

May 2, 1939.

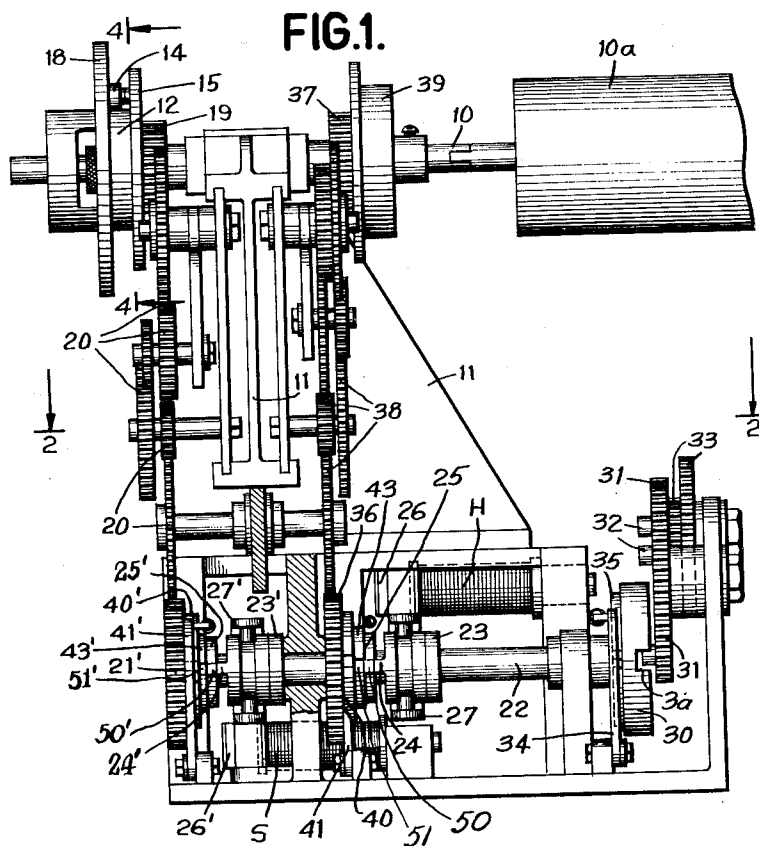
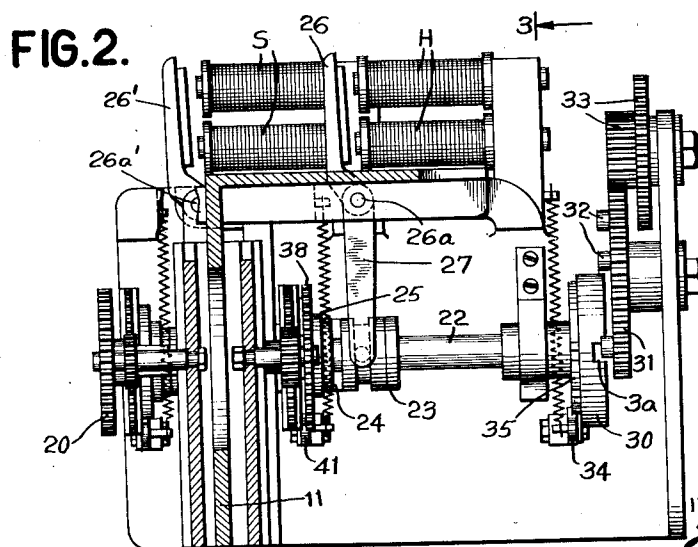
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2,156,990

PAPER SPACING MECHANISM FOR PRINTING MACHINES

Filed Oct. 4, 1935

4 Sheets-Sheet 1



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PAPER SPACING MECHANISM FOR PRINTING MACHINES

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4 Sheets-Sheet 2

FIG. 3.

