

Sept. 1, 1942.

A. H. DICKINSON

2,294,720

APPARATUS FOR VERIFYING STATISTICAL DATA

Filed July 25, 1939

5 Sheets-Sheet 1

FIG. 1.

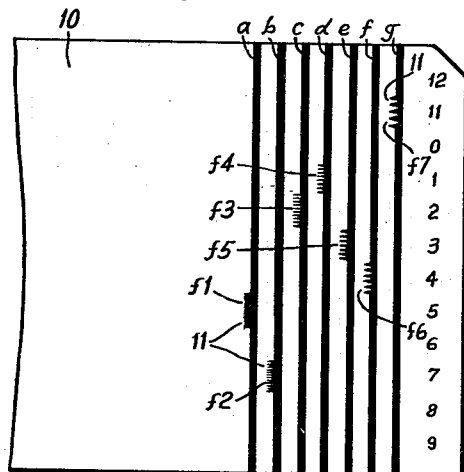


FIG. 3.

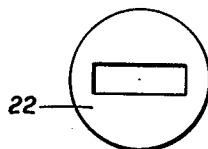


FIG. 2.

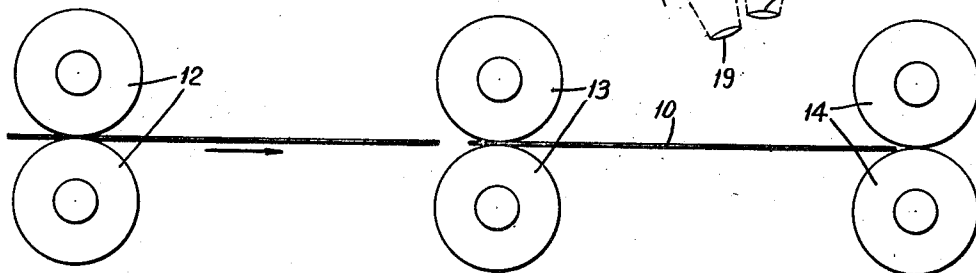
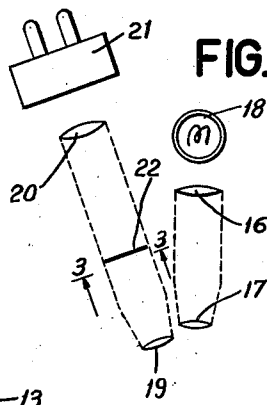
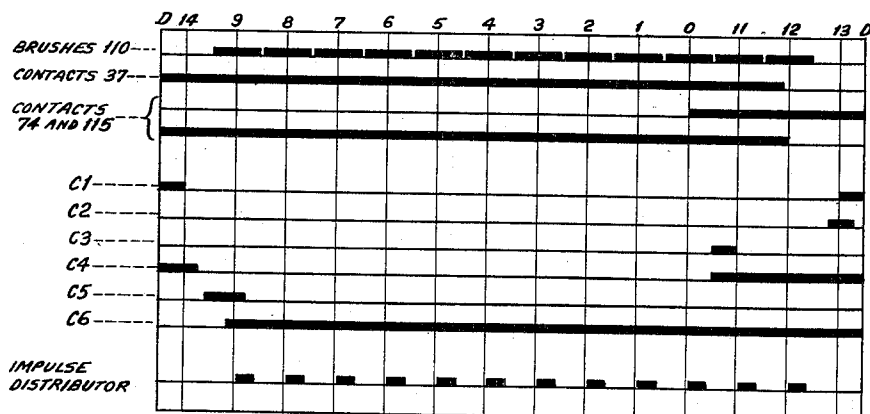


FIG. 9.



