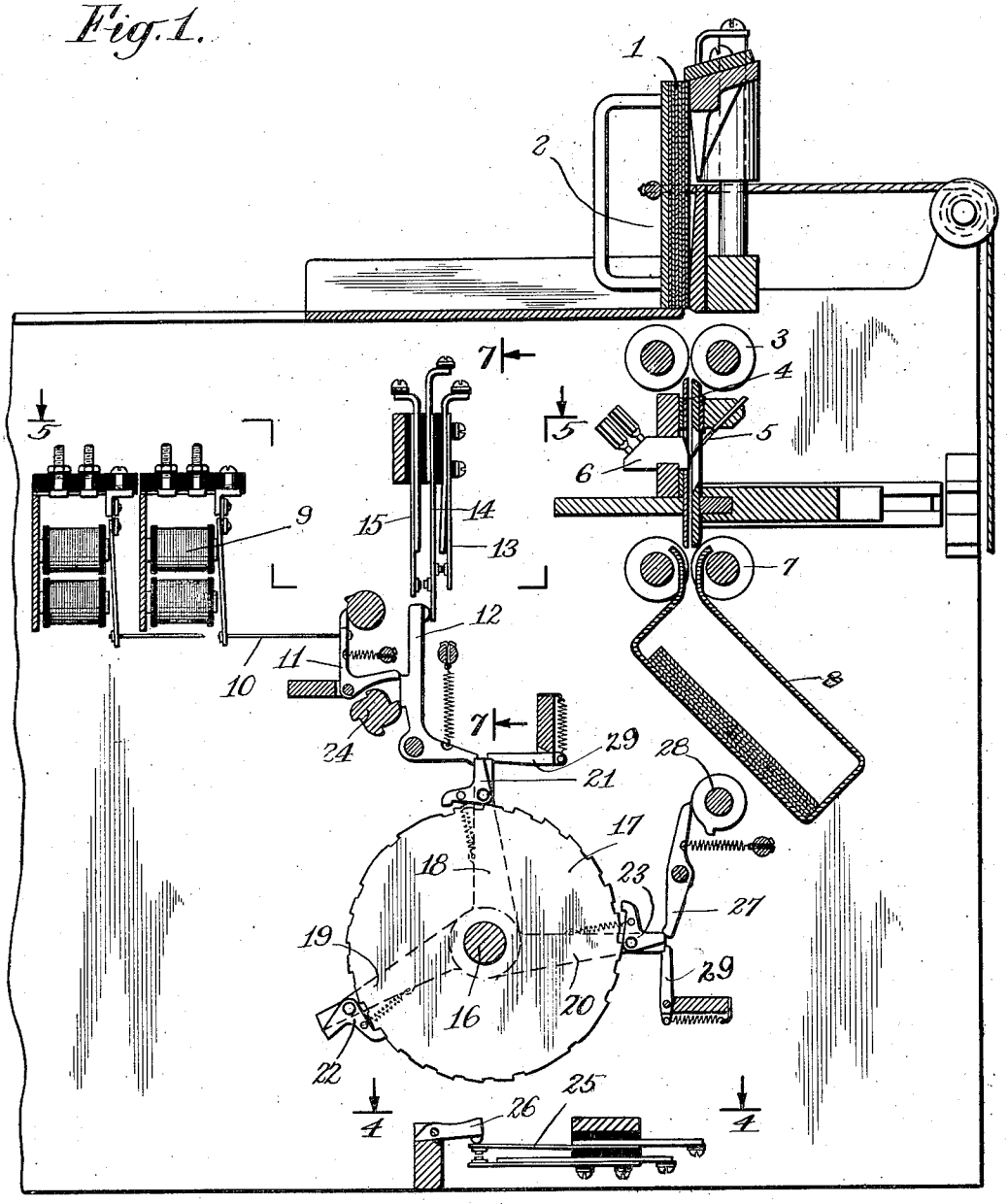
March 11, 1924. 1,486,149

C. D. LAKE

SINGLE BRUSH AUTOMATIC CONTROL FOR TABULATING MACHINES

Filed April 30, 1921 3 Sheets-Sheet 1

Fig. 1.



