

Feb. 9, 1943.

I. GHERTZMANN

2,310,418

PAPER FEEDING DEVICE

Filed Sept. 24, 1936

7 Sheets-Sheet 1

FIG. 1.

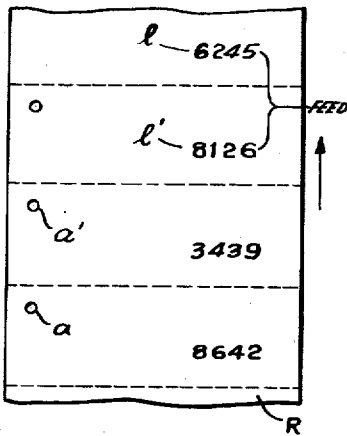


FIG. 2.

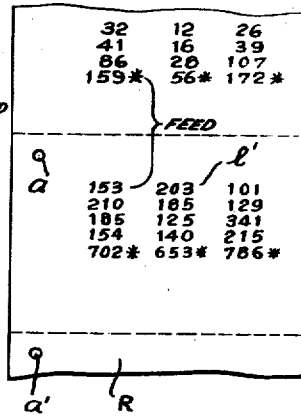


FIG. 3.

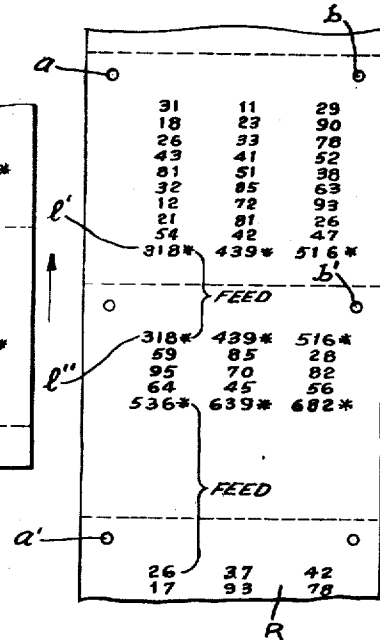


FIG. 4.

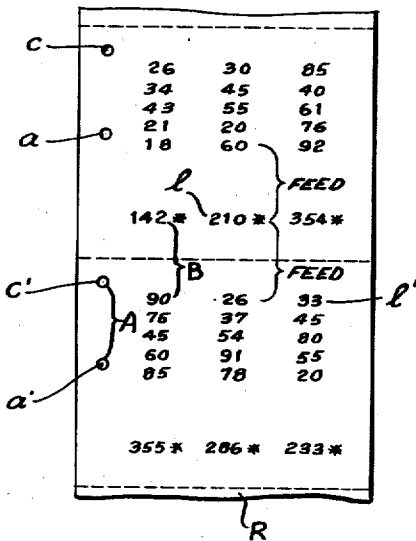
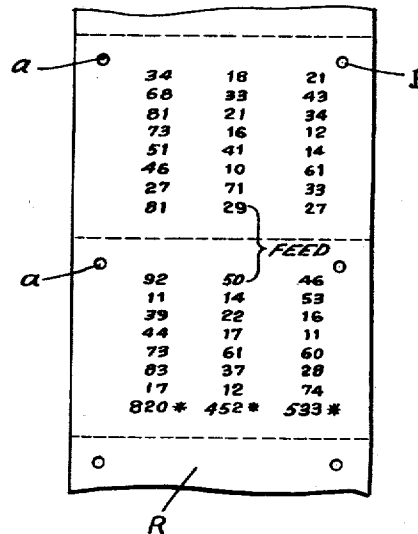


FIG. 5.



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FIG. 6.

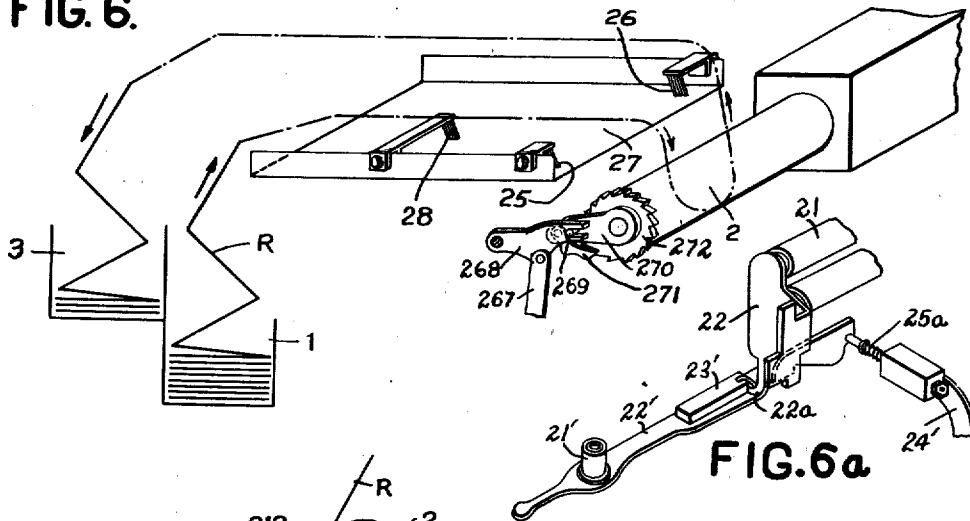
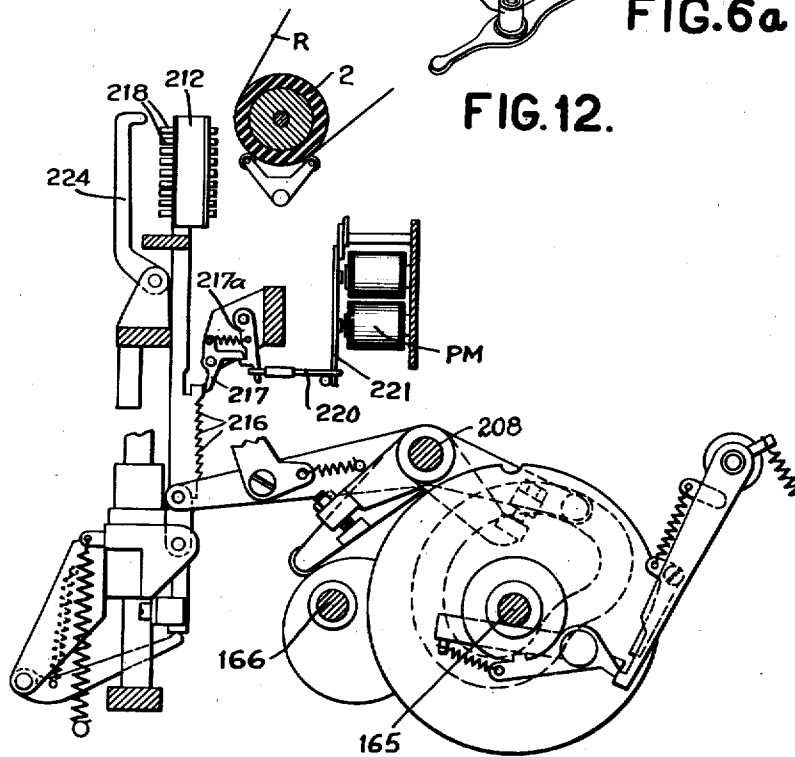


FIG. 12.



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FIG. 7.

This figure is a perspective view of a mechanical assembly. It features a main housing (5) with a base (B) and a side panel (21). A large gear (10) is mounted on a shaft (13) and is connected to a smaller gear (11) via a gear train (12, 13, 14, 15, 16, 17, 18). A lever (19) is pivoted to the housing and is connected to a rod (20) that passes through a series of guides (21, 22, 23, 24, 25). The rod is terminated in a handle (2). A spring (26) is connected to the lever and the rod. A motor (27) is mounted on the base and drives a shaft (28) which is connected to a gear (29) that meshes with a gear (30) on the rod (20).

FIG. 8.

This figure is a side view of the mechanical assembly shown in FIG. 7. It shows the internal components, including the gear train (10, 11, 12, 13, 14, 15, 16, 17, 18), the lever (19), the rod (20), and the motor (27). The housing (5) is shown in cross-section, revealing the internal arrangement of the components. The base (B) and side panel (21) are also shown. The rod (20) is shown passing through the housing and being connected to the handle (2). The spring (26) is shown connected to the lever (19) and the rod (20). The motor (27) is shown driving the shaft (28) which is connected to the gear (29) that meshes with the gear (30) on the rod (20).

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FIG. 9.