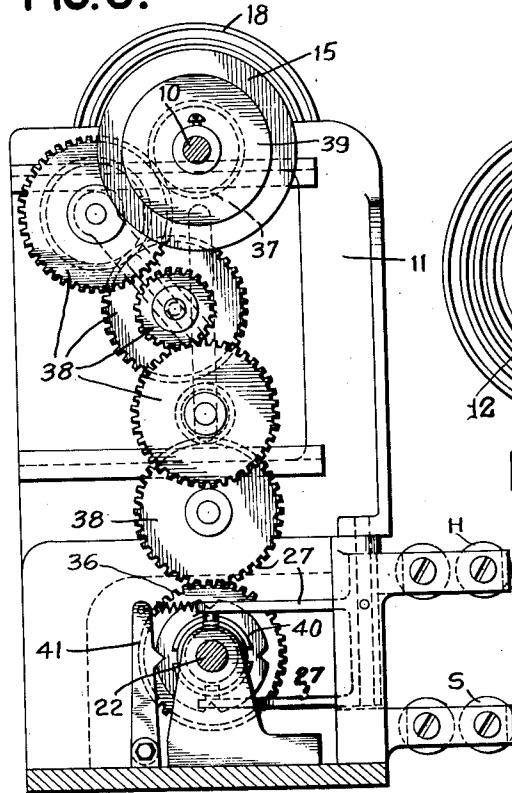


FIG. 4

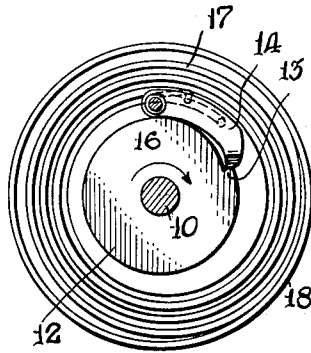
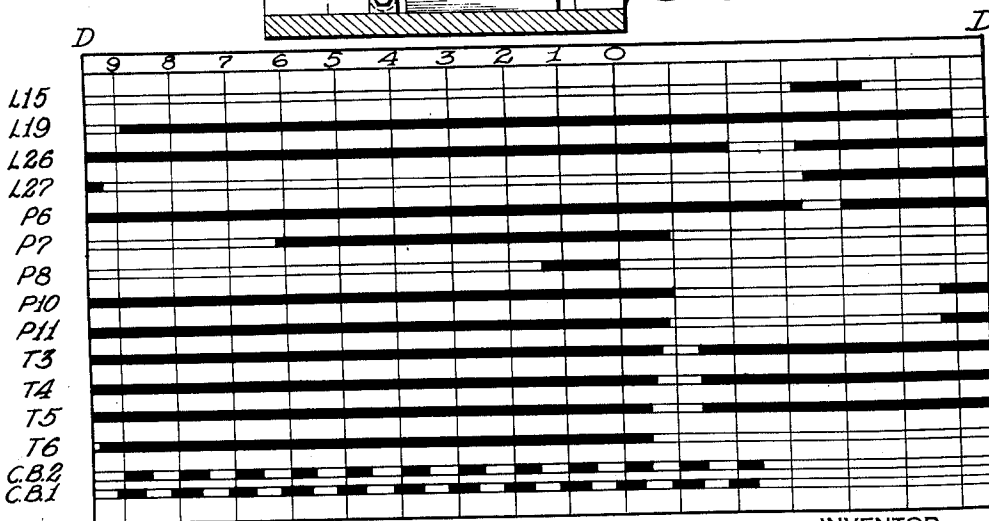


