Dec. 27, 1949 A. G. SEIPOS 2,492,664

STOP MECHANISM FOR SORTERS

Filed Oct. 26, 1945 2 Sheets-Sheet 1

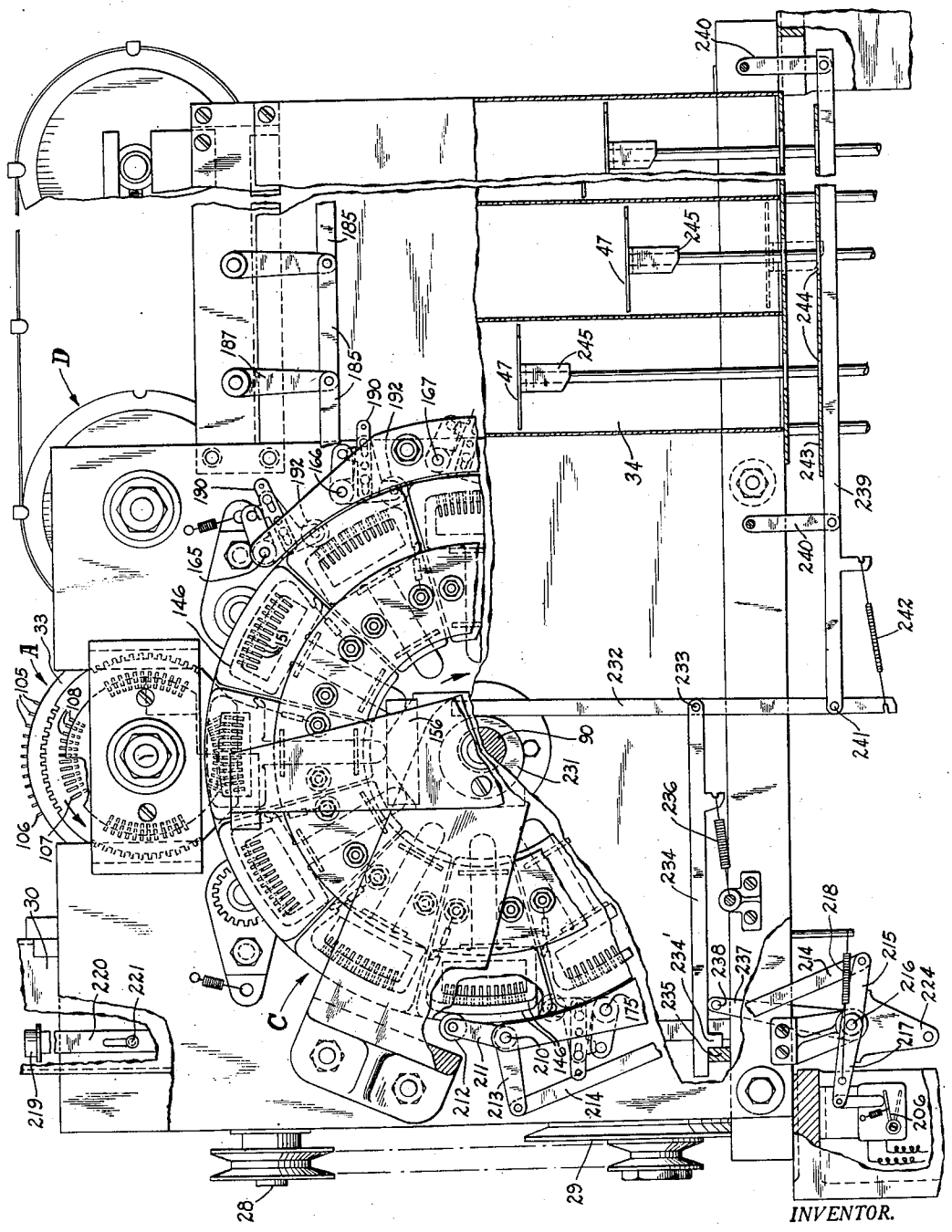

Fig. 1

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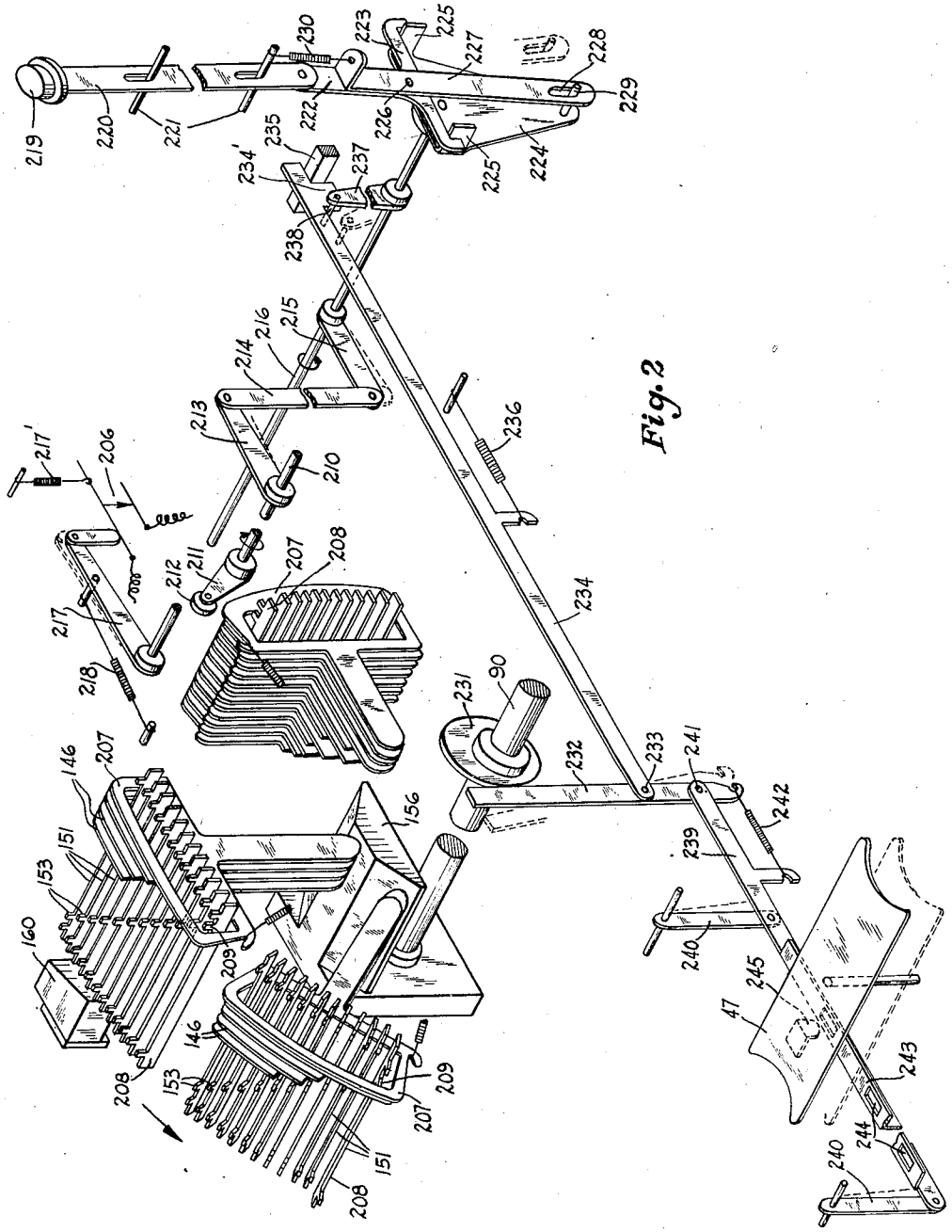

Fig. 2

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UNITED STATES PATENT OFFICE

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STOP MECHANISM FOR SORTERS

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Application October 26, 1945, Serial No. 624,879

10 Claims. (Cl. 192—125)

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This invention relates to improvements in statistical card machines and has particular reference to an automatic stop mechanism therefor.

Although the invention may be adapted to various types of punch card machines, it is especially designed for use in the sorting machine disclosed in the co-pending application of Karl J. Braun, Serial No. 565,108, filed November 25, 1944, now issued as Patent No. 2,454,628, dated November 23, 1948.