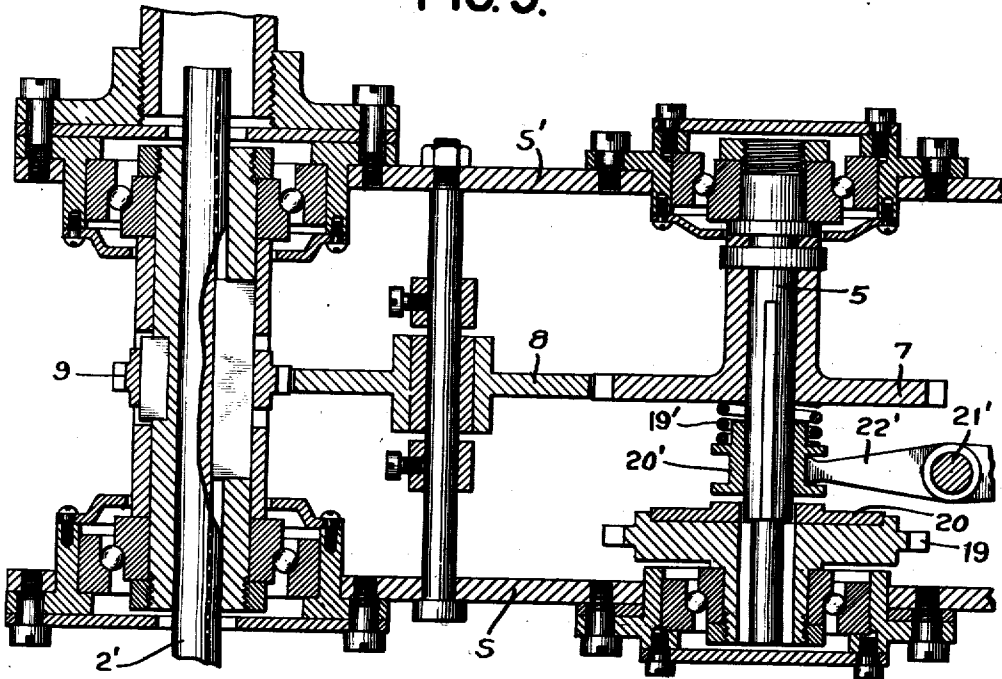
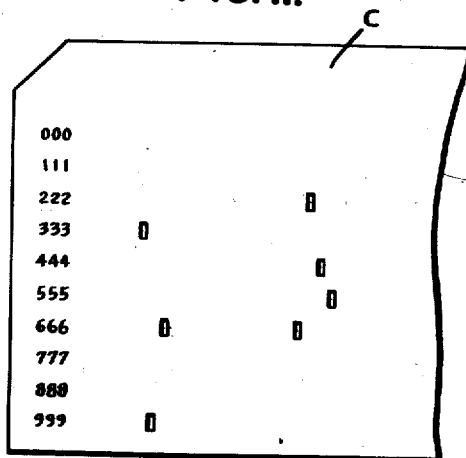


FIG. 11.



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FIG. 13.

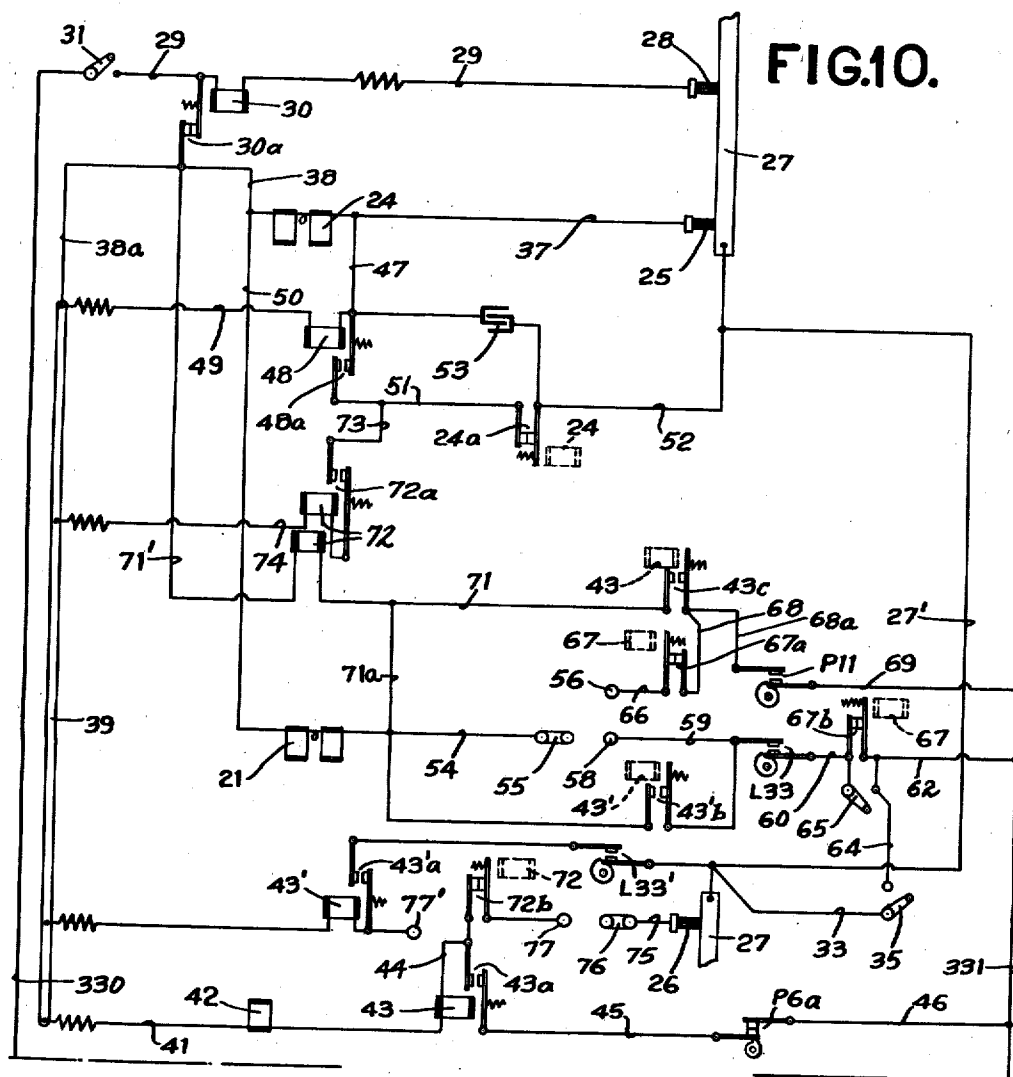


FIG. 10.

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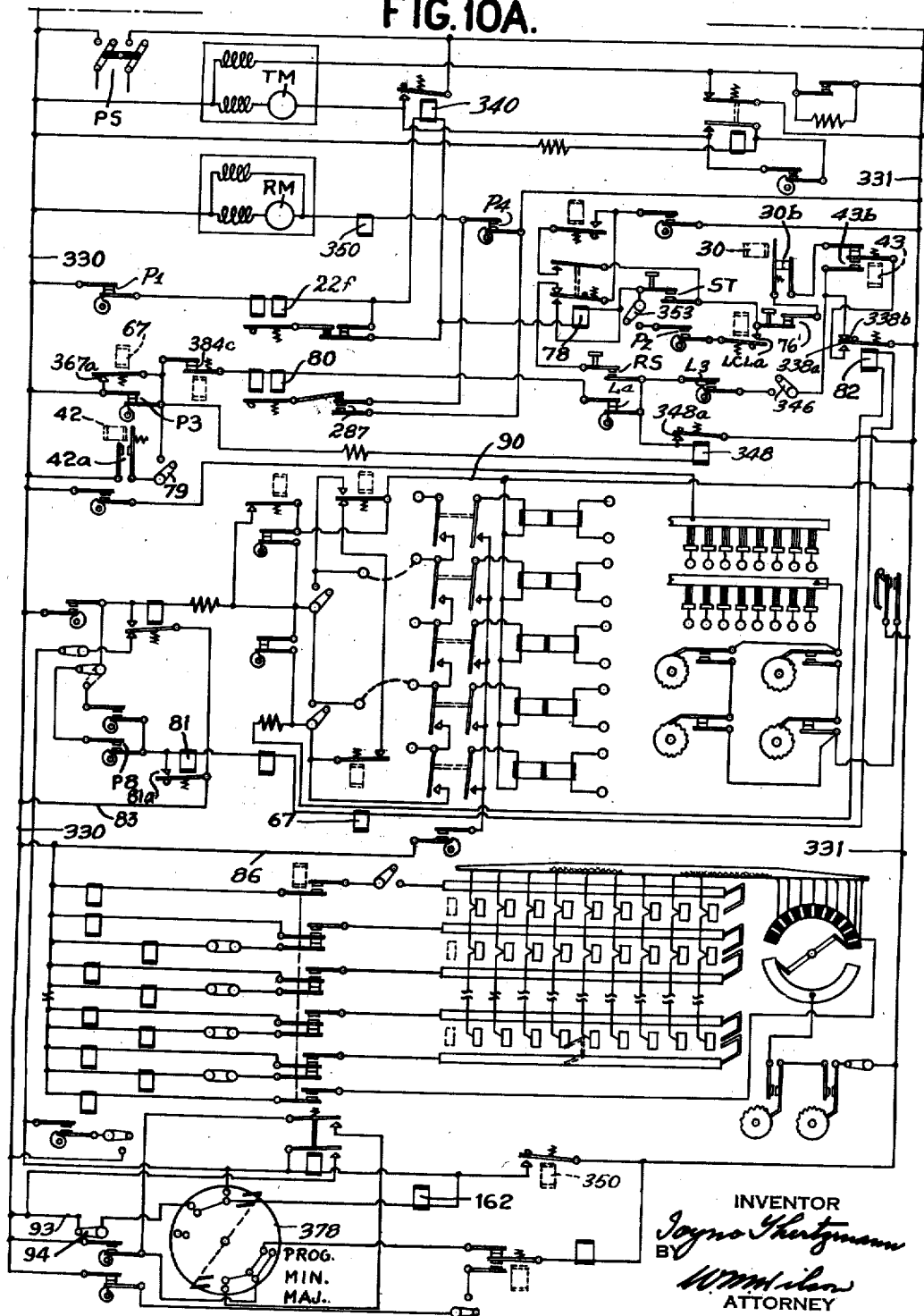
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FIG. 10A.



