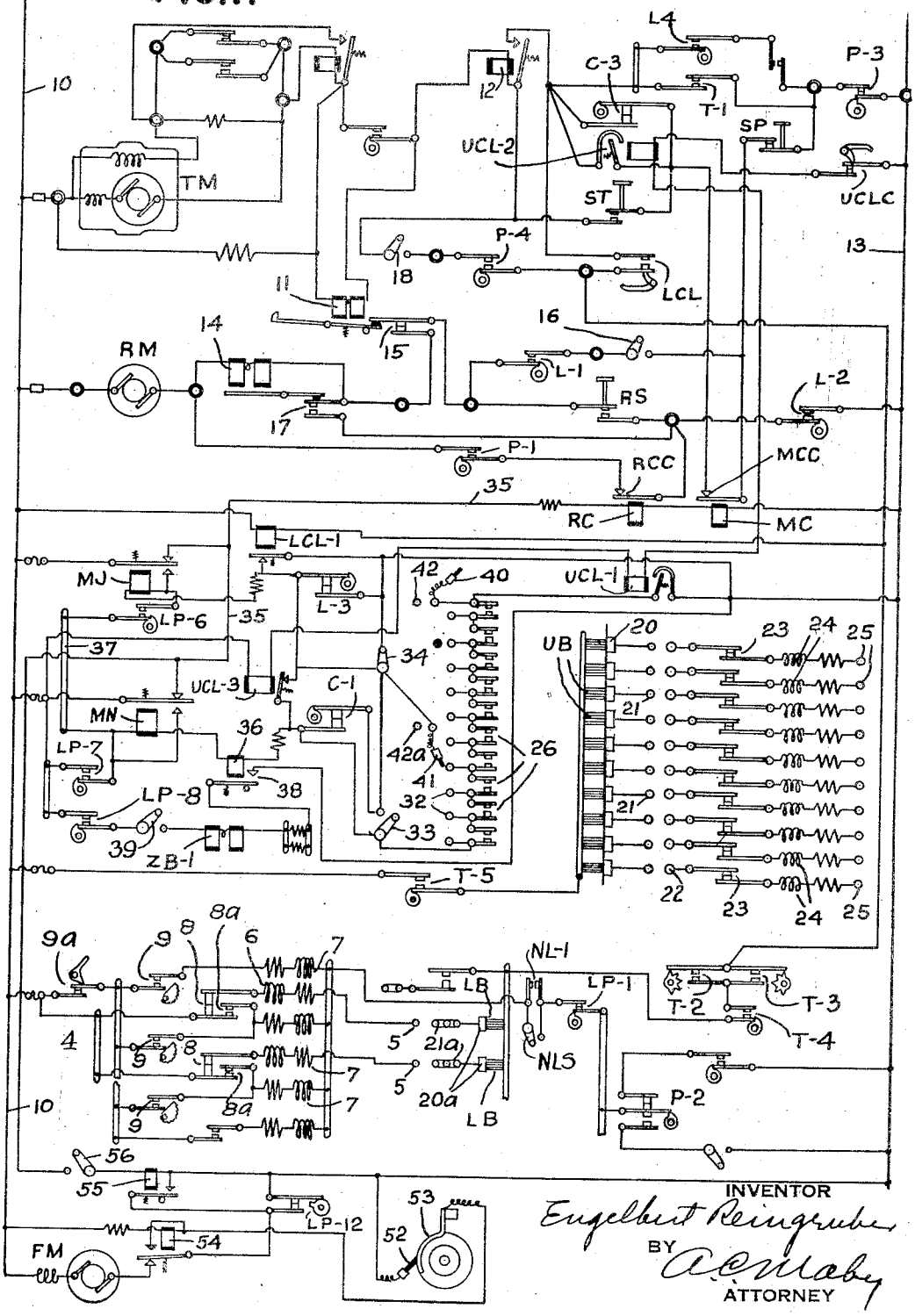
Feb. 1, 1938. E. REINGRUBER 2,107,128

PAPER FEEDING MECHANISM

Filed July 19, 1932 2 Sheets-Sheet 1

FIG.1.



INVENTOR

Engelbert Reingruber

BY

A. C. Mabey

ATTORNEY

Feb. 1, 1938. E. REINGRUBER 2,107,128

PAPER FEEDING MECHANISM

Filed July 19, 1932 2 Sheets-Sheet 2

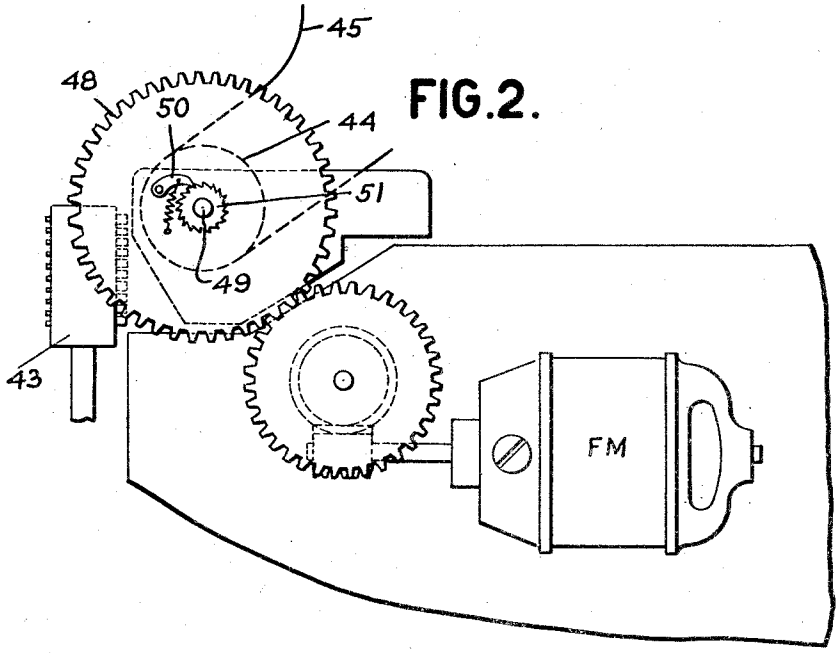


FIG.2.