In prior automatic stop devices, it has been known to provide separate controls for stopping the machine under different conditions, such as when the last card of a stack in the magazine has been fed therefrom and through the sensing position, and when a predetermined maximum number of cards have been deposited into any one of the pockets of the machine. In the first circumstance, it is desirable to delay the stopping of the machine until all analyzed cards which have not reached their respective pockets, at the moment of card exhaustion, are deposited into said pockets, while under the second condition, the machine is stopped immediately upon a pocket becoming filled.

In accordance with the present invention, it is proposed to accomplish both of the aforesaid functions by utilizing improved mechanisms which are operatively connected with a common control element to stop the machine drive.

In connection with the first of said functions, the operation of said control element is governed by a timing unit common to all the pockets of the machine and adapted, in response to selective operations made therein under the influence of the sensing mechanism, to control the distribution of the cards into their respective pockets. To utilize said timing unit to automatically control the stopping of the machine drive after a predetermined interval following exhaustion of cards of the magazine, or upon failure of a card to reach the sensing position during normal operation of the machine, the sensing mechanism again performs a selecting operation in the timing unit and, as a result of such selection, the aforementioned control element will be operated as said timing unit approaches the end of its cycle, thereby allowing all cards sensed prior to the occurrence of said selecting operation to be properly deposited.

To accomplish the immediate stopping of the machine when a card pocket becomes filled, the shaft of the timing unit is utilized to control a mechanism common to the various pockets and

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responsive to a filling of any one of them to operate the above mentioned control element.

The inventive idea involved is capable of receiving a variety of mechanical expressions one of which, for purposes of illustration, is shown in the accompanying drawings; but it is to be expressly understood that said drawings are employed only to facilitate the description of the invention as a whole and not to define the limits thereof, reference to be had to the appended claims for this purpose:

Fig. 1 is a fragmentary side elevation, partly broken away and shown in section, or a card sorting machine, illustrating the present invention applied thereto.

Fig. 2 is an isometric view showing the automatic stop mechanism.

The invention is illustrated in its adaptation to the machine described in the above identified patent to which reference is made for a complete description of the construction and operation of the machine. Briefly, cards are fed from a magazine 30 to a continuously rotating sensing mechanism A which analyses the cards in transit through the sensing position and, in so doing, performs a selective operation in the rotary timing unit C that controls the distribution of the cards into their respective pockets 34 each containing a movable card support 47, said cards being transmitted from the sensing position to said pockets by the endless conveyor D. Said sensing mechanism and timing unit are driven in opposite directions by a timing shaft 28 connected to a motor (not shown) by the drive 29, and the operation of said motor is controlled, in a manner to later appear, by a switch 206 shown in its open position in Fig. 1, and closed in Fig. 2.

As shown in said patent, the sensing unit A comprises a wheel 33 capable of columnar adjustment and carrying four groups of pins, each group containing eleven sensing pins 105 and an additional detector pin 106, the latter being the first pin of the group to reach the sensing position and determining whether or not there is a card at said position to thereby control the subsequent operation of the machine. In the event the pin 106 engages a card, then the analysis of said card proceeds so that it will be deposited into its proper pocket, but if there is no card at the sensing position when the pin 106 reaches the same, said pin detects such condition and initiates an operation, through a spring-urged detector slide 107, which prevents the following sensing pins 105 from effecting a selective operation in the timing unit C by the locking of all of the other