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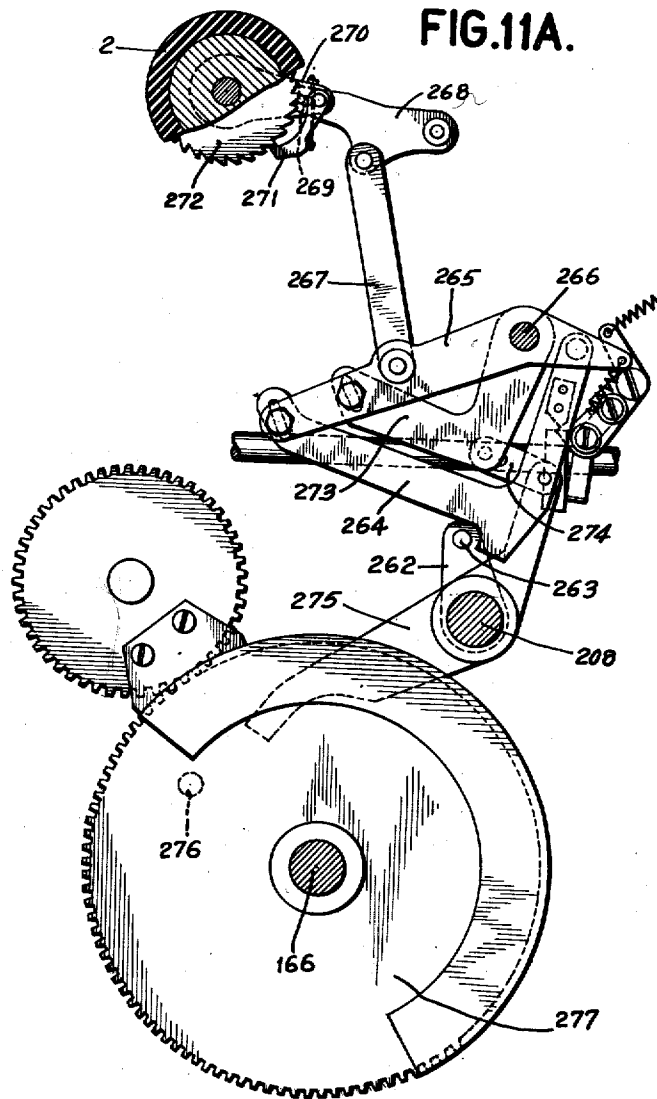
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7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE

2,310,418

PAPER FEEDING DEVICE

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Application September 24, 1936, Serial No. 102,279
In France November 6, 1935

18 Claims. (Cl. 235—61.7)

This invention relates generally to paper feeding control devices and more specifically to devices for controlling the printing of various forms of records in a perforated card controlled tabulator.

An object of the invention is to provide feeding devices for handling forms of statements, receipts, invoices, etc., so that printing is started at the proper position on each of a succession of such forms and if the number of items is greater than the number of lines on a form, printing will continue automatically at the proper position on the following form.

Another object of the invention is to adapt the feeding devices for control by a card controlled tabulator wherein the cards are arranged in groups, each group relating to a separate form, with means for feeding the record sheet automatically from form to form whenever card groups change. The extent of feed is automatically controlled to put a form in place with its first line in printing position regardless of the number of lines printed on the previous form when a group change occurs.

An object of the invention is to provide means for stopping the record paper for the printing of a first line at any desired location on a form, the feeding movement of the paper up to the first line of the following form being resumed either immediately after the printing of a single line on the form or after the printing of several consecutive lines and a total which may or may not be carried forward to the first line of the following form.

An object of the invention is to provide record sheet form feeding devices which are controlled by sets of perforations in the forms, there being one or two marginal perforations in one or both margins of each form to control the starting and stopping of the sheet feeding devices. The perforations permit electric contact between adjustable brushes and a plate over which the consecutive forms move, causing operation of a magnetic clutch to disengage the drive to the platen roller. Subsequent connection of the drive to the platen is obtained by energization of another magnet controlling the clutch whenever a line is printed, a total is printed, an automatic group change occurs, or a progressive total is printed.

By means of the devices forming the subject matter of the invention it is possible to carry out the following form feeding operations:

1. The printing of a single line per form; the tabulating machine operating in listing and a single perforation being provided on the side of each form, feeding will occur after each line of print and the feed control indicium or perforation of each form will stop the following form with its first line in printing position.

2. The printing of a variable number of lines

on each form together with the printing of a total after the last printed line in the list; the machine functioning with automatic group control and a single perforation being provided on the side of each form, the printing of the various items will occur each beneath the other, the functioning of the automatic control will cause the printing of the total below the last line of the list and then the paper is fed forward and the perforation on the following form will stop the paper with the first line of print of the following form in printing position.

3. The printing of the items of any one group of cards on several forms with a progressive total printed at the top of each one of them: the machine functioning with the automatic group control and the device for taking progressive totals, two perforations being provided on each form, one on the left and one on the right, the right hand perforation of a form causing printing of a progressive total on the preceding form below the last item listed on said form, then feeding is stopped by the left hand perforation of the following form with the first line of print of the form in its printing position, the progressive total printed on the preceding form being repeated on said first line of the following form while the selection of a clearing operation will finally cause the printing of the general total after the last line of the list on the last form, following which the feeding of the paper will restart and will be stopped by the left hand perforation of the next form in position to record the first items of a new group.

4. The printing of the total at the bottom of the form irrespective of the number of lines listed on said form: the machine functioning with the automatic group control and two perforations being provided on the side of each form, the functioning of the automatic control will cause the feeding of the paper which will be stopped by the first perforation of the following form for the printing of the total at the bottom of the first form considered and said impression of the total causing a further feeding of the paper which is stopped by the second perforation of the following form with the first line of said last form in printing position.

5. The printing of the items of a group of cards on several forms with or without a total on each and without carrying forward a progressive total from one form to another: two perforations being provided on each form, one on the left and the other on the right, the perforation on the right hand side of the following form will initiate the printing of the total of the items listed on the form considered even if, at this moment, the functioning of the automatic group control does not occur, the feeding of the paper restarting automatically after the printing of said total until

it is stopped by the left hand perforation on the form which comes after the following form which has just been referred to, with the first printing line of said following form in printing position.

The foregoing and other objects of the invention will become apparent as this specification continues with reference to the drawings forming part of the disclosure.

In the drawings:

Figs. 1 to 5 show sample sheets of the various record forms which may be produced under control of the devices of the invention.

Fig. 6 is a diagrammatic perspective view of the perforation sensing devices cooperating with the record strip.

Fig. 6A is a perspective view of the paper feeding clutch lever and cooperating latch which is released by the associated engaging magnet.

Fig. 7 is a side elevation of the feeding mechanism and the control magnets therefor.

Fig. 8 is a front elevation of the structure shown in Fig. 7.

Fig. 9 is a sectional view of the feeding mechanism as seen when a section is taken along the line 9-9 in Fig. 7.

Figs. 10 and 10A show a wiring diagram of the electrical feeding controls connected to the wiring of a perforated card controlled tabulator.

Fig. 11 is a detail view of a portion of a record card of the kind used to control the tabulator.

Fig. 11A is a side elevation view of the line spacing mechanism.

Fig. 12 is a sectional elevational view of the printing mechanism.

Fig. 13 is a timing chart of the special cam contacts in the machine.

The feeding devices are incorporated in a card controlled machine of the kind disclosed in United States Patent No. 1,976,617. In such machines, record cards C (Fig. 11) are sensed to control accumulating and printing operations. These cards are arranged in groups according to group numbers perforated therein so that a series of related items may be added to form a total amount of the group. The cards are passed through the machine in succession and automatic group control devices compare the group numbers on consecutive cards so that a group change may be detected. When such a change is detected, a total printing operation is initiated and the accumulator is reset.

The tabulator printing mechanism is shown in Fig. 12. There it is seen that a listing shaft 165 drives the mechanism during listing operations and a totaling reset shaft 166 drives it during total taking operations. The machine is provided with a number of cam operated contacts identified by the prefix letters L and P, the former operated by cams on shafts that operate only during listing, and the latter operated by cams that rotate only during total taking as in Patent 1,976,617. The record strip R is held around a platen 2 and there receives the printing impressions. A printer control magnet PM is energized at a differential instant according to the time of sensing a perforation in the record card or the time that an accumulator controlled total contact is closed. Moving in synchronism with the other tabulating mechanism is a type bar 212 formed with notches 216 that are moved in succession past a stop pawl 217. When magnet PM is energized it attracts an armature lever 221 to which is attached a call wire 220 connected at the opposite end to a latch 217a for releasing pawl 217. Thus the type bar 212 is stopped

differentially by the pawl engaging in one of the notches 216; the bar stopping between a hammer 224 and platen 2 to place at the printing line, type 218 corresponding to the value of the perforation or total amount sensed. For a more detailed understanding of the structure and operation of the tabulator, reference may be made to the patent identified hereinbefore.