FIG.3.

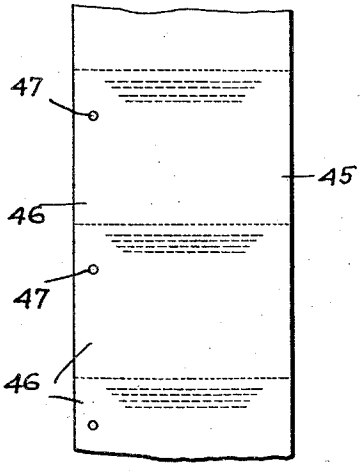
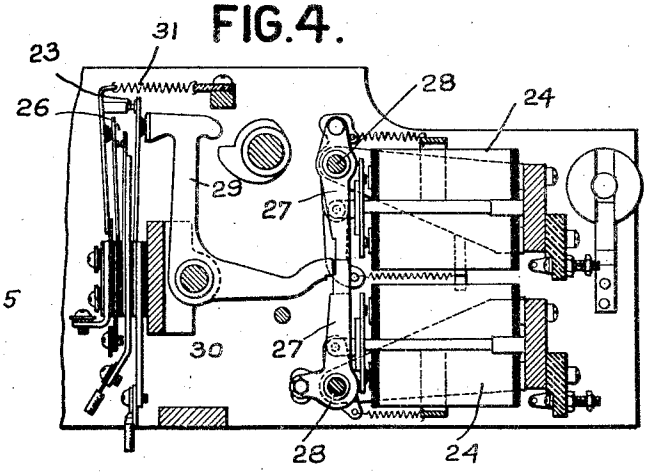


FIG.4.



INVENTOR
Engelbert Reingruber
BY
A. C. Mabey
ATTORNEY

Patented Feb. 1, 1938 2,107,128

UNITED STATES PATENT OFFICE

2,107,128

PAPER FEEDING MECHANISM

Engelbert Reingruber, Vienna, Austria, assignor, by mesne assignments, to International Business Machines Corporation, New York, N. Y., a corporation of New York

Application July 19, 1932, Serial No. 623,365
In Germany July 20, 1931

12 Claims. (Cl. 235—61.9)

The present invention relates to record controlled machines in general and more particularly to machines of the type used in compiling accounting and statistical data as, for instance, the well-known Hollerith electric accounting machine wherein perforated record cards control the operation of the machine.

The broad object of the present invention is to generally improve the construction and operation of machines of the above type whereby to increase their efficiency, promote greater reliability and flexibility of operation, and make them more convenient to operate.

Machines of the Hollerith type commonly have embodied therein accumulating mechanism controlled by the perforated records, mechanism for taking totals from the accumulating mechanism under control of the latter, and printing mechanism which is usually adapted to be controlled by both the records and the total taking mechanism to print items and the totals thereof on a suitable record material such as a continuous web of paper or on blank forms. The forms may be either of predetermined lengths or variable in length. Special form feeding mechanism is usually desired and has been provided in some machines to properly feed the forms into position to receive imprints from the printing mechanism.

Machines like the well known Hollerith accounting machine are often equipped with automatic group control devices or mechanisms which compare classification or group numbers.

A form of such group control mechanism is described and claimed in application Serial No. 227,127 filed October 19, 1927, by James W. Bryce now Patent No. 1,933,308. The mechanism described in said application is capable of causing from one to three totals to be printed when a change occurs in from one to three classification numbers.

An object of the present invention is to provide a novel and improved feeding mechanism for the record sheets used in machines of the above type.

Another object is to provide mechanism for automatically feeding forms or predetermined lengths of a continuous web of record material into position to receive imprints from the printing mechanism.

A specific object is to provide mechanism for feeding forms into position to receive imprints irrespective of whether the forms are of predetermined length or of variable lengths and under control of the form itself through the medium of a designation in the form such as a perforation having a predetermined location in the form.

Another object is to provide form feeding mechanism the operation of which is initiated by the group control mechanism as a consequence of a change in the group numbers and terminated under control of the form itself as by a hole having a given location on the form.

A specific object is to provide form feeding mechanism operated by a motor individual to said mechanism and jointly controlled by the form itself and either the total taking mechanism or the group control mechanism.

Various other objects, advantages, or features of the present invention will be pointed out in the following description and claims, or will be clear after a study thereof and of the accompanying drawings.

In the drawings:

Fig. 1 is a diagram showing the electrical connections of the invention.

Fig. 2 is a side elevation of a portion of the printer unit and shows the manner in which the form feeding motor is attached to the machine.

Fig. 3 is a view of several connected blank forms such as may be used in connection with the present invention.

Fig. 4 is a vertical transverse section showing the mechanical construction of certain parts of the automatic group control mechanism.

The present invention will be described as embodied in a machine like that disclosed in Letters Patent No. 1,762,145 and equipped with automatic group control mechanism similar in principle to that described in the patent mentioned above. In order to simplify the drawings and description the automatic group control mechanism will be described herein and illustrated in the drawings as limited to major and minor control only, that is, to functioning as a consequence of one or two changes in group number instead of as a result of one to three changes as in the Bryce application above mentioned.

