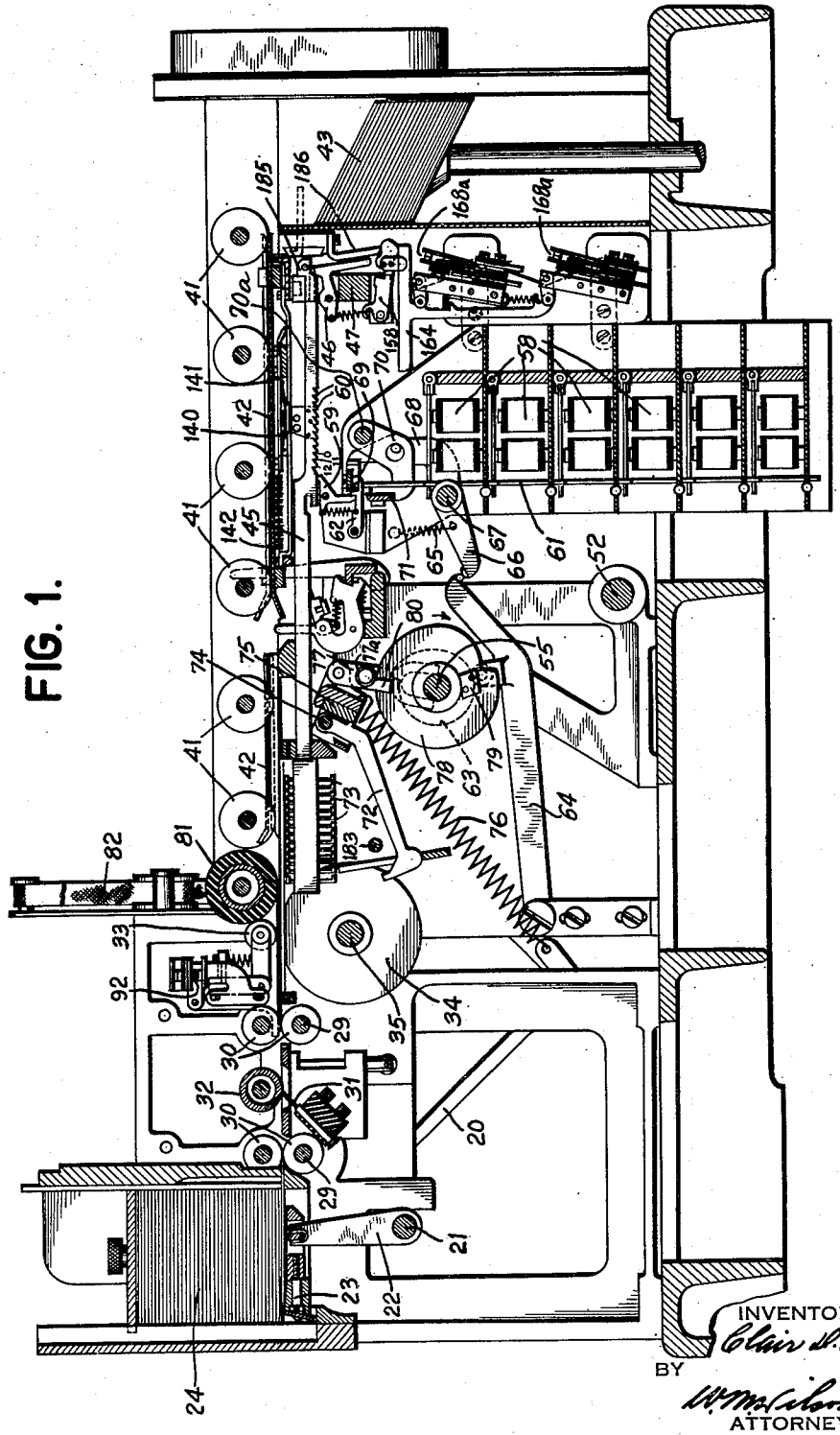
July 1, 1941. C. D. LAKE 2,247,914

MACHINE FOR INTERPRETING AND PRINTING PERFORATED RECORDS

Filed Dec. 28, 1937 6 Sheets-Sheet 1

FIG. 1.



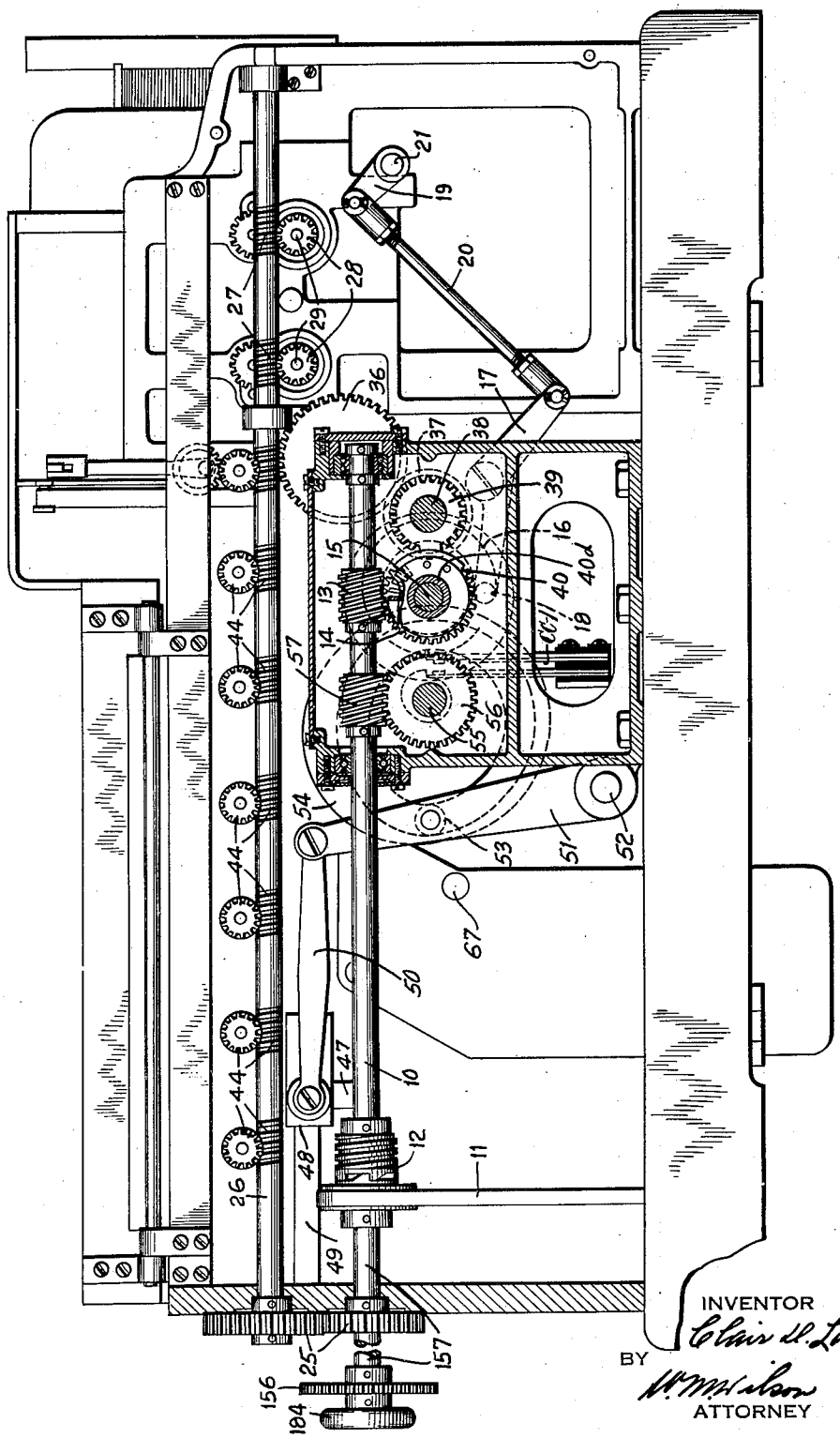
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MACHINE FOR INTERPRETING AND PRINTING PERFORATED RECORDS

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FIG. 2.