slides 108 associated with said detector slide. It will later appear how, in accordance with the present invention, this same failure of the detector pin to engage a card is utilized to open the switch 206 and thus stop the machine. A selecting operation in the timing unit C is accomplished when one of the sensing pins 105 passes through a punched index point. As this occurs, the slide 108, similar to the slide 107 and individual to said index point, is spring-urged outwardly to similarly actuate the then opposed latch bar or interposer 151 of a group of eleven of such bars associated with a similarly numbered group of cams 146 of the timing unit which are then passing the sensing position in the cyclic operation of said unit, the start of a cycle being when any one of said groups of cams is at the sensing position and said cycle being terminated when said group again reaches said position. As each of the twelve groups of such cams of the timing unit approaches said sensing position, they are moved radially outward against spring tension by a stationary cam 156 located directly above the shaft 90 of the timing unit so that the lug 153 of the selected bar 151 will be positioned in vertical alignment with the cam 146 which is individual to the punched index point and which subsequently controls the opening of the pocket into which the analyzed card is to be deposited. When the cams of the group pass from the sensing position, all of them, with the exception of the one which has been selected by the projection of a latch bar 151, recede to their normal positions as they leave the stationary cam 156, and the selected cam 146 is retained in its raised or radially projected position by the lug 153 of the operated latch bar, since said lug is then directly under the outer portion of said cam and supports it in such position until the end of the cycle of the timing unit is approached. At this time, a stationary cam 160 restores the operated latch bar 151 to normal, thus allowing the associated cam 146 to also return to its normal position just before the group of cams in which it is located again reaches the sensing position. Arranged about the rotating unit C are rocker shafts 165 to 175, each assigned to one of the pockets 34 of the machine. Each rocker shaft carries a trip device 190 individual to the corresponding pocket and so arranged longitudinally on said shaft as to be in the path of movement of the selected cam 146 of any one of the twelve groups which is also individual to said pocket. As said cam reaches the trip device in its path, the roller 192 of said device is engaged by the cam, resulting in the rocking of the shaft on which said device is mounted. Thereupon, an oscillatory member of a distributing mechanism, shown in said patent, is actuated to operate the link 185, associated with the pocket for which the sensed card is destined. Because of the spacing of the trip devices about the rotating groups of cams, the link 185 is operated in timed relation to the movement of the sensed card along the conveyor D to swing the arm 187 just as said card approaches its pocket to thereby operate the delivery mechanism which guides the card into said pocket.

In connection with the automatic stopping of the machine due to exhaustion of the card supply in the magazine 30 and consequent failure of a card to reach the sensing position, the present invention involves the addition of a twelfth cam 207 shown as the innermost cam in each of the groups in the timing unit A, and also the provision of a twelfth latch bar or interposer 208

individual to said cam and provided with a lug 209, similar to the lugs 153 on the other bars, which is adapted to be vertically aligned with the outer portion or head of said cam 207 when said latch bar is operated. As previously described, when the detector pin 106 of any one of the groups of pins on the sensing unit fails to engage a card at the sensing position, the slide 107 associated with said detector pin will be projected outwardly with the result that the remaining slides 108 of the group are locked so as to prevent a selective operation in the timing unit. In the machine of the patent, the control of the slides 108 is the sole function of the slide 107 since it has no corresponding latch bar associated therewith. However, in the present instance, the slide 107 has the additional function, when it is projected outwardly, of causing a selection of the added cam 207 of the raised group passing through the sensing position. Thus, when said detector slide 107 is projected outwardly to make its selection it engages and similarly moves the latch bar 208, this occurring when the middle group of cams (Fig. 2), shown just prior to said selection, is passing through said sensing position. The actuated latch bar 208 then assumes the position shown in the left hand group so that its lug 209 will be disposed directly beneath the head of the cam 207 to prevent it from receding with the other cams 146 as the latter pass from engagement with the stationary cam 156. The selected cam 207, which subsequently controls the stopping of the machine after a predetermined interval of time has elapsed, is thus retained in its operative position until after it has accomplished its function, whereupon the outer end of the latch bar 208 is engaged by the stationary cam 160 and restored to normal to release said cam 207.

The interval between the selection of the cam 207 and the point in its cycle of rotation where it becomes operative to stop the machine, is utilized to permit any cards which have been analyzed prior to the selection of said cam 207 to reach their respective pockets so that the conveyor D will be cleared of cards when the machine is stopped. To accomplish this purpose, an additional rock shaft 210, similar to the shafts 165, etc., is located at a point beyond the last rocker shaft 175 and supports a trip arm 211 having a roller 212 at one end which is adapted to be engaged by the projected cam 207 of any one of the groups included in the timing unit. As will be seen, this engagement occurs after all the previously analyzed cards have been deposited into their respective pockets, and when the shaft 210 is rocked by such engagement an arm 213 secured thereto depresses a link 214. At its lower end, said link is joined to an arm 215 secured on the switch control shaft 216 so that the latter also is rocked in the direction of the arrow in Fig. 2. This movement of said shaft lifts the arm 217 secured to it at one extremity thereof to thereby permit separation of the contacts of the switch 206 by the spring 217' to open the circuit of the motor which drives the machine. A toggle spring 218 is connected to the arm 217 and after the latter has been raised by the shaft 216 to a point past the dead center, said spring will act to yieldably retain said arm in raised position until a manually operable switch, presently to be described, is operated to reverse the direction of rotation of the shaft 216 and thereby lower said arm 217 to again close the contacts 206.