FIG. 7

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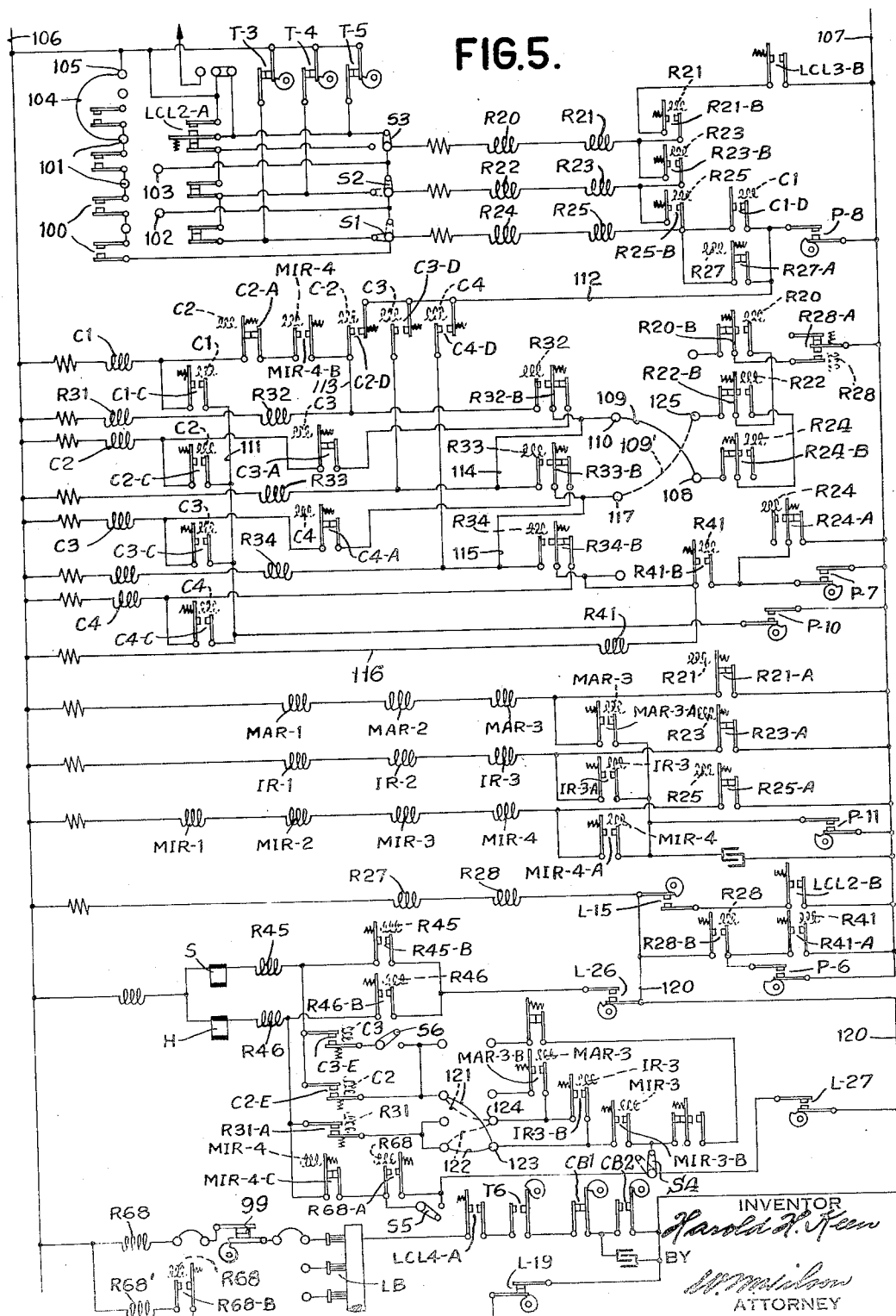
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PAPER SPACING MECHANISM FOR PRINTING MACHINES