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MACHINE FOR INTERPRETING AND PRINTING PERFORATED RECORDS

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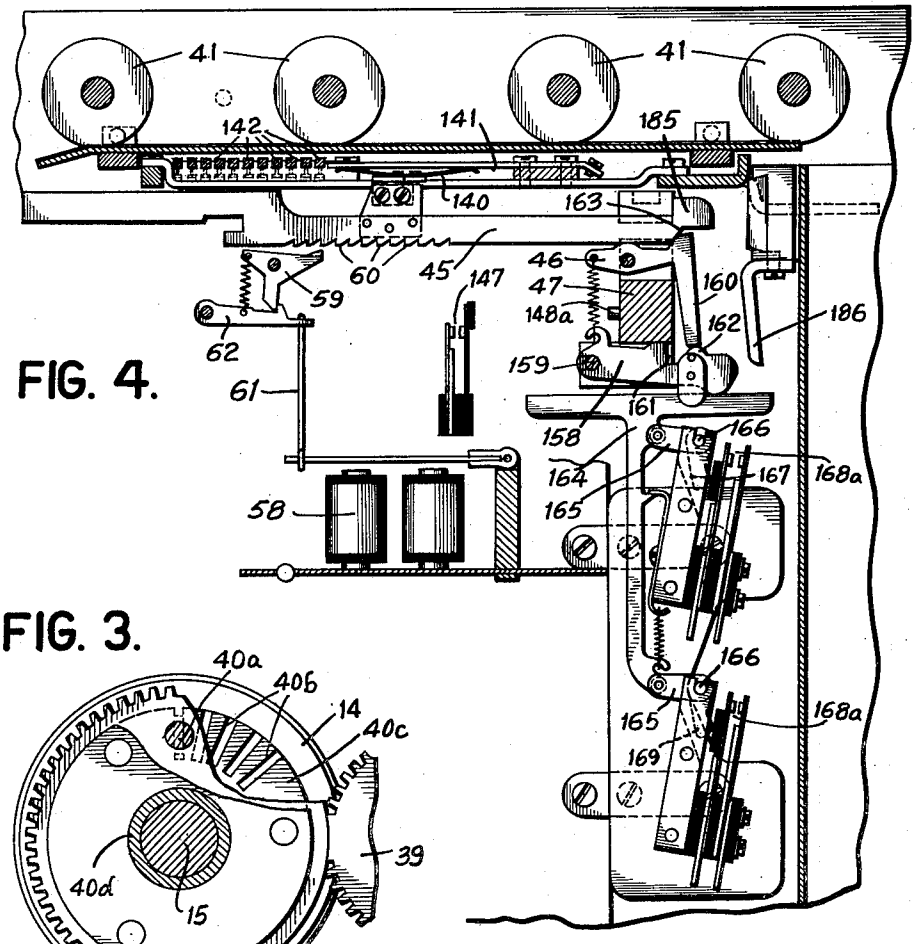


FIG. 4.

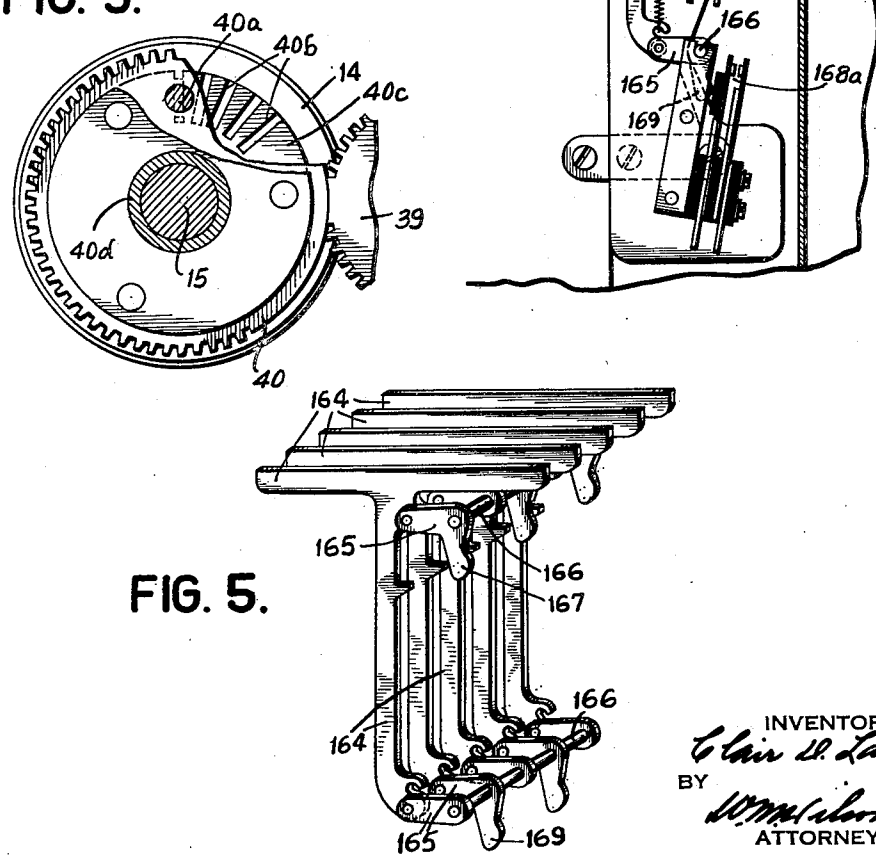


FIG. 3.

FIG. 5.

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MACHINE FOR INTERPRETING AND PRINTING PERFORATED RECORDS

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FIG. 6.

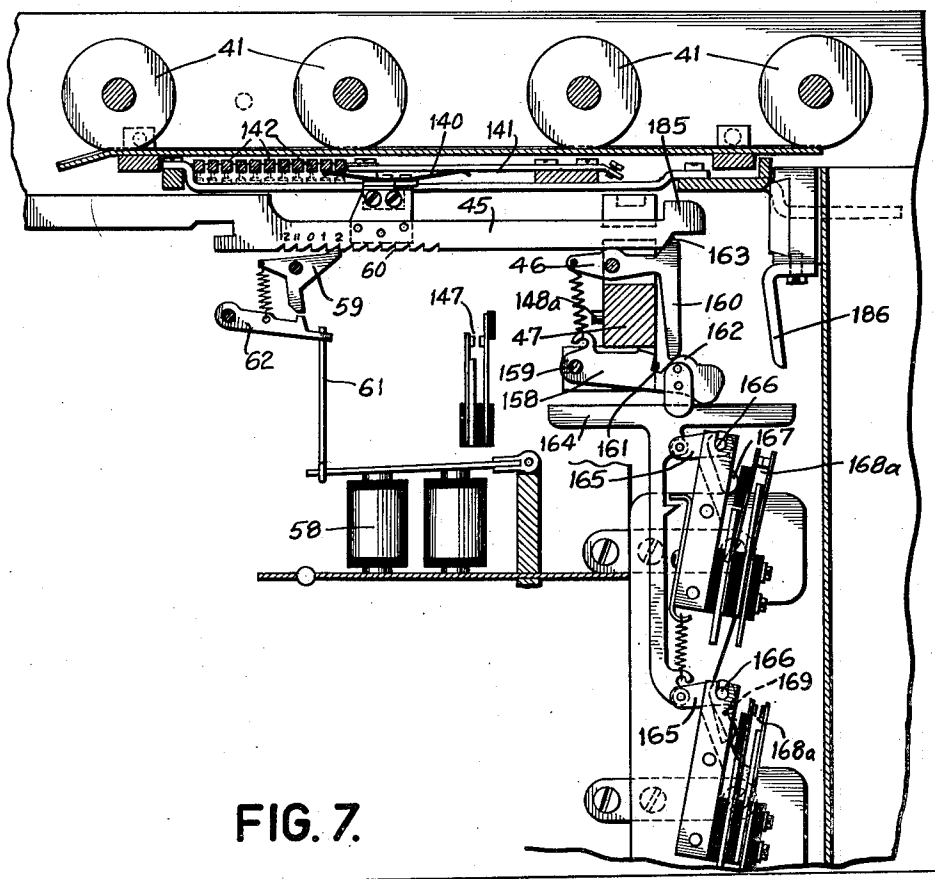
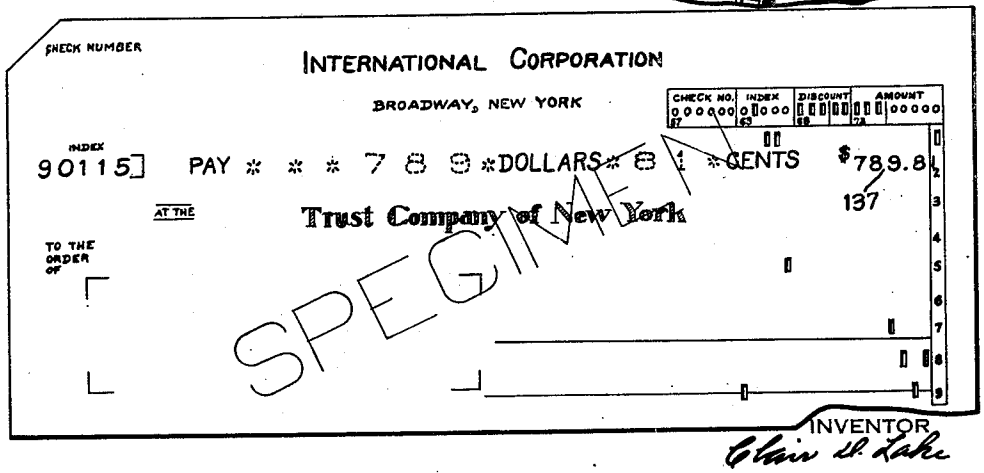