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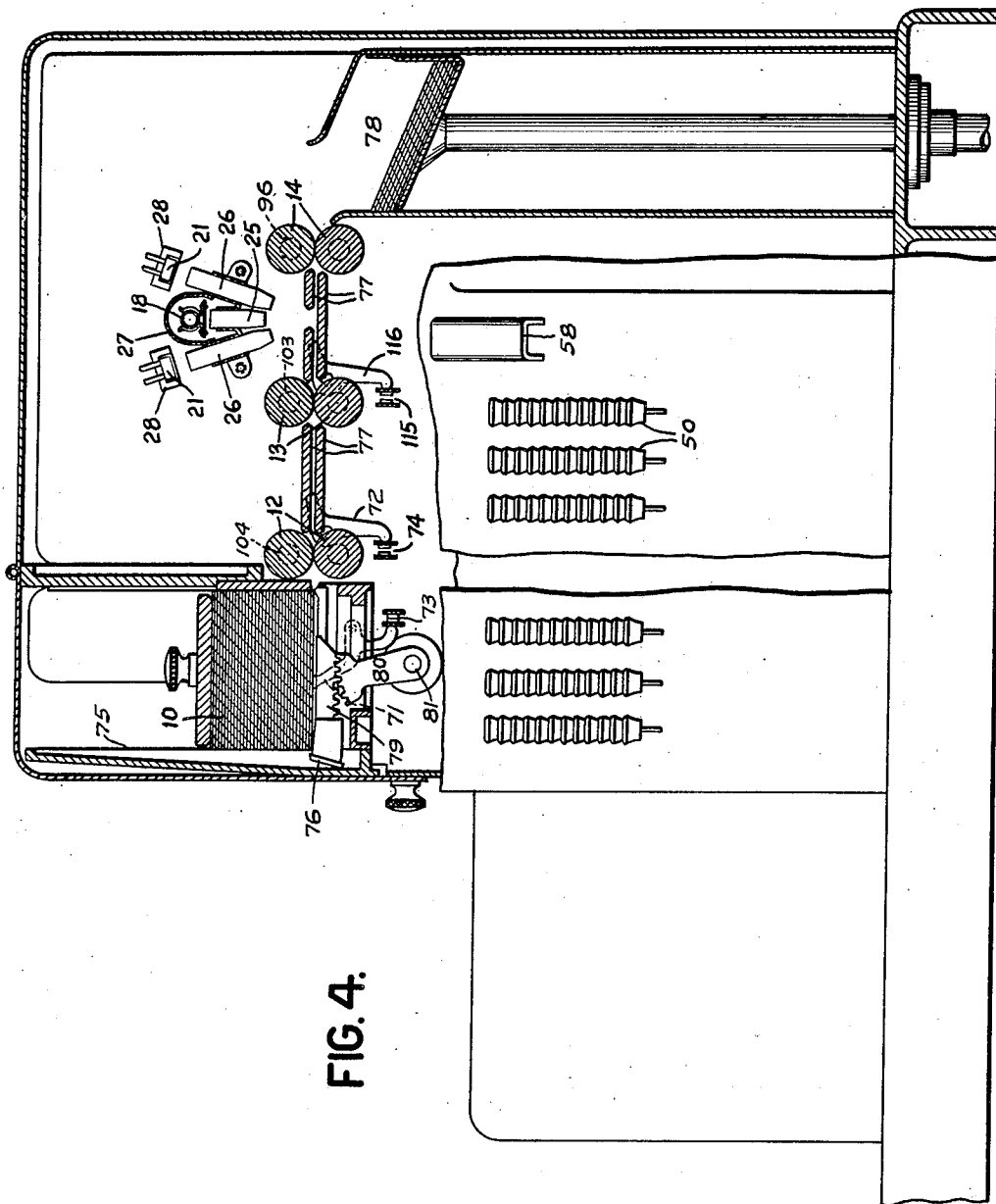
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5 Sheets-Sheet 2



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FIG. 7.

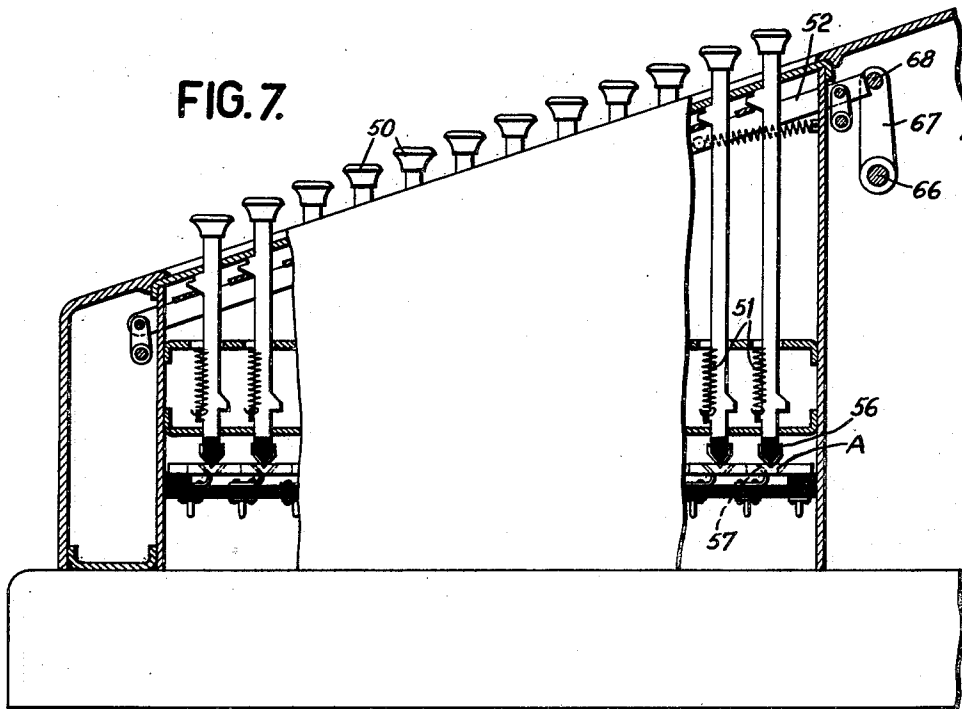
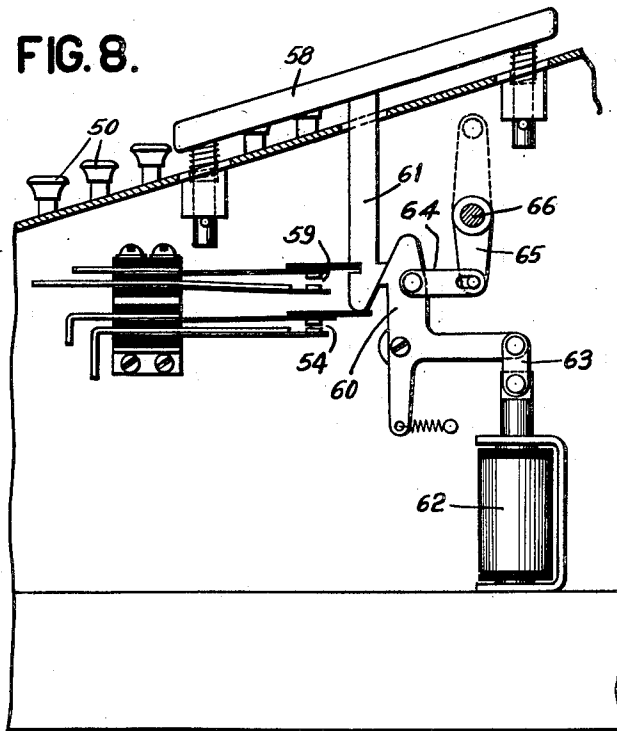