Before proceeding with the description of the invention, a brief explanation will be given of the operation of the circuits of the machine as a whole. In the following description it will be understood that certain cam contacts designated with the letters T, L, and C are operated by the tabulating motor, while contacts designated P or LP are operated by the reset motor. The timing of these various contacts will be briefly given wherever necessary in the description of the circuits which follow.

The tabulating machine includes accumulating mechanism and associated total taking mechanism which are of well known form and may be like those disclosed in Patents Nos. 1,822,594 and 1,762,145, for instance. Since the above mechanisms are well known in the art only brief mention will be made of a few of their controlling parts purely for sake of identification and completeness.

Only one accumulator is illustrated in Fig. 1, but it will be understood that several are usually present in the machines as commonly constructed. The single accumulator is designated generally by the numeral 4 and comprises a plurality of denominational orders each including a plug socket 5, a counter magnet 6, a printing magnet 7, control contacts 8, 8a, respectively, and total printing contacts 9. The latter have a common connection through zero button contacts 9a to the left line wire while the contacts 8 and 8a are connected to magnets 6 and 7, respectively, the latter having a common connection to the right line wire through non-list contacts NL—1, cam contacts LP—1 and upper cam contacts P—2.

The sockets 5 may be connected by plug wires to plug sockets associated with a given group of lower brushes to permit the counter magnets 7 to be actuated according to the value of index-point perforations representing items. When a lower brush senses a perforation in a card column one of the magnets 6 will be energized to open contacts 8 and close contacts 8a thereby effecting clutching of a counter wheel to its drive shaft for differential movement in a well known manner and as described in the above patents. Closure of contacts 8a energizes the appropriate printing magnets 7 to cause printing of items from the cards, provided the non-list switch NLS in parallel with contacts NL—1 are closed as described in Patent No. 1,762,145.

During total printing operations contacts 9 close at points depending upon the amounts accumulated on the associated counter wheels and control the magnets 7 to print the total in a well known manner. The zero button contacts 9a may be closed either manually or automatically by a zero button magnet as described in the Bryce patent.

The tabulating mechanism is driven by the tabulating motor TM which is controlled through a motor control relay MC. The latter is controlled through the automatic control unit hereinafter to be described. The circuit for said motor TM extends from the left line wire 10, through said motor, the tabulator clutch magnet 11, the motor relay 12, start key ST, the contacts MCC of the relay MC, the stop key SP, and the cam contacts P—3 to the right line wire 13.

The motor TM is of the two-speed type described in Patent No. 1,762,145, consequently, it will not be described in detail here. For a more complete description of such motor and its associated control circuits reference may be had to said patent.

The machine is provided with upper card lever contacts UCL which control three card lever relays UCL—1, UCL—2, and UCL—3, respectively; said relays and the contacts UCLC being in series across the line wires 10, 13. The functions of these card lever relays will be brought out more clearly hereafter in the description of the automatic control unit.

The total taking and resetting mechanism is driven by a reset motor RM which is adapted to be operatively coupled to said mechanism through the medium of a clutch (not shown) controlled by a magnet 14. The motor RM is started from a circuit extending from line wire 10, through said motor, clutch magnet 14, contacts 15, the starting key RS and the cam contacts L—2 to the line wire 13.

The contacts 15 are controlled by the tabulator clutch magnet 11 and are so arranged that said contacts 15 are opened whenever the magnet 11 is energized to clutch the tabulating motor to the tabulating mechanism. The clutch and the contacts 15 are described in detail in Patent No. 1,600,413.

For the purpose of starting the motor RM automatically whenever the tabulating motor stops there are provided cam contacts L—1 and a switch 16, said cam contacts and switch being connected in series between the stop key SP and a point in the wire connecting contacts 15 and the start key RS.

Whenever the tabulating motor comes to rest as a consequence of an interruption in its circuit causing the tabulating mechanism to stop at its home position, cam contacts L—1, closing just prior to the stoppage of the tabulating mechanism, will set up a circuit from the left line wire 10 through said motor RM (provided the switch 16 is closed), clutch magnet 14, contacts 15, the cam contacts L—1, switch 16, stop key SP, and cam contacts P—3, to the right line wire 13, thereby causing the machine to go through a total taking and resetting cycle.

After the motor RM has started as a consequence of the setting up of the foregoing circuit causing energization of the magnet 14, contacts 17 associated with the clutch controlled by the magnet 14 will close, thereby setting up a holding circuit for said motor through the magnet 14 and the cam contacts L—2. During the resetting and total taking cycle the cam contacts P—1 close, causing the magnet 14 to be short-circuited, provided contacts RCC of relay RC are closed, thereby affecting disengagement of the clutch for the resetting motor and, when the cam contacts P—1 reopen near the end of the total taking cycle, the resetting motor RM will come to a stop.

The relay magnet RC is in series with the motor control relay MC across the line wires 10, 13 through the upper contacts of the major and minor control relays MJ and MN hereinafter to be described more fully.

When the total taking and resetting mechanism comes to rest at the end of a total taking cycle, the tabulating motor TM may be automatically started as a consequence of the closure of cam contacts P—4 which, through the automatic restart switch 18 and lower card lever contacts LCL bridge the contacts of the motor relay 12, thereby automatically restarting the motor TM, provided there is a card under the lower brushes.

Certain cam contacts designated T—1 and C—3 are provided whose purpose is to maintain the circuit for the motor TM until the end of each card cycle where, unless cards are being fed through the machine resulting in the lower card lever contacts LCL and upper lever card contacts UCL remaining closed, the tabulating motor will come to a stop.