FIG. 7.



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MACHINE FOR INTERPRETING AND PRINTING PERFORATED RECORDS

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FIG. 8.

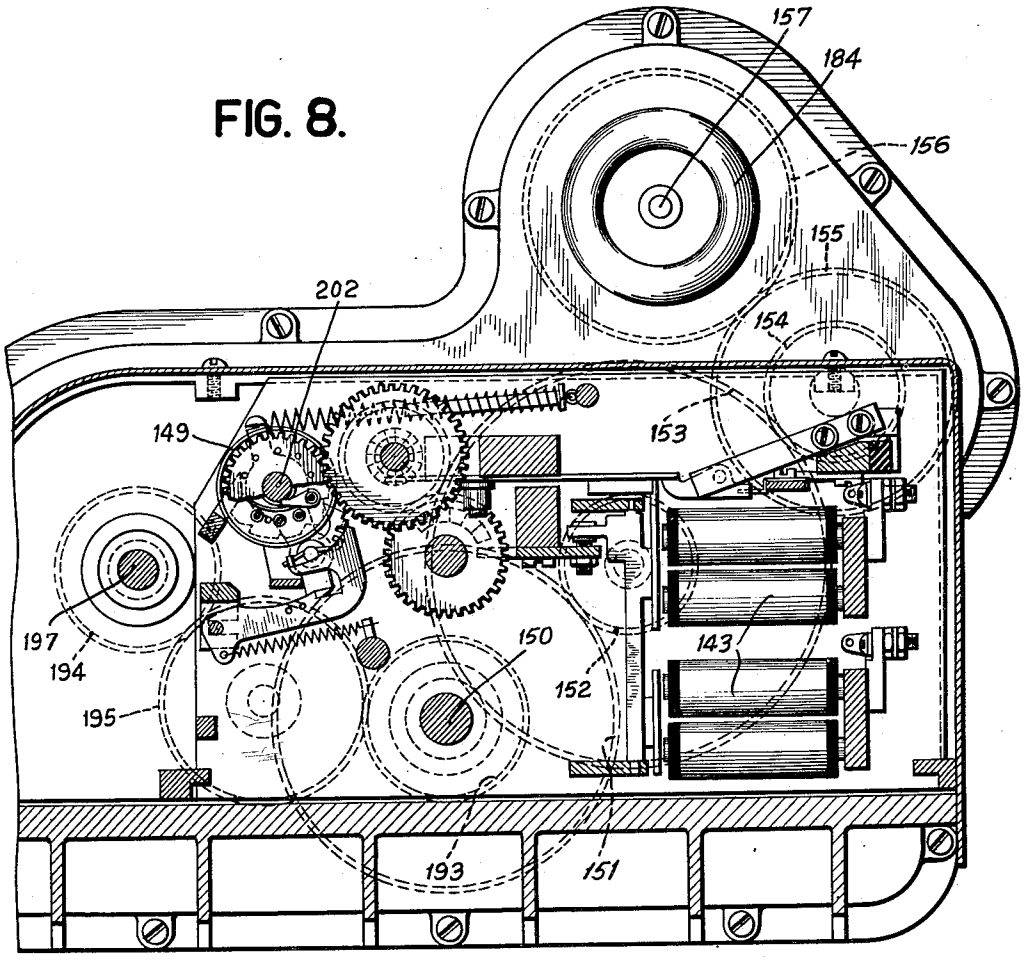
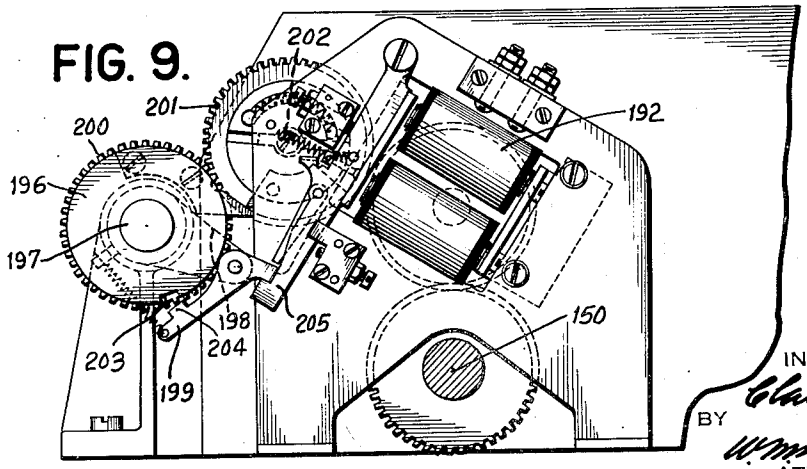


FIG. 9.



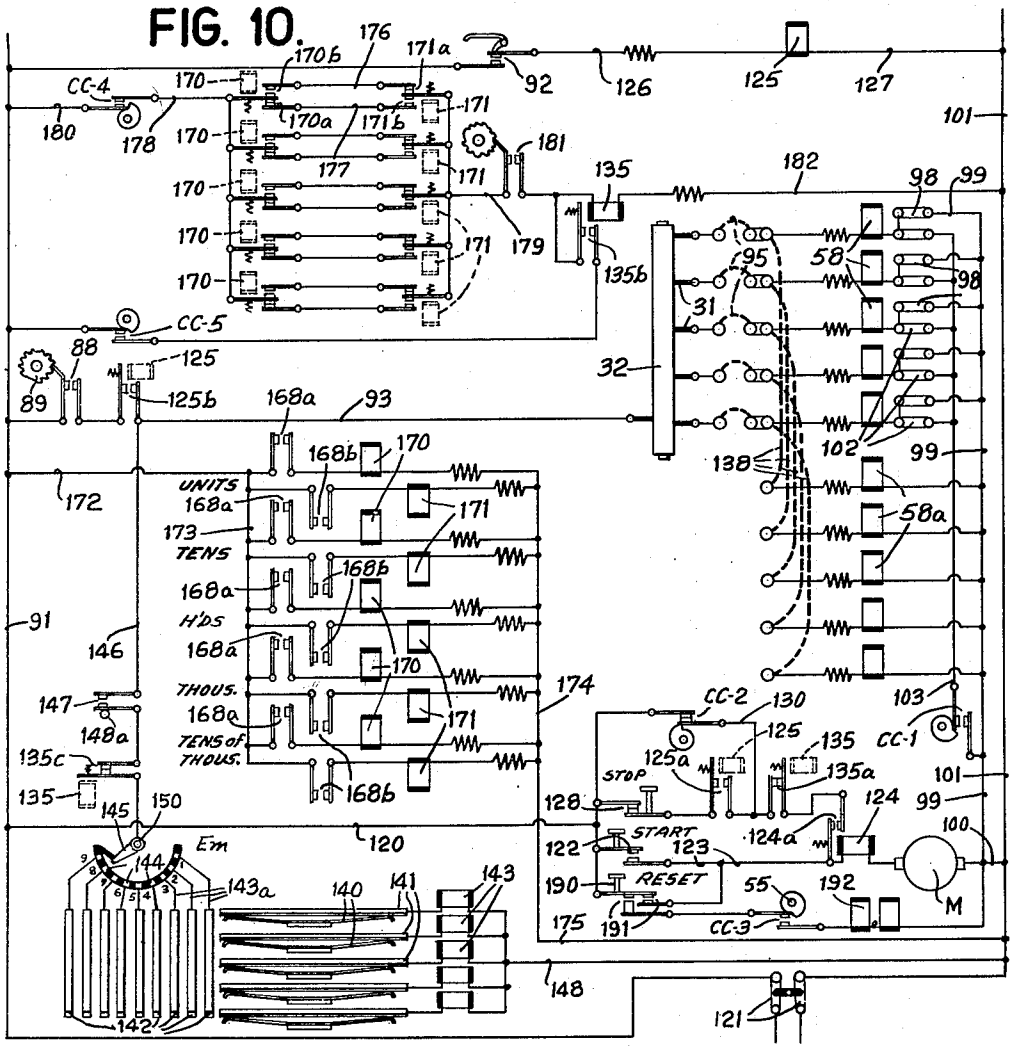
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MACHINE FOR INTERPRETING AND PRINTING PERFORATED RECORDS

