June 9, 1936. C. D. LAKE 2,043,295

ELECTRIC CARD COUNTER

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FIG.1.

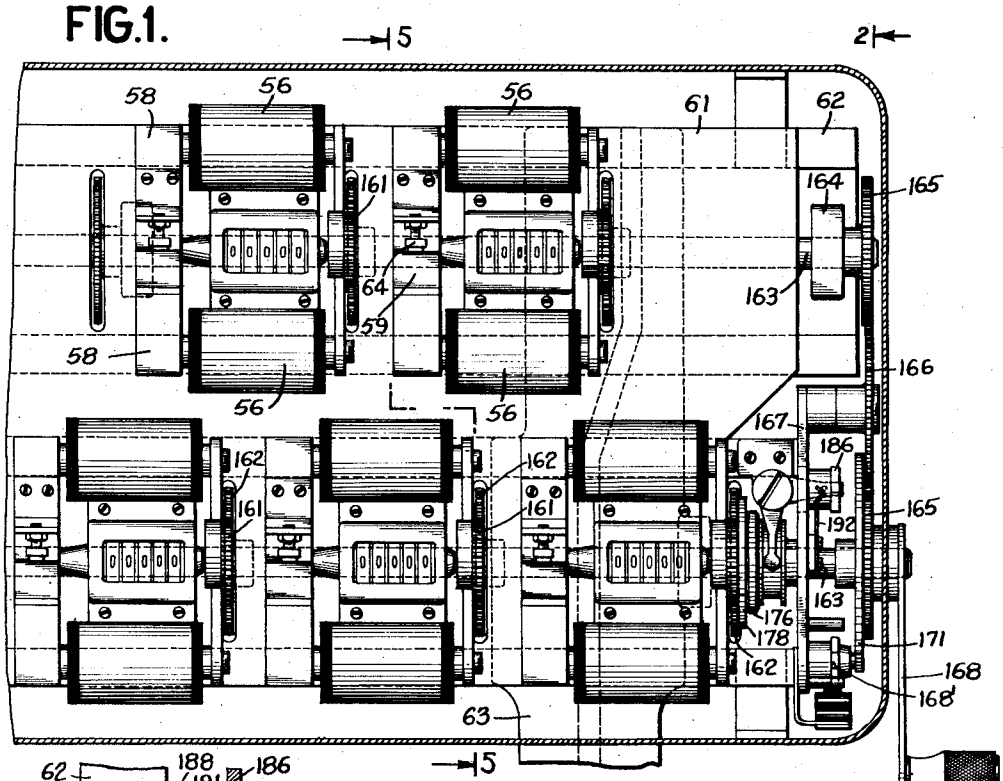

FIG.3.

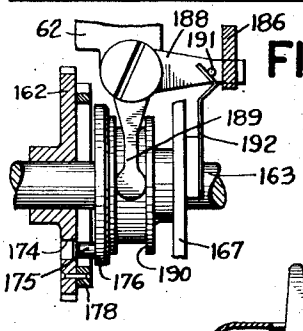

FIG.4.

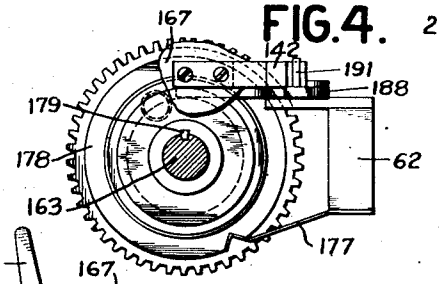

FIG.2.

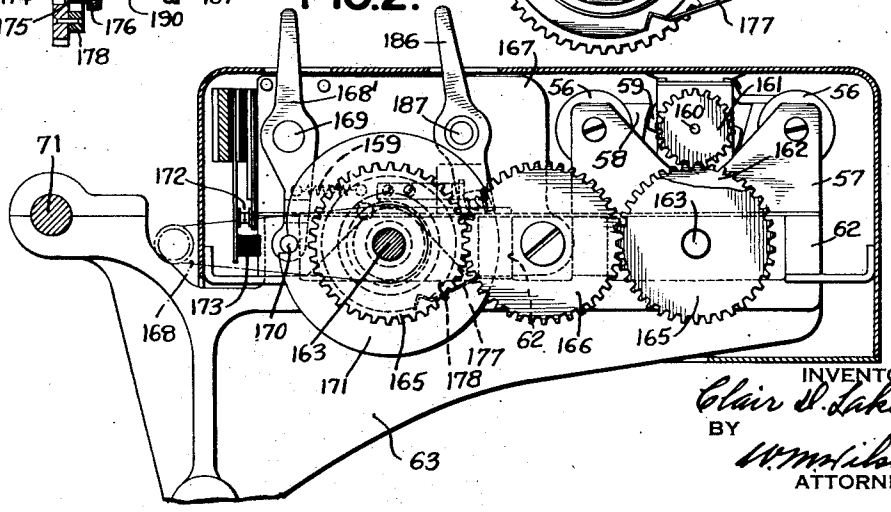

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FIG.5.