FIG. 8.

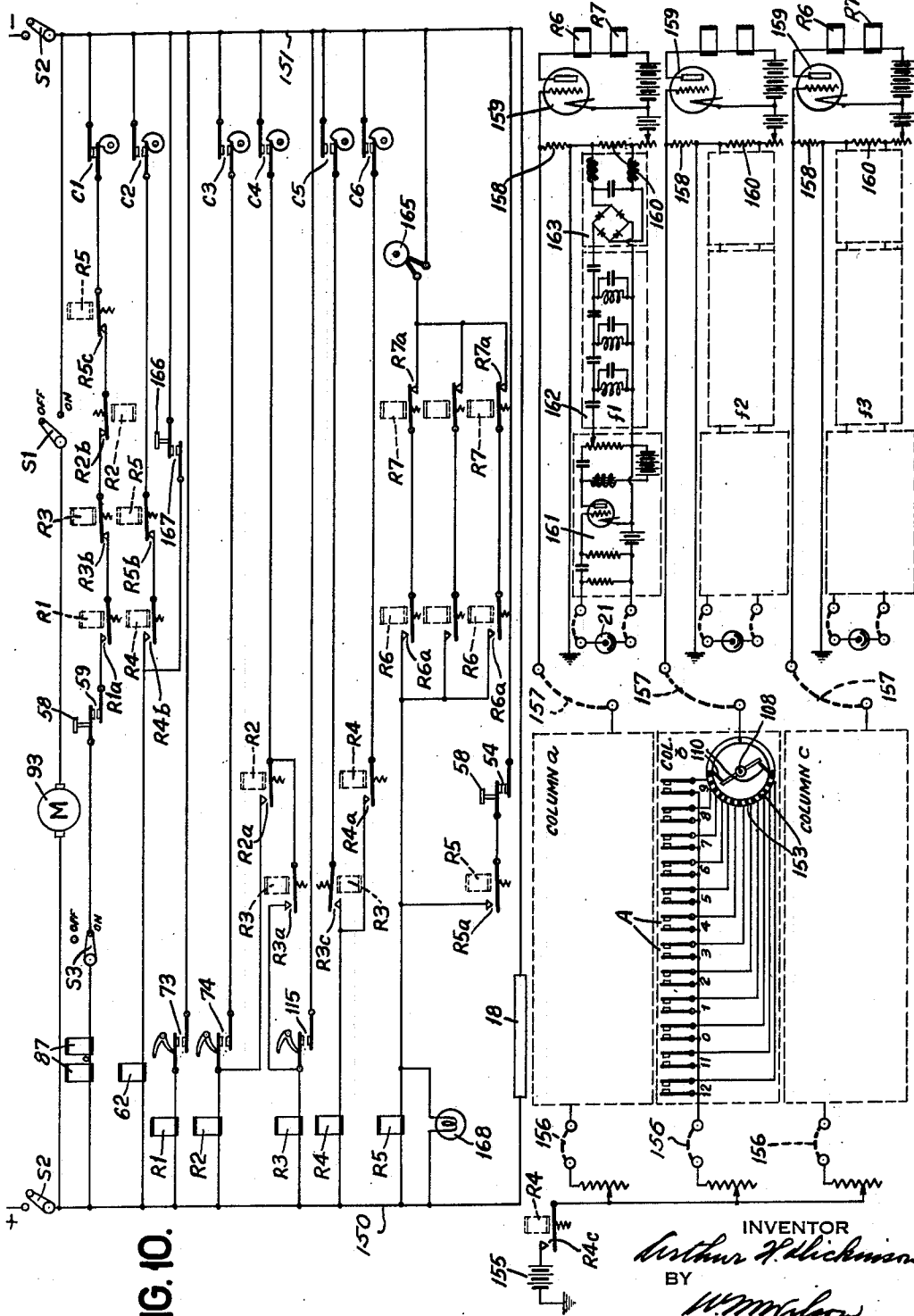


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Filed July 25, 1939

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UNITED STATES PATENT OFFICE

2,294,720

APPARATUS FOR VERIFYING STATISTICAL DATA

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Application July 25, 1939, Serial No. 286,446

8 Claims. (Cl. 73-54)

This invention pertains broadly to statistical systems and more specifically relates to apparatus for verifying statistical data recorded upon records in the form of index marks which are adapted for use in statistical machines, the said index marks controlling the statistical operations of the machine.