Filed Dec. 23, 1937 6 Sheets-Sheet 6

FIG. 10.



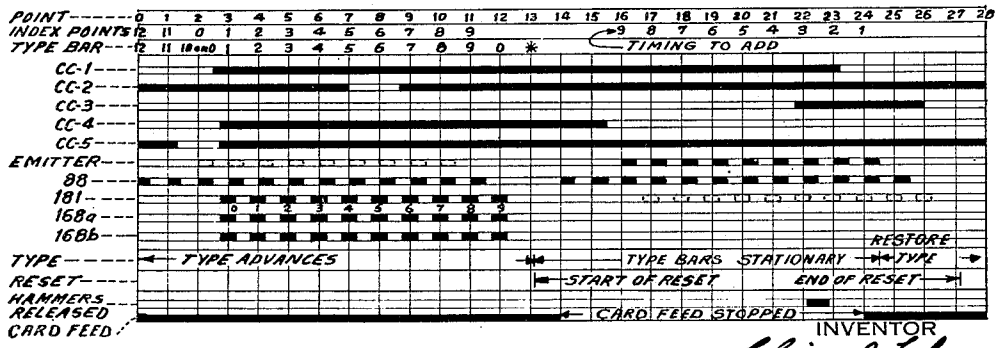


FIG. 11.

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UNITED STATES PATENT OFFICE

2,247,914

MACHINE FOR INTERPRETING AND PRINTING PERFORATED RECORDS

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Application December 28, 1937, Serial No. 182,057

7 Claims. (Cl. 235—61.7)

This invention relates to tabulating machines and more particularly to machines of the type capable of sensing perforated records, interpreting the meaning of the perforations, controlling the operation of printing mechanism to print the amounts represented by the perforations on the records, and for controlling the entry of the amounts in the accumulator mechanism.

Machines of the above type have been utilized for printing on the perforated records to form checks issued for payment of some monetary transaction. It is very desirable that the amounts be printed in the checks at two places, one by protective type, that is, pin-point type capable of resisting alterations, and also to print the amount by type which is more legible.

Machines of the above type have been found to be highly accurate in their operations when used commercially. Nevertheless any single instance of improper printing should be guarded against, however rare its occurrence.

Such improper operations may result from wear of parts, dust, change in adjustment of parts, and the signaling to the user of such a change is an indication of a requirement of service for such machines to prevent repetition of improper printing.

It is, therefore, the main object of the present invention to provide a machine capable of printing two equal amounts by a single operation of the machine and to provide a comparing mechanism for indicating to the operator if the amounts printed were not equal.

A still further object of the invention is to provide an accumulator with means to effect the entry of such amounts in the accumulator and to provide means to prevent the entry of the amounts if the printed amounts are unequal.

More specifically it is an object of the present invention to analyze a record, to provide means under control of the analyzing means to control the setting of two sets of type bars to print amounts at two places on a record, to cause the entry of such amounts in an accumulator, to provide means to compare the setting of the two sets of type bars, and means to prevent the printing and entry operations, whereby an amount will not be entered in the accumulator nor printed upon the record.

A still further object of the invention is to provide a read-out mechanism settable under control of the type bars for reading out the amounts represented by the already set type bars, and entering the same in the accumulator. Such an arrangement insures that the entered amount is always the same as the printed amount.

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 central longitudinal sectional view of the machine.

Fig. 2 is a sectional view taken at one side of the machine.

Fig. 3 is a detail view of the connection adapted for effecting printing line adjustments.

Fig. 4 is a view in side elevation disclosing in normal position the means controlled by the type bars for causing the closure of checking contacts at the time the type bars are stopped.

Fig. 5 is a perspective view of the contact closing devices to more clearly show their arrangement and construction.

Fig. 6 is a view similar to Fig. 4 but showing certain parts in operated position.

Fig. 7 is a representation of a check capable of being printed by the machine disclosed herein.

Fig. 8 is a sectional view of an accumulator and the driving mechanism therefor.

Fig. 9 is an end view of the accumulator resetting driving mechanism and the magnetic resetting control therefor.

Fig. 10 is an electrical wiring diagram.

Fig. 11 is a timing diagram showing the timing desirable to close certain electrical contacts.

Card feeding mechanism

In more detail, 10 (Fig. 2) represents the main drive shaft of the machine. This may be driven in any suitable manner as by an electric motor through belt 11 rotating a pulley attached to a shaft 157. A uni-directional coupling 12 is interconnected between shaft 10 and 157.

From shaft 10 a worm 13 (Fig. 2) drives worm wheel 14 secured to a shaft 15 to which is also secured a box cam 16. A pivoted cam follower arm 17 has a roller 18 at one end riding in the cam groove and at the other has connection to an arm 19 through adjustable rod 20.

Arm 19 is secured to a shaft 21 having arms 22 (see Fig. 1) in pin and slot engagement with pickers 23 mounted for reciprocation in the frame of the machine. This reciprocating picker mechanism is adapted to advance one record

card at a time from the supply stack or magazine 24.

Shaft 15? through gears 25 shown in Fig. 2 drives a parallel shaft 26 which has threaded sections 27 meshing with worm gears 28 on feed roller shafts 29 to drive feed rollers 30 (Fig. 1) constantly. The card which is advanced by the picker passes into the bite of the first pair of feed rollers 30 to the left in Fig. 1 and is subsequently guided to the analyzing or perforation reading devices which comprise brushes 31 and a contact roller 32. These brushes and contact roller are of conventional structure such as is commonly used in electrically controlled tabulating machines.

After passing the analyzing brushes 31, the cards pass to the second pair of feed rollers 30 which advance each card to a pair of intermittently driven rollers comprising upper spring pressed rollers 33 and lower rollers 34 which engages the edge of the card. These rollers 33 and 34 advance the card to printing position at which time they momentarily pause in their rotation to stop the feeding of the card to permit printing on the card in accordance with the preceding analysis.

This interruption in the advance of the card is accomplished as follows: Rollers 34 are secured to a shaft 35 (Fig. 1) journaled in the frame of the machine and having attached at one end a gear 36 (Fig. 2) meshing with a gear 37 on shaft 38 on which shaft is also a gear 39 adapted to be driven by a mutilated gear 40 free on the continually running shaft 15. Gear 40 carries a pin 40*a* (see Fig. 3) which may be set in any one of five slots 40*b* in a disk 40*c* which is integral with worm wheel 14. Gear 40 is supported by a sleeve 40*d* which is loosely mounted on the shaft 15.

During the rotation of shaft 15 the gear 40 will pick up gear 39 by means of the teeth thereof to advance the card to printing position, upon reaching which, the toothless portion of gear 40 moves into locking engagement with gear 39 as shown in Fig. 3. After printing has been effected gear 39 is again engaged for rotation and the card is fed forward to a conveying means (Fig. 1) comprising rollers 41 and tracks 42 which convey the card to a suitable stacker 43 where they are collected. The shafts upon which rollers 41 are secured are adapted to be continually driven by reason of the gear connections 44 to the shaft 26 as shown in Fig. 2. It is the frictional engagement of rollers 41 with the upper surface of the card which causes the card to be advanced along the tracks 42.