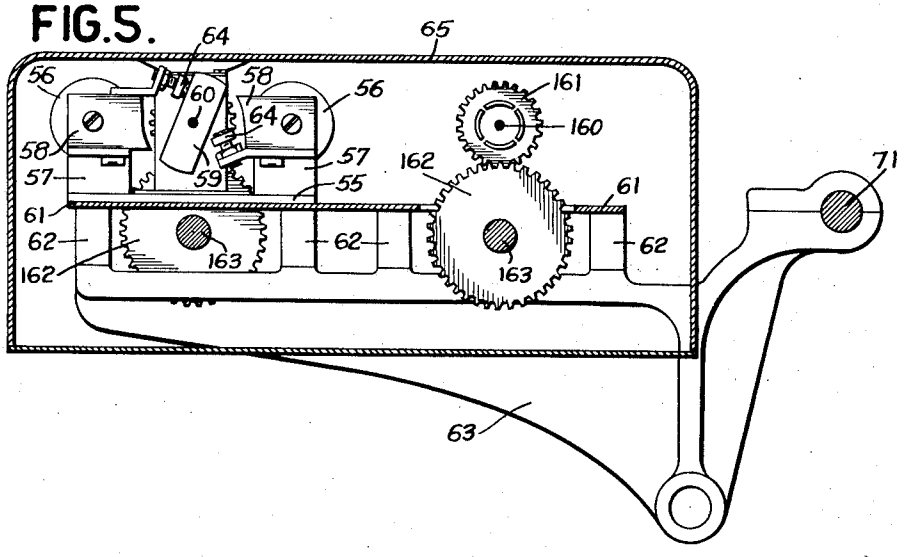

FIG.6.