Heretofore, it has been customary to employ differently positioned index marks in different columns on the record elements or mediums for controlling the operations of statistical systems and having all the index marks in the different columns formed in precisely the same manner. For example in the Hollerith system differentially positioned perforations are employed to represent the data, the size of which are all the same in the different columns on the record cards. In other suggested systems employing graphical characters on the record mediums in combination with different forms of analyzing devices the configurations of the index marks vary but solely for the purpose of identifying the value of the data representing marks.

In none of the systems suggested have index marks of different patterns or variations been used for determining the value of the representing mark by virtue of its differential position and in addition thereto by virtue of its configuration or pattern denote its columnar value or relationship with respect to the record medium.

It is important to note that provision is made whereby the data sensing means is controlled directly by the index marks for creating the differentially timed electrical impulses. Light sensitive devices are provided for sensing the index marks on the records, which devices vary the electrical pulses or currents in the associated circuits in response to and in accordance with varying amounts of light to which the light sensitive devices are subjected. Novel records are provided for controlling the light sensitive devices not only at differential times in the sensing cycle when the index marks thereon are sensed, but also for controlling the different light variations to which the said devices are subjected at the particular timed intervals the index marks are sensed in the cycle. The index marks of the novel records are differentially positioned thereon in different columns to represent the different values of the data represented thereby. The configurations or patterns of the index marks in each column are alike, but the patterns of the index marks in the different columns differ with respect to each other. These index marks com-

prise light controlling representations which are formed in different patterns having a plurality of light controlling portions arbitrarily disposed in the index mark areas for controlling the frequencies of light variations directed to the associated light sensitive devices, or stated in other words, the light controlling portions are arranged in the index mark areas for controlling the changes in the amounts of light to which the associated light sensitive devices are subjected. It is now understood that upon sensing these index marks having different light controlling properties the light sensitive devices are controlled accordingly to generate electrical oscillations differing in frequency depending upon the frequencies of light interruptions caused by the index marks. The differentially timed impulses or oscillations of different frequencies which are generated are then impressed upon the connected circuits for controlling the data manifesting sections. Appropriate tuned circuits are provided with the different control elements for each order of the data manifesting sections to direct the impulses of different frequencies to the proper control elements thereby controlling the statistical operations of the machine in accordance with the sensed index marks. The novel records described herein are claimed in the copending application Serial No. 286,444, filed July 25, 1939, and issued February 10, 1942, as U. S. Patent Number 2,272,366; and another type of statistical machine controlled by the mentioned records, and analyzing means is described and claimed in U. S. Patent No. 2,231,494, issued February 11, 1941.

The subject matter of the instant application relates solely to means for verifying the records produced and which are provided with the differentially positioned index marks, which marks are recorded in different frequency representations. Means are provided whereby the verifying data or comparing data is suitably stored for controlling the verifying operations. Such means in the instant disclosure comprise manually operable keys which upon depression are latched in a depressed position for maintaining the selection of the desired control circuits. The initiation of differentially timed impulses for comparison purposes is controlled by the selected keys so that the differentially timed impulses initiated by the index marks can be compared and checked. Both groups of timed impulses are impressed upon electronic discharge means for controlling the conductivity thereof. As long as the both groups of impulses are initiated simultaneously

at the proper times the non-correspondence control circuits remain deenergized, thereby signifying that the compared data is in agreement.

Accordingly, an object of the present invention resides in the provision of means for comparing preselected data with the data sensed on record cards having index marks formed in varying patterns and indicating whether or not the compared data is in agreement.

Another object of the present invention resides in the provision of means for determining the relationship between preselected data and data sensed on record cards when the said data on the records are represented by differentially disposed index marks having varying wave shapes.

Another object of the invention resides in the provision of means for determining the relationship between preselected data and data sensed on records having photographically formed data representations which are recorded in differential positions and in different frequency values.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a fragmentary view of a portion of the control record.

Fig. 2 is a diagrammatic view of the record analyzing means.

Fig. 3 is a detail view taken along the lines 3—3 of Fig. 2.

Fig. 4 is a part sectional and part elevational view of the machine showing the keyboard section in elevation and the card feeding means in section.

Fig. 5 is an end view of the gear box of the machine.

Fig. 6 is a side view of the gearing shown in Fig. 5.

Fig. 7 is a sectional view of the keyboard section.

Fig. 8 is a detail view of the keyboard section showing the key and motor bar release mechanism.

Fig. 9 is a timing chart of certain elements of the machine.

Fig. 10 shows a wiring diagram of the circuit connections of the machine.