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4 Sheets-Sheet 3



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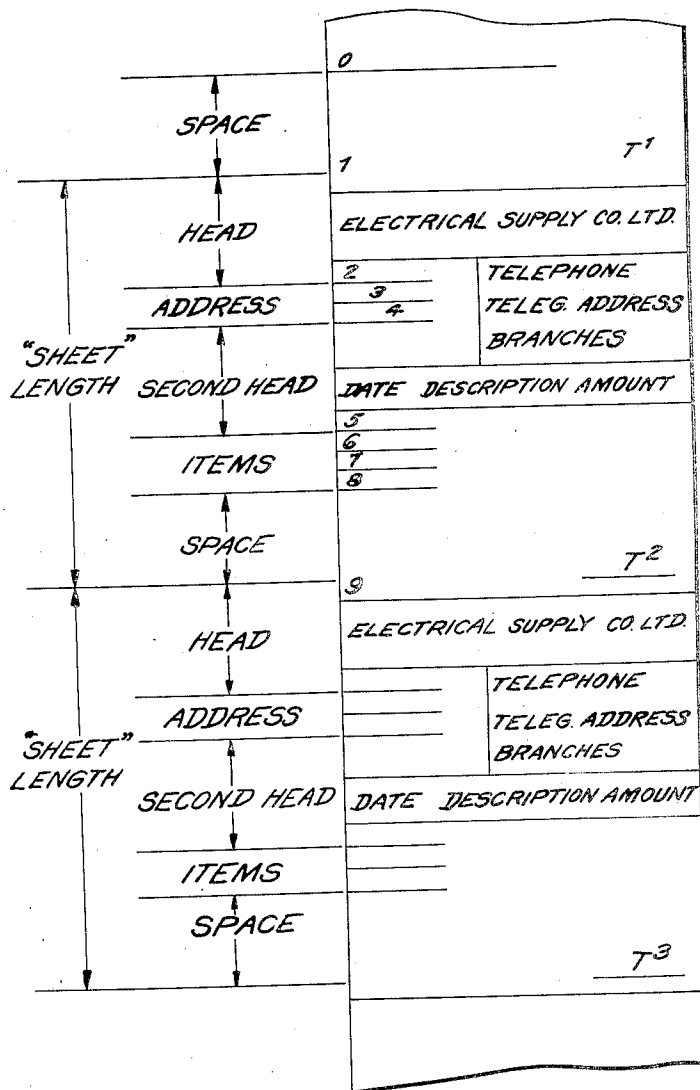
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PAPER SPACING MECHANISM FOR PRINTING MACHINES

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4 Sheets-Sheet 4

FIG. 6.



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2,156,990

PAPER SPACING MECHANISM FOR
PRINTING MACHINES

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Application October 4, 1935, Serial No. 43,537
In Great Britain October 30, 1934

5 Claims. (Cl. 197—133)

This invention relates to statistical printing machines of the kind controlled by grouped record cards and arranged to print the items read from each group of cards on a separate one of a series of connected sheets.

More specifically, this invention relates to a machine provided with sheet feeding mechanism of the kind comprising a platen or other feeding member rotatable to feed a paper strip past a printing line, line spacing mechanism for rotating the feeding member step by step to line space the sheet after each printing operation, and sheet spacing mechanism operable automatically, after each group of cards has been read by the machine, to space the strip to a larger but variable extent than the normal line space in such a manner that the strip can be subsequently divided into sheets of equal length. The sheet feeding mechanism feeds the strip through the difference between the length of a sheet and the distance through which the strip has been fed since the sheet feeding mechanism last operated.

The strip is usually provided with pre-printed headings and rulings, and the machine commences to print immediately below the heading and continues printing line by line on consecutive lines until the last card of a group has been read. The strip is then spaced by the sheet feeding mechanism to bring the line immediately below the next heading into printing position. When preparing statements of account for despatch to customers it is desirable that the name and address of the customer should be printed at the head of the statement and should be separated from the details of the account by a space which may be occupied by pre-printed matter.

In such a case the group of cards relating to this account may be regarded as comprising two sub-groups, the first of which contains cards on which the name and address of the customer are recorded, and the second sub-group cards containing the details of the account.

Prior machines of the above kind are incapable of printing the information contained on such a group of cards with a space between the name and address and the details of the account, and it is one object of this invention to provide means by which this operation may be done.