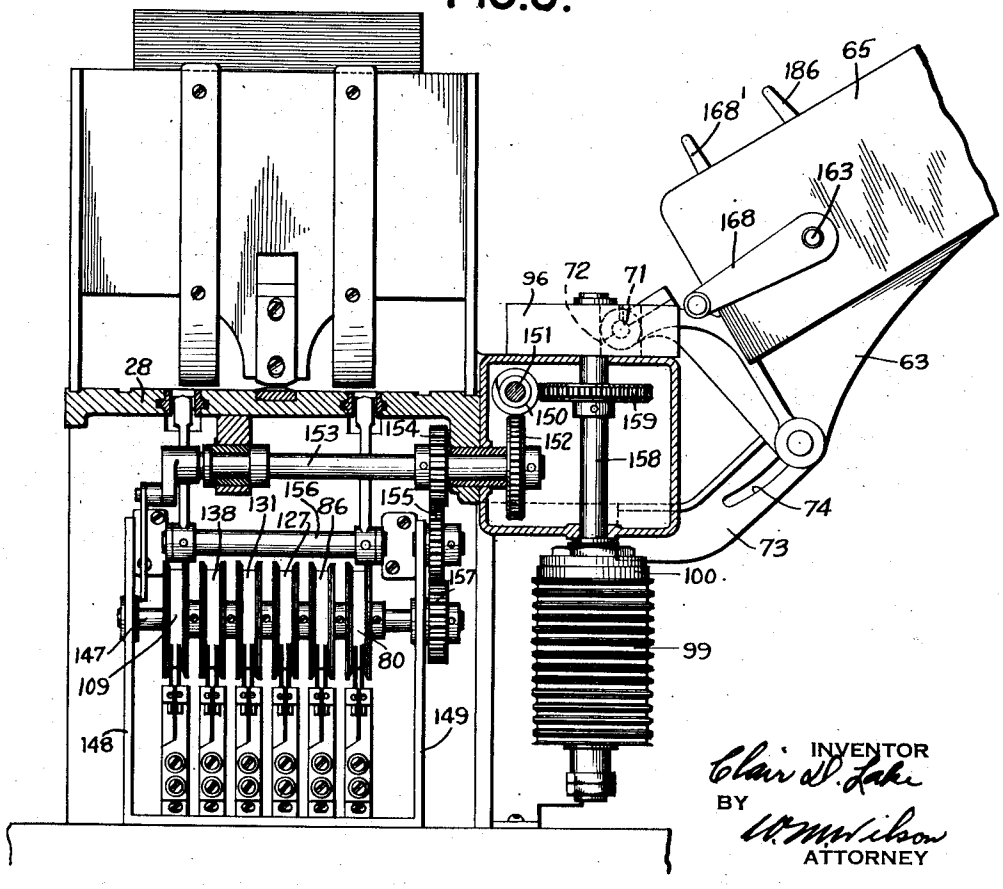

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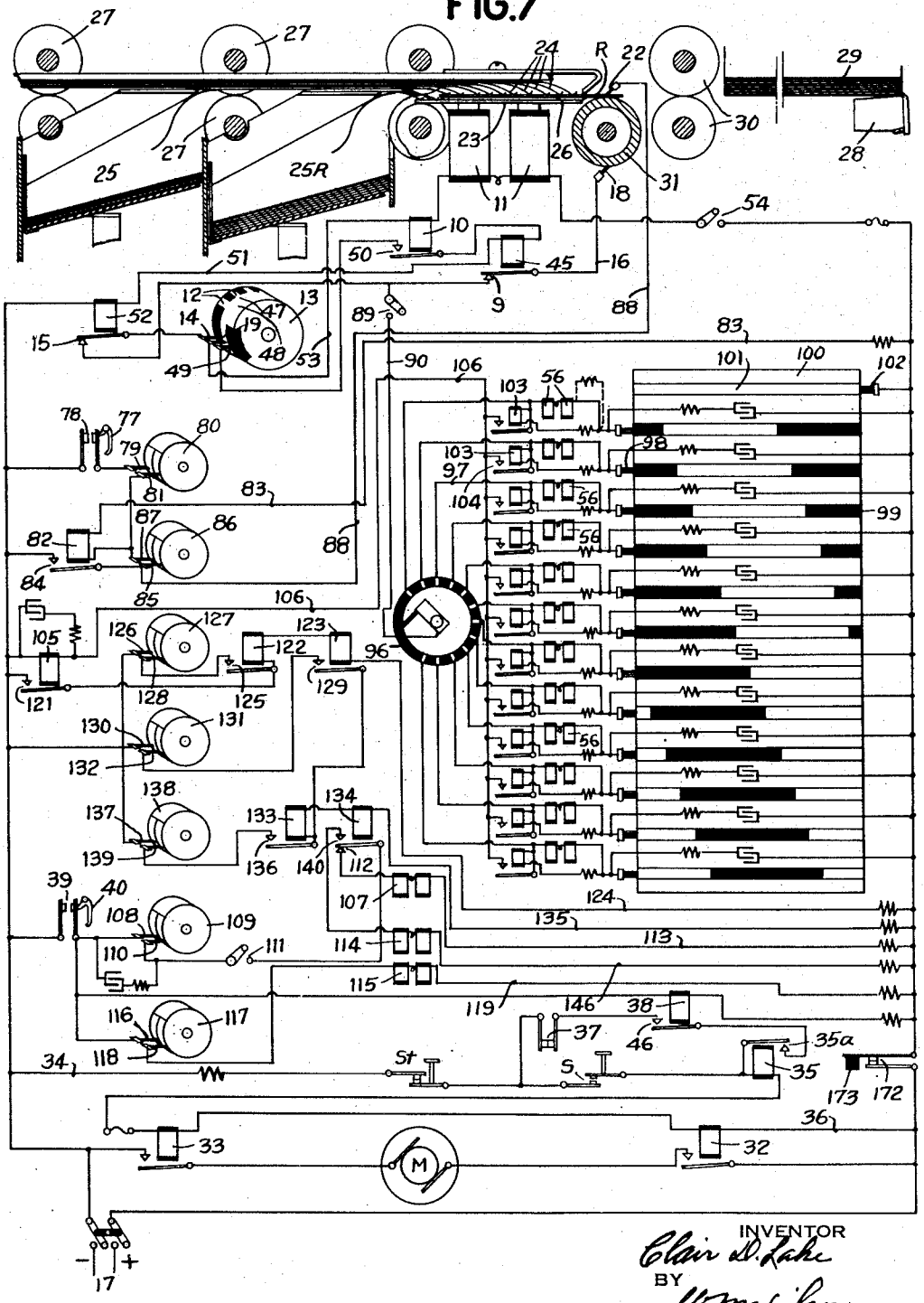
FIG.7



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Patented June 9, 1936

2,043,295

UNITED STATES PATENT OFFICE

2,043,295

ELECTRIC CARD COUNTER

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Application October 7, 1932, Serial No. 636,663

5 Claims. (Cl. 235—92)

This invention relates to card controlled machines and more particularly refers to machines for sorting cards, such, for instance, as those used to control the operation of tabulating machines of the well-known Hollerith type.

