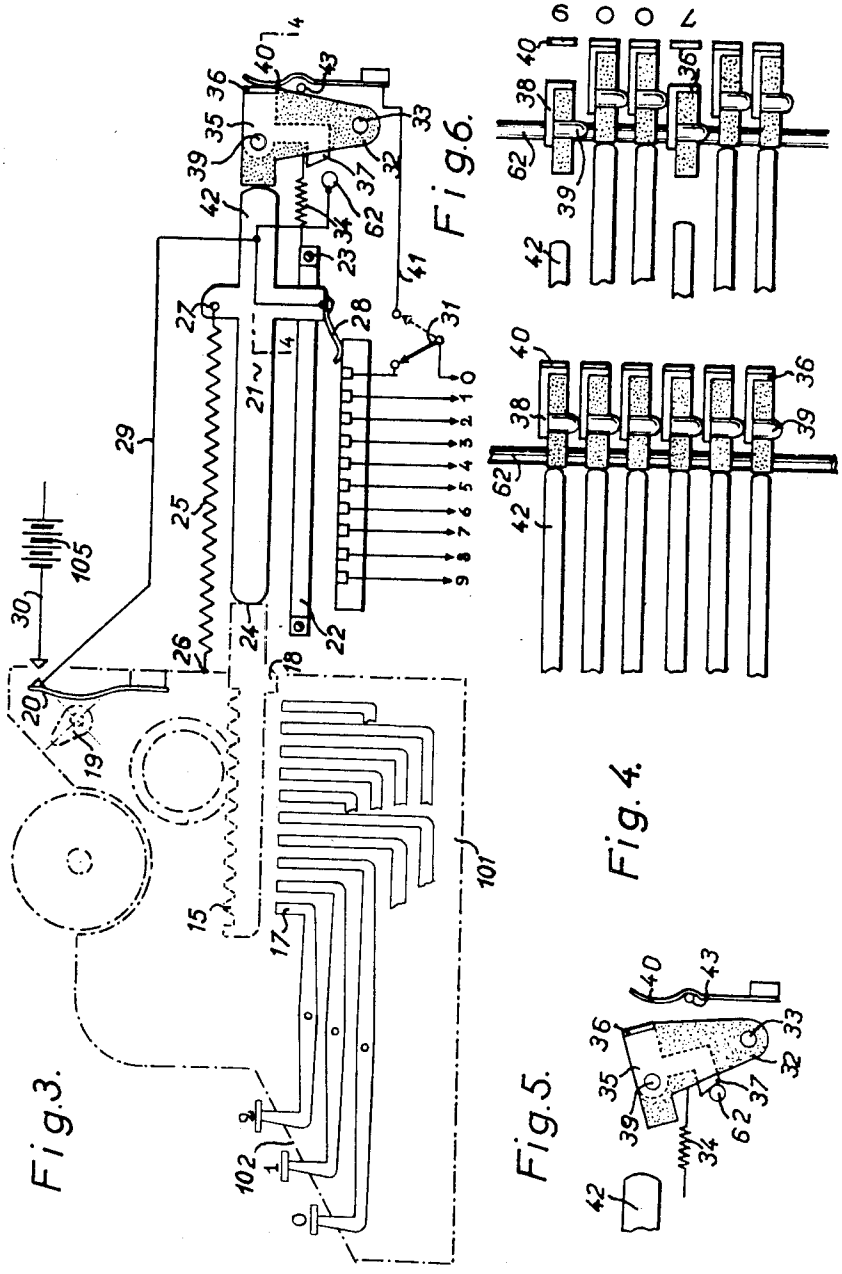


Fig. 3.

Fig. 4.

Fig. 5.

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TRANSDUCER FOR ACTUATING A CARD-PUNCHING MACHINE OR THE LIKE FROM A RACK COMPUTER OR THE LIKE

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2 Claims. (Cl. 164—113)

One object of our invention is to provide a transducer adapted to translate information, such as numbers, identified in a first machine, such as a computer, by well-defined positions of racks, or the like, into sequential or simultaneous electrical pulses to be used, either at once or after having been stored into any suitable memory, for actuating a second machine, such as a card-punching machine, adapted to read successively said electrical pulses into step-by-step information records.

It is usual to record on card-punching machines manually actuated by an operator typing on a keyboard, digital information, such as account operations, invoices and so on, which have been previously printed on a suitable computing machine.