According to the present invention there is provided, in a record card controlled statistical printing machine, sheet feeding mechanism of the above kind which is provided with head spacing driving mechanism operable cyclically to rotate the feeding member to a constant extent

in a single cycle, a clutch for bringing the head spacing driving mechanism into action, a card reading device arranged to determine when the last card of the first sub-group has been read and to cause the clutch to engage for a single cycle of the head spacing driving mechanism when the information on said card has been printed. The head spacing driving mechanism is thus brought into action to feed the strip after the information from the first sub-group has been printed, so as to provide a space between this printed information and the information printed under the control of the second sub-group of cards.

The card reading device may determine when the last card of the first sub-group has been read by detecting a special hole made in the last card of the first sub-group or in the first card of the second sub-group.

A preferred embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 is an elevation, partly in section, of sheet feeding mechanism according to this invention.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Fig. 4 is a section on the line 4—4 of Fig. 1.

Fig. 5 is a diagram of the circuits controlling the sheet feeding mechanism, and

Fig. 6 shows a typical record made by a machine.

Fig. 7 shows a time chart showing the time of operation of the cam-controlled contacts indicated in Fig. 5.

The mechanism will be described as applied to a machine of the kind described in British Patent No. 422,135, dated January 7, 1935. As the general arrangement of the machine and the construction of the printing mechanism is well known it will not be described herein.

Printing is effected on a paper strip which passes around a platen 10a. Line spacing mechanism (not shown) of any known construction is operated after each printing operation to rotate the platen one step and line space the strip. A shaft 10 (Fig. 1) is journaled in a frame 11 and is connected to the platen 10a to drive it. A ratchet disk 12 (Fig. 4) formed with a single tooth 13 is secured to the shaft 10. A pawl 14 cooperates with this disk 12 and is mounted on a member 15 loose on the platen shaft. A pin 16 on the pawl engages a spiral groove 17 cut in a disk 18 secured on the shaft 10.

In their home position the nose of the pawl 14 engages the tooth 13 on the ratchet disk as shown

in Fig. 4. As the platen is line spaced, the tooth 13 of the ratchet wheel is moved away from the nose of the pawl 14 and the latter is concurrently moved radially with respect to the shaft 10 by the groove 17.

When it is desired to space the strip, the pawl carrying member 15 is rotated and the pawl 14 moves towards the tooth 13 on the ratchet disk. Concurrently, the pin 16 on the pawl travels along the spiral groove 17 and is moved radially inwards. The arrangement is such that if the platen has been moved through a given extent the pawl carrying member will rotate through an equal extent before the pawl engages the tooth, and during this period will not drive the platen. After the pawl has engaged the tooth, the platen will be driven by the pawl carrying member 15.

The pawl carrying member 15 is secured to a gear wheel 19 which is driven through a train of gearing 20 from a gear wheel 21' which is rotatably mounted on a driving shaft 22. The gear wheel 21' can be connected to the driving shaft 22 by means of a sheet feed clutch which is engaged on the energization of an electromagnet S. The construction of the clutch will be described later. This magnet S will be referred to as the sheet spacing magnet since it controls the operation of the sheet spacing mechanism just described. The train of gearing 20 is arranged so that the gear ratio it affords can be varied, by replacing the gear wheels with others of different sizes, in order to vary the total length of the sheets produced by the mechanism.

The shaft 22 has a member 30 which has crossed slots 3a and which is driven by a gear wheel 31 having three pins 32, these members constituting a Geneva drive. The wheel 31 is driven by gearing 33, which affords a 3-1 reduction, from any constantly rotating shaft in the machine which makes one revolution per card cycle.

For example, the gear 33 may be geared to and driven by the shaft 516 shown in the previously mentioned British Patent No. 422,135; said shaft being constantly driven from the driving motor at the rate of one revolution per card cycle. With this arrangement the shaft is turned through a quarter of a revolution with smooth acceleration and retardation during each cycle of the machine and each movement of the shaft is separated from the next by a short period of rest owing to there only being three pins 32. A spring-pressed detent 34 cooperates with a notched disk 35 to prevent accidental displacement of the member 30 when it is in its position of rest.