Inventor
Clair Dennison Lake
By his Attorneys
Kerr, Page, Cooper & Hayward

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C. D. LAKE

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Fig. 2.

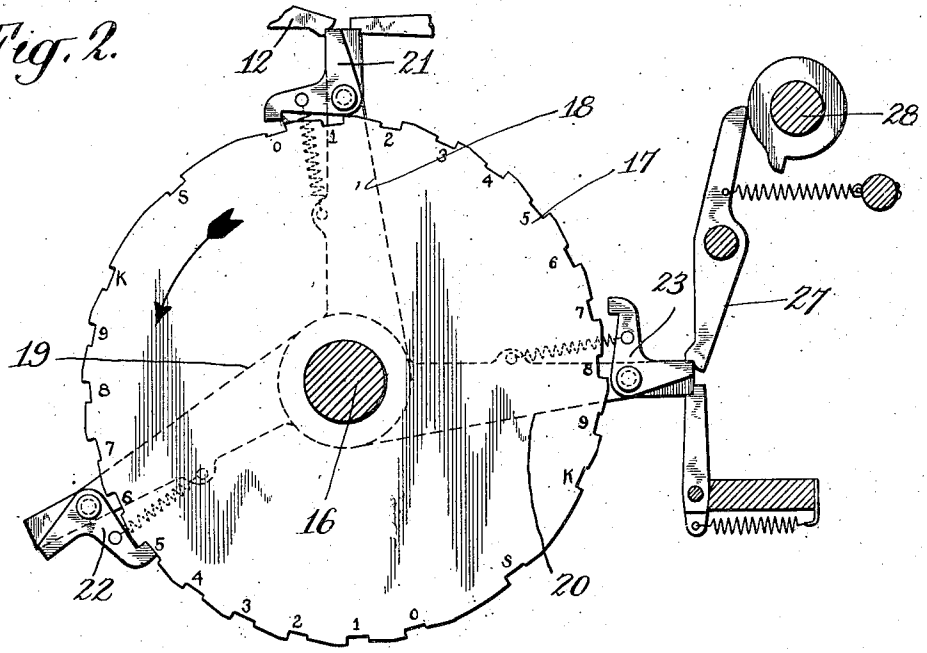


Fig. 3.

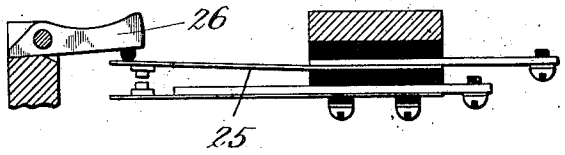
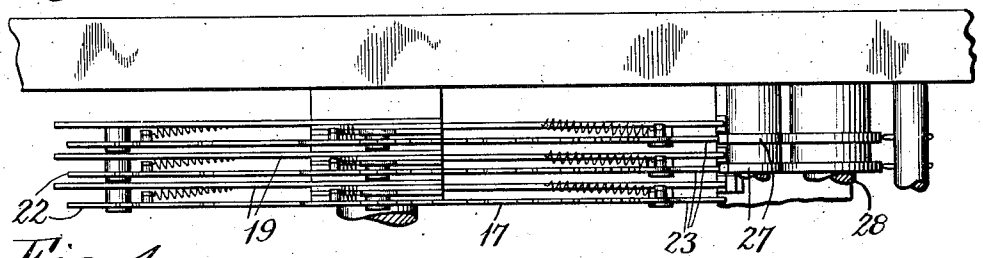
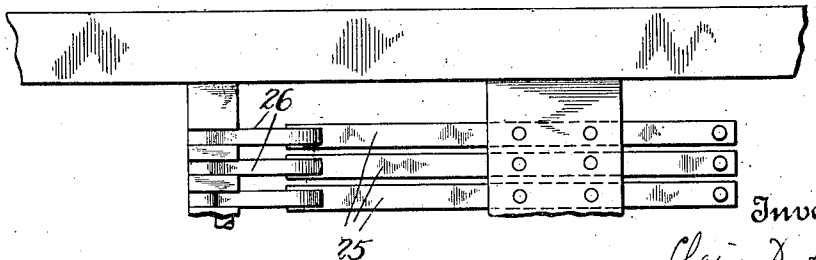


Fig. 4.