The line spacing mechanism is shown in Fig. 11A where a shaft 208 is shown as having a space operating arm 262 secured to one end thereof. Shaft 208 is rocked on every printing cycle of the machine by the cams on shafts 165, 166. Fig. 12. Arm 262 (Fig. 11A) is rocked therewith and carries a pin 263 which is adapted to engage a member 264 integral with an arm 265 rotatable about a fixed pivot 266. The arm 265 is connected by a link 267 to an arm 268 which has a pin and slot connection 269 with an arm 270 pivoted on the supporting axis of the platen.

Arm 270 carries the spring pressed pawl 271 which is adapted to engage a ratchet 272, Fig. 6, for driving the platen 2. Clockwise rocking of shaft 208, Fig. 11A, accompanied by the upward movement of the printing cross-head will rock member 264 and arm 265 in a counterclockwise direction to cause actuation of the ratchet 272 in a clockwise direction and effect paper spacing before the printing hammers are tripped. Arm 265 has secured thereto a further member 273 connected by a link 274 to an arm 275 loosely pivoted on the shaft 208. A pin 276, projecting from a mutilated gear 277 secured upon the total shaft 166, is adapted to rock arm 275 during total taking operations to effect an additional spacing operation of the platen. Pin 276 is so located that it actuates the paper spacing mechanism after the printing operation.

As shown in Fig. 6, the record forms are on a strip R which is unfolded out of a magazine 1, passed around the platen roller 2 and then returned to a receiving magazine 3. The forms may be separated by printed dotted lines across the strip, but perforated lines should be avoided because electrical contact is liable to be established therethrough.

In Figs. 7, 8, and 9 are shown the mechanisms by which platen 2 is turned to feed the strip. The platen may be turned under control of the listing shaft 165 or the reset shaft 166, the former turning one revolution on each listing cycle and the latter revolving on each total printing cycle. The shafts are connected to the platen shaft 2' through a chain 6 and three gears 7, 8 and 9. The mechanism is mounted between a pair of side plates S and S' fixed to the base B.

Fixed to the shaft 166 is a ratchet wheel 10 engaging a pawl 11 pivoted on a gear 13 loosely mounted on the shaft. A spring 12 tends to keep the pawl in engagement. Gear 13 meshes with a gear 14 loose on shaft 165 but carrying a pawl 15 which engages the teeth of a ratchet wheel 17 keyed on said list shaft 165. A spring 16 holds the pawl 15 against wheel 17. Gear 14 is formed with a sleeve 4 carrying a sprocket wheel 18 around which passes the chain 6 which also meshes with a sprocket wheel 19 loosely mounted on a shaft 5 which is keyed to the feeding drive gear 7. The sprocket 19 may be connected to the drive gear 7, gears 8 and 9, and platen 2, through a friction clutch comprising a friction disk 20 which is fastened on the sprocket and a slidable keyed sleeve 20' which may be pressed against disk 20 by spring 19' or moved away

therefrom by electric controls about to be described.

It is apparent from the foregoing that when clutch 20—20' is engaged, paper feed roller 2 is driven either by list shaft 165 or by reset shaft 166 according to which of said shafts is in rotation. If, for instance, it is the resetting shaft which is in operation, the drive of the roller will occur through ratchet wheel 10 driving pawl 11 and consequently gear 13 in its rotation, said gear 13 driving gear 14 the pawl of which will slide idly over ratchet wheel 17 which is stationary (see arrows in Fig. 7 showing rotational direction of gears 13 and 14) and through sprocket wheel 18 solid with gear 14 and driving chain 6, sprocket wheel 19 and the series of gears 7, 8, and 9. If on the contrary it is listing shaft 165 which is in operation, it is ratchet wheel 17 which, through pawl 15, will drive gear 14, the rest of the movement continuing up to roller 2 in the same manner as in the other case; the rotation of gear 14 will actuate gear 13, the effect of which will simply be to cause pawl 11 to slide over the teeth of the stationary ratchet wheel 10.

In other words, paper feed roller 2 rotates either through shaft 165 or through shaft 166 each time clutch 20—20' is in engagement. An engaging electromagnet 21 makes it possible, by means of an associated armature 22 pivoting at 23, to control engaging sleeve 20' by a lever 22' arranged to bring it against disk 20 to determine clutch engagement. Magnet 21 trips the latch connections (Fig. 6A) which normally hold lever 22' and sleeve 20' (Fig. 9) out of clutching relationship, against the tension of spring 19'. Lever 22' has an end which fits into the groove on sleeve 20', and pivots on a vertical stud 21' (Fig. 7) so that a block 23' thereon is in the path of a depending finger 22a on armature 22. When the armature is attracted, finger 22a moves to the right (Fig. 6A) out of the path of block 23' and thereby releases lever 22 (Fig. 9) so that it may be rocked in a counterclockwise direction (clockwise in Fig. 6A) by spring 19' to press sleeve 20' against disk 20 in driving relationship. A disengaging electromagnet 24 (Figs. 7 and 8) operates in an opposite way through an armature lever 24' cooperating with lever 22' to shift sleeve 20' away from disk 20, compress spring 19' and relatch lever 22' and block 23' behind armature finger 22a and thus stop the rotation of platen 2 and the feed of the paper strip. Lever 24' pivots on a rod 24b and carries an adjustable projection 25a pushing against the end of lever 22' so that it may be rocked in a clockwise direction (Fig. 9) and relatched as shown in Fig. 6A.

The devices for controlling the energization of magnets 21 and 24 which make it possible to engage or disengage the clutch for controlling the platen drive will now be explained.

Energization of engaging magnet 21 is obtained either under control of the print devices when listing, operation of the automatic group control devices, the means for printing a progressive total, the actuation of the major, intermediate or minor total control, the operation of class selection devices by special cards, or finally through the action of a marginal perforation provided on one side of a record form in cooperation with an adjustable brush 26 (Fig. 6) adapted to contact a conducting plate 27 when a start indicium or perforation appears under

the brush, said plate 27 serving at the same time as a guide for the paper.

Paper feeding is stopped in order that a single line may be printed, or the first line as an item or a progressive total may be printed, or totals may be impressed in the desired position on a form, any of the aforesaid controls being produced by devices including an adjustable brush 26 cooperating with the left side of strip R and contacting with plate 27 at times determined by the differential placement of marginal stop indicia or perforations in the forms.

A third adjustable brush 28 is out of line with the perforations in the strip because it is provided merely to sense the passage of the end of the record strip R. When the end passes the brush 28, contact with plate 27 is established and a means is activated to stop the tabulator so that no more cards are fed.

The electrical connections about to be considered make it possible to control the energization of engaging magnet 21 and disengaging magnet 24 and consequently the engaging or disengaging of the paper feed device. These connections not only include the sensing devices cooperating with the strip, but also modifications in the wiring of the tabulating machine in order to obtain the control of printing in any desired position on a form.

Reference may be made to Fig. 10 where is shown the electrical strip sensing controls that are connected to printing tabulator so that it may fulfill the various requirements indicated hereinbefore. As seen in this diagram, brush 28, which controls to stop the feeding of cards when the paper strip comes to an end, is connected by a wire 29 to a stop relay 30 which acts, when energized, to open contacts 30b (Fig. 10A) in series with the stop key contacts 76' of the tabulator. On wire 29 is also located a hand-controlled switch 31 which is closed when it is desired to bring into action the sensing devices forming part of the subject matter of the invention. Plate 27, with which brush 28 makes contact when there is no more paper available for passing over printing roller 2, is connected to wires 32, 64 and 62 leading to an opposite main line 331 and in the path of which is positioned a hand-operated switch 35 which is closed when it is desired to utilize the paper feed devices which form the subject matter of the present invention.

It should be noted that main lines 330, 331 are connected to the tabulator wiring in Fig. 10A and are energized when a switch PS is closed to connect to the power source. It should likewise be noted that the electric connection shown at 27' in Fig. 10 is merely a diagrammatic indication, said connection being obtained in actual practice by conducting plate 27 itself. From the foregoing it will be seen that when the paper passes over plate 27 to pass round printing roller 2, it insulates brush 28 from plate 27; consequently relay 30 is not energized and its contact 30b (Fig. 10A) does not break the energizing circuit of the engaging electromagnet of the card feed device and said cards continue to pass through the machine unless other operations (automatic control, stop key operation, etc.) stop said feed in the usual manner. On the contrary, if there is no more paper passing under brush 28, that is to say, if there is no other form ready to pass over roller 2 for printing, brush 28 makes contact with plate 27 and the following circuit is set up in consequence: line 330, switch 31,

relay 30, wire 29, brush 28, plate 27—27', wire 33, switch 35, wires 64 and 62, and line 331. Consequently, relay 30 is energized which causes, as hereinabove indicated, the breaking of the energizing circuit of the engaging electromagnet of the tabulator card feeding devices.

When it is energized, electromagnet 30 also controls the breaking of contact 30a which is normally closed, the effect of which, when there is no more paper passing on plate 27, is to suppress all action of the paper feeding devices.