The automatic control mechanism is substantially the same as the one illustrated and described in the patent of James W. Bryce mentioned above. A brief description of such control mechanism will be given herein in order to enable a clear understanding of the present in-

vention which under certain circumstances may be operatively controlled through such control unit.

The function of the automatic control mechanism is to sense changes in the perforations representing group numbers in two successively fed record cards and, if such changes occur, total taking and resetting cycles are automatically initiated. The control mechanism to be described briefly hereinafter is operative to sense changes only in major and minor group numbers, that is to say, the cards are arranged in a number of main classes or groups called "major groups" and each major group is in turn divided into a plurality of sub-groups called "minor groups."

If a change occurs only in the minor group the machine will go through one total taking and resetting cycle during which cycle the total of the previously tabulated minor group of cards will be printed and the counters retaining the minor totals will be automatically reset to zero without necessarily resetting the accumulator retaining the major total or grand total. When a change occurs in the major group two total taking and resetting cycles will be initiated and will take place successively. During the first of such cycles the minor total of the minor group previously tabulated will be printed, thereafter the total of the entire major group previously tabulated will be printed and the counters retaining both the major and the minor totals will be automatically reset to zero.

The machine, as in Patent No. 1,762,145, is provided with upper brushes UB and lower brushes LB which are spaced apart a sufficient distance to permit the two sets of brushes to read simultaneously corresponding index-point positions in two successive cards for the purpose of comparing the designations in said cards to determine if the group numbers are identical on both cards.

The upper brushes UB are mounted on a common bar and connected to the left line wire **10** through cam contacts T—**5**. Each upper brush coacts with an insulated brush block **20** which is individually connected to a plug socket **21**. The lower brushes LB are provided with a common connection to the right line wire **13**, over a series circuit including cam contacts T—**4**, the cam contacts T—**2** and T—**3**, jointly, the lower card lever contacts LCL, cam contacts T—**1**, P—**3**. Each lower brush has a coacting brush block **20***a* independently connected to a triple plug socket **21***a*.

The control mechanism includes a bank of control contacts and magnets, which includes ten automatic control circuits, each circuit comprises a plug socket **22**, normally closed contacts **23**, a magnet **24**, a suitable resistance, and plug sockets **25**. Each magnet **24** is arranged to control the opening of contacts **23** and closure of contacts **26** associated therewith. The mechanical construction of the magnets **24** and the contacts **23**, **26** controlled thereby is illustrated in Fig. 4.

It will be observed in Fig. 4 that the magnets **24** are bipolar and arranged in pairs, one above the other, for compactness and associated with each magnet is a latch **27** carrying an armature coacting with the poles of an adjacent magnet. The latches **27** are loosely mounted on shafts **28** and are spring-pressed away from the poles of the coacting magnets. Each latch coacts with one end of a bell crank **29**, loosely mounted on a shaft **30** suitably supported. Normally the latches **27** hold said bell cranks in the position shown in Fig. 4. The other arm of the bell crank **29** bears on an insulating button carried by one of a pair of contacts **23**. When bell cranks **29** are latched in the position shown in Fig. 4, the contacts **23** will be closed. Normally a spring **31** tends to draw the left contact **23** to the right Fig. 4, such movement being prevented, however, by bell crank **29**. The left contact member **23** has an insulating button coacting with one of a pair of normally open contact **26**.

It will be obvious from an inspection of Fig. 4 that energization of any magnet **24** will cause the coacting bell crank **29** to be unlatched thereby allowing the spring **31** to draw the left hand contact **23** to the right to close the contacts **26** and then the same bell crank **29** will move far enough to the right to permit the right hand contact **23** to spring away from its associated contact thereby opening the contacts **23**.

The operation of these contacts, as well as the details of the mechanical knock-offs for the armatures and other features are more fully described in Patent No. 1,822,594, consequently, a more detailed description is unnecessary herein.

When the machine is functioning under control of the automatic control unit the upper brushes UB sensing the columns of the record cards in which the perforations representing a group number appear are plugged to the required number of group control circuits through plug wires inserted between the plug sockets **21**, **22**, Fig. 1, while the corresponding plug sockets **25** are plugged to the triple plug sockets **21***a* associated with the lower brushes sensing columns in which the perforations representing group numbers appear. This operation will be more clearly explained later after the other circuits for the control unit have been more fully described.

The contacts **26** are connected in series and each series connection between adjoining pairs of contacts is provided with a plug socket **32**. The lower contact **26**, Fig. 1, is connected to one terminal of a switch **33** and also to contacts C—**1** while the upper contacts **26** are connected to the line wire **13** through the contacts of the upper card lever relay UCL—**1**. The switch **33** is arranged to shunt cam contacts C—**1** which are connected across the terminals of said switch, the upper terminals of the switch being connected to one of the terminals of a second switch **34** and also to cam contacts L—**3**. The switch **34** is arranged to shunt cam contacts L—**3**, which are connected to both terminals of the switch while the upper terminal of said switch is connected to the right line wire **13**.

It will be obvious that when the switches **33** and **34** are open the series circuit formed by the associated cam contacts C—**1**, and L—**3** will be in parallel with the series circuit formed by contacts **26**.

Associated with the contacts C—**1** is the minor total relay MN, while associated with the cam contacts L—**3** is the major total relay MJ. The functions of the relays MN and MJ are to control the circuit through the motor control relay MC and the reset control relay RC. The common contacts of relays MJ and MN are connected to the line wire **10** while the upper contacts are connected to a wire **35** leading to the relay RC. Thus, a series parallel circuit across the line wires **10**, **13** is provided which includes the upper

contacts of relays MJ and MN, wire **35**, and the relays RC, MC. It will be clear that de-energization of either or both of relays MJ and MN will cause the relays RC and MC to be energized.