Inventor
Clair D. Lake

By his Attorneys
Kerr, Page, Cooper & Hayward

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C. D. LAKE

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Fig. 5.

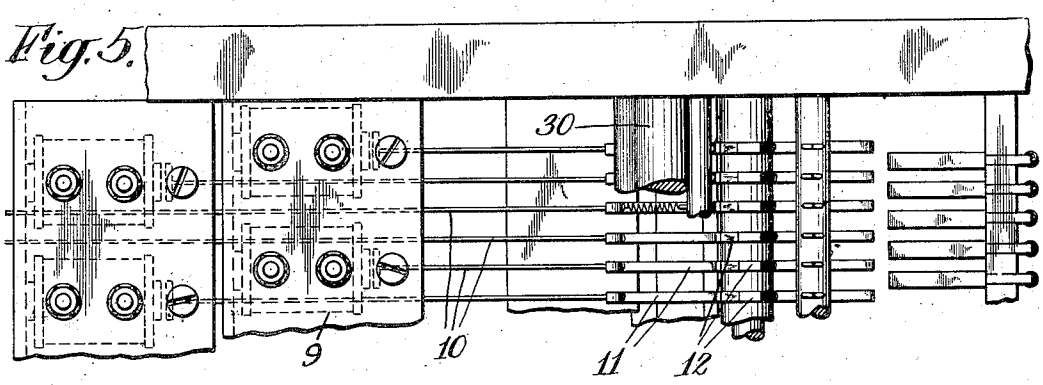


Fig. 6.

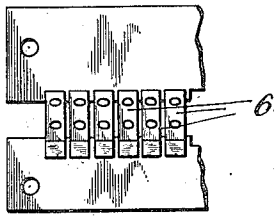


Fig. 7.

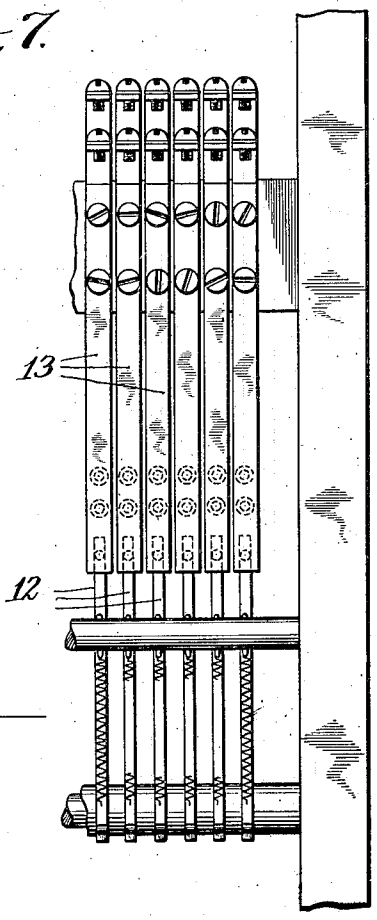
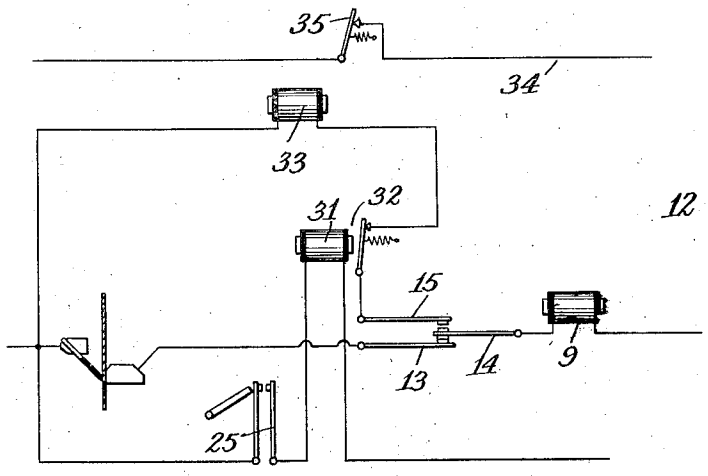


Fig. 8.