It will be apparent that by altering the relationship between gear 40 and wheel 14, the position on the card in which printing is effected will be altered. That is, if the gear 40 is so adjusted that the cam portion is earlier effective in its time of operation, the card will be sooner interrupted in its advance and a lower line will receive the printing impression.

Printing mechanism

For effecting the printing on the record cards as they successively pass through the machine a plurality of type bars 45 (Fig. 1) are provided. These bars are all mounted for reciprocation in the frame of the machine and each have a connection through a spring-pressed pawl 46 to a crosshead 47. Thus, in Fig. 1, upon movement of crosshead 47 to the left the pawls 46 through frictional engagement with bars 45 will move the bars concurrently in the same direction.

The bars may be arrested at any point in their travel and subsequently the pawls 46 will disengage and permit the further movement of the crosshead 47. Upon the reverse movement of crosshead 47 the shoulders 185 of the bars 45 will be engaged thereby to positively move the bars to restored position. For reciprocating crosshead 47 the following mechanism is provided.

As shown in Fig. 2 the crosshead 47 is connected at its ends to blocks 48 slidable upon rods 49 and having pivoted link connections 50 to a follower arm 51 pivoted at 52. Arm 51 has a roller 53 cooperating with the cam groove of a box cam 54 mounted on a shaft 55 connected through worm gear 56 and worm 57 to the constantly running shaft 10. The arrangement and timing of the parts is such that the type bars 45 are advanced under the influence of pawls 46 synchronously with the movement of a card past the analyzing or sensing brushes 31.

If a perforation at, say, the 5 position on the card is under the sensing brushes, the corresponding type representing 5 will be at the printing line. The establishment of an electric circuit through the index point perforations by the brushes is adapted to energize a magnet 58.

There are a number of these magnets 58, each magnet being related to a corresponding type bar 45. The energization of any magnet is adapted to release a pawl device 59 through a wire 61 and latch 62 and allow it to engage one of the ratchet teeth 60 on the bar 45. After pawl 59 has engaged the teeth 60 further movement of the type bar 45 to the left in Fig. 1 is prevented. The type bars 45 are positioned during a passage of a card past the brushes. Subsequently these type bars are held during the period that a card passes from the analyzing station to printing position and during the printing operation. After the printing operation, pawls 59 and latches 62 are positively restored in the following manner.

Secured to shaft 55 is a cam 63 (Fig. 1) against which presses the roller of an arm 64 and which latter is pressed upwardly by a spring 65 acting through an arm 66 on shaft 67. The shaft 67 has secured thereto arms 68 which carry a restoring plate 69. Arms 70 pivoted on a rod 70*a* and having a pin and slot connection to arms 68 carry a restoring plate 71. By this construction cam 63 is adapted to move plate 69 to the left to restore pawls 59 and plate 71 is moved upwardly to restore latches 62 and their connected wires 61.

For each type bar 45 there is an individual hammer 72 which is adapted to strike the particular type 73 on the type bar which is at the printing line. The hammers are pivotally mounted on a rod 74 carried by a bar 75 and depend for their actuation upon movement of said bar. The bar 75 is pivoted on the frame of the machine by means of pintles co-axial with rod 74 and has springs 76 biasing the bar in a clockwise direction in Fig. 1.

To the middle of bar 75 there is pivoted a cam follower arm 77 bifurcated to straddle shaft 55 and having a roller 77*a* in cooperation with a cam 78. Fixed to one face of the cam 78 is a cam member 79 which cooperates with a projection 80 of the cam follower arm 77.

As the cam 78 revolves, by virtue of the shaft 55 being driven in the manner previously de-

scribed, it cooperates with the arm 77 through its follower roller 77a, gradually retracting the hammers 72 in a counterclockwise direction against the tension of springs 76.

As the roller 77a leaves the high point of the cam 78, member 79 engages the projection 80 and upon continued rotation of the cam the projection 80 drops from the member 79 and the springs 76, thus released, turn the common bar 75 in a clockwise direction to swing the hammers 72 against type 73 thus effecting printing.

Referring to Fig. 1, 81 designates a printing platen journalled in the frame of the machine and adapted to be turned by frictional engagement with the passing card to prevent excessive wear at any one place. The inking ribbon devices are of conventional form and require no detailed description the ribbon 82 being guided along the platen 81 and beneath the tabulating card.

Circuit diagram (Fig. 10)

In machines of this type it is desirable that the circuits which are closed through the perforations in the card to magnets 58 be interrupted before the brushes 31 leave the perforations in order to prevent arcing at the brushes. To this end circuit breaker contacts 88 are provided as shown, in Fig. 10.

These contacts 88 are adapted to be closed by a dentated cam 89 rotated by a shaft which is geared to the shaft 55 so as to rotate twice for each rotation of shaft 55. Contacts 88 make contact just after the analyzing brush 31 makes contact with the roller 32 and open such contact before the perforation has left the brush 31. The circuit to the magnet 58 through the hole in the card is as follows:

From line 91 through circuit breaker contacts 88, card lever relay contacts 125b closed when cards are being fed, wire 93, to common contact roll 32, brushes 31, plug connections 95, magnets 58, switches 98, wire 99, wire 100 to other side of line 101.

A set of switches 102 as more particularly explained in Patent No. 1,946,900 is provided and the switches 98 are opened and switches 102 are closed to conduct the above described sensing circuit from magnets 58 through switches 102, wire 103, cam contact CC—1, wire 99, wire 100 to line side 101. Cam contact CC—1 and other CC contacts are controlled by cams on the shaft 55 and cam contact CC—1 is timed to be opened during the time the 12th, 11th and "0" index points on the card arrive at the sensing brushes and to close just after the "0" index point has passed the brushes so that the occurrence of a perforation in the "0," "11" or "12" positions will not be effective to control magnet 58 in the columns in which switches 98 were opened and switches 102 closed.

In the present machine both switches 98 and 102 are closed as shown in Fig. 11 so that contacts CC—1 are ineffective. This will permit the perforations at the "11," "12" and "0" positions to control the position of the type bar to print related characters. However, for printing digits representing amounts printed on checks, "11" and "12" are not printed. However, under control of the "0" perforation, the zeros are printed, and as will be later evident, are checked for accuracy in printing.

Referring now to the circuit diagram (Fig. 10) certain of the mechanical parts are shown in a diagrammatic manner in this view. In this figure M is the driving motor which by the belt and pulley connection drives the main drive shaft 10 of the machine. This shaft through the gearing described drives the picker devices, which advance the feed rolls to feed the card past the cooperating brushes 31 and passing the brushes the usual card lever is pressed by the cards thus closing card lever contacts 92.

To start the machine into operation the operator first closes main line switch 121. Thereupon start key 122 is depressed which upon the closure of its contacts establishes a circuit from line 91, wire 120, through start key contacts 122, wire 123, motor relay magnet 124, motor M, wire 100, to other side of line 101. The energization of the motor causes the feeding of cards to close the card lever contacts 92 and cause the energization of card lever relay magnet 125 through a circuit from line 91, card lever contact 92, wire 126, magnet 125, wire 127, to the line 101. This closes the relay contacts 125a which together with relay contacts 124a establishes a holding circuit for the motor M from the line 91 through stop key contacts 128, relay contacts 125a, relay contacts 135a, (now closed) relay contacts 124a, motor relay magnet 124, motor M to line 101.

A cam contact CC—2 is provided to hold this circuit during the interval between cards when relay contacts 125a will be open and the circuit follows from line 91, line 120, cam contacts CC—2, wire 130, relay contacts 135a (now closed), relay contacts 124a, motor relay magnet 124, through motor M to line 101 as before. Contact CC—2 also serves to take the arc from the relay contacts 125a with which it is in parallel.

Printing of zeros is effected by the usual zero suppression devices the description of which is not necessary for an understanding of the present invention but which may be of the form shown and described in the patent to G. F. Daly, No. 1,946,900, issued February 13, 1934.

Multiple amount printing

The card check illustrated in Fig. 7 shows the printing of the amount 789.81 in protective type, that is, pin point material piercing type, under control of the printing control magnets 58. For printing this data five printing bars are utilized. In some types of check writing work it is desirable to print the same amount on the check in another position and in more clearly readable type, as identified by reference numeral 137 in Fig. 7.