One circuit which is influenced by the opening of contact 30a is the circuit containing left hand brush 25 and the disengaging magnet 24 for stopping the paper feed mechanism. This brush 25 is provided to sense the appearance of a left hand marginal perforation in the paper and thereby energize magnet 24 by means of a circuit including line 331, wires 62 and 64, switch 35, wire 33, connection 27', plate 27, brush 25, wire 37, magnet 24, wire 38, contact 30a, wire 29, switch 31 and line 330. A progressive total control circuit is also influenced by operation of contact 30a, because it follows a path through line 330, switch 31, wire 29, contact 30a, wire 38a, bus bar 39, wire 41, progressive total relay 42, progressive total magnet 43, wire 44, contact 72b, plug wire from 77 to 76, wire 75, brush 26, through a right side marginal perforation to plate 27, wire 33, switch 35 and wires 64 and 62 to line 331.

The disengaging magnet 24 is in addition connected, by one of its terminals, to a wire 47 leading to one terminal of disengaging relay 48, the other terminal of which is connected, by a wire 49, to bus bar 39. Said magnet 24 is connected, through its other terminal, to a wire 50 leading to one of the terminals of engaging magnet 21. Disengaging relay 48, when energized, closes a contact 48a one of the terminals of which is connected to wire 47 and the other terminal of which is connected to a wire 51 connected to a contact 24a which is normally closed (the breaking of which is controlled by the energizing of magnet 24) and to a wire 52 leading to plate 27. A condenser 53 is generally provided as a shunt in relation to contacts 48a and 24a in order to avoid sparking on the breaking of said contacts.

One of the terminals of engaging magnet 21 is connected to wire 50; its other terminal is connected to a wire 54 leading to a twin plug socket 55 which can be electrically connected by means of plug wire connections either to socket 56 relative to the minor control, or to a socket 58, or to both of these.

Socket 58 is connected, by a wire 59, to a cam contact L33 which is adjusted to close for a moment between the passage of the cards and after the printing of each line, said cam contact being moreover connected, by a wire 60, to one of the terminals of a contact 67b (controlled by electromagnet 67 positioned on the minor control circuit, as will be seen later), the other terminal of which is connected by a wire 62, to line 331 and by a wire 64 to switch 35; said contact 67b may be short-circuited by a switch 65 which is closed when the machine is operated only for listing and which is opened when the machine is operated with automatic control. Socket 56 of the minor control is connected, by a wire 66, to a contact 67a which is closed when magnet 67, which controls it, ceases to be energized (said magnet being positioned as will be explained later, in the relay circuit of the minor control) and which is connected, in addition, by wires 68 and 68a to a cam contact P11 designed to be closed after

total printing, said cam contact being connected by a wire 69 to line 331.

A circuit through wire 68a includes a contact 43c (the closing of which is controlled by the energizing of coil 43 hereinabove mentioned), a wire 71, one winding of double wound relay 72 and a wire 71' which leads to one of the terminals of contact 30a and to wire 38. Said double wound relay 72, the second winding of which is positioned in another circuit leading from bus bar 39 to wire 51, controls a contact 72a which closes when the first mentioned winding of the relay in question is excited; said contact is placed on the same circuit as the second winding of double wound relay 72 inserted between wires 73 and 74.

Right hand brush 26 is connected, by wire 75, to a double socket 76 which may be connected, by means of a plug wire connection, to a socket 77 which is connected to a contact 72b, the breaking of which is controlled by the energizing of double wound relay 72, said contact 72b being arranged in series relatively to coil 42 of the relay corresponding to the progressive total and to coil 43 mentioned hereinbefore.

When it is desired to control the engagement of the paper feed by means of a perforation swept by brush 26, the socket 76 is connected by a plug wire to a socket 77' wired to a relay 43', said relay being itself connected by a wire and a resistance to bus bar 39. When energized, relay 43' closes a contact 43'd, one terminal of which is connected to coil 43' while the other terminal is connected by a cam contact L33' (adjusted to open at the same time as cam contact L33) and by wires to plate 27. Coil 43', when energized, likewise controls the closing of a contact 43'b shunted in relation to the combination of sockets 55 and 58.

Moreover, according to the invention, in the customary circuit of stop key contacts 76' (see Fig. 10A) is positioned a contact 30b which is normally closed but which opens when stop relay 30 (see Fig. 10) is energized, that is to say, when brush 28 makes contact with plate 27, in other words, when there is no more paper to be passed over printing roller 2; the breaking of said contact 30b breaks the circuit of the stop contacts in which is also positioned the usual engaging magnet 22' of the card feed device as well as start relay 78 which starts and holds the energization of said magnet. When there is no more paper to be supplied to roller 2 the card feed device is therefore disengaged and the card feed of the machine is automatically stopped in consequence.

In the same circuit as the stop contacts 76' is positioned a three blade contact 43b which normally occupies the position shown in Fig. 10A, with its upper contacts normally closed in series with start relay 78 holding magnet 22' engaged, but the central blade of which is moved to open upper contact 43b when a feed control magnet 43 is energized. The circuit which initiates the effectiveness of the card feed clutch magnet 22' while the tabulator is operating, may be traced through line 330, cam contact P1, magnet 22', relay 340, relay 78, switch 353, cam contact P2, card contact LCLa, stop key contact 76', contact 30b, upper contact 43b, lower contact 338a closed by control magnet 82, and line 331. This circuit is again initiated if the upper contact 43b is held closed. Said contact 43b has been provided in order to deenergize relay 78 which would otherwise tend to hold the energization of the card feed engaging magnet between the printing of

one progressive total and the printing of a carry forward of said total on to another form. Magnet 43 is energized, to open upper contacts 43b when brush 26 encounters a marginal perforation, in order to stop card feeding and in order to prevent the feeding of cards between said two consecutive printings of progressive totals, as will be seen from what follows.

Magnet 42 related to the taking of a progressive total, also causes, when energized, the closing of a contact 42a shunted in relation to contact P3 (see Fig. 10A) when switch 79 is closed, said switch being closed when it is desired to print on the forms, accounting items with progressive totals. The first progressive total is initiated by directing a circuit through the auto reset relay 348 which in turn activates the reset clutch magnet 80 and the motor RM. The circuit through relay 348 includes line 330, contact 42a, switch 79, relay 348, cam contact L3, switch 346, lower contact 43b (closed because relay 43 is energized at the same time as relay 42) lower contact 338a and line 331. Relay 348 then closes contact 348a to energize magnet 80 and establish a holding circuit. The holding circuit passes through line 330, contact P3, magnet 348, contact 348a, to line 331. At the end of the cycle, contact L4 closes completing a circuit from line 330, contact p3 and 384c, clutch magnet 80, contact L4, contact 348a and line 331. Magnet 80 then operates a lever to close contacts 287 in shunt around contact P4. Then the reset motor RM and the zero control magnet 350 are energized and a total printing operation is effected, but resetting of the accumulator is prevented. A second cycle of totaling is induced by the continued closure of contact 42a. Said contact 42a remains closed during the time relay 42 is energized, said period of energization being regulated by the duration of the closing of cam contact P8a (see Fig. 10); the setting of the cam of said contact is such that magnet 42 remains energized sufficiently long and that contact 42a may in consequence be closed long enough to carry out two successive total taking cycles (whereas the duration of the closing of P3 is such that normally a single total taking cycle is effected through the magnet 80 which controls engagement of the total print mechanism with the reset motor RM) making it possible, in the case of progressive total selection, to print said progressive total and then to print the carry forward of said total on the following form. Near the end of the first total printing cycle, feeding of the record sheet is initiated by the momentary closure of contacts P11, Fig. 13, but immediately before this, contacts P8a open momentarily, and close again before brush 26 is insulated from plate 27 by the sheet which starts to move. Therefore, magnet 42 is again energized to close contacts 42a and initiate a second progressive total printing cycle. Near the end of this second cycle, contacts P8a again open and close, and this time magnet 42 becomes de-energized because brush 26 has been insulated by the shifted record sheet.

The closure of contacts 42a serves to make magnet 80 effective longer than usual. When contacts P4 open at the end of the total print cycle, the reset motor circuit is not broken as it is usually, instead a shunt comprising contacts 287 held closed by magnet 80 maintains reset motor operation for another cycle.

As shown in Fig. 10A, a magnet 67 is inserted in the circuit of relay 81 of the minor control which also includes relay 82 controlling the tabulating

motor. The excitation of magnet 67 causes the breaking of contact 67a hereinabove mentioned (see Fig. 10) and also opening of contact 67b. In addition, relay 81 of the minor control, controls contact 81a, the blade of which is connected as usual to bus bar 83 leading to main line 330, which components exist in the tabulating machines already known. Contact 81a assumes the position shown in Fig. 10A when relay 81 of the minor control is not energized. Instead of using coil 67 and the associated connections in the minor control circuit, similar connections may be inserted in the major control circuit, if such control is desired.

In order to prevent resetting of the accumulators while totals are printed as at 1' and 1'', Fig. 3, a switch 94, Fig. 10A, is provided to open the connections leading to the reset magnet 182, thus preventing resetting of the accumulators. This switch 94 when opened causes the taking of progressive totals, after which it may be closed to allow magnet 182 to be energized for a clearing total.