Inventor
Clair D. Lake

By his Attorneys
Kerr, Page, Cooper & Hayward

Patented Mar. 11, 1924. 1,486,149

UNITED STATES PATENT OFFICE.

CLAIR DENNISON LAKE, OF BINGHAMTON, NEW YORK, ASSIGNOR TO THE TABULATING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SINGLE BRUSH AUTOMATIC CONTROL FOR TABULATING MACHINES.

Application filed April 30, 1921. Serial No. 465,869.

To all whom it may concern:

Be it known that I, CLAIR D. LAKE, a citizen of the United States of America, residing at Binghamton, in the county of Broome and State of New York, have invented certain new and useful Improvements in Single Brush Automatic Controls for Tabulating Machines, of which the following is a full, clear, and exact description.

The invention, subject of this application for Letters Patent, resides in an automatic control attachment for tabulating machines. As typical of this class of machine, the well known Hollerith tabulator may be taken, and will herein be considered as an example, and it requires, for purposes of this case, but a brief and very general explanation.

For the useful operation of these machines a series of punched cards are required. Each card has a certain number of columns with spaces corresponding to numbers or arbitrary data, and is punched by a special machine in such manner that the location of the holes will indicate the numbers or other information and data which it is desired to record. By still another machine, known in the art as a sorter, a large number of cards representing different facts or data may be sorted into groups. For example, all cards indicating sales of a given class or kind of merchandise may be selected into one group, all those of a certain date in another, and so on, and such classification of cards is determined by the particular hole or holes punched in a certain column or columns known as control columns.

To tabulate by means of such cards they are passed through the tabulator under a series of brushes, and when any brush comes over a perforation it closes an electric circuit which brings into operation that part or element of the tabulator which makes a record corresponding to such perforation, or which performs any other operation which such perforation was intended to represent.

In the use of a single or any number of groups of tabulator cards it is manifestly of the first importance to the accuracy of the result, that if a group contain a card which does not properly belong in that group, but by mischance has become displaced, or that after all cards of any group have passed through the machine, the tabulator should be positively stopped either that the misplaced card should not be recorded or that the total may be taken of a group of cards before the next group starts to pass. Provision is therefore made to stop the machine when a wrong card passes, and stop cards are usually placed between two groups of sorter cards.

The object of the present invention is to dispense with the use of stop cards, and to eliminate the danger of a misplaced card in any group being added into or included in the computation from any group of sorted cards, and this is accomplished by the provision of means for automatically stopping the machine upon the change of a control number; that is, the punching of a different hole, in any column which is used as a control, the stopping of the machine being effected in such manner that it may not be started up again without operating the reset key and going through the process of resetting.

Provision of this nature is not new with me in machines of this character, but has heretofore been accomplished by the use in the tabulator of an additional or supplemental set of brushes under which the cards pass, and these are so arranged that the control holes in two consecutive cards must come under the two sets of brushes at the same time, otherwise circuits are made or broken which control the means for stopping the machine.

In the means heretofore used for controlling the tabulator by two sets of brushes, the use of a large number of relay magnets was required. To obviate this objection I have shown and described in an application filed of even date herewith a simplified device which involves less electrical and more mechanical elements, but I have sought to still further simplify the apparatus and in this application I have shown a single brush control in connection with which I have employed simple mechanical devices which will operate to stop the machine when the number in any control column changes.

In describing my invention I have assumed that the construction and mode of operation of the Hollerith tabulator are well known to all those skilled in this art and to which this specification is addressed. I have illustrated herein, therefore, only such parts as are properly comprised in or im-

mediately associated with the present improvement, and for this purpose the annexed drawings show the following:

Figure 1 is a schematic illustration of my improved single brush automatic control unit.

Fig. 2 is an enlarged view of the main parts of the same, shown in a similar manner.

Fig. 3 is a top plan view of the parts shown in Fig. 2.

Fig. 4 is a view of the circuit controllers looking downward from the line 4—4 of Fig. 1.

Fig. 5 is a view of the parts shown in Fig. 1 looking downward from the line 5—5 of that figure.