Control records

Referring now to Fig. 1 one of the preferred types of light controlling records adapted for use in the verifying machine will be described. The reference numeral 10 designates a record card similar to the type now used in the present Hollerith statistical system which is shown divided into different columns as indicated at *a*, *b*, *c*, etc. Each column is divided into twelve index point or mark positions, so that the positioning of the index marks at these different positions in the different columns denotes the different values of the data represented by the index marks. The differently positioned index marks are shown in the said figure and indicated by the reference numeral 11. It is to be noted that the configurations of the index marks in the different columns which in Fig. 1 comprise graphical wave forms or patterns are different with respect to each other. It is to be understood that the configurations of the index marks appearing in each column, but at different positions therein, are alike. It is seen that the light

and dark portions of the index mark areas are arbitrarily arranged so as to produce differently shaped wave forms or patterns. The purpose of the described arrangement is for controlling the changes in the amount of light directed to co-operating light sensing devices whenever the index marks are scanned or sensed by the rays of light. The operations of analyzing or sensing the index marks will be described presently. The record card 10 is opaque, therefore, reflected light is directed to the light sensitive devices whenever the card and index marks thereon are exposed to the light rays. It is well known that varying amounts of light are reflected by light and dark areas on control records which are scanned by light rays, the frequency of the light variations depending upon the arrangement of the light controlling portions or areas. It is seen that the configurations of the graphical patterns at the different index mark positions in the columns differ with respect to each other, and for illustrative purposes, assume that the configurations are so shaped so that the index mark 11 in the column designated *a* is effective to cause *f*1 variations in the light reflected thereby, or stated in other words represents a frequency of *f*1, the index mark in column *b* represents frequency *f*2, the index mark in column *c* represents frequency *f*3, etc. It will be understood as the description progresses that the different frequencies represented by the different index marks will be effective for determining the columnar segregation or differentiation of the data represented by the index marks. The varying patterns of the index marks may be printed in black ink on record cards affording a white background for the marks, or if desired, the light controlling records may be made photographically in accordance with well known photographic methods. The record cards can be provided with a light sensitive surface so that individual light controlling patterns or graphs can be formed thereon photographically.

Analyzing the light controlling records

Referring now to Figs. 2, 3 and 4 the means for analyzing or sensing the light controlling index marks disposed on the records will be described.

A lens system is provided comprising two cylindrical lenses 16 and 17 to cause a narrow beam or line of light to be projected across the length of the record card 10 from the tubular light source 18. For each column on the record card a lens system 19 and 20 is provided to focus the light reflected from the card upon an individual light sensitive device 21, such as a photocell. Interposed between the individual lenses 19 and 20 a slotted disk 22 is provided to limit the amount of light reflected and projected from the card to the photocell so that the light from the corresponding column of the card is the only light the corresponding and associated photocell is subjected to. It is understood now, that, if a record card provided with differently shaped patterns at different index mark positions is fed past the sensing station described, the amount of light reflected and transmitted to any one photocell will pulsate or vary exactly in accordance with the pattern of light and dark portions of the index mark sensed. If the photocell is connected in a closed circuit, the varying amounts of light projected thereon will cause a corresponding pulsating current to flow therein, the frequency of which will correspond to the frequency of the variations in the light caused by the sensed index

mark. It is obvious that the varying amounts of light are directed to the corresponding photocell only at the particular timed intervals the index marks are fed past the beam of light which is projected across the record card. The position where the said beam of light is projected upon the card will be referred to as the data sensing position. By reference to Fig. 4 it is seen that the lens system 19 and 20 and photocells 21 are disposed in a staggered arrangement, in this manner the spacing of the columns on the record cards can be less than if the lens system and photocells were all positioned adjacent to each other along a straight line.

In Fig. 4 the arrangement of the record sensing means is shown. The common tubular light source 18 is arranged to extend transversely across the machine and corresponds in length to the length of the record cards and serves as a source of light rays for all the individual sensing means. An individual sensing means is provided for each column of data which may be provided upon the record cards. The reference character 25 designates the assembly of the lenses 16 and 17 in a suitable housing or case and reference character 26 designates the assembly of the lenses 19 and 20 and disc 22 in a similar housing. The said assemblies are suitably supported by the member 27 which is in turn fastened to the side frames of the machine. The photocells 21 are suitably supported in the members 28.

Keyboard section

Referring now to Figs. 4, 7 and 8 the keyboard section is shown to comprise a plurality of columns or orders of individual keys. The number of keys in each order can vary as desired, however, in the instant case an individual key is provided for each index mark or point position in the individual columns of the records. The purpose of the keyboard section is to provide means for storing the desired comparing data.

Provision is made whereby upon depression of the individual keys 50 against the action of the associated springs 51 they are held latched in the depressed positions by the related latch bars 52 (of which one for each order of keys is provided). Each keybar is provided with a V-shaped conducting portion 56 adapted to engage, upon depression of the associated key, the related contact 57. This connection will be referred to as contacts A on the wiring diagram.