Said manually operated switch is mounted upon one of the side plates of the machine adjacent the magazine 30 and is coupled to the control shaft 216 so that the machine may be started and stopped at the will of the operator. Said switch comprises a push button 219 having a plunger extension 220 guided in its movements by the stationary pins 221 and pivotally connected at its lower end to the upper extremity of an oscillatory arm 222 the lower end of which has an operating head 223. Associated with said head is a toggle lever 224 in the form of a plate having lateral extensions 225 at its upper end adapted for alternate engagement with the extremities of said operating head whereby said lever 224 is rocked in opposite directions each time the button 219 is depressed. Said lever 224 is fixed upon the adjacent end of the control shaft 216 so as to alternately turn said shaft in opposite directions when the lever is actuated by said depression of said button 219. Also, when the shaft 216 is operated automatically to stop the machine, the lever 224 will be shifted to properly position one of its extensions 225 relative to an extremity of the head 223 so that said lever will be actuated, when the button 219 is again depressed, to turn shaft 216 in the direction to close the switch contacts 206. Pivoted intermediate its ends, at 222, to the head 223, is a lever 227 having a slot 228 at its lower end for receiving a pin 229 projecting from the lower end of the toggle lever 224 and, at its upper end, said lever 227 is joined to the lower stationary pin 221 by a coil spring 230. As the lever 224 is rocked from one position to another by successive downward movements of the arm 222 and consequent engagement of the head 223 with one or the other of the extensions 225, the pin 229 will swing the lever 227 about its pivotal connection with the head 223 and thereby activate the spring 230 so that upon release of the push button 219, the plunger extension 220 and the parts connected thereto will be restored upwardly and be ready for the next depression of said button which will effect a reversal of the rocking movement of the lever 224 and, consequently, of the shaft 216 to open or close the contacts of the switch 206. From the foregoing, it will be apparent that when the manually operable switch is actuated to start the machine, the lever 224 will be shifted to turn the shaft 216 in a direction which will close the switch contacts 206, and when the machine is automatically stopped, the position of the lever 224 will be reversed so that the next operation of said manual switch will again start the machine.

At the time that the machine is automatically stopped by the operation of the trip arm 211 by one of the cams 207, all similar cams following the first named one which have passed the sensing position before the machine is stopped will have been selected and held in operative position by reason of the non-appearance of a card at said position. Therefore, if the push button 219 were depressed and instantly released to again start the machine, the next cam 207 following the one which effected the automatic stopping of the machine, would also trip the arm 211 and again stop the machine, and a similar action would take place each time the button 219 would be so operated until all the selected cams 207 have passed the trip arm 211 and been restored by the stationary cam 160. To overcome this condition, it is only necessary to hold the button 219 depressed for a short interval of sufficient duration to permit all the selected cams 207 to pass the trip arm 211, whereupon, with the cards feeding normally to the sensing position, the machine will continue to run.