To this end there is provided five supplemental type bars set in the same manner previously described but are under control of five printer control magnets 58a (see Fig. 10). The magnets 58a are plug connected by plug connections 138 to the brushes 31 and therefore, receive impulses at the same time to effect the printing of a corresponding amount on the check, as shown in Fig. 7.

Adding amounts printed on checks

The machine is provided with an accumulating mechanism for adding together the amounts represented by the successive card checks and which amounts are printed on the card checks.

The accumulating mechanism is of a type well known in the art since its construction is employed in tabulating machines of a commercial type and for this reason is only generally described herein.

The setting of the type bars is utilized to control the entry of amounts in the accumulator and the entry part of the cycle occurs after the

setting up of the type bars, as will be shown in connection with the timing diagram. Hence the amount represented by the setting of the type bars will be entered in the accumulator.

As best shown in Figs. 4 and 6 each of only one set of the type bars 45 has attached thereto a contact making spring element 140 which at normal and in any differential position of the type bar always makes contact with a contact making plate 141 and at a differential position of spring element 140 makes contact with one of a series of wire bus bars 142, depending upon the adjustment of the type bar 45. There are five spring contact making plates 141 and each has a wire connection to a related accumulator control magnet 143 (see Fig. 10). The nine bars 142 have wire connections 143*a* to the nine contact points 144 of an emitter E*m*. The contact points 144 of the emitter E*m* are contacted by a rotatable brush 145. The brush 145 of the emitter E*m* is driven by a shaft to be later referred to and which rotates twice for each machine cycle but due to the opening of the circuit to the accumulator control magnets 143 at this time the first contact of the brush 145 with contact points 144 is ineffective as shown by dotted timing points in Fig. 11. During its second rotation when the type bars are at rest the brush 145 will sweep by the contact points and energize the control magnets 143 at differential times depending upon the position of the contact element 140 and which bus bar 142 it contacts therewith.

The complete adding circuit is described as follows: From the line side 91, circuit breaker contacts 88, timed to close during the second rotation of cam 89 at the same time that the brush 145 closes the circuits to the adding control magnets 143, card lever relay contacts 125*b*, a wire 146, contacts 147, closed after the type bars have been set, as will be explained, relay contacts 135*c* normally closed, brush 145, a contact point 144, a related bar 142, contact spring 140, contact plate 141, control magnet 143, and a wire 145 connected to one side of all the control magnets 143 and to the line side 101.

In Fig. 4 there will be seen the contacts 147 which are closed by a pin 148*a* carried by the cross head 47 in the extreme rocked position of the crosshead, that is, after the type bars have been differentially set. The cross head remains in this position during the operation of the emitter E*m*. Contacts 147 are opened, of course, during the first closure of the circuit breaker contacts 88 to thus prevent adding operations during the type bar setting operations.

As previously intimated the accumulator is of a type well known in the art and is fully shown and described in the patent to C. D. Lake, No. 1,307,740, dated June 24, 1919. The transfer mechanism for this accumulator is shown in the patent to Hollerith No. 974,272, dated Nov. 1, 1910.

As shown in Fig. 8 the accumulator control magnets 143 correspond to the magnets designated by numeral 1 in Patent No. 1,307,740 which control the operation of clutches to differentially set accumulator reading wheels 149, so that data entered therein may be visually read.

The drive shaft 150 of the accumulator unit carries a gear 151 meshing with a pinion 152 rotatable with a gear 153, the latter meshing with a pinion 154. The latter is rotatable with a gear 155 meshing with a gear 156 (Fig. 2) attached to a shaft 157, and which shaft 157 is constantly driven by the belt 11. By these gear connections the machine has driving connections to drive the accumulator drive shaft 150 provided for the accumulator unit.

It is pointed out that the shaft 150 drives the brush 145 of the emitter E*m* for reading out electrically the setting of the type bars 45.

Checking for simultaneous positioning of the two sets of type bars

It is desirable to check the position of the two sets of type bars to ascertain whether the simultaneous positioning of both sets is effected. This is performed by mechanism shown particularly in Figs. 4 and 6 and explained in connection with the wiring diagram.

For each type bar of the two sets there is provided a camming lever 158 pivoted at 159 to the crosshead 47 and provided with a high portion 162 cooperating with the tail 160 (Fig. 4) of the pawl 46 when the crosshead 47 is moved slightly to the left, as will be made clearer later. The camming lever 158 is also provided with a recess 161 to the left of the high portion 162.

When the pawl 62 is unlatched (as shown in Fig. 6) due to the energization of the magnet 58 after a short travel of the type bar 45 the pawl 59 will engage the notch 60 to stop the type bar 45 and as the crosshead continues further after the type bar is stopped a cam edge 163 of the stopped type bar 45 will rock the pawl 46 so that the tail 160 in engagement with the portion 162 of level 158 will rock the lever 158 so that it actuates a T-shaped lever 164, the latter being carried by a pair of arms 115 loosely mounted on rods 166. A continued rocking of the pawl 46 will cause the tail 160 thereof to slip by the high portion 162 and into the recess 161, permitting both the lever 158 and T-shaped lever 164 to be rocked upwardly to normal by a spring connected to each lever 164.

For one denominational order of the type bars 45 the upper arm 165 has integral therewith an arm 167 adapted to close a pair of contacts 168*a*. Each of the five type bars of one set will cause the closure of a related pair of five pairs of contacts 168*a*.

For the next denominationally ordered type bar of the same set it will be seen from Fig. 5 that the lower arm 165 has an integral arm 169 adapted to close its pair of contacts 168*a*. This construction is desirable in order to provide for the proper side spacing of the five pairs of contacts 168*a* since each is substantially wider than a type bar 45. The above arrangement is repeated for the next two adjacent orders of the same set of type bars, as best shown in Fig. 5.

A similar construction is provided for the other set of type bars and the five pairs of controlling contacts are designated 168*b* in Fig. 10.

Obviously for the same denominational order the contacts 168*a* and 168*b* closed by type bars 45 of two sets will close at the same time if both type bars are set to the same positions to thus cause the energization of relay magnets 170 and 171 (Fig. 10) controlled by contacts 168*a* and 168*b*, respectively, by a circuit now to be described with reference to Fig. 10.

This circuit is from line side 91, a wire 172 leading to a wire 173 connecting one side of all the contacts 168*a* and 168*b*, through either contacts to the related magnet 170 or 171, to a wire 174 connecting one side of all the magnets 170 and 171, and a wire 175 to line side 101.

The relay magnet 170 when energized closes relay contacts 170b (Fig. 10) and opens relay contacts 170a, while the energization of relay magnet 171 closes relay contacts 171b and opens relay contacts 171a. Wires 176 and 177 are connected to the blades of relay contacts 170b and 171b and relay contacts 170a and 171a in such a manner that if both relay magnets 170 and 171 are energized simultaneously a circuit between wires 178 and 179 will be kept open, but if either magnet 170 or 171 is energized at a time dissimultaneous with the energization of the other magnet the circuit between wires 178 and 179 will be closed to cause the energization of the relay magnet 135. This circuit is from the line side 91, a wire 180 to cam contacts CC—4, wire 178 to wire 179 and generally speaking through certain relay contacts which are shifted to closed position from open position while the other relay contacts remain closed, circuit breaker contacts 181, relay magnet 135, and wire 182 to line side 101. Circuit breaker contacts 181 are closed by a dentated cam driven by the same shaft as cam 89, previously referred to. Cam contacts CC—4 are opened during the second closure of contacts 181 hence these contacts are ineffective as shown by dotted timing points in Fig. 11 for contacts 181.

Attention is directed to the timing diagram in Fig. 11 wherein it will be seen that the contacts 181, 168a, 168b are timed to close ¾ of a point later than the contacts 88 this lag being due to the fact that it takes a short time to close contacts 168a and 168b after the type bars are stopped in their travel. From Fig. 6 it will be appreciated that for a particular index point circuit breaker contacts 88 first close to cause the closure of the circuit to the magnet 58 to cause the stoppage of the type bar. After the energization of magnet 58 the type bar travels slightly until it is stopped. After the type bar is stopped the crosshead continues further in its travel to the left and a slight interval in time occurs before the related contacts 168a or 168b are closed.