The verifying operations of the machine are initiated by the manual operation of a motor bar 58, the depression of which causes the contacts 54 and 59 to be closed. By means of a latch lever 60 the depressed bar is maintained so, due to the engagement of the step of the stem 61 of the bar with the said latch lever, upon completion of the recording cycle means are provided, such as solenoid 62, to be energized to restore the motor bar to its normal position. It is seen that energization of the solenoid causes pivoted latch member 60 to be partially rotated in a clockwise direction upon displacement of the solenoid plunger by means of the link 63 thereby releasing the latched stem 61 of the motor bar.

During the said rotation of latch member 60 and after the release of the motor bar the link 64 causes lever 65 to be partially rotated and in turn to rotate the shaft 66 in a counterclockwise direction. Rotation of shaft 66 effects displacement of the arm 67 (secured to said shaft) and transverse bail 68, which bail, upon being rocked,

thrusts the latch bars 52 forwardly (to the left as viewed in Fig. 7) releasing any depressed keys which have been latched down. For a more detailed description of this well known type of keyboard reference may be made to the Patent No. 2,147,626.

Record feeding means

Referring now to Figs. 4 to 6 suitable record feeding means will be described. The mechanism for feeding the individual records 10 from the magazine 75 is well known in the statistical machine art and comprises a card picker 76 which is adapted to feed the record cards singly from the bottom of the stack to the first pair of feed rolls 12 and thence through the guide plates 77 to the card hopper 78 by the remaining pairs of feed rolls 13 and 14.

The card picker is shown secured to rack 79 which is reciprocated by the gear sector 80 which sector is secured to shaft 81 (see Figs. 4 and 6). The operation of the said shaft is under control of the electromagnetically controlled clutch device which comprises in part a single tooth ratchet 82 secured to gear 83 and a pivotally mounted cooperating pawl 84 which is shown held in a latched position by latch member 85 which member is fastened to the armature 86 associated with magnet 87. Upon energization of the said magnet the latch member 85 is positioned to release the pawl 84 and arm 88 (which arm is secured to shaft 89 and carries the said pawl 84) thereby permitting the said pawl to cooperate with the ratchet 82 and rotate the said pawl, arm and shaft 89 in unison with gear 83 and ratchet 82. An eccentric 90 secured to shaft 89 is then effective to impart an oscillatory movement to the eccentric extension arm 91 and cooperating arm 92, the latter being fastened to shaft 81 for oscillating the shaft 81 and gear sector 80 thus causing the card picker 76 to function as described.

The means provided for driving the gear 83 and ratchet 82 comprises a constant speed motor 93 (see Fig. 10) for driving the belt 94 and drive pulley 95 which is secured to shaft 96. A gear 97 fastened to the said shaft drives gears 98 and 99 through the idler gears 100 and 101, respectively. The gears 97, 98 and 99 are secured to the upper feed roll shafts 96, 103 and 104, respectively. The drives to the lower feed rolls are by means of gears 105 which are secured to the upper feed roll shafts and gears 106, the latter being secured to the lower feed roll shafts. Now as long as the motor is energized the described gearing is operated to rotate constantly the gear 83 which is rotatably mounted on shaft 89. Gear 83 also drives gear 107 secured to shaft 108 to rotate the cams 109 and brushes 110 of the emitter devices (see Fig. 10). One of the said cams is shown in Fig. 5 and arranged for controlling the operation of the associated contacts C.

Now it is understood that upon energization of magnet 87 the clutch mechanism is effective to couple the driving means to shaft 89 thus causing the card picker to effect feeding of the individual cards to the feed rolls. As the cards are advanced they pass under the sensing means for effecting verifying operations which will now be described.

It should be mentioned that the usual card controlled contacts 73 and 74 and 115 are provided to be operated by the levers 71, 72, and 116, respectively. Contacts 73 are closed as long

as cards remain in the record card magazine 75. Contacts 74 are closed by the cards fed from the magazine just after leaving the feed rolls 12, and contacts 115 are closed just before the cards pass under the sensing means, the purpose of which will be understood as the description progresses.

Operation of the machine

Referring now to Fig. 10, the operations of the machine will be explained in conjunction with the circuit diagram. Assume that the cards are properly placed in the card magazine, that switches S1, S2 and S3 are closed, that the comparing data is set up on the keyboard section and stored by the latched keys when the motor bar 58 is depressed to initiate the verifying operations. A circuit is then completed from conductor 150 to the card feed clutch control magnet 87, switch S3, contacts 59, contacts R1a (now closed since contacts 73 are closed to energize relay R1), R3b, R2b, R5c, and C1 to conductor 151 energizing said magnet and causing the card feeding means to function to advance a card from the stack to the first pair of feed rolls 12. As the card is fed past the first pair of feed rolls contacts 74 are closed and relay R2 is energized when contacts C3 are closed establishing a holding circuit for the relay through contacts R2a and C4. Opening of contacts R2b prevents the magnet 87 from being energized when contacts C1 are closed again. As the card is fed past the second pair of feed rolls 13 contacts 115 are closed to energize relay R3 establishing a holding circuit for this relay through contacts R3a and C4 thereby opening the circuit by means of contacts R3b to the magnet 87.