Fig. 6 is a detail of the contact brushes.

Fig. 7 is a view of the parts of Fig. 1 looking to the left from the line 7—7 of that figure, and

Fig. 8 is a circuit diagram.

Referring to Fig. 1, the cards 1, which are assumed to have been sorted in a given group or series of groups, are placed in a holder 2 and by the usual and well known means are drawn or forced down one by one to the rolls 3 by which they are passed through the chute 4, between the brushes 5 and the contact blocks 6, to the lower rolls 7, and thence passed out into a suitable receptacle 8.

When a perforation in a control column in a card comes under a brush a circuit is completed to a magnet 9, which, being energized, attracts its armature and by means of a connecting wire 10, trips a spring-actuated latch lever 11 and permits a contact controlling lever 12 to swing to the left. This movement of lever 12 permits two contacts 13 and 14 to separate and contact 14 to engage contact 15.

A shaft 16 power-driven at a definite rate relative to the movement of the cards carries cycle wheels 17 having two sets of notches, each corresponding to the positions for the holes in any given column of a card, and these wheels make one complete revolution during the period occupied by the passage under the brushes of two consecutive cards.

On the shaft 16 are loosely mounted three arms 18, 19 and 20 to each of which is pivoted a spring-actuated dog 21, 22 or 23, one end of which is adapted to fit into any one of the notches in the wheel 17, and the other to project radially outward along the arm, and assuming, for the moment, that dog 21 in engagement with a notch in the wheel has been brought by the movement of the latter into engagement with the lever 12, while in its latched position, it is upset or thrown out of engagement with said wheel and stops in the position indicated in Fig. 1.

The movement of the parts is so timed that at the time a hole of a given value is passing under its brush to energize a magnet 9, a notch in wheel 17 of corresponding value will be under dog 21. The energization of the magnet 9 will therefore permit the engagement of the dog with the notch in the wheel 17 which corresponds in value to the then passing hole in the card. If no hole is in the card the K notch will be engaged by the dog under conditions to be hereinafter referred to. After engagement, the arm 18 is carried around to the left or anti-clockwise moving in unison with wheel 17.

A cam wheel 24 is constantly rotated by the power applied to drive the machine and it has a number of teeth or points which knock back the lever 12 and relatch it before the next notch has come into position and before certain contacts 25, to be described, are separated.

Following the locked dog in its travel with the wheel 17, it reaches at a given point the two contacts 25 and the end of the arm 18 engaging a lever 26, brings these contacts together. The said arm being still locked by its dog, continues its movement to the point in which dog 23 is shown, where it encounters a latch lever 27 and is upset or thrown out of engagement with the wheel 17. Here it rests until a cam 28 revolved by the machine unlatches lever 27 and allows the dog to engage with an S notch in the wheel 17, by which it is carried on to the starting point where it is again unlocked by the lever 12.

Considering now the other arms 19 and 20 and their dogs 22 and 23, each one goes through the same operations as above described, but successively. That is to say, while dog 21 is unlocked and stationary the arm 19 is being carried down to the contacts 25, and the dog 23 is being carried up to the latch 27, where it will rest until what is known as the S notch on the wheel comes under it, when it is tripped by the cam 28. Associated with the levers 12 and 27 are lock latches 29 which engage the arms after they have been freed from the wheel and prevent any backward movement of the same.

So far as the mechanical construction of the device is concerned, it need only be stated that a cam 30 with a single high point engages the latch lever 11 and withdraws it from engagement with the lever 12, once near the end of each cycle. This is to release the dog engaging lever 12 at such times as to permit the uppermost dog to enter a K notch and permit the arm to be carried onward in case no current is sent to the magnet 9 in that part of the cycle.