A more particular object of our invention is to interpose a transducer of the type described between a computing machine such as a Burroughs-Moon machine and a card-punching machine such as an I. B. M. machine, the perforating machine being then automatically actuated in response to operation of the computing machine.

This arrangement has the advantage of eliminating the need for an operator for the perforating machine and thus avoids any risk of personal error. .

Now, generally speaking in digital informations, a zero has a significance only when it is written after a significant digit. In this cae, it is not necessary to write zeros before significant digits. For example, the number 0000105 is then exactly equal to the number 105. In a card-punching machine, it is advantageous to provide means for suppressing or eliminating all perforations identifying such non-significant zeros.

A further object of our invention is to provide a transducer of the type described comprising means to inhibit pulses corresponding to non-significant zeros, so as to suppress any useless perforation of the cards.

However, in certain cases, it may be desired to record zeros before significant digits, e. g. when such zeros are used as code items.

A further object of our invention is to provide in the transducer a shunt for said zero-pulse inhibiting means whereby to make the latter inoperative.

Other objects and advantages of the invention will be apparent from the following detailed description, together with the accompanying drawings, submitted for purposes of illustration only and not intended to define the scope of the invention, reference being had for that purpose to the subjoined claims.

In these drawings:

Fig. 1 is a general diagrammatical view showing a transducer according to the invention interposed between a typewriting computer and a card-punching machine.

Fig. 2 shows a card perforated under the control of a transducer according to the invention.

Fig. 3 is a longitudinal sectional diagrammatical view of a transducer according to the invention, shown with an associated typewriting computer.

Fig. 4 is a top plane view taken from line 4—4 of Fig. 3, Figs. 3 and 4 showing the transducer at rest.

Figs. 5 and 6 are views corresponding to Figs. 3 and 4 respectively, but showing the transducer conditioned to transmit digit information to produce the perforations shown in zone 119 of the card of Fig. 2.

As shown in Fig. 1, a typewriting computer 101 is provided with a keyboard 102. Digital data set on the keys of keyboard 102 are printed on a sheet of paper 103 while setting the racks, of the machine, Figure 3, in well-defined positions.

The transducer 104 according to the invention, which is described in detail hereunder is fed from a source of electric current such as a battery 105. Transducer 104 translates the positions of the racks 15 into electrical pulses which are available on the various outputs 106 of said transducer 104, each one of said outputs identifying one numerical value of one digit of the number set on keyboard 102. According as whether computer 101 operates step by step or simultaneously, the electric pulses appear on outputs 106 successively or simultaneously. In the first case they are transmitted directedly to electro-magnets 108, the number of which is equal to the maximum number of digits of the information items to be transmitted. In this case all output leads corresponding to a given digit but to different digit positions in the information number are multipled to one single electro-magnet 108.

In the case when the output pulses at 106 appear simultaneously, they are first conducted into a memory 107 which may be of any suitable known type and in which they are stored each at a separate storing position corresponding to one given digit and to one given digit position in the original information number. In this case, memory 107 also comprises any suitable known means for reading out step by step the digits stored to transmit them to electro-magnets 108, through a cable 16. Memory 107 and its step-by-step reading means are fed from any suitable power source such as a battery 105 through a conductor 110. Electro-magnets 108 are returned in parallel, as shown at 14, to battery 105.

Each electro-magnet 108 controlls one die 9 of the card-punching machine 12 which, otherwise, would be actuated from keys 13. From this moment the card-punching machine 12 operates as usual and perforates a card 10 step-by-step according to a predetermined code.

In the example shown in Fig. 2, card 10 is divided vertically into four zones 117, 118, 119, 120. Each one of said zones is to receive perforations for indicating a given data item. For example, zone 117 may indicate a code corresponding to a bank agency, zone 118 may indicate the date, zone 119 the code of a client and zone 120, a sum to be credited to said client. In the example shown, zones 117, 118, 119, 120 respectively, comprise 3, 5, 6 and 8 vertical columns permitting to record numbers having respectively 3, 5, 6 and 8 digits. On the other hand the card is divided horizontally into 10 rows each corresponding to a well-defined digit from 0 to 9. In the example shown, said digits are printed on the card to permit visual reading of the same. The perforations shown as an illustration in Fig. 2 mean, with the previous assumptions, that in the agency 135, on February the 23rd, 1952, a client identified by the code number 7.009 has been credited of $256.