At the beginning of the verifying cycle relay R4 is energized by the circuit completed through contacts R3c and C5 establishing a holding circuit for the relay through contacts R4a and C6 which is maintained for the duration of the cycle. In the event the data on the sensed card checks with the data set up on the keyboard the contacts C2 are closed after the verification portion of the cycle to complete a circuit to the key and motor bar release solenoid 62 through contacts R4b and the setting of the keyboard is cleared.

However before the last mentioned circuit can be completed the verifying circuits are established in the following manner. It is assumed that the photocells 21 for sensing the index marks are connected to the proper amplifiers 161 and filters 162 so that the connected filters are tuned to the frequency in which the related columns of data are supposed to be recorded. For example, assume that it is desired to sense and check the recordings in columns a, b, and c on the cards and that the data in these columns are to be recorded in frequencies f1, f2, and f3, then it is necessary to connect the photocells manually, by means of plug connectors indicated by the dotted lines between the connected photocells and amplifiers, for columns a, b, and c to the amplifiers 161 and filters 162 tuned to pass frequencies f1, f2 and f3, respectively.

Now, as the record card passes under the photocells to be sensed to initiate the oscillations of different frequencies at differential times another group of differentially timed impulses are initiated in accordance with the comparing data set up in the keyboard. It is remembered that brushes 110 of the emitter devices are rotated by shaft 108 to engage the conducting segments 153

in succession, which rotation is in timed relationship with the advancement of the cards under the sensing means. For example, when the "9" index mark position is in a position to be sensed the brushes 110 engage a conducting segment 153 connected to the contacts A associated with the "9" key of the keyboard to complete a circuit at that timed interval if the "9" key is depressed. In this manner differentially timed impulses can be initiated in accordance with the data stored in the keyboard section, due to the circuits established at the differentially timed intervals which can be traced as follows: from grounded battery 155 to contacts R4c (now closed) conductors 156, contacts A, conducting segments 153 and brushes 110 of the emitters, conductors 157 to the grounded resistors 158 which are connected in the input circuits of the tubes 159. Additional resistors 160 are included in the input circuits of the said tubes and are connected in series with the first mentioned resistors. The circuits associated with the resistors 158 and 160 are so adjusted that the voltage drops created across each resistor are equal and that similar polarities of the impulses impressed thereupon are applied at similar points or terminals of the resistors. The grid element of each tube 159 is normally negatively biased by means of a suitable potential source, indicated by the battery included in the grid-cathode circuit, so that each tube normally is non-conductive. Positive potential is impressed across each resistor 158, whenever the related control circuits are closed to battery 155; to overcome the normal negative biasing potential impressed upon the tube control grid. Similarly, whenever, the circuits associated with each photocell 21 are rendered conductive, positive potential is impressed across the related resistor 160 to overcome the said biasing potential, and thus render the corresponding tube conductive. The coils of relays R6 and R7 are connected in series in each output circuit of the tubes 159 and are so adjusted that if a voltage drop exists across either resistor 158 or 160 but not across both resistors at the same time the value of the plate current passed by each tube is sufficient to energize the related R6 relay, but not sufficient to energize the associated relay R7. If, however, the voltage drops across resistors 158 and 160 occur at the same time the value of the plate current passed by each tube is sufficient to energize both the related relays R6 and R7.

It is understood now that in the event the data set up in the keyboard section and the data sensed on the card is in agreement that the timed impulses initiated by the keyboard setting and associated emitter devices and the timed impulses initiated by the sensing means are initiated at the same timed intervals. It is understood that the index marks on the card as they pass under the sensing means not only initiate impulses at such timed intervals, but also initiate oscillations or impulses the frequencies of which correspond to the frequencies of the recordings sensed. These differentially timed oscillations are impressed upon the connected amplifiers 161 and filters 162. In the event the frequencies of the oscillations generated correspond to the frequencies the said filters are tuned to, the oscillations are passed to the connected rectifier units 163 and the pulsating impulses are impressed at such timed intervals upon the related resistors 160.

If both resistors 158 and 160 are energized at

the same time the related relays R6 and R7 are energized causing the associated contacts R6a to be closed and contacts R7a to be opened thus preventing a circuit to be completed to relay R5. Whenever the last mentioned relay is not energized a circuit can be completed after the verifying operations upon closure of contacts C2 as follows: conductor 150, release solenoid 62, contacts R4b, R5b and C2 to conductor 151 to energize the said solenoid. As described hereinabove upon energization of the release solenoid the latched data keys and motor bar are released to restore the keys and circuits described to normal conditions preparing the machine for another verifying operation as described whenever the new data is set up on the keyboard and the motor bar is depressed.

The novel control record described herein is claimed in the copending application Serial No. 286,444, filed July 25, 1939.