The lower contacts of the major and minor relays are connected to the magnets operating said relays which magnets also have a connection to the cam contacts L—**3** in the case of the major relay MJ, and the zero button control relay **36** and the cam contacts C—**1** in the case of the minor relay. The lower contacts of the major relay MJ are connected to a bus bar **37** through cam contacts LP—**6**. The lower contacts of the minor relay MN and the bus bar **37** have a common connection through cam contacts LP—**7** to the left line wire **10**.

The contacts **38** of relay **36** are in a series circuit which extends from left line wire **10**, cam contacts LP—**8**, a zero button switch **39**, zero button magnet ZB—**1**, and contacts **38** to the right line wire **13**. The contacts of the upper card lever relay UCL—**3** are connected in shunt across the cam contacts C—**1**.

Connected in shunt with the cam contacts L—**3** are the contacts of the lower card lever relay LCL—**1** which is controlled by the lower card lever contacts LCL, said relay LCL—**1** being connected between the left line wire **10** and the lower card lever contacts LCL.

The zero button magnet ZB—**1** is arranged to shift a clutch which operatively connects the counter resetting shaft (not shown) with the shaft supporting the accumulator wheels of one accumulator for the purpose of resetting said accumulator or counter to zero in the manner described in the Bryce patent cited hereinbefore. Since the magnet ZB—**1** and associated mechanism is not directly involved in the present invention it will not be discussed further herein, except to state that its functions are to cause the printing of a total from the accumulator or counter with which it is associated and the subsequent resetting to zero of the accumulator wheels.

A major plug wire **40** is provided and is connected to the wire leading from the upper contacts **26** to contacts of relay UCL—**1**. This plug wire is adapted to be inserted in any of the plug sockets **32** while a similar minor plug wire **41** is provided and has a connection to the lower terminal of switch **34**. When not in use the plug wires **40**, **41** may be inserted in unwired sockets **42** and **42***a*, respectively.

The operation of the automatic control unit while functioning under major and minor control will now be briefly described.

It will be assumed that the major and minor group numbers will not exceed 5 digits each so that five columns of the record card will be assigned to the major group numbers and five additional columns will be assigned to the minor group numbers.

The lower five plug sockets **21** will be assumed to be the ones associated with the five upper brushes UB which sense the card columns containing minor group number and such plug sockets will be connected by plug wires to the adjacent five plug sockets **22**. The corresponding plug sockets **25** to the right (Fig. 1) will be plugged by means of plug wires to the plug sockets **21***a* associated with the five lower brushes LB which also sense the card columns containing the minor group number. Similarly, the upper five plug sockets **20** will be plugged to the corresponding plug sockets **22** and adjacent plug sockets **25** will be plugged to the triple plug sockets **21***a*, which correspond to the five lower brushes reading major group numbers. It is assumed, of course, that the upper five plug sockets **20** correspond to the upper brushes sensing the columns in which the major group numbers are placed.

The switches **33** and **34** will both be placed in open position and the major plug wire **40** will be placed in the adjoining unconnected socket **42** while the minor plug wire **41** will be placed in the plug socket **32** between the middle two pairs of contacts **26**. By virtue of the plug wire **41** the bank of contacts **26** will be split into two groups or sections which will be electrically connected in series but may function independently of each other.

When the main switch (not shown) is closed the tabulating motor TM can not be started until two total taking and resetting cycles have been carried out for the reason that both the major and minor relays MJ and MN are de-energized so that their upper contacts remain closed, thereby connecting the relays RC, MC across the line wires **10**, **13**.

The first total taking and resetting cycle must be initiated by manually depressing the key RS to start the resetting motor RM, as described before. During the first total taking and resetting cycle the cam contacts LP—**6** will close and reopen slightly before cam contacts LP—**7**, with the result the major relay MJ will not be energized. However, the closure of contacts LP—**7** will energize the minor relay MN and the zero button control relay **36** over a circuit which extends from the left line wire **10**, contacts LP—**7**, the windings of the relays MN and **36**, the contacts of relay UCL—**3** and relay LCL—**1** to the right line wire **13**. As a result the lower contacts of the relay MN will become closed, thereby setting up a holding circuit for said relay and the relay **36** through the lower points of the relay MN to the line wire **10** over the circuit just traced.

The cam contacts LP—**6** and LP—**7** do not close until near the end of each total taking and resetting cycle, consequently, energization of relay **36** has no immediate effect in controlling the resetting of the counter which is associated with the zero button magnet ZB—**1**, assuming, of course, that the switch is closed. At the end of the first total taking and resetting cycle the major relay MJ is still deenergized, consequently, the motor control relay MC and reset control relay RC remain energized, thus, closure of the cam contacts P—**1** near the end of the first resetting cycle fails to short circuit the magnet **14**, consequently, the reset motor will continue to turn for another cycle.

During the second total taking and resetting cycle cam contacts LP—**8** close early in the cycle, consequently, the zero button magnet ZB—**1** will be energized and will reset the counter with which it is associated to zero during the second cycle. Near the end of the second cycle the cam contacts LP—**6** will close and energize the major relay MJ causing it to close its lower contacts which will set up a holding circuit through said relay in exactly the same fashion as the relay MN was set up. Since the minor relay has been previously energized and its upper contacts have been opened, the opening of the upper contacts of the major relay MJ will cause the reset control relay RC and motor control relay MC to become deenergized.