The mechanism for automatically stopping the machine when a predetermined maximum number of cards have entered any one of the pockets 34, will now be described. This mechanism is controlled from the shaft 90 of the timing unit in such manner that when a pocket becomes filled with cards the control shaft 216 will be rocked in the direction of the arrow in Fig. 2 to open the switch contacts 206 and thus stop the machine. To this end, an eccentric 231 is secured on the shaft 90 and engages the upper end of an oscillatory lever 232 to continuously operate the same while the machine is running. At 233, adjacent the lower end of the lever 232, there is pivoted one end of a link 234, the other end of which is provided with a head 234' that abuts against a stop 235 against which it is held, during the running of the machine, by a heavy coil spring 236. Thus, the pivot 233 acts as a fulcrum for the lever 232 until such time when the link 234 is moved to the left, as viewed in Fig. 2. When this occurs, an arm 237 having a pin 238 in the path of said head 234', is swung in a counter-clockwise direction and thus turns the shaft 216 to open the switch contacts 206, as previously described in connection with the first automatic stop control. During the operation of the machine and while the lever 232 is being oscillated about the fulcrum 233, it reciprocates a lock bar 239 which is suspended from the frame of the machine by links 240 and has one end thereof pivotally connected, at 241, to the lever 232, adjacent its lower extremity and below the fulcrum 233. A coil spring 242 connecting the lower extremity of the lever 232 with the bar 239 maintains the upper end of said lever in constant engagement with the eccentric 231. As shown in Fig. 1, said lock bar 239 extends horizontally beneath the pockets 34, and is provided with a flange 243 having a series of spaced slots 244 therein each of which is individual to and located directly below one of said pockets. The card support 47 in each pocket is provided with a depending latch or interposer 245 adapted, when the pocket becomes filled and the support therein has been depressed to the dotted line position shown in the middle pocket of Fig. 1, to enter the slot 244 beneath said pocket and thus lock the bar 239 against further reciprocation, the entry of said latch 245 into its associated slot occurring when the bar 239 is at the extremity of its right hand movement as viewed in Fig. 1. This locking of the bar prevents the same from completing its return stroke and thereby immediately shifts the fulcrum of the lever 232 from the pivot 233 to the pivot 241. A slight continued movement of the lever 232 under the influence of the eccentric 231 now pulls the link 234 to the left (Fig. 2) and, through contact of the head 234' with the pin 238, swings the arm 237 to the dotted line position so that the control shaft 216 will be rocked to open the switch contacts 206 and thus stop the machine drive which cannot be started again by an operation of the manual switch until the cards are extracted from the filled pocket. Upon stopping the drive and extraction of cards from the filled pocket to release the bar 239 by the upward restoration of the support 47 in a well known manner and consequent withdrawal of the latch 245 from its slot 244, the spring 236, which is heavier than the spring 242, will pull the link

234 to the left (Fig. 1) until its head 234' engages the stop 235. In so doing, said link will also pull said lock bar to the left by swinging the lever 232 about the eccentric 231 as a fulcrum. This action leaves the arm 237 in the position of Fig. 1, with the switch contacts still open. Operation of the manual switch to again start the machine will now turn the shaft 216 to close the switch contacts 206 and move the arm 237 to the position where its pin 238 is again contiguous to the head 234' for operation thereby when the machine is to be again stopped. Thus, the fulcrum of the lever 232 is now restored to the pivot 233 so that the lock bar 229 may again be reciprocated while the machine is running.

What is claimed is:

1. In a card sorter, a plurality of pockets having movable supports for receiving analyzed cards, means to feed cards to said pockets, a reciprocatory member continuously movable under said pockets while said feeding means is operating, cooperating means between said supports and reciprocatory member operable, upon entry of a predetermined number of cards into any one of said pockets, to stop reciprocation of said member, and means responsive to the stopping of said member to interrupt the operation of said feeding means.

2. In a card sorter, a plurality of pockets having movable supports for receiving analyzed cards, means to feed cards to said pockets, a reciprocatory member continuously movable under said pockets while said feeding means is operating and having openings therein each associated with one of said pockets, a latch on each support movable into the corresponding opening in said reciprocatory member to stop its reciprocation when the cards on said support have reached a predetermined number, and means responsive to the stopping of said member to interrupt the operation of said feeding means.

3. In a card sorter, a plurality of pockets having movable supports for receiving analyzed cards, means to feed cards to said pockets, a switch for controlling said means, a reciprocatory member continuously movable under said pockets while said feeding means is operating, an oscillating lever pivotally connected at one point to said reciprocatory member for operating same, a switch-operating element connected to said switch and to which said lever is pivoted, at a point spaced from the first named point, for oscillation while said reciprocatory member is reciprocated, cooperating means between said supports and reciprocatory member operable, upon entry of a predetermined number of cards into any one of said pockets, to stop said reciprocatory member so that the fulcrum of said lever will be shifted from the second named point to said first named point to thereby actuate said switch-operating member to open said switch.

4. In a card sorter, a plurality of pockets having movable supports for receiving analyzed cards, means to feed cards toward said pockets, a timing shaft extending transversely to the line of feed of said cards, a timing unit on said shaft controlling the distribution of cards into said pockets, a switch controlling the operation of said shaft, a lock member continuously movable beneath said pockets while said shaft is rotating, means driven by said shaft for so moving said lock member, means on each of said supports engageable with said lock member, when a predetermined number of cards have been deposited on a support, for stopping movement of said lock member, and means responsive to the stopping of said member to operate said switch to stop rotation of said shaft.