Now in the event the comparing data and sensed data is not in agreement, the said groups of timed impulses will not be initiated at the same timed intervals to effect energization of both relays R6 and R7 or in the event the data in one column or more is not recorded in the proper frequency the oscillations initiated will not be passed by the filters to permit energization of the resistors 160 at the same time as the resistors 158, thus preventing energization of both the related relays R6 and R7. For either condition a circuit will be completed from conductor 150 to relay R5, contacts R6a, R7a and impulse distributor 165 (which is mounted on shaft 108) to conductor 151 to energize the said relay. Now, energization of this relay opens the contacts R5b and R5c and closes contacts R5a. A holding circuit is established through the latter contacts and contacts 54 for the said relay thus maintaining the relay energized until the non-check key 166 is depressed to close contacts 167 thereby effecting energization of the release solenoid. Opening of contacts R5b and R5c prevent energization of the release solenoid 62 and the card feed clutch magnet 87 after the verifying operations. Whenever relay R5 is energized a suitable signal indication is provided in the form of lamp 168 which is energized at the time the said relay is energized.

It can be seen that whenever the non-check key 166 is depressed to energize the key bar release solenoid the upper motor bar contacts 59 are purposely adjusted to open before the lower motor bar contacts 54 to insure that the said upper contacts 59 will be open before contacts R5b are closed thus preventing a possible circuit through contacts C1 to energize the clutch magnet 87.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. A machine of the character described comprising means for feeding individual records having data representations formed in differential positions in various columns of the records, said representations comprising index marks having different light controlling properties, means for sensing simultaneously the columns of index marks for determining the differential positions

of the said marks in the columns comprising light source means, and individual light responsive means for each column of data to be sensed the latter being conditioned at differential times by the light rays modified by the different light controlling properties of the sensed index marks, means controlled by the conditioned light responsive means for generating at the different times the index marks are sensed oscillations of different frequencies in accordance with light controlling properties of the index marks, settable mechanism with means for setting the same for representing different data patterns with which the index marks on the records should conform, means controlled thereby for initiating groups of timed impulses representing the data pattern set up in the said mechanism, means for determining if the times of initiation of the said oscillations and impulses correspond including means for determining if the frequencies of the oscillations initiated are in error, and means for indicating any disagreement between the sensed data and the data of the set up pattern represented by the said differentially timed oscillations of different frequencies and the said timed impulses respectively.

2. The invention set forth in claim 1 having means for maintaining the pattern set up in the settable mechanism during the determining operations and means for clearing automatically the pattern set up when the said compared data is in agreement.

3. The invention set forth in claim 1 having means for maintaining the pattern set up in the settable mechanism during the determining operations, means for clearing the pattern set up, and means for preventing the clearing means to be effective when the compared data is in disagreement.

4. The invention set forth in claim 1 in which the said determining means comprises electron discharge means having an input and output circuit, means in the input circuit upon which the said oscillations and timed impulses are impressed for controlling the conductivity of the discharge means, and means in the output circuit for controlling the operations of the indicating means.

5. A device of the character described comprising means for feeding individual records having data representations formed in differential positions in various columns of the records, said representations in the columns having different configurations, means for sensing simultaneously the columns of different representations for determining the differential positions of the said representations in the columns including means for distinguishing between the different configurations of the representations, settable means for setting up predetermined data representations with which the sensed data should conform, means for comparing the sensed data and predetermined data set up to determine whether or not the data values represented by the different positions of the representations on the records agree with said predetermined data representations including means for determining whether or not the configurations of the representations on the records are in agreement with the representations set up by the settable means, and means for indicating the relationship of the compared data.

6. A device of the character described comprising means for feeding individual records having data representations in different columns, which

representations are recordings formed in different frequency values, means for sensing simultaneously the different frequency recordings in the columns on the records, including means for distinguishing between the different frequency values sensed, means for selecting predetermined data to which the sensed data should conform, means controlled jointly by the latter and said sensing means for comparing the said predetermined and sensed data to determine if the sensed data and frequency values are in error, and means for indicating whether or not the said compared data is in agreement.

7. A machine of the character described comprising means for feeding individual records having data representations formed in differential positions in various columns of the records, said representations comprising index marks which are recorded in different frequency values, means for sensing the index marks in the different columnar positions, means controlled thereby for initiating differentially timed oscillations of different frequencies, means for setting up verifying data with which the sensed data should conform, means controlled by the latter for initiating timed impulses in accordance with the settings thereof, a common control circuit and means for impressing the timed oscillations and impulses upon the said circuit including means for preventing the impression of the oscillations

thereon if the frequency values are in error, and means controlled by the said circuit for indicating disagreement between the sensed and verifying data represented by the timed oscillations and impulses respectively.

8. A device of the character described comprising means for feeding individual records having data representations formed in different positions in various columns, means for sensing simultaneously the different data representations in the columns on the records, means controlled by the last mentioned means for initiating a plurality of differentially timed impulses in accordance with the sensed data, settable means for setting up a plurality of orders of verifying data with which the orders of sensed data should conform, means controlled by the settable means for initiating a plurality of additional timed impulses in accordance with the settings thereof, a plurality of electron discharge devices having input and output circuits, one for each order of the data to be verified, individual means included in each input circuit for impressing all the first and second mentioned impulses of each order upon a related discharge device, and means controlled by the output circuits of said devices for indicating the relationship of the sensed and verifying data represented by the first and second mentioned timed impulses respectively.

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