It will be recalled that cam contacts P—1 close during the early part of each resetting cycle. It is clear that the closure of the contacts RCC near the end of the second cycle owing to energization of the relay MJ will cause the clutch magnet 14 to become deenergized. The cam contacts P—1 will open near the end of the second cycle and interrupt the circuit to the reset motor RM causing the latter to stop. Since no cards are as yet under either the upper or lower brushes, none of the card lever relays UCL—1 to UCL—3 and LCL—1 will be energized. The automatic starting circuit for the tabulating motor TM will not be established since said circuit is set up by the cam contacts P—4 through the lower card lever contacts LCL.

The starting key ST of the motor TM will now be depressed and held depressed until one card cycle has been completed and a second cycle initiated. As a result the tabulating motor will start as described hereinbefore.

During the first cycle the machine will feed one card from the magazine into a position to close the upper card lever contacts UCL thereby energizing the card lever relays UCL—1 to UCL—3 and bringing the leading edge of the card just under the upper brushes which events occur about the end of the first cycle.

The cam contacts L—3 and C—1 will open momentarily during the first cycle but will have no effect as the card lever contacts UCL do not close until after the cam contacts have reclosed. It is clear that the major and minor relays will not be deenergized during the first cycle although none of the contacts 26 have closed owing to the lower card lever contacts LCL being open preventing circuits from being set up through magnets 24 as the card lever relay contacts LCL—1, UCL—1, UCL—2 hold the circuit through the relays MN, MJ until after contacts C—1, L—3 have reclosed.

During the second card cycle contacts UCL—3 will be open, consequently, the opening of cam contacts L—3 and C—1 during this cycle will break the circuit through the minor control relay MN only. This is due to the fact that a card is not yet under the lower brushes and contacts LCL—1 remain closed and, as before, none of the contacts 26 will have been closed. The deenergization of the relay MN will cause its upper contacts to close, thereby causing the relays RC and MC to become energized to open the circuit through the tabulating motor TM which will come to a stop at the end of the second cycle. Since the lower card lever contacts open during most of the second cycle, the lower card lever relay LCL—1 will be deenergized. Thus, the major relay MJ will remain energized throughout the second cycle. It should be remarked here that toward the end of the second cycle the contacts LCL close due to the first card reaching a position with its leading edge just under its lower brushes, however, closure of the contacts LCL and consequent opening of contacts of relay LCL—1 will have no effect upon the major relay because the cam contacts L—3 will have reclosed before the card lever contacts LCL close.

When the tabulating motor TM is deenergized at the end of the second cycle, the clutch magnet 11 will become deenergized thereby closing contacts 15. The closure of contacts L—1 at the end of the cycle causes the resetting motor RM to start automatically in the manner previously described to carry out one total taking and resetting cycle. During this total taking cycle the minor relay MN will be again set up in the manner briefly described to break its upper contacts and close its lower contacts. Since cards are now under both the upper and lower brushes the motor will automatically restart when the cam contacts P—4 close during the resetting total taking cycle just mentioned.

The machine will now commence to tabulate cards under the power of the motor TM, as long as the group control perforations in the ten columns assigned to receiving the major and minor control perforations representing group numbers agree in successive cards parallel circuits will be established as follows: line wire 10, cam contacts T—5, the upper brushes UB, through the holes designating the group numbers, the plug wires connecting sockets 21 and 22, the contacts 23, the magnets 24, the plug sockets 25 and the plug wires to the lower brushes LB, the cam contacts T—4 and T—2, T—3 jointly, the lower card lever contacts LCL, and cam contacts T—1, P—3, to the line wire 13. Thus, where all the perforations agree in corresponding columns all of the magnets 24 will be energized, consequently, all of the contacts 26 will close.

During each card cycle the cam contacts C—1 and L—3 will open, but will have no effect since the circuits through the major and minor relays will still be maintained around said cam contacts through the contacts 26, thus, the relays RC and MC will remain deenergized.

If it should happen that two successive cards disagree as to their group numbers, the perforations representing such group numbers will not agree in at least one of the columns of the record card. Consequently, at least one of the parallel circuits through the magnets 23 will not be established, and at least one of the contacts 26 will remain open. Either one or two total taking and resetting cycles will be initiated depending upon whether one or more of the lower five contacts 26 or one or more of the upper five contacts remain open, respectively.

The failure of one or more of the lower five pairs of contacts 26 to close signifies that a change has taken place in the minor group number and has the effect of breaking the circuit through the minor control relay MN when the cam contacts C—1 open during the cycle in which the disagreement is sensed. The deenergization of relay MN causes its upper contacts to close, thereby energizing the relays RC and MC and interrupting the circuit through the tabulating motor TM. As a result, the tabulating motor will come to a stop and, due to closure of contacts 15 as a consequence of the deenergization of the clutch magnet 11 and subsequent closure of contacts L—1, the resetting motor RM will automatically start to carry out one total taking and resetting cycle.

During the last named cycle the accumulator which accumulates minor totals will be reset to zero and the total will be printed in the manner described in Patent No. 1,822,594. Also the minor relay MN will be set up in the manner previously described permitting the tabulating motor TM to automatically restart when the single total taking cycle comes to an end.

Thus, it will be seen that a change in a minor group number causes one total taking and resetting cycle to take place after which tabulating operations will be resumed on the next minor group of cards.