The same progressive totaling form of control may be obtained in another way with switch 94 held closed. Then the dial switch is set at "Prog," but turned to "Min" after progressive totals have been recorded. The auto restart switch 353 may be opened so that the machine is stopped after each progressive total printing cycle so that the operator can turn the dial switch to "Min" and press the reset key whenever he desires to take a clearing total.

The diagram of the circuits and of the modifications which are made in the electric connections of the tabulating machine having been described hereinbefore, the operation of the devices which form the subject matter of the invention will now be explained with reference to various typical cases such as those indicated in the objects of the invention.

Assuming first of all that it is desired to print on each form (an invoice for instance) a single line from each of a series of cards passing through the machine operating in listing, each line of print containing the particulars of a single card on each form and the feed of the paper having to occur between each line printed. This is the case represented in Fig. 1. In said figure, the arrow indicates the direction of travel of the paper forms. In the case considered, a single perforation on the left hand side is necessary on each form; this is the perforation shown at a. In addition, special switch 65 (Fig. 10) is closed (in addition to switches 31 and 35 which are always closed when it is desired to operate the feeding devices) and a plug wire connection is made between socket 55 and socket 58. Finally, the position of the left hand brush 25 (see Figs. 6 and 10) is so adjusted that perforation a shall appear under said brush when the location for printing on the preceding form is beneath the printing ribbon against which the type impinges. For instance, referring to Fig. 1, the adjustment of the position of brush 25 is such that when perforation a' is beneath brush 25, line 1' on which the printing of the previous form is to take place, is in the printing position.

Referring now to the diagram of the circuits represented in Fig. 10, it will at once be seen that as soon as the line of print 1 has been printed, engaging magnet 21 of the paper feed device is energized by the establishing of the following circuit: line 330, switch 31, wire 29, contact 30a, wire 38, wire 50, magnet 21, wire 54, socket 55,

plug connection leading to socket 58, wire 59, cam contact L33 closed at this moment, wire 60, switch 65, wire 62, and line 331. The setting up of this circuit occurs due to the closing of contact L33 which is so adjusted as to close for a moment between the passage of the cards and after the printing of the line. The paper feed device being thus engaged after the printing of line 1, the paper travels forward until said device becomes disengaged, which is brought about by means of perforation *a'*, the position of which is such that it causes the stoppage of the paper at line 1' (see Fig. 1). This disengagement of the paper feed device is obtained by means of magnet 24 which is energized long enough to cause said disengagement. The energization of magnet 24 is sustained momentarily by an impulse carrying circuit set up by a relay 48 which is energized at the same time as magnet 24 when sensing brush 25 encounters a perforation *a'*. When perforation *a'* arrives under brush 25 the following circuit is established: line 330, switch 31, wire 29, contact 30a, wire 38a, wire 49, relay 48, wire 47, wire 37, brush 25, plate 27—27', wire 33, switch 35, wires 64 and 62, and line 331. At the same time, magnet 24 is energized by a circuit through line 330, switch 31, wire 29, contact 30a, wire 38, magnet 24, wire 37, brush 25, plate 27—27', wire 33, switch 35, wires 64 and 62 and line 331. Then, with both relay 48 and magnet 24 energized, the relay closes contact 48a and the magnet opens contact 24a; but the contact operation is not simultaneous, because contact 48a is quick to close and contact 24a is slow to open, therefore there is an instant that magnet 24 is energized independently of the brush circuit. Energization of relay 48 during the short period that the perforation passes under the brush, quickly causes the closing of contact 48a which is coupled to it and the setting up of the following impulse circuit for momentarily holding the energization of the disengaging magnet 24; line 330, switch 31, wire 29, contact 30a, wire 38, magnet 24, wire 47, contact 48a, wire 51, contact 24a, wire 52, plate 27—27', wire 33, switch 35, wires 64 and 62, and line 331. Consequently, magnet 24 is energized sufficiently long, even after the perforation is no longer beneath brush 25, for the paper feed device to be declutched; in other words, perforation *a'* has caused the stoppage of the feed of the paper with line 1' in the printing position so that the particulars corresponding to the next card may be printed at this spot. The contact 24a is soon opened by the energized magnet 24 and then both relay 48 and magnet 24 are deenergized because brush 25 is separated from plate 27 by the record paper. Contact 24a finally resumes the normal closed position when magnet 24 is deenergized.

It will now be assumed that the machine is functioning with automatic group control and that on each printed form it is desired to print a variable number of lines corresponding to one group of cards, the printing of the total appearing beneath the lines previously printed on the form. In this case, represented in Fig. 2, a single perforation is still necessary, namely, perforation *a* on the left hand side of each form. In addition, switch 65 is open and a plug connection is made between socket 55 and socket 56 corresponding to the minor control.

Engaging magnet 21 in the example under consideration becomes energized after the printing of the total on the closing of cam contact P11 (see Fig. 10), the cam of which is so adjusted

that the contact closes after the printing of the total. The energizing circuit is as follows: line 330, switch 31, wire 29, contact 30a, wire 38, wire 50, magnet 21, wire 54, socket 55, socket 56, contact 67a closed at this moment owing to the energization of the control relay 67, wire 68, wire 68a, contact P11, wire 69, and line 331. After energization of magnet 21, the paper feeds forward until perforation *a'* stops the paper with line 1' of the preceding form in the printing position (see Fig. 2). The operating circuits of disengaging magnet 24 are in every way similar to those described in connection with the preceding case and need not be described anew. Said disengaging magnet 24 functions, as has been seen, owing to the passage of perforation *a'* under brush 25.

It will now be assumed that the list of items of one group of cards is too long to be printed on a single sheet and that it is necessary to use several forms with a progressive carry forward on each form. In such case, several successive forms will be completed, the last form corresponding to a group of cards under consideration comprising the final general total positioned below the last line of accounting items placed on the list. As seen in Fig. 3, it is necessary to employ two perforations, one located on the left, perforation *a*, working in cooperation with brush 25, and the other located on the right, perforation *b*, working in cooperation with brush 26 (see Figs. 6 and 10). Perforation *a* is intended to stop the feed of the paper so that the first line of the preceding form shall be in the printing position. Perforation *b* is utilized to cause the stopping of the paper and the printing of a progressive total at the bottom of the preceding form. The right hand brush 26, which cooperates with perforation *b*, should be adjusted in such manner that it comes into contact with perforation *b* when the line before the last line of the preceding form is under the printing ribbon. Left hand brush 25 will be adjusted as in the preceding case.

In addition, the connections to be made in Fig. 10 are as follows; switch 65 open, a plug connection made between socket 55 and socket 56, and a plug connection made between socket 77 and socket 76. When perforation *b* comes under brush 26, the following circuit will be established: line 330, switch 31, wire 29, contact 30a, wire 38a, bus bar 39, wire 41, relay 42, coil 43, contact 72b normally closed, socket 77, plug connection leading to socket 76, wire 75, brush 26, plate 27, wire 33, switch 35 closed, wires 64 and 62, and line 331. Consequently, progressive total relay 42 is energized; a holding circuit is moreover established by contact 43a which is closed owing to the energizing of coil 43. This holding circuit, which continues from coil 43 up to line 331 and which includes contact 43a, wire 45, cam contact P6a and wire 46, maintains the progressive total relay 42 energized even after perforation *b* is no longer under brush 26. The duration of the closing period of contact P6a is adjusted in such manner that magnet 42 controlling contact 42a of the progressive total circuit (see Fig. 10A, with switch 79 closed when the device is operated with a taking of progressive totals) makes it possible to carry out two successive total taking cycles and consequently two printings of the progressive total, one at the bottom of one form and the other on the first line of the following form as explained hereinbefore. Upper contact 43b (see Fig. 10A) controlled by coil 43 (see Fig. 10) opens to deenergize relay 78 for disengagement of the card feed device and thus stops card feeding and prevents

the feeding of cards in the machine between the two printings of the progressive total at the end of one form and at the beginning of the following form.

In addition, the energization of coil 43 causes the closing of contact 43c and in consequence the energization of magnet 21 for engaging the paper feed device after the printing of the progressive total owing to the establishing of the following circuit: line 330, switch 31, wire 29, contact 30a, wire 38, wire 50, engaging magnet 21, wire 71a, wire 71, contact 43c, wire 68a, cam contact P11, wire 69, and line 331. Thus, after the printing of the progressive total at the bottom of the form at 1', said printing occurring owing to right hand perforation b' on the following form, engaging magnet 21 is energized and the sheet of paper is fed forward until it is stopped by perforation a' of the form which is behind it, the position of brush 25 being adjusted in such a way that said perforation a' stops the form preceding it with line 1' in printing position. The circuit through which disengaging magnet 24 becomes energized and the sheet of paper is stopped when line 1' is in the printing position (the progressive total being carried forward to this line owing to the duration of energization of magnet 42) will be through brush 25 the same as in the previous instances. Therefore, it is not necessary to describe it anew.

During the first progressive total printing cycle, brush 25 (Fig. 10) projects through perforation b' and maintains relay 42 energized even though cam contact P6a opens for a short time near the end of the operation. At the end of this first cycle, paper feeding takes place and the brush 25 is insulated, but contact P6a has again closed to hold the energization of relay 42. On the second progressive total printing cycle, after printing has occurred, contact P6a again opens and then relay 42 is deenergized. Contact 42a (Fig. 10A) then opens to deenergize relays 30 and 348, thereby causing contacts 287 to open, and later in the second cycle, contact P4 opens to deenergize the reset motor RM.