Taking the case now for a particular denominational order, say the units, and considering the corresponding setting of the units type bars of the two sets it will be seen that if the card is perforated at the "3" index point position, for example, that contact points 88 close to cause the simultaneous energization of control magnets 58 and 58a. At three quarters of a point in the cycle later the contact points 168a and 168b and circuit breaker contacts 181 close simultaneously to cause the concurrent energization of magnets 170 and 171. Thus magnet 170 opens its contacts 170a and closes its contacts 170b and magnet 171 opens its contacts 171a and closes its contacts 171b and at the same time circuit breaker contacts 181 close and cam contacts CC—4 are closed thus keeping the circuit to magnet 135 open.

However, if the type bar for one set should inadvertently be stopped at the "2" position, for example, its contacts 168a, will be closed to cause the energization of relay magnet 170 before relay magnet 171 is energized at the "3" index point position. At the time circuit breaker contacts 181 close at the "2" point (Fig. 11), relay magnet 170 will close its contacts 170b thus completing a circuit from the line side 91, wire 180, cam contacts CC—4 now closed, relay contacts 170b, to relay contacts 171a now closed, wire 179, circuit breaker contacts 181 now closed, relay magnet 135, wire 182 to the line side 101.

Relay magnet 135 will now close relay contacts 135b to provide a stick circuit through cam contacts CC—5 to the line side 91.

The energization of relay magnet 135 will open its relay contacts 135a thus opening the circuit to the motor M. The hammers 72 are adapted to be released for striking the selected type 73 at the time in the cycle substantially at the time disclosed in Fig. 11, this occurring after all the type bars have been set. In practice it has been found that the energization of the relay magnet 135 will cause the stoppage of the motor M prior to the time that the hammers are released to prevent improper printing upon the perforated card.

The indication given by the stoppage of the machine with cards in the magazine 24 informs the operator that an improper printing operation has been prevented. With the machine stopped after partially completing its cycle of operation, the operator inserts a rod 183 (Fig. 1) in the machine frames to block the hammers 72 and prevent them from striking the type 73. The machine is provided with a hand wheel 184 (Fig. 8) and by manually turning this the shafts 157 and 10 (Fig. 2) are turned so as to complete the cycle of machine operation to feed the card past the hammers 72. When the card has reached such a position the rod 183 can be removed and the machine restarted so as to complete printing operations on the remaining cards. The unprinted card can, of course, be located in the storage hopper or if the operator watches carefully it can be received by hand as it is fed by the last set of rollers 41.

Obviously, since relay contacts 135c (Fig. 10) are opened the circuit to the adding control magnets 143 is opened during the time the machine is operated by the turning of the wheel 184. Cam contacts CC—5 are closed during the remainder of the cycle to retain relay magnet 135 energized and thus relay contacts 135c are retained closed to prevent entry in the accumulator of the amount represented by the unprinted perforated card.

The type bars are restored at the end of the cycle of machine operation as previously stated by causing the cross bar 47 to contact with shoulders 185 of the type bars 45 restoring the latter to their home position, as shown in Fig. 1. As the crosshead returns to home position a plate 186 contacts with the extremity of the levers 158 causing them to be rocked to disengage the tail 160 from the recess 161, as best shown in Fig. 1. At the initial operation of the machine the crosshead carries the lever 158 out of engagement with the cam plate 186 permitting the lever 158 to be rocked so that the tail 160 occupies a position on top of the portion 162 of the lever 158 as shown in Fig. 4, the parts now being in position to cause the closure of contacts 168a or 168b by the stoppage of the type bar, as previously explained.

Resetting of accumulator

A reset key 190 (Fig. 10) is depressed to cause the resetting of the accumulator after the cards have been analyzed, printed, and the amounts they represent entered in the accumulator.

When the reset key 190 is depressed it closes two sets of contacts 191, one set to cause the energization of the motor control relay 124 to cause the motor M to operate.

Cam contacts CC—3 close a circuit from the line side 91, by wire 120, the other reset key contacts 191, cam contacts CC—3, to a reset clutch

magnet 192, and to the line side 101 to cause the energization of the reset clutch magnet 192.

Shaft 150 has secured thereto a gear 193 (Fig. 8) adapted to drive a gear 194 through an idler gear 195. The gear 194 has attached thereto a clutch disk 196 (Fig. 9) both the clutch disk and gear being loosely mounted on a shaft 197. Attached to the shaft 197 is an arm 198 carrying a clutch pawl 199 and to said shaft there is secured a gear 200 meshing with a gear 201 attached to the reset shaft 202 of the accumulator.

Obviously, the clutch disk continually rotates and the cam contacts CC—3 are timed to close the circuit to the reset clutch magnet 192 at such time that the clutch notch 203 of the clutch disk is registered with the clutch tooth 204 of the clutch pawl 199. The energization of the reset clutch magnet 192 attracts its armature 205 to release the clutch pawl 199 to cause the clutch engagement to drive the reset shaft 202. The manner of resetting is very well known in the art and for more complete details of construction and operation reference may be had to the patent to C. D. Lake, No. 1,600,414.

General summary of operation

In order that the operation of the machine as a whole may be better understood, a brief résumé of its operation will now be given.

The operation of the machine is initiated by the depression of the "Start" key which closes its contacts 122, referring to Fig. 11, which will effect the energization of the motor control relay 124 and also close the circuit of the motor M. The operation of the motor M will cause the drive shaft 10 to be rotated and cam 16 will thereupon be rotated to rock shaft 21 (Fig. 2). The rocking of the shaft 21, referring to Fig. 1, will reciprocate the card picker 23 to thereby advance a card from the magazine 24 to the first set of feeding rollers 30 (Fig. 1). As the card emerges from the first set of feeding rollers 30, it will be disposed between a contact roller 32 and the analyzing brushes 31 and the card perforations will be analyzed as the card is fed past the brushes 31. During the analysis of the card perforations, the crosshead 47 will be shifted to cause the movement of the type bars 45 synchronously with the analysis of the perforations. When the analyzing brush encounters a perforation, the related type bar 45 is stopped in its movement to thereby cause, for a plurality of type bars, their digit representing settings in order to bring type 73 representing such digits to the printing line. The setting of each of the type bars 45 is effected by the energization of a printing control magnet 58 at a differential time. After the type bars have been set to represent the digits corresponding to the perforations analyzed, they remain in differential adjusted position and during this time, the card is being fed from the analyzing brushes 31 by the second set of feeding rollers 30 to convey the card between rollers 33 and 34 and the latter feed the card so that the leading marginal edge of the card is cooperatively related with a platen 81. When this relationship is obtained, the rollers 33 and 34 are stopped in their rotation, thereby retaining the card in cooperation with the platen 81. The hammers 72 (Fig. 1) are now released to effect the printing from the selected type 73. Thereafter the rotation of rollers 33 and 34 is resumed, causing the feeding of the card further to the right, as viewed in Fig. 2, away from the platen 81 so that by a series of rollers 41, the printed card may be directly fed to the storage receptacle 43. The type bars are, nevertheless, retained in their differential adjusted position in order that a read-out device carried thereby may effect the entry into an accumulator of the amount printed on the card.

The electrical circuits for effecting the energization of the type bar control magnets 58 are shown in Fig. 10 and referring to the wiring diagram, the circuit extends from the line side 91 through impulse distributor contacts 88, relay contacts 125*b* now closed, to the contact roller 32. Upon the presence of a perforation, contact is made between an analyzing brush 31 and the contact roller 32, thereby effecting the energization of a related magnet 58, the circuits for the magnets 58 being closed through cam contact CC—1 which from Fig. 11, it will be seen, is closed during the time that the perforations are analyzed.

By plug connections 138, the analyzing brushes 31 are adapted to effect the energization of a supplemental set of magnets 58*a* to cause the setting of a second set of type bars. The two sets of type bars 45 controlled by the sets of magnets 58 and 58*a* are adapted to effect multiple printing on the card, as shown in Fig. 7.

In order to effect the entry of the amounts represented by the card, one set of type bars 45 is provided with contact making elements 140 which are differentially positioned to make contact with digit representing bars 142 (Fig. 10), the elements 140 and bars 142 providing an amount read-out device. The type bars remain in their differentially adjusted position during approximately the second half of the operating cycle, as is shown in the timing diagram in Fig. 11, and with the contact elements 140 in their differentially adjusted position, an emitter E*m* will read out the digit settings of the contact elements 140 during the second half of the operating cycle to effect the energization of accumulator control magnets 143 (see Fig. 8) at differential times, thereby causing the entry of an amount in the accumulator.