The cards have index points of perforations thereon, the exact location of the perforation on the card determining the value and character of the information interpreted therefrom when the card is passed through a suitable tabulating machine.

The function of the sorting machine, preferably of the type disclosed in Letters Patent of the United States No. 1,741,985 issued December 31st, 1929 to E. A. Ford, is to sort and classify into groups a promiscuous stack of cards as desired by the operator for the purpose of more readily permitting analyzation of the index point on the card.

The cards are sorted electrically, that is, as the cards are fed through the sorting machine, a sensing device finds the index point and completes an electrical circuit to select one of a plurality of receptacles or pockets into which the card is to be deposited.

After an indeterminate number of cards, or groups of cards have been sorted, it is desirable to ascertain the exact number of cards sorted into each group, as well as the total number of cards sorted. I am aware that counting devices have been provided to count the number of cards as they are deposited in each individual receptacle. Such counting devices are usually located proximately to the receptacles and require considerable time to read and to note the amount standing thereon.

It is, therefore, an object of the present invention to provide a novel counter mechanism for a card sorting machine wherein the counters are arranged in a compact unit.

Another object is to provide a novel card counting mechanism to count the cards having a plurality of designations as they are analyzed.

A further object is to provide a novel electrically operated card counter adapted to be located remotely from the card receptacle and which may be located remotely from the sorter.

Another object is to provide a plurality of card counters with novel means simultaneously to reset all, or a selective number of said counters to zero.

With these and incidental objects in view, the mechanism includes certain novel features of construction and combination of parts, the essential elements of which are set forth in appended claims and a preferred form or embodiment of which is hereinafter described with reference to the drawings which accompany and form part of this specification.

In said drawings:

Fig. 1 is a top plan view of several of the counters with the casing broken away for clearness.

Fig. 2 is a view in elevation taken just inside the casing or cabinet on line 2—2, Fig. 1, showing the reset mechanism.

Fig. 3 is a fragmentary view of the reset clutch for the grand total counter. The view being an enlargement of the lower right hand portion of Fig. 1 and showing parts in section to more clearly show the details of the mechanism.

Fig. 4 is a detail view of the aligner for the grand total reset gear and the aligner for the grand total lever.

Fig. 5 is a sectional view taken on line 5—5, Fig. 1.

Fig. 6 is a view in end elevation of the sorter showing the drive for the commutators and distributor drive.

Fig. 7 is a circuit diagram of the sorter, together with a portion of the sorting mechanism.

Before proceeding with the description of the invention, a brief description of the sorting machine will be given. In a sorting machine of the type disclosed in the above mentioned patent, the sorting of the record cards is accomplished through the medium of a sorting magnet 11 under the control of a brush relay 10, brush 22 and receives an impulse from a source 17 as soon as a hole in the card is encountered.

The end of tongues 24 are spring urged downwardly on an armature 23, so that during the card analyzing cycle, the record card is entered between the ends of the tongues 24 and the armature 23, with the result that on the energization of the sorting magnets 11 only as many tongues 24 are lowered by the armature as do not overlie the record card, while the remaining tongues 24 are held in raised position by the card. For this purpose, there is provided a fixed bar 26, parallel to, and on a level with the armature 23 in its normal position. The bar 26 is arranged to support the record card after the armature is lowered.

According to the point of time at which the energization of the sorting magnet 11 occurs, the armature 23, upon which the ends of the tongues 24 of the guide plates leading to the card receiving pockets 25 rest, determines the destination of the card being analyzed. It may be mentioned that the time of energization of the sorting mag-

nets depends upon the position of the hole in the card column, each of which has twelve index point positions, so that the card may be guided selectively into any one of twelve sorting pockets 25.

The downward movement of the armature 23 produces an aperture between the last tongue to the left Fig. 7 restrained by the card and the last tongue to the right bearing downwardly with the armature 23 by an inherent spring tension, into which aperture a record card is moved and then guided into the selected pocket by the usual feed rollers 27.