On the form coming next (which form commences at line 1' by the carry forward of the progressive total (see Fig. 3) will be inscribed other related accounting items and, if there is no change in the group of cards, a progressive total will be printed at the bottom of the form, as has previously been explained. If, on the contrary, a minor or major change of group occurs in the interval, the total will be printed and the paper will feed after the printing of said total up to the first line of the following form exactly as in the case previously considered. The last mentioned total will also be a progressive total unless the operator intervenes to close switch 94, Fig. 10A, or shift the dial switch to Min. But, in order to avoid the reenergization of relays 42 and 43 in this latter case by the passage of the perforation in front of the right hand brush during the feed after the printing of the major or minor total, provision has been made, as indicated in the previous general description, of double wound relay 72, the purpose of which is to break contact 72b which is situated in said circuit of brush 25, which breaks the circuit of progressive total relay 42 and of coil 43. The energization of double wound relay 72 is caused by the following circuit: line 330, switch 31, wire 29, contact 30a, wire 71', double wound relay 72, wire 71a, wire 54, socket 55, plug connection leading to socket 56, contact 67a closed owing to the operation of the group con-

trol, wire 66 and wire 68a, cam contact P11, wire 69, and line 331. A holding circuit for relay 72 is established by the closure of contact 72a. The circuit may be traced through line 330, switch 31, wire 29, contact 30a, wire 38a, bus bar 39, wire 74, holding coil 72, contact 72a, wires 73 and 51, contact 24a, wire 52, connection 27', wire 33, switch 35, wires 64 and 62, and line 331. This circuit is maintained during feeding until contact 24a is opened by energization of magnet 24 brought about when brush 25 encounters a control perforation.

It will now be assumed that the total is to be printed at the bottom of the form irrespective of the number of lines listed on said form. This is the case represented in Fig. 4. Under these conditions it is necessary to provide two perforations on the left hand side of each form and to establish a plug wire connection between double socket 55 and socket 58 and another plug wire connection between double socket 55 and socket 56, switch 55 being open as before. In this manner, two feeding operations of the paper may be obtained; one feed which occurs with the functioning of the major or minor control and which is arrested by the first perforation c of the next form for the printing of the total at the bottom of the form (referring to Fig. 4, perforation c' will stop the paper with line 1 of the preceding form in the total printing position) and a feed which occurs after the printing of said total and which is arrested by perforation a of the form (for instance, if Fig. 4 is considered, perforation a' will stop the paper, after the printing of line 1, with line 1' in the printing position).

Distance A (Fig. 4) between the two perforations on any one form must obviously be equal to distance B included between the line on which the total is printed and the first line of the following form as will readily be understood.

As already explained, it is necessary that after the printing of the last line listed on a statement, and prior to the printing of the total, a forward feed should occur, that is to say that engaging magnet 21 should be energized, and this occurs through the following circuit: line 330, switch 31, wire 29, contact 30a, wire 38, wire 50, magnet 21, wire 54, socket 55, plug connection leading to socket 58, wire 59, contact L33, wire 60, contact 67b, wire 62 and line 331. It has been explained that contact L33 is adjusted in such manner as to be closed for a moment between the cards and after the printing of each line; also that contact 67b closes on account of the functioning of the major or minor automatic control; a feeding operation therefore occurs after the functioning of the control and prior to the printing of the total. Said feed is arrested by the first perforation c of the following form when said perforation arrives beneath brush 25 to energize the disengaging magnet 24 and at the same time energizes the sustaining relay magnet 48. Then the following circuit is established: line 330, switch 31, wire 29, contact 30a, wire 38a, wire 49, magnet 48, wire 47, wire 37, brush 25, plate 27-27', wire 33, switch 35, wires 64 and 62 and line 331. Relay 48 being energized, contact 48a closes and the following circuit is established: line 330, switch 31, wire 29, contact 30a, wire 38, magnet 24, wire 47, contact 48a, wire 51, contact 24a, wire 52, plate 27-27', wire 33, switch 35, wires 64 and 62 and line 331. The paper is thus stopped just before printing occurs with the last line, 1, of the form in printing position.

The total is printed and immediately after, a

further feeding operation occurs owing to the energization of engaging magnet 21 due to the establishing of the following circuit: line 330, switch 31, wire 29, contact 30a, wire 38, wire 50, magnet 21, wire 54, socket 55, plug connection leading to socket 56, contact 67a, wire 68, wire 68a, cam contact P11, wire 69, and line 331. The adjustment of cam contact P11 is such that said contact closes after the printing of the total. This further feed of the paper is then stopped by the second perforation a of the form so that said paper is stopped with first line l' of the form in the printing position. The circuit for stopping the feed of the paper is the same as in the preceding cases; it is therefore not necessary to describe it anew.

Finally it will be assumed, in the last example, that it is desired to print the items of a group of cards on several forms. This is the case shown in Fig. 5. It will be seen that it is necessary to employ two perforations in this case: perforation a positioned on the left and cooperating with brush 25, and perforation b positioned on the right and co-operating with brush 26. Perforation b makes it possible to obtain a paper feeding operation after the printing of the last line of the form. Perforation a is utilized to stop the feed of the paper after the feed subsequent to said printing, with the first line of the form in the printing position. For the continuation of item printing it is necessary to establish the following connections: close switch 65, plug connection between socket 55 and socket 56, plug connection between socket 76 and socket 77'. Under these conditions, when perforation b arrives beneath brush 26, the following circuit will be established: line 330, switch 31, wire 29, contact 30a, wire 38a, bus bar 39, coil 43', socket 77', plug connection leading to socket 76, wire 75, brush 26, plate 27, wire 33, switch 35, wires 64 and 62 and line 331. As coil 43' is energized, contact 43'a will close, maintaining the energization of coil 43' through the following circuit: bus bar 39, coil 43', contact 43'a, cam contact L33' closed at "I" and held closed until after printing, wire 33, switch 35, wires 64 and 62 and line 331. The energization of coil 43' determines the closing of contact 43'b which establishes the circuit of engaging magnet 21 and therefore causes the feeding of the paper when contact L33 closes, that is to say immediately after the printing of the line. Should the account call for the printing of the total before the end of a form is reached, then sheet feeding is initiated after total printing by the energization of engaging magnet 21 through a circuit including line 330, switch 31, wire 29, contact 30a, wires 38 and 50, magnet 21, wire 54, socket 55, plug wire to socket 56, contact 67a, wires 68 and 68a, cam contacts P11, wire 69 and line 331. The feeding operation will be arrested by perforation a so that the first line of the following form will be in the printing position. The termination of the paper feed under these conditions occurs in the same manner as in the cases previously described, making further explanation unnecessary.

While there is disclosed the fundamental novel features of the invention as applied to a tabulating machine, it will be understood that various omissions, substitutions and changes in the form and details of the devices illustrated and in their 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 as follows:

1. In a machine for printing items on a strip divided into forms with start and stop feed control indicia on each form, means for line spacing the strip after each item print, means for feeding the strip from form to form, means for sensing said start indicium, means under control of said indicia sensing means for initiating operation of said feeding means after the last of a predetermined number of item printing operations on one form, adjustable indicia sensing means for sensing said stop control indicium to determine the space for a heading on each form, and means under control of the last mentioned sensing means for stopping said feeding means with said strip in position to receive the first item print on the next form.

2. In a card controlled machine with an accumulator item and total printing mechanism for printing items and progressive totals on a record strip divided into forms with control indicia, card feeding mechanism and total taking devices, the combination of means for line spacing said strip after each item printing operation, means for sensing said indicia, means under control of said sensing means for suspending operation of said card feeding mechanism, calling said total taking devices into operation and initiating operation of said total printing mechanism to print a progressive total at the bottom of a form, means for feeding said record strip, and means under control of said total printing devices for calling said strip feeding means into operation after printing has occurred.

3. In a machine with printing means for printing on a strip divided into forms with a pair of feed control perforations one on each side of each form, means for feeding the strip from form to form, a pair of adjustable brushes for sensing the perforations in the strip, means for line spacing the strip after each operation of the printing means, means under control of one of said brushes for initiating operation of said feeding means when one of said feed control perforations in a form is sensed, means under control of the other brush for stopping said feeding means when the other feed control perforation in the form is sensed, a third adjustable brush cooperating with the strip, and means under control of said third brush for stopping said printing means when the end of the strip is sensed.

4. In a machine with item accumulating and total printing mechanisms, for printing items and totals on a record strip divided into forms with a pair of control indicia for each form, the combination of means for feeding the strip, means for sensing an indicium on the form, means under control of said sensing means for initiating operation of said total printing mechanism for printing a total, other means under control of said sensing means and total printing mechanism for initiating operation of said feeding means after printing said total, other means for sensing the other indicium on the form, and means under control of said other sensing means for stopping the operation of said feeding means.