If a change occurs in the major group number, one or more of the upper five contacts 26 will re-

main open, consequently, the opening of cam contacts L—3 and C—1 will cause both the relays MN and MJ to be deenergized, since the holding circuit for both is maintained through either cam contacts L—3 or the upper five contacts 26. As before the tabulating motor will come to a stop and the resetting and total taking motor RM will again be started. Two total taking and resetting cycles will now take place. During the first cycle the minor relay MN will be set up and the minor total printed, and, of course, the accumulators retaining the minor totals will be reset. The setting up of the minor relay MN during the first cycle will cause the zero button magnet ZB1 to become energized so that during the second cycle the total will be printed from the accumulator retaining the major totals and the major relay MJ will be set up. At the end of the second total taking and resetting cycle the tabulating motor TM will again be started to resume tabulating of the cards of the group following the one which has just been passed through the machine.

The general circuits for the machine and their operation having been described, the present invention will now be explained in detail.

Fig. 2 illustrates a portion of the left end of the printing unit which is substantially the same as the one described in Patent No. 1,762,145. Since the specific details of the printer unit itself are not a part of the present invention, no further description will be given herein, except to remark that the reference numeral 43 indicates one of the usual vertically movable type bars described in the foregoing patent which type bar is controlled by a magnet 7 and coacts with the impression roller 44 to print upon the record material 45.

In the present case, the record material 45 comprises a series of connected blank forms 46 (Fig. 3). If desired the blank forms 46 may be provided with preprinted headings indicated diagrammatically by the parallel broken lines in Fig. 3. Naturally the forms will have a certain limit as to the number of items which may be printed on each and when a form becomes completely filled it is necessary to feed another form into position to receive further imprints. Each form is provided with a control perforation 47 whose function is to exercise control over the proper feeding of the forms into printing position, as will be explained hereinafter.

It is usually desirable after a group of items have been printed on the form to automatically feed the next form into position to receive the first item from another group of items and, in order to accomplish this result, automatic means is provided, according to the present invention for automatically initiating feeding of the form as a consequence of a total taking and resetting cycle, or as a consequence of a change in the group number.

In order to automatically effect feeding of the form as a consequence of a total taking and resetting cycle, the present invention provides a driving motor FM, Fig. 2, hereinafter to be termed the "feed motor" which, through suitable worm and spur gearing, drives a large gear 48 loosely mounted on the shaft 49 to which is secured the paper feed roller 44, or platen as it is commonly termed. The gear 48 carries a spring-pressed pawl 50 which coacts with a ratchet wheel 51 secured to shaft 49. It is obvious, therefore, that the motor FM is adapted to drive shaft 49 in a clockwise direction to feed the record material 45 to the printing point. The ratchet and pawl arrangement provides means whereby the roller 44 may be automatically fed by the usual line spacing mechanism described in the above patents or turned by hand through the medium of the usual paper feeding knob secured to shaft 49 for the purpose of initially adjusting the first form to the proper position to receive the first item of the cards.

The circuit for the feed motor FM is controlled through cam contacts LP—12, Fig. 1, which are operated by the resetting motor RM once during each resetting cycle and is interrupted through control effected by a brush 52 mounted adjacent the feed roller 44. Coacting with the brush 52 is a contact member 53 which is curved at one end to conform to the surface of the platen 44 and secured at its other end to a part of the frame work of the printer unit adjacent one end of the platen 44. The curved portion of the contact 53 is disposed flush with the surface of the roller 44 and so arranged that the left edge (Fig. 3) of the record material 45 passes between said contact and its coacting brush 52.

The feed motor FM is connected between the lower contact of a relay 54 and the left line wire 10, the armature of said relay being connected to cam contacts LP—12. The winding of relay 54 is connected between the contact 53 and the line wire 10. The holes 47 are so disposed in the connecting forms 46 that when the first form is positioned in readiness to receive the first entry under control of the cards, the brush 52 will make contact with the contact 53 through the hole 47 in the first form, thus energizing the relay 54. The energization of the relay 54 causes its upper contacts to close, thereby setting up a circuit from the line wire 10 through said relay, the cam contacts LP—12 (normally closed) to line wire 13. This results in disconnecting the feed motor FM from the line wire 13 and also sets up a holding circuit for the relay 54 through the upper contact of said relay.

When the tabulating motor is listing the items on the cards, the platen 44 will be advanced step-by-step in a clockwise direction until a total taking and resetting cycle takes place. During said cycle the cam contacts LP—12 will open momentarily, thereby deenergizing the relay 54 and causing its lower contacts to close. Since the progressive step-by-step feeding movement imparted to the platen 44 during the printing of items causes the hole 47 of the first form to pass out of register with brush 52, the relay 54 remains deenergized, and the reclosing of the contacts LP—12 sets up a circuit to the feed motor FM through the lower contacts of relay 54.

The motor FM will begin to drive the platen 44 through the gearing between said motor and the gear 48, the pawl 50 and ratchet 51 so that the record material 45 will be advanced with a continuous motion until the hole 47 on the next form comes into register with the brush 52. A circuit will then be established as before through the relay 54 which, of course, will open its lower contacts and close its upper contacts, thereby interrupting the circuit through the feed motor FM. As a result further feeding of the record material 45 under the power of the motor FM will cease and the form will stop in a position with 52 coacting with the contact 53 through the hole 47 in the second form. Closure of the upper contacts of relay 54 will again set up the holding circuit for said relay so that subsequent entries under control of the following cards will

not cause deenergization of said relay due to the hole 47 in the second form moving out of register with the brush 52. When another total taking and resetting operation takes place the same cycle of events will be repeated.

The principal advantage of the present invention lies in the arrangement whereby feeding of the form may be automatically effected at the end of a given group of cards through the medium of the automatic control mechanism. In order to control the motor FM as a consequence of a change in group number there is provided a relay 55 which is connected between the upper contacts of relays MN, MJ and the line wire 13 through a switch 56. The contacts of the relay 55 are connected in parallel with the cam contacts LP—12.