If there are no perforations present in the particular card column being analyzed, the magnets 11 will not be energized and the cards will pass beneath all of the tongues 24 and will be guided to a thirteenth pocket 25R, known as the "reject pocket". The card feeding mechanism comprises a picker 28 horizontally reciprocable to feed cards from the bottom of the stack 29 to a pair of feed rollers 30, which advance the cards to and between brush 22 and contact roller 31.

The machine is driven by a motor M under the control of motor relays 32 and 33. Upon energization of the relays 32 and 33, the motor is connected to the source 17. The relays 32 and 33 are energized by depressing a start key, thus closing contacts S and closing a circuit from the negative side of the source 17, wire 34, stop key contacts ST, start key contact S, relay 35, relays 33 and 32, wire 36 and back to the positive side of the source 17.

A relay 38 wired in series with contact 39 adapted to be operated by a card lever 40, is energized as long as cards are being fed through the machine. Energization of the relay 38 attracts its armature, closing contacts 46, thus establishing a holding circuit around the start key to obviate the necessity of holding the start key depressed during the entire operation of the machine.

After the last card has passed the brushes 22 and the card lever contacts 39 have opened, or after the stop key contacts ST have been opened the relays 35, 32 and 33 are deenergized, resulting in opening the motor circuits from the source 17, thus bringing the machine to rest.

In order to secure proper operation of the sorting machine, it is necessary that the sorting magnets 11 remain energized from the moment at which energization takes place until the last index point position in the card column has passed from beneath the analyzing brush 22. The winding of the brush relay 10 is connected in series with the sorting magnet 11 and is energized therewith as soon as a hole is encountered in the card column analyzed and corresponding to the adjustment of the contact segments 12 of a commutator 13.

There are twelve segments 12 on the commutator 13 and the segments successively wipe by a brush 14 connected through contacts 15, normally closed contacts 9 and a wire 16 to a common brush 18 of the roller 31. A common brush 19 rests on a metallic portion 47 which serves as a ring of the commutator 13, the portion 47 being electrically connected to a segment portion 48, with which cooperates a brush 49. This brush is connected through contacts 50 of the brush controlled relay 10, a relay 45, a wire 51 and a relay 52 to the source 17. The brush 19 is connected by a wire 53, relay 10, sorter magnets 11 and a switch 54 to the positive source 17. The commutator 13 is synchronized with the passage of the card past the brush 22, and moves the segments 12 successively past the brush 14, one segment for each index point in the column being analyzed.

When, during the passage of the card, an index hole in the column being analyzed passes the brush 22, the sorting magnet 11 and the brush relay 10 are energized in a manner to be described hereinafter. Energization of relay 10 forms a holding circuit from source 17 through winding of relay 52, relay 45, contacts 50, brush 49, segment portion 48, ring portion 47, brush 19, relay 10, sorter magnets 11, switch 54 and back to source 17, thus maintaining the magnets 11 energized until all of the remaining index points have passed the card brush 22.

Energization of the sorting magnets 11 through the holding segment 48 would impart impulses through the sorting distributor 13 to a counter mechanism presently to be described, if the circuit to the brush 18 were left closed. This would result in wrong totals on the counters. This effect is overcome by opening the contacts 15 by energization of the relay 52 when the holding circuit for the sorting magnets is formed.

The counters

The foregoing is a brief description of the operation of the sorters in connection with which the counting mechanism, now to be described, is adapted to be used.

An individual counter is provided for each card pocket there being, as set forth above, 13 pockets including the "reject pocket". In addition to the counter for the card pockets, a grand total counter and a sub-total counter are provided. The counters for the individual card pocket are actuated as the card destined for a particular pocket passes the card brush 22. The reject counter adds "1" as each rejected card passes the card brush, the grand total and sub-total counters are both actuated to add "1", as each card bearing a punched hole in the column being analyzed passes the card brush.

A reset mechanism is provided simultaneously to reset all of the counters except the grand total counter which, as is hereinafter described, is normally disconnected from the universal resetting mechanism, to which it may be coupled at will.

The counters are of the well-known Veeder type, each counter being mounted on a sub-base 55 (Fig. 5) between a pair of field coils or magnets 56 supported by brackets 57 secured to the sub-base 55. Poles 58 are secured to the armature ends of the magnets between which poles an armature 59 secured to a countershaft 60 is adapted to operate under the influence of the magnets 56 when energized.

All of the counters are alike and are mounted in two rows, the sub-bases 55 being mounted on a plate 61, supported on cross-bars 62, which in turn are secured on a bracket 63.

The counters are encased in a cabinet 65 through sight opening in which cabinet the reading lines of the counters are visible.