5. In a machine with item accumulating and total printing mechanisms, for printing totals on a record strip divided into forms, each form having a pair of control indicia, the combination of means for line spacing the strip, means for sensing one of the control indicia, means for feeding the strip, means under control of said

sensing means for initiating operation of said total printing mechanism to print two totals, means under control of said total printing mechanism for initiating operation of said feeding means after printing the first total, other means for sensing the second indicium of the pair, and means under control of said other means for stopping said feeding means after the strip is spaced to receive the second total impression in a predetermined position.

6. In a card controlled machine for printing items and totals on a strip divided into forms with pairs of control indicia, the combination of means for sensing the cards in succession, means under control of said sensing means for printing items on the strip, means for accumulating the items, total taking means cooperating with said printing means and accumulating means to cause a total to be printed on said strip, means for line spacing said strip, means for feeding said strip from form to form, means for sensing a control indicium, instrumentalities under control of said indicium sensing means for suspending operation of said card sensing means and initiating the operation of the total taking means to print a total, and means under control of said total taking means for initiating operation of said feeding means after printing the total, other means for sensing the other of the pair of indicia, and means under control of said other means for stopping said feeding means with the strip in position to receive the first line of print on a new form.

7. In a machine for printing groups of items and related totals on a record strip divided into forms with a pair of control indicia on each form, the combination of an accumulator, printing means, total taking means, means for line spacing the strip after each item printing operation, means for feeding the strip a plurality of line spaces, means for detecting a change in item groups when the last item of a group is printed, means under control of said detecting means for initiating operation of said feeding means, devices for sensing said pairs of control indicia, means under control of said indicia sensing devices when cooperating with one of said pair of control indicia for stopping said feeding means, means under control of said detecting means for initiating operation of said total taking and printing means to print a total which occurs after said feeding means is stopped, means under control of said total taking means for again initiating operation of said feeding means, said stopping means also being under control of said indicia sensing devices when cooperating with the other of said pair of indicia and then serving to position the strip to receive the first item print at the head of a new form.

8. In a record controlled machine having automatic group control devices, an accumulator, total taking devices and item and total printing mechanism for printing on a record strip divided into forms with feed stop and start control indicia on each form, the combination of means for sensing said start indicium on a form, means under control of said sensing means for controlling said total taking devices to cause two total printing cycles, strip feeding means, means under control of said total taking devices for initiating operation of said feeding means to feed the strip from form to form after the first total printing cycle during which a total is printed at the bottom of the first form, means for sensing said stop control indicium, means

under control of the last mentioned sensing means for controlling said feeding means to stop the strip in position to receive the second total impression at the top of the second form, line spacing devices for spacing said strip between item adding and printing operations, means under control of said group control devices and the total taking devices for initiating operation of said feeding means after a third total amount is printed, said second mentioned sensing means again becoming effective by sensing another stop indicium to control the control means for the feeding means to stop the strip in position to receive the first item impression of the new record group at the top of a succeeding form.

9. In a record controlled machine having automatic group control devices, an accumulator, total taking devices and item and total printing mechanisms for printing on a record strip divided into forms with two aligned feed stop control indicia on each form, the combination of strip feeding means, means under control of said group control devices for initiating operation of said feeding means upon a group change before a group total amount is printed, means for sensing said control indicia, means under control of said sensing means when sensing the first indicium for controlling said feeding means to stop the strip in position to receive the total impression near the bottom of the form, means under control of said total taking and group control devices for again initiating operation of said feeding means after operation of said total printing mechanism, said sensing means then sensing the second indicium and controlling said feed control means and feeding means to stop the strip in position to receive the first item impression of the new record group at the top of the second form, and line spacing devices for spacing said strip between item adding and printing operations.

10. In a record controlled machine having automatic group control devices, an accumulator, total taking devices and printing mechanism for printing on a record strip divided into forms with feed start and stop control indicia on each form, said total taking devices operating said printing mechanism during a total taking cycle to record a total, the combination of line spacing devices for spacing said strip between item adding and printing operations, means for sensing said start indicium on a form, strip feeding means, means under control of said sensing means and said printing mechanism for initiating operation of said feeding means after an item is printed near the bottom of the form, means for sensing said stop indicium, means under control of said stop sensing means for controlling said feeding means to stop the strip in position to receive continued item impressions starting near the top of a second form, means under control of said group control devices and said total taking devices operation of which is initiated thereby for again initiating operation of said feeding means during the latter part of the operation of said printing mechanism when printing a total, said stop sensing means and feed control means then sensing another stop indicium and controlling said feeding means to stop the strip in position to receive the first item impression of the new record group near the top of the succeeding form.

11. In a machine for printing on a record sheet having feed control start and stop indicia, the combination of devices for feeding said sheet,

means for spacing said sheet between printing operations, means for sensing a start control indicium, means under control of said sensing means for initiating operation of said feeding devices, other means for sensing said stop control indicium, and means under control of said other sensing means for terminating the operation of the feeding devices to stop the sheet after it has moved a predetermined distance.

12. In a machine for printing on a record sheet having feed control start and stop indicia, the combination of devices for feeding said sheet, means for sensing a start control indicium, means under control of said sensing means for initiating operation of said feeding devices, other means for sensing said stop control indicium, means under control of said other sensing means for controlling the feeding devices to stop the sheet after it has been moved a predetermined distance, line spacing mechanism for spacing said sheet between printing operations, means for selectively causing said start sensing means to be effective or ineffective, and means for selectively causing both sensing means to be effective or ineffective.

13. In a machine having an accumulator, total taking devices, and printing mechanism for printing on a record strip having total and feed control indicia, the combination of means for line spacing said strip between operations of the printing mechanism, means for sensing said total control indicium, means under control of said sensing means for initiating operation of said total taking devices, said total taking devices operating said printing mechanism to record a total during a total taking cycle, means for feeding said strip, means operated as an incident to total printing to initiate operation of said strip feeding means to advance the strip following the printing of the total, means for sensing said feed control indicium, and means under control of the last mentioned sensing means for terminating the operation of said feeding means to stop the strip in position to start receiving additional printing impressions.

14. In a machine having an accumulator, total taking devices and printing mechanism, said total taking devices operating said printing mechanism during a total taking cycle to record a total on a record strip with total control indicia and feed stop control indicia thereon, the combination of means for line spacing said strip between item printing operations, means for feeding said strip a plurality of line spaces, means for sensing said total control indicia, means under control of said sensing means for initiating two operations of said total taking devices and printing mechanism to print two totals, means operated as an incident to total printing for initiating operation of said feeding means after the first total printing operation, means for sensing said stop control indicia, means under control of said stop indicia sensing means for controlling said feeding means to stop the strip in position to receive the second total impression.

15. In a machine having an accumulator, total taking devices and printing mechanism, said total taking devices operating said printing mechanism during a total taking cycle to record a total on a record strip with a total control indicium, the combination of means operated as an incident to operation of said printing

mechanism for line spacing said strip, means for sensing said total control indicium, and means under control of said sensing means for initiating total taking operation of said devices and said printing mechanism to record a total at a predetermined point on the record strip.

16. In a machine having an accumulator, total taking devices and printing mechanism, said total taking devices operating said printing mechanism during a total taking cycle to record a total on a record strip with a total control indicium and a feed stop control indicium, the combination of means operated as an incident to operation of said printing mechanism for line spacing said strip, means for sensing said total control indicium, and means under control of said sensing means for initiating operation of said total taking devices which then operate said printing mechanism to record a total at a predetermined point on the record strip, means for feeding said strip, means operable as an incident to total printing for initiating operation of said feeding means after printing the total, means for stopping said feeding means, means for sensing said stop control indicium, and devices under control of said stop indicium sensing means for operating said stopping means after said strip is fed a predetermined distance from said point at which the total is recorded.

17. In a record controlled machine having an accumulator, total taking devices, printing mechanism, said total taking devices operating said printing mechanism during a total taking cycle to record a total on a record strip divided into forms with total start and stop control indicia on each form, and line spacing devices for spacing said strip between item adding and printing operations, the combination of strip feeding means, means for sensing a total start indicium on a form, means under control of said sensing means and said printing mechanism for initiating operation of said feeding means after an item is printed near the bottom of a form, other means controllable by said sensing means for initiating operation of said total taking devices to operate the printing mechanism to print a total at a predetermined position on said strip, means operated as an incident to total printing to initiate operation of said strip feeding means to advance the strip, means for selectively bringing said other means under control of said sensing means whereby a total taking operation is initiated and said first mentioned initiating means is rendered ineffective, means for sensing a stop indicium, and means under control of said stop sensing means for controlling said feeding means to stop the strip in position to receive printing impressions starting near the top of a second form.

18. In a machine for printing items on a strip divided into forms with a pair of start and stop indicia on each form, means for line spacing the strip after each item print, means for feeding the strip from form to form, means for sensing said start indicium, means under control of said sensing means for initiating operation of said feeding means after printing near the bottom of one form, other means for sensing said stop indicium, and means under control of the last mentioned sensing means for stopping operation of said feeding means when the top of the next form is in position to receive the first item print.

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2,310,418

CERTIFICATE OF CORRECTION.

Patent No. 2,310,418.

February 9, 1943.

IOYNO GHERTZMANN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 10, second column, line 4, claim 15, for "initiating total taking operation of said devices" read --initiating operation of said total taking devices--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of March, A. D. 1943.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.