In Fig. 3, it may be seen that upon the depression of each of the keys 0, 1, 2, 3, etc., of each vertical row of the keyboard 102 of computer 101 an abutment such as 17 is raised to a position to predetermine a well-defined position of rack 15 the raised abutment acting as a stop for cooperation with an abutment 18 on the associated rack. The latter is brought into said well-defined position

upon depression of the corresponding key by well-known means incorporated in computer 101. The latter also comprises a number of moving parts, such as cam 19 which are displaced by a constant stroke, at each actuation of the computer, whichever may be the particular key or keys depressed. In the example shown in Fig. 3, cam 19 has been selected to control the transducer according to the invention.

Said transducer comprises a switch 20 closed when cam 19 reaches the maximum amplitude of its stroke, i. e. whenever at least one key of keyboard 102 is depressed. A brush-carrier 21 slidably guided e. g. in a slot 22 of a comb 23 is associated with each rack 15 of computer 101. In the example of Fig. 3, brush-carrier 21 is continuously urged into abutment at 24 with rack 15 by means of a spring 25 anchored at one end as shown at 26 on the frame of computer 101 and at its other end, as shown at 27, on brush-carrier 21.

Each brush-carrier 21 carries a brush 28 scanning a row of ten fixed contacts numbered from 0 to 9. All brushes 28 are fed in parallel through conductors 29 from switch 20 which is fed from battery 105 through a conductor 30.

The relative arrangement of the fixed contacts 0 to 9 and brushes 28 with respect to the arrangement of abutments 17 and 18, is such that when rack 15 occupies a position corresponding to, say, digit 3, the brush 28 associated with said rack is set on the fixed contact numbered 3 of its associated row. In these conditions, when switch 20 is closed under the control of cam 19, an electrical pulse is transmitted to fixed contact 3. There is provided a number of rows of ten fixed contacts equal to the number of racks 15, which is itself equal to the digit capacity of computer 101. The above described fixed contacts correspond to outputs 106 of Fig. 1.

As mentioned in the preamble, it may be desired to inhibit pulses corresponding to zeros located, in a number, before significant digits. For this purpose, the output connections from all zero fixed contacts may be interrupted by means of a reversing switch 31 interposed in said connections, the zero outputs being then obtained from switch 20 through inhibiting means adapted to inhibit all pulses corresponding to zeros located before significant digits, while transmitting all pulses corresponding to zeros located behind significant digits.

In the example shown in Figs. 3 to 6, said inhibiting means are constituted by a series or stack of tiltable contacts 32 pivoted at 33 around a common axis and continuously urged counter-clockwise by springs 34. Each tiltable contact 32 comprises a body of insulating material and a metal member 35 having an output contact end portion 36, an input contact portion 37, a contact face portion 38 on one side thereof and a contact pin portion 39 extending from its opposite side. In the at rest position shown in Figs. 3 and 4, the output end portion 36 is engaged with an output spring contact 40 connected through a conductor 41 with the above-mentioned reversing switch 31. The tiltable contact 32 is normally held in at rest position by an extension 42 of the corresponding brush carrier 21. When said brush-carrier is set on a position corresponding to a significant digit, the extension 42 moves away from the relevant tiltable contact 32, thus releasing the same so that it tilts into the position shown in Fig. 5 in which the input contact portion 37 is engaged against the input bus-bar 62 fed from switch 20. In the meantime, the output contact between portion 36 and spring contact 40 has been interrupted due to the fact that the movement of the latter has been stopped by an abutment 43.

The relative arrangement of the tiltable contacts in a stack is such that the contact pins 39 are adjacent the contact faces 38 of the preceding contacts, that is, looking from top to bottom in Figures 4 and 6. Thus the face 38 of any tilted contact such as for the digit 7 in Figure 6 is in slidable engagement with the pin of the next successive contact, looking from bottom to top of the figure even though the latter contact is not tilted. The pin of the tilted contact has moved out of engagement with the face of the preceding tiltable contact and remains out of engagement therewith until such time as that preceding or lower contact in the figure is tilted.