The bracket 63 carrying the entire counter mechanism is pivotally supported on a rod 71, mounted in brackets 72, only one of which is shown (Fig. 6) secured to the sorter frame proper. Brackets 73 also secured to the sorter frame are provided with concentric slots 74 adjustably to support the counter frame 63. By this construction, it is obvious that the counters may be adjusted to any position within the limits of the slot 74.

The oscillatory movement of the armature 59,

and consequently of the countershaft 60, is limited in both directions by adjustable stops 64, one secured on top of the left hand pole 58 (Fig. 5) and one secured to the bottom of the right hand pole. Obviously, energization of the magnets 56 and their poles 58 attracts the ends of armature 59 rotating said armature and the shaft 60 clockwise, as viewed in Fig. 5, until the armature strikes the lower stops 64. This movement of the shaft 60 is sufficient to advance the units wheel one step.

Energization of the magnet 56 is accomplished in the following described manner: When the machine is set in operation by depressing the start key, as set forth above, feeding a card through the machine, the card strikes a card lever 77 (Fig. 7) closing contacts 78, thus, closing a circuit through contacts 78, a brush 79, commutator 80, a brush 81, a card lever set-up relay 82, through wire 83 to source 17. Energization of the relay 82 closes relay contacts 84, thus establishing a holding circuit around the card lever contacts 78 through the contacts 84, a brush 85, commutator 86, a brush 87, winding of relay 82, wire 83 to source 17. Closing the contacts 84 also makes a circuit through these contacts, a wire 88 to the card brush 22, thence through the roller 31, brush 18, wire 16, a switch 89, wire 90 to the usual distributor 96. The distributor 96 is of a well-known type and is rotated in synchronism with the passage of the card by the brush 22, so that as a hole punched in the card column being analyzed passes the brush 22, current is supplied through the circuits just described to the distributor 96, which through one of a series of wires 97, energizes a particular counter magnet 56, corresponding to the position of the index point or perforation on the card.

The circuit through the magnet 56 is completed through a brush 98, a particular commutator segment 99 on a holding commutator 100, through a common ring 101, a brush 102, thence to the source 17. When the wire 97 is energized, as above described, a relay 103 is also energized closing its contacts 104, thus establishing a holding circuit through the magnet 56 as follows: From the source 17 through the winding of a relay 105, a wire 106 common to all of the contacts 104, the selected contacts 104, counter magnets 56, thence through the holding commutator and its brushes to the other side of the source 17.

The holding commutator 100 is rotated in synchronism with the passage of the card by the card brush 22, and the individual segment 99 is of sufficient length to hold the counter magnets 56 energized long enough to complete their adding function.

In addition to supplying current to the distributor 96, the impulse through a hole in the card also energizes the sorting magnets 11 over the following circuit: Negative line 17, contacts 84, wire 88, brush 22, roll 31, brush 18, wire 16, contacts 9, contacts 15, brush 14, brush 19, wire 53, magnet 10, sorter magnets 11, switch 54 to positive line 17. Energization of magnet 10 closes contacts 50 to establish the previously described holding circuit for the sorter magnets 11.

It was stated above, that when no hole is punched in the card column being analyzed, the card passes beneath all of the tongues 24, and into the reject pocket 25R. When this occurs no energy is supplied to the distributor 96, since no hole passes the card brush 22, for which reason other means is provided to count the cards sorted into the reject pocket. When the card lever contacts 39 are closed and no hole passes beneath the card brush 22, the circuit is set up through a reject counter magnet 107 (Fig. 7) through a brush 108, commutator 109, brush 110, a switch 111, contacts 112, through the reject counter magnet 107, through a line 113 to source. This energizes the reject counter magnets to advance the reject counters one step for each card sorted into the reject pocket.

However, if a hole is encountered in the card column being analyzed, it is desired to energize sub-total magnets 114 in order to advance this counter one step. This is accomplished in the following manner:

As was stated above, when the counter magnets 56 are energized, the relay 103 is also energized setting up a circuit through a relay 105. This closes the contact 121 and sets up a circuit through contacts 121, relays 122 and 123, through wire 124 back to source. Energization of the relay 122 closes its contact 125, thus establishing a circuit through brush 126, commutator 127, brush 128 to the contacts 125, relays 122 and 123 and back to source. Energization of the relay 123 closes its contacts 129, thus establishing a circuit through brush 130, commutator 131, brush 132, contacts 129, a relay 133, relay 134, wire 135 and back to source. Energization of the relay 133 closes its contacts 136, thus establishing a holding circuit through brush 137, holding commutator 138, brush 139, contacts 136, relays 133 and 134, wire 135 and back to source.