5. In a card sorter, a plurality of pockets each having a movable support therein for receiving analyzed cards, means to feed cards to said pockets, a member continuously movable while said feeding means is operating, cooperating means between each support and movable member operable, upon deposit of a predetermined number of cards onto any one of said supports, to stop movement of said member, and means responsive to the stopping of said member to interrupt the operation of said feeding means.

6. In combination, a plurality of pockets into which cards are selectively sorted, sensing means to which said cards are fed, a plurality of pocket control members arranged in groups for successive cooperation with said sensing means, means to so control said groups, means operated by the appearance of holes in successive cards being sensed to set one of said control members in each group in pocket controlling position, means thereafter actuated by each set member to open one of said pockets, a switch controlling member in each of said groups, means operated by the failure of a card to be fed to said sensing means for setting the switch controlling member in any one of said groups, and switch operating mechanism arranged with respect to said pocket opening means so as to be actuated by the set switch controlling member in any group only after all set pocket control members in preceding groups have become effective to actuate said pocket opening means.

7. In combination, a plurality of pockets into which cards are selectively sorted, sensing means to which said cards are fed, a rotatable timing unit controlling the distribution of cards into said pockets and comprising a plurality of pocket and switch control members arranged in groups circumferentially around said unit with one switch control member in each of said groups, means to rotate said unit to successively associate said groups with said sensing means, means operated by the sensing of holes in cards to set a pocket control member in each group, means thereafter actuated by each set member to open one of said pockets to receive a sensed card, means operated by the absence of a card at said sensing means to set the switch control member in the group then in association with said sensing means, and switch operating means arranged with respect to said pocket opening means so as to be actuated by the last named control member only after all set pocket control members in the groups preceding the last named group have acuated said pocket opening means.

8. In combination, a plurality of pockets into which cards are selectively sorted, sensing means to which said cards are fed, a rotatable timing unit controlling the distribution of cards into said pockets and comprising a plurality of pocket and switch control members arranged in groups circumferentially around said unit with one switch control member in each of said groups, means to rotate said unit to successively associate said groups with said sensing means, means operated by the sensing of holes in cards to set a control member in each group, an endless conveyor movable over said pockets for receiving sensed cards from said sensing means, mechanism successively operated by the set control members in the various groups to open said pockets to receive the

cards on said conveyor, means operated by the absence of a card at said sensing means to set the switch control member in the group then in association with said sensing means, and switch operating means arranged with respect to said pocket opening mechanism so as to be actuated by the last named control member only after all cards on said conveyor have been deposited into said pockets.

9. In combination, a card sensing means, a plurality of pockets into which cards are sorted under control of said sensing means, a shaft, a timing unit rotatable about said shaft and including a plurality of pocket and switch control members arranged in groups with one switch control member in each group and all the members of each group being arranged side by side along said shaft and radially movable relative thereto to positions of selection, means to so move said members, means controlled by said sensing means to select one pocket control member in each group as holes in successive cards are sensed, means controlled by each selected member for opening one of said pockets, means operated by the absence of a card at said sensing station to select the switch control member of one of said groups, and switch operating means arranged with respect to said pocket opening means so as to be actuated by the selection of said switch control member only after all other selected pocket control members have opened their pockets.

10. In combination, a plurality of pockets into which cards are selectively sorted, sensing means to which said cards are fed, a rotatable timing unit controlling the distribution of cards into said pockets and comprising a plurality of pocket and switch control members arranged in groups circumferentially around said unit with one switch control member in each of said groups, means to rotate said unit to successively associate said groups with said sensing means, means operated by the sensing of holes in cards to set a pocket control member in each group, a group of trip devices also arranged circumferentially about said timing unit and with respect to which said unit is rotatable, said devices being operable by the set pocket control members in the various groups, means controlled by the operation of said trip devices for opening said pockets, means operated by the absence of a card at said sensing means to set the switch control member in the group then in association with said sensing means, another trip device included in said group of devices and arranged last in the order of their circumferential succession with respect to the direction of rotation of said timing unit and operated by said set switch control member after all preceding set pocket control members have actuated the first named trip devices, and switching means actuated by the operation of said other trip device.

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