Now, when a given rack is set on zero, the corresponding tiltable contact is but slightly moved counter-clockwise by a displacement which is insufficient to establish engagement of input contact portion 37 with bar 62. This slight movement is also insufficient to break engagement between output contact portion 36 and spring contact 40. In these conditions, for zeros located in advance of significant digits, the relevant tiltable contacts do not receive any current even if the contacts corresponding to significant digits have been tilted. Such would be the case, for example, for zeros set on the two lower racks of Fig. 6. On the contrary, for zeros occurring behind or in succession of a significant digit, the relevant non-tilted contacts receive current from the preceding tilted contact associated with said significant digit and are then capable of transmitting electrical pulses. Such is the case, for example, for zeros corresponding to the second and third tiltable contacts of Fig. 6, as viewed from the top of this figure.

In the example shown in Fig. 6, if number 007009 is set on computer 101, the first two zeros are inhibited and the perforating machine only perforates number 7009, as shown in zone 119 in Fig. 2, which avoids the presence of superfluous perforations, such as shown in zone 120. If, however, said perforations are required, it suffices to set the reversing switch 31 of Fig. 3 into the dotted line position. Then, no output is transmitted from the tiltable contacts and the zeros outputs are taken directly from the relevant fixed contacts exactly as in the case of significant digits.

What is claimed is:

1. A transducer for actuating a card-punching machine adapted to translate electrical pulses into decimal number records from a computing machine of the type in which the numerical value of each decimal order of an information number is identified by a position selected among ten possible positions of a rack, comprising a source of electric current, a plurality of rows of ten fixed contacts, a brush adapted to scan each of said rows of ten contacts, a brush-carrier movable in response to movement of each of said racks and adapted to engage the brush carried thereby with one contact of the associated row of contacts for each one of the ten numerical value identifying positions of said rack, a switch adapted to be closed upon any digit identifying actuation of said computing machine, means establishing a feeding circuit from said source to said brush through said switch, means for feeding said card-punching machine with output electrical pulses from those of said fixed contacts which correspond to significant digits zero pulse inhibiting means comprising an input bus-bar fed from said source through said switch, a plurality of output spring leaves and a stack of tiltable contacts, each tiltable contact having an input portion adapted to engage said bus-bar upon tilting of said contact, an output portion adapted to be held in engagement with one of said spring leaves when said contact is in non-tilted condition, said contacts further including a contact pin on one side thereof and a contact face on the opposite side thereof, the contact face of a tilted contact being slidably engaged with the contact pin of the next succeeding tiltable contact and the contact pin of said tilted contact being engaged with the contact face of the next preceding contact only if the latter is also tilted, elastic means urging each of said tiltable contacts toward tilted position and each contact being maintained in non-tilted position by an associated rack so long as the latter is not set on a significant digit and means including switching means for selectively feeding said card-punching machine with output electri-

cal pulses either from said output spring leaves or from those of said fixed contacts which correspond to zeros.

2. A transducer for actuating a card-punching machine adapted to translate electrical pulses into decimal number records from a computing machine of the type in which the numerical value of each decimal order of an information number is identified by a position selected among ten possible positions of a rack, comprising a source of electric current, a plurality of rows of ten fixed contacts, a brush adapted to scan each of said rows of ten contacts, a brush-carrier movable in response to movement of each of said racks and adapted to engage the brush carried thereby with one contact of the associated row of contacts for each one of the ten numerical value identifying positions of said rack, a switch adapted to be closed upon any digit identifying actuation of said computing machine, means establishing a feeding circuit from said source to said brush through said switch, means for feeding said card-punching machine with output electrical pulses from those of said fixed contacts which correspond to significant digits, zero pulse inhibiting means comprising an input bus-bar fed from said source through said switch, a plurality of output spring-leaves and a stack of tiltable contacts, each tiltable contact having an input portion adapted to engage said bus-bar

upon tilting of said contact, an output portion adapted to be held in engagement with one of said spring leaves when said contact is in non-tilted condition, said contacts further including a contact pin on one side thereof and a contact face on the opposite side thereof, the contact face of a tilted contact being slidably engaged with the contact pin of the next succeeding tiltable contact and the contact pin of said tilted contact being engaged with the contact face of the next preceding contact only if the latter is also tilted, elastic means urging each of said tiltable contacts toward tilted position and each contact being maintained in non-tilted position by an associated rack so long as the latter is not set on a significant digit, and means for feeding said card-punching machine with output electrical pulses from said output spring leaves.

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