Energization of the relay 134 opens the contacts 112 to the reject counter magnets and closes the center contact 112 and the goose-neck contact 140, thus opening the circuit to the reject counter and making a circuit through contacts 39, brush 108, commutator 109, brush 110, switch 111, contacts 112 and 140 through the sub-total magnets 114 through wire 146 to source. Energization of the magnets 114 controls addition of one on the sub-total counter.

The total counter is provided to count the total of all cards run through the machine whether or not there is a hole punched in the particular column being analyzed.

The grand total counter is operated by magnets 115 (Fig. 7) under the control of the card lever 40. As a card passes the lever 40 said lever closes the contacts 39 establishing a circuit through a brush 116, a holding commutator 117, a brush 118, magnets 115, wire 119 to source 17. Thus the magnets 115 are energized as each card passes the card lever 40, to add "one" on the ground total counter.

The contacts 39 are not closed until one card cycle later than the cycle during which the index points on the card are sensed. This is necessary in order to provide for sensing all of the index points on the card in order to determine whether the cards should be rejected or passed into one of the selected pockets.

The commutators 80, 86, 127, 131, 138 and 109 are secured on a shaft 147 (Fig. 6) rotatably mounted in suitably supported frames 148 and 149. The shaft 147 is rotated by a usual drive shaft 151, (Fig. 6) having a worm gear 150 secured thereto and meshing with a gear 152 on a picker shaft 153. A gear 154 secured to the shaft 153 meshes with the gear 155 on a shaft 156, which gear 155 meshes with a gear 157 secured on the shaft 147. The shaft 151 through the train of gears just described rotates the shaft 147 and the commutators one complete rotation at each card cycle of the machine.

The holding commutators 100 bearing the elongated segments 99 is mounted on a vertical shaft 158 suitably supported in the machine having secured thereto near its upper end a gear 159 which also meshes with the worm gear 150 on the shaft 151.

The distributor 96 is mounted at the upper end of the shaft 158 and is adapted to be rotated thereby. The shaft 158 is given one complete rotation at each card cycle of the machine, thus rotating the holding commutator 100 and the armature for the distributor 96 one complete rotation at each card cycle of the machine.

Resetting mechanism

Mechanism is provided to reset all of the counters simultaneously. Each of the counters is provided with the reset shaft 160 upon which is secured a gear 161 meshing with the gear 162 secured on one of a pair of universal reset shafts 163 rotatably mounted in brackets 164 secured to the frame 63. Two shafts, 163, are provided, one for the upper row of counters and one associated with the lower row of counters as viewed in Figure 1. Gear 165 secured to the right hand end, as viewed in Fig. 1, of the shaft 163 meshes with an intermediate gear 166 rotatably mounted on a stud carried by a bracket 167. A manually operable crank 168 is secured to the lower gear 165 (Fig. 1) to provide a convenient means to reset all of the counters to zero simultaneously. The ratio of the gears 162 and 161 is two to one, consequently, requiring one-half of one rotation of the crank 168 to impart a full rotation to the reset shaft 160. These counters are well known and it is understood that their reading may be restored to zero by the turning of their shaft for one complete revolution. It is believed to be unnecessary to show the details of construction of these counters here. These details may be found in U. S. Patent No. 1,370,540, dated March 8, 1921.

The resetting mechanism is normally locked against operation and before the counters may be reset to zero, it is necessary for the operator to rock a lever 168', (Fig. 2) rotatably mounted on a stud 169 in the bracket 167 clockwise as viewed in Fig. 2, to remove a stud 170 on the lower end of the lever 168' from a notch in the periphery of a disc 171, secured to the gear 165 to which the crank 168 is secured. As soon as the stud 170 is clear of the notch, the crank 168 may be rotated clockwise, as viewed in Fig. 2, to reset all of these counters to zero.

Provision is made to prevent energization of the counter magnets while the counters are being reset to zero. This preventative means includes a pair of contacts 172 suitably supported on the bracket 167. Clockwise operation of the lever 168' brings the lower end of said lever into contact with the block of insulation 173 carried on the lower end of one of the contact carrying switch blades, thus opening the contacts 172. The contacts 172 are wired in series with the energy source, consequently, when opened by operation of the lever 168' (Fig. 2) prevents energization of the sorting and counting mechanism.