Considering now the diagram Fig. 8, assume that a card has a certain number of

control columns and that in a given group of cards the numeral hole 5 is punched in one column on each card. Then when this hole comes under the brush for that column, the current will pass from the brush to its contact block and thence through contact 13 to the appropriate magnet 9, energizing such magnet and causing it by the means above described to momentarily break contact between 13 and 14, thus taking the spark from the brushes and making contact between 14 and 15. This occurs not only with the first card, but all the others of the group, and as the wheel 17 has a definite movement relative to that of the cards, the dog engaging with lever 12 will be locked in the number 5 notch, and carried around thereby. At the instant that the arm thus locked by this dog encounters the contacts 25 the 5 hole of the next succeeding card has again energized the magnet 9, and locked the next arm, but as contacts 25 are closed at the same time as contacts 14 and 15, the relay 31 is energized, which attracts armature 32 and thereby breaks the circuit of the stop relay magnet 33, so that the machine continues to run.

Assume, however, that a magnet 9 is energized by a certain hole which is different from that which has locked the dog on its way to contacts 25, then the closing of contacts 25 and the closing of contacts 14 and 15 will not occur at the same instant, and hence the current will flow through the stop relay magnet 31, the armature 32, and contacts 14 and 15, and the machine will come to a dead stop as soon as, or whenever, the magnet 9 is energized, and in this way any change in a control number, which may be due to a misplaced card or to a new group of cards, will immediately stop the machine.

Other conditions may be assumed where no interference with the running of the machine occurs. For example, if there is no brush contact at the time when the contacts 25 are apart, or if a brush contact be not made while contacts 25 are together, the stop magnet would not be energized, and the machine would continue to run. It is only when a brush contact is made and a magnet 9 energized, at the instant that contacts 25 are not together, that the machine is stopped. This stoppage of the machine may be effected in any proper manner, as by the interruption of the motor circuit or motor control circuit 34 by the attraction of armature 35 by the magnet 33.

The magnets 9 which have herein been described operate in conjunction with the stop control mechanism, but if the contact 15 be omitted from its connection with any magnet, the latter has no longer this function. Such magnets therefore as do not close contacts 14 and 15 are simply counter control magnets and lock the dogs in such position on the wheels 17 that the closing by the arms carrying the locked dogs with contacts 25 will operate the counter wheels in the well known manner.

The arms 18, 19 and 20, it will be observed, are entirely independent but the movement of one must never interfere with that of another. Furthermore, the reengagement of the dogs with the notched wheels must be timed and is preferably accomplished by the parts marked 27, 28 so that each dog will engage one of the so-called S notches (i. e. a non-value representing notch) when said notch comes under the dog. If no hole is in a given column, the corresponding magnet 9 will not be energized and under these conditions, the uppermost dog 21 must be released to engage the K notch. This is effected by knock-off cam 30. When an arm travels with its dog engaging a K notch, the closure of contacts 25 will in no wise effect the control of the counter since this closure will not take place during the normal adding part of the cycle.

It will be observed that when a brush passes over a perforation in a card the result of the contact thus made upon the action of the tabulator or its counters is not immediate, as in the ordinary instruments, but is delayed for what is practically a full cycle and is completed only at the corresponding instant of the next cycle, or during the passage of the next succeeding card. Such a machine is known as a delayed action tabulator. For this purpose, the register magnets, which are of the well known Hollerith type, are disposed in the circuits containing the contacts 25. In fact the magnet or magnets 31 may be used as the register magnet.

By the apparatus above described a perfect control of the tabulator is effected by the most simple form of mechanism. Such parts as are employed may be most readily and cheaply made in quantity as by punching or stamping, and the cost of the machine as a whole, in this way very greatly reduced.

Having now described my invention what I claim is:

1. In a delayed action tabulator in which the result of a brush contact through one card is completed at a corresponding instant with reference to the next succeeding card, the combination with the means responsive to a brush contact for setting up the tabulator mechanism, and with the means for causing said set up mechanism to subsequently complete the operation corresponding to such brush contact, of circuit closing contacts, a motor control circuit which is controlled by such contacts and completed only when such contacts are not simultaneously closed.

2. In a delayed action tabulator in which the result of a brush contact through one card is completed at a corresponding instant with reference to the next succeeding card, the combination with the means responsive to a brush contact for setting up the tabulator mechanism, and with the means for causing said set up mechanism to subsequently complete the operation corresponding to such brush contact, of two sets of circuit closing contacts respectively operated by such means, a control relay circuit, and a motor control circuit, the former containing the contacts operated by the setting up mechanism, and the latter controlled by the relay circuit, and the relay circuit containing the other named contacts, whereby the motor circuit will be completed only when the two sets of contacts are not simultaneously closed.