The cam contacts LP—12 are timed to open momentarily during the interval between the reopening of cam contacts LP—6 and closure of cam contacts LP—7. It is clear that when a change occurs only in the minor group number the opening of cam contacts LP—12 during the single total taking and resetting cycle which results from such change will have no effect since at that time the relay 55 will still be energized so that its contacts shunt the cam contacts LP—12. By the time cam contacts LP—7 close to set up the minor relay MN and deenergize relay 55 the cam contacts LP—12 will have reclosed.

When a change occurs in the major group number the opening of cam contacts LP—12 during the first resetting and total taking cycle will have no effect for the reasons described above. During the second resetting and total taking cycle cam contacts LP—6 will close to set up the relay MJ and deenergize relay 55 before cam contacts LP—12 open. When the latter event occurs the motor FM will be started in the same fashion as previously described since opening of cam contacts LP—12 at such time results in deenergization of relay 54.

It follows, therefore, that a form will be fed only during a major total taking and resetting circle. When the switch 56 is open it is clear that the motor FM will be operated once during each total taking and resetting cycle.

The present invention, for sake of convenience in description and in order to explain the principle thereof, has been illustrated and described as embodied in a specific form and in a particular type of machine. However, it is to be understood that the invention is not limited in scope to the precise form or machine selected for illustration as variations may be introduced or the invention may be embodied in other machines without departing from the principles herein set forth.

What I claim is:

1. A record controlled machine having total recording mechanism, mechanism for feeding a record strip adapted to receive entries from the recording mechanism, means controlled by the total recording mechanism for initiating operation of the feeding mechanism, and means controlled solely by a single designation in the record strip for interrupting operation of the feeding mechanism at a point determined by the location of said designation in the record strip.

2. A record controlled machine provided with mechanism for sensing changes in classification designations identifying the controlling records, a feeding device for a record strip, means controlled by the first named mechanism for initiating operation of the feeding device to feed said strip, and means controlled by a designation in said strip for interrupting operation of the feeding device at a point determined by the location of said designation in the record strip.

3. A record controlled machine comprising mechanism adapted to sense a plurality of different changes in classification data designations identifying the controlling records, record strip feeding mechanism, means controlled by the first named mechanism as a consequence of more than one change in classification data designations for initiating operation of the feeding mechanism, and means controlled by a designation in the record strip for interrupting operation of the feeding mechanism at a point determined by the location of said designation in the record strip.

4. A record controlled machine wherein the controlling records are arranged according to major classification groups each subdivided into minor classification groups, each class of group being identified by major and minor group designations respectively, means for sensing changes in both the major and minor group designations, record strip feeding mechanism, means controlled by a change in the major group designations only through said sensing means for calling the record strip feeding means into action to feed the record strip, and means controlled by a control designation in the record strip for interrupting operation of the feeding means when a predetermined length of record strip has been fed by the feeding means.

5. A record controlled machine having total taking mechanism, record strip feeding mechanism, a motor for driving said feeding mechanism, means under control of the total taking mechanism for initiating operation of the motor and means controlled by a designation in the record strip for interrupting operation of the motor when a length of record strip predetermined by the designation in the record strip has been fed by the feeding means.

6. A record controlled machine having automatic group control mechanism for sensing changes in classification designations identifying the controlling records, record strip feeding mechanism, a driving motor therefor, means controlled by the group control mechanism for calling said motor into operation as a consequence of a change in classification designations, and means controlled by a designation in the record strip for interrupting operation of the motor when a predetermined length of record strip has been fed by the feeding means.

7. A record controlled machine having total taking mechanism; record strip feeding mechanism comprising a feeding roller, a driving motor therefor, and over-running clutch connections between said driving motor and the feeding roller; means controlled by the total taking mechanism for starting the motor whereby to impart continuous feeding movement to the record strip; and means controlled by designating holes in the record strip for interrupting operation of the motor at predetermined points on the record strip.

8. A record controlled machine having means to take a total, means to feed forms into said machine, means to drive the form feeding mechanism, means to cause the driving means to operate the feeding means, means controlled by the total taking means for rendering the causing means effective to initiate operation of the feeding means, and means responsive to a designation in each form for controlling the causing

means to terminate operation of the feeding means by the driving means.

9. A record controlled machine having automatic group control mechanism for sensing changes in classification designations identifying the controlling records, record form feeding mechanism and driving means therefor, means controlled by the group control mechanism for rendering the driving means effective to drive the form feeding mechanism, and means controlled by a designation in each record form for interrupting operation of the driving means at a point determined by the location of the designation in the record form.

10. In a machine controlled by records arranged in groups, record form feeding mechanism, a drive therefor, means for automatically initiating operation of the drive at the end of each group of controlling records, and means controlled by a designation in each record form for interrupting operation of the driving means at a point determined by the location of the designation in the form.

11. A machine controlled by successively presented records representing items, comprising recording mechanism for making entries under control of the records, means for feeding a record form to the recording mechanism to receive entries therefrom, means controlled by the item records for initiating operation of the form feeding means, and means controlled by a designation in said record form and operative when a predetermined zone or space in said form is in entry receiving position to suspend the operation of the form feeding means.

12. A record controlled machine comprising recording mechanism operable in cycles, means for feeding record forms to said recording mechanism to receive entries from the recording mechanism, means automatically effective as an incident to a recording cycle for initiating operation of the form feeding means to feed a form, and means controlled solely by a single designation in the record form fed by the feeding means for terminating operation of the feeding means when a predetermined length of record form has been fed to the recording mechanism.

ENGELBERT REINGRUBER.