It was stated above that the resetting mechanism for the grand total counter is normally disconnected from the reset shaft 163 associated therewith and may be connected herewith at will, in order to reset the grand total counter simultaneously with the remaining counters. The gear 162 associated with the grand-total counter resetting mechanism is loosely mounted on the shaft 163. A hole 174 in the gear 162 is normally held in alignment with a stud 175 carried on a clutch member 176 by a spring retainer 177 mounted on one of the cross bars 62. The retainer 177 normally engages a notch in an aligning disc 178 secured to the side of the gear 162. The clutch member 176 is slidably mounted on the shaft 163, and is made to rotate with said shaft by the usual key 179 (Fig. 4).

In order to enter the stud 175 into the hole 174 in the gear 162, thus coupling the clutch member to the gear, a lever 186 is provided. The lower end of the lever 186 is bifurcated and straddles the free end of one arm 188 of a bell crank pivotally supported on the bar 62.

The other arm 189 of the bell crank is embraced by an annular groove 190 in the clutch member 176. Clockwise rotation of lever 186 as viewed in Fig. 2 or downward movement in Fig. 3 rocks the bell crank 188—189 clockwise as viewed in Fig. 3, sliding the clutch member 176 towards the left, thus entering the stud 175 in its hole 174 so that upon rotation of the shaft 163 the clutch member 166 and the gear 162 rotate in unison. As the bell crank 188—189 rocks clockwise, as viewed in Fig. 3, a pin 191 on the arm 188 of the bell crank wipes by an angular portion of a spring retainer 192, which retainer, under its own tension moves back on the opposite side of stud 191, thus holding the bell crank in alignment in either of its two positions.

With the gear 162 thus clutched to the shaft 163, the movement of the crank 168 is transmitted to the resetting gear 161 associated with the grand total counter, thus resetting this counter to zero at the same time the remaining counters are reset to zero. When the resetting crank 168 is restored to its home position, after having been operated to reset the counters, the lever 168' is rocked counterclockwise under the influence of a restoring spring 159 moving the stud 170 into its notch in the disc 171. At this point, the contacts 172 open under the influence of their inherent spring tension.

The coupling lever 186 may be left in its operating position in which case the grand total counter resetting mechanism remains coupled to its drive shaft 163, thus effecting the resetting of the grand totalizer whenever the remaining totalizers are reset, or the operator may, by manipulating the lever 186, cause the resetting of the grand total counters at his discretion.

While the form of mechanism herein shown and described is admirably adapted to fulfill the object primarily stated, it is to be understood that it is not intended to confine the invention to the form or embodiment herein disclosed, for it is susceptible of embodiment in various forms all coming within the scope of the claims which follow.

What is claimed is:

1. In a machine of the class described capable of operating on record cards having index points thereon, the combination of means to analyze the record card, counters corresponding to the index points, means controlled by the analyzing means and the index points to initiate an impulse, and means to prolong the impulse to operate the counters, said means comprising a separate timed commutator element for each counter, the commutator elements being adapted to maintain the impulses for all of the counters an equal length of time.

2. In a machine of the class described capable of operating on record cards having differential index points thereon, the combination of means to analyze the record card, counters correspond-

ing to the index points, means controlled by the analyzing means and the index points to initiate timed impulses corresponding to the index points to operate the counters, and means under the control of the impulses to increase the duration of said impulses and adapted to cause the impulses for all of the counters to endure an equal length of time.

3. In a machine of the class described capable of operating on record cards having control points thereon, the combination of means to analyze the cards, means to selectively distribute the cards according to a plurality of designations, a counter for each designation, means controlled by the analyzing means to initiate an electrical impulse to control an operation of the corresponding counter, and means to prolong the impulse to complete operation of the counter and adapted to cause such impulses to endure for an equal duration of time.

4. In a machine of the class described capable of operating on record cards having control points thereon, the combination of means to analyze the cards, means to selectively distribute the cards according to a plurality of designations, a counter for each designation, means controlled by the analyzing means to initiate an electrical impulse to initiate an operation of the corresponding counters, means responsive to said impulse to establish an operating circuit, and means to cause an equal duration of all such circuits.

5. In a machine of the class described capable of operating on a record card having contro points thereon, the combination of means to analyze the control points, means to selectively distribute the cards according to the location of the control points, a counter for each control point, means controlled by the analyzing means and the control points to initiate an electrical impulse to initiate an operation of the corresponding counter, means responsive to said impulse to establish an operating circuit, and a commutator having a series of elongated segments thereon to cause the duration of the operating circuit for all of the counters to be the same.

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