3. A single brush automatic tabulator control mechanism comprising in combination the following: brushes under which pass perforated tabulator cards, control magnets energized by the passage of a perforation under a brush, parts movable in definite relation to the movements of the cards under the brushes, circuit controllers adapted to be locked to said movable parts by the control magnets in positions corresponding to the positions of the perforations in a card, which are closed by the said control magnets when locking the circuit controllers other contacts which are closed by the locked circuit controllers at a given point in their travel, a stop controlling relay circuit including said last named contacts, a stop magnet and a circuit including the same and the contacts operated by the control magnets, which circuit is controlled by the relay circuit and is completed only when the contacts therein and those in the relay circuit are not closed simultaneously.

4. In a single brush automatic tabulator control mechanism, the combination with wheels containing two sets of notches corresponding in position to the points where holes are to be punched in the tabulator cards, means for rotating said wheels at a definite rate with relation to the movement of the cards and so as to make one revolution during the period in which two cards are passing under the brushes, loosely mounted arms on the shaft of said wheels, pivoted dogs carried thereby, levers for upsetting said dogs and throwing them out of engagement with the notched wheels, controlling magnets responsive to a brush contact for tripping the unlocked dogs and permitting them to engage with the wheels, and tabulator contacts adapted to be operated by the locked dogs at a given point in their travel.

5. In a tabulator, the combination with wheels rotated at such rate as to make one complete rotation during the period occupied by two successive cards in passing under the brushes, and containing two sets of notches in positions corresponding to the points where holes are to be punched in a tabulator card, arms loosely mounted on the shaft of said wheels, pivoted dogs carried thereby, levers for upsetting the dogs and releasing them from engagement with the notched wheel and thereby arresting the arms, one of said levers being at the point where the wheel in rotating starts on a cycle of movement and the other at a point in advance thereof, counter magnets for causing said dogs at their starting point to engage with notches in the wheel corresponding to perforations in a card, and a cam operating at given points in the cycle to cause the unlocked stationary dogs to engage the wheel and be thereby carried to the starting point, and circuit connectors to the tabulator mechanism and stop magnet therefor controlled by the above named devices.

6. In a tabulating machine, in combination, an automatic control device for interrupting the tabulating of items from record cards comprising means for setting up therein the index points of passing cards, means operable on the passage of succeeding cards for comparing the index point or points of said card with the set-up of the previous index points and for interrupting the operation if said points are unlike, the aforesaid means for setting up the index points operating successively upon the passage of each card to effect an individual set-up for each card irrespective of changes or non-changes of the index points therein.

7. In a tabulating machine, in combination, an automatic control device comprising continuously operating set-up devices for successively setting up the index points of each card which passes through the tabulator irrespective of changes or non-changes therein, means for comparing the index points thus set up with the index points of each succeeding card entering said machine, and means for interrupting the operation of the tabulator if the index points on the card are unlike the index points set up in the set-up devices by the previous card, said last mentioned means permitting a continued operation of the machine if said respective index points in the cards and set-up devices correspond.

8. In a machine of the character described, means for feeding cards through the machine, means operative synchronously with the passage of a card through the machine, means controlled by perforations in the cards for effecting a set-up on said synchronously operative means, and means controlled by said synchronously operative means when the perforations in successive cards are differentially positioned for stopping the machine.

9. In a tabulating machine, means for feeding cards through the machine, means for sensing perforations in a card while it is in motion through the machine, an accumulator, control element and delayed action means controlled by said sensing means for controlling said element.

10. In apparatus of the class described, in combination with means for feeding cards through the machine, means for sensing the perforations of said cards while the latter are in motion through the machine, a set-up mechanism receiving set-ups from the aforesaid means, and means controlled by said set-up mechanism and operating at a time subsequent to the receiving of the set-up for controlling the counter operation.

In testimony whereof I hereto affix my signature.

CLAIR DENNISON LAKE.