After the accumulator entry operation and during the final part of the operating cycle, the crosshead 47 (Fig. 1) is returned to its normal position, thereby restoring both sets of type bars to their normal positions.

The present machine also includes a checking device whereby the positions of the two sets of type bars are compared and the amount is entered in the accumulator in accordance with the result of the comparing operation. The electrical comparing means includes two sets of contacts, contacts 168*a* being closed by one set of type bars and contacts 168*b* being closed by the other set of type bars. Referring to Fig. 10, upon the simultaneous closure of contacts 168*a* and 168*b* for each denominational order, related magnets 170 and 171 will be energized. Referring to the top of Fig. 10 each of the last mentioned magnets will effect the closure of the related contacts 170*b* and 171*b* and at the same time, when the type bars are differentially stopped at the same position in each denominational order. Upon the setting of the two sets of type bars in corresponding positions for all of the denominational orders, magnet 135 will remain deenergized. In the event that in a particular denominational order the type bars are not set to the same digit representing position, either contacts 171*b* or 170*b* will be closed and causing, in this instance, the energization of the relay magnet 135. The

checking device is operated during the first half of the operating cycle, during which time the two sets of type bars are set to digit representing positions and in the event that one of the type bars of one set is improperly adjusted, the relay magnet 135 will be energized to cause the opening of contacts 135c (Fig. 10). This will open the circuit to the emitter Em and even though the latter operates during the second half of the operating cycle, the accumulator entry operation will not be effected.

In order that the operator will know of the improper operation, it is preferable upon this detection to cause the machine to stop in its operation. In the present machine this is preferably effected by the opening of contacts 135a which, as shown in Fig. 10, open the stick circuit of the motor control relay 124 and the motor M. The latter will stop in its operation and in practice the motor will be stopped prior to the time that the hammers are released in order to prevent the improper printing upon the perforated card.

After a series of cards has been printed and the amounts are entered in the accumulator, the latter may be reset by the depression of a reset key 190. This will cause an operation of the motor M and at the same time effect the energization of the reset clutch magnet 192 and the latter will cause the resetting of the accumulator in a manner which is well known in the art and which is fully shown and described in the patent to C. D. Lake, No. 1,600,414.

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. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a machine of the class described provided with an accumulator, the combination of an entry controlling means, two sets of type bars, type bar positioning means, supplemental accumulator entry control means settable for controlling the entry to be effected in said accumulator, means under control of the first named entry controlling means to control said type bar positioning means to cause the two sets of type bars to be differentially positioned to select amount type for printing and to cause the setting of said supplemental entry control means to determine the accumulator entry, comparing means controlling by said sets of type bars for comparing the positioning of the two sets of type bars, means to render said supplemental entry control means ineffective for controlling an accumulator entry, and means controlled by said comparing means for causing said last named means to be effective to thereby prevent an accumulator entry when the two sets of type bars are positioned unlike.

2. In a machine of the class described having an accumulator, the combination of two sets of type bars, respective type bar positioning means therefor, entry controlling means, means controlled by the entry controlling means to control the operation of one type bar positioning means to effect the differential positioning of the related set of type bars to select amount representing type for printing, an amount read-out means for controlling the entry in said accumulator, means under control of the entry controlling means to control the operation of said other type bar positioning means to effect the position of said other and related set of type bars to select duplicate amount representing type for printing and to set said read-out means to determine the accumulator entry, comparing means controlled by said sets of type bars for comparing the positioning of the sets of type bars, means to render said read-out means ineffective for an accumulator entry operation, and means controlled by said comparing means to cause said last named means to be effective to thereby prevent an accumulator entry when the two sets of type bars are positioned unlike to effect the printing of different amounts.

3. In a machine of the class described provided with an accumulator, the combination of a movable crosshead, two sets of type bars moved by said crosshead, entry controlling means, an amount read-out means for controlling an accumulator entry, means controlled by said entry controlling means for causing the type bars in their movement effected by said crosshead to be set at differential positions to select type for printing duplicate amounts and for causing said read-out means to represent the same amount which is to be entered in said accumulator, devices for causing the read-out means to be normally ineffective for controlling an accumulator entry, said devices being controlled in their operation by said crosshead to cause the read-out means to be effective for controlling an accumulator entry after the crosshead has completed its movement and after said sets of type bars are at the aforesaid differential positions, comparing means controlled by said sets of type bars for comparing the positioning of the two sets of type bars; and means controlled by said comparing means for causing said read-out means to be ineffective, when the two sets of type bars are positioned unlike to effect the printing of different amounts, irrespective of the operation of said devices by the crosshead to cause the read-out means to be effective.

4. In a machine of the class described provided with an accumulator, the combination of an entry controlling means, two sets of type bars, type bar positioning means, an amount read-out means for controlling the entry to be effected in said accumulator, means under control of the entry controlling means to control said type bar positioning means to effect the differential positioning of said sets of type bars to select amount type for printing and to cause a setting of said read-out means to determine the accumulator entry, comparing means controlled by said sets of type bars for comparing the positioning of the two sets of type bars, means to render said read-out means ineffective for an accumulator entry operation, and means controlled by said comparing means for causing said last named means to render the read-out means ineffective and thereby prevent an accumulator entry when the two sets of type bars are positioned unlike.

5. In a machine of the class described, the combination with two sets of positionable type bars, of entry controlling means, respective type bar positioning means for said sets of type bars, an accumulator amount entry control means comprising a read-out device, means under control of said entry controlling means to control one type bar positioning means to differentially position the related set of type bars for selecting

type for printing an amount and for positioning said read-out device to represent the amount to be printed, means under control of said entry controlling means to control the other type bar positioning means to differentially position the other set of type bars for selecting type for printing a duplicate amount, means cooperating with said read-out device for reading out the amount represented thereby to control an accumulator entry after said sets of type bars have been positioned for printing, comparing means controlled by said sets of type bars for comparing the positioning of the two sets of type bars, and means controlled by said comparing means to render the reading out means ineffective when the two sets of type bars are positioned unlike to effect the printing of different amounts.

6. In a cyclically operable machine for printing upon a perforated record the amount represented by perforations therein and accumulating such amounts in an accumulator, the combination of a printing means comprising type bar positioning means for two sets of positionable type bars and means to effect printing from said type bars on the record, settable accumulator amount entry controlling means, record analyzing means, means under control of said analyzing means to control the operation of the type bar positioning means to cause the differential positioning of the sets of type bars for printing in duplicate an amount on the record and for setting said accumulator control means to control the entry of the amount in said accumulator, devices for terminating the operation of said printing means and for rendering said accumulator entry control means ineffective in the cycle of operation said type bars are positioned, comparing means controlled by said sets of type bars for comparing the positioning of said sets of type bars, and means controlled by said comparing means to render said devices effective when the two sets of type bars are positioned unlike to effect the printing on the record of different amounts, to thereby prevent the entry in the cycle of operation the type bars are positioned unlike, and to terminate the operation of the printing means.

7. In a cyclically operable machine for printing upon successively fed perforated records the amounts represented thereby and for accumulating said amounts in an accumulator and which is provided with record feeding means for successively feeding the records for printing operations thereon, the combination of a printing means comprising type bar positioning means for two sets of positionable type bars and means to effect printing from said type bars on the record, settable accumulator amount entry controlling means, record analyzing means, means under control of said analyzing means to control the operation of the type bar positioning means to cause the differential positioning of the sets of type bars for printing in duplicate an amount on the record and for setting said accumulator control means to control the entry of the amount in said accumulator, devices for terminating the operation of said record feeding means and said printing means and for rendering said accumulator entry control means ineffective in the cycle of operation said type bars are positioned, comparing means controlled by said sets of type bars for comparing the position of said sets of type bars with one another, and means controlled by said comparing means to render said devices effective when the two sets of type bars are positioned unlike to effect the printing on the record of unlike amounts to thereby prevent the entry in the cycle of operation the type bars are positioned unlike and to terminate the operation of the record feeding means and printing means.

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