The driving shaft also carries a second gear wheel 36 which can be engaged with it by means of a head space clutch. This latter clutch is engaged when a head space magnet H is energized. The second gear wheel drives a gear wheel 37 loosely mounted upon the platen shaft through a train of gearing 38 which is also arranged so that the gear ratio it affords can be varied. The wheel 37 is connected to the shaft 10 by a one-way drive 39 of suitable construction. This drive 39 is so arranged that slip occurs when the shaft 10 is driven independently but that the shaft 10 can be driven from the driving shaft 22 through the train of gearing 36, 38, 37 just referred to. This mechanism constitutes a head spacing driving mechanism.

The two clutches comprise members 23 and 23' loosely mounted on the shaft 22 and having dogs

24 and 24' respectively integral with each member. Said dogs extend into slots 50 and 50' in collars 25 and 25' respectively and said collars are secured to the shaft 22. The dogs 24 and 24' are never withdrawn from the slots in collars 25 and 25' when the members 23 and 23' are moved to the right, consequently, said members are constantly rotated with the collars 25 and 25'.

Clutch members 43 and 43' are rotatably mounted on the shaft 22 and are provided with notches 51 and 51' adapted to receive the dogs 24 and 24' respectively when the clutch members 23 and 22' are moved to the left as viewed in Fig. 1. When said clutch members are moved to the left the dogs 24 and 24' extend through the slots 50 and 50' to engage the slots 51 and 51'. Notched disks 40 and 40' are also rotatably mounted on the shaft 22. The clutch member 43 and notched disk 40 are both fixed to the gear 36 and all rotate together when engaged by the clutch member 23. The clutch member 43' and notched disk 40' are both fixed to the gear 21', the two clutches being of identical construction. The disks 40 and 40' are engaged by spring-pressed detents 41 and 41' having projections which engage the notches in the disks to positively hold the gear wheels 21 and 36 in normal position.

When the magnet H is energized, it rocks its associated armature 26 about its pivot 26a and an extension 27, having a yoke and collar connection with the member 23, slides said member to the left coupling the clutch member 43 to the collar 25 and thus to the shaft 22, the gear 36 thereby being rotated by the shaft 22. The magnet S, when energized, operates the member 23' through identical mechanism to couple the gear 21 to the shaft 22.

The sheet feeding drive 19, 20, 21 is arranged to feed the strip through the length of one sheet, for example, ten inches, while the head spacing drive mechanism 36, 37, 38 is arranged to feed the sheet through a much shorter extent, for example, two inches. The extent of feed of the latter mechanism is determined by the length of sheet occupied by the printed headings.

Fig. 5 shows only the circuits of the machine that directly affect the operation of the mechanism just described. All the cam contacts designated by a prefix L operate during each cycle, those designated T during card feed cycles only and those designated P during totaling cycles only.

The cards are fed through the machine one by one first past a row of upper brushes (not shown) and then one cycle later past a row of lower brushes LB. As the cards pass the lower brushes, information on them is read and printed in the conventional manner. Automatic group control mechanism is controlled by the upper and lower brushes to compare a group designation on the card passing the upper brushes with the group designation on the card passing the lower brushes. If these group designations do not agree, the card feed is interrupted and a variable number of cycles is initiated on the conclusion of which the card feed is automatically resumed. As the automatic control and cycle controlling circuits differ somewhat from those described in the prior specification aforesaid, they will be described briefly herein.

The automatic control circuits are shown in Fig. 5 adjusted for minor control only. With this setting there is a minor control circuit which extends normally from the line 106 through cam

contacts T3, a switch S1, relays R24 and R25, contacts R25—B which are now held closed by the relay R25, contacts R23—B and R21—B which are now closed, and contacts LCL3—B.

- 5 The contacts LCL3—B are closed by a lower card lever relay (not shown) which is energized, in a known manner, so long as a card is passing the lower brushes. In a similar manner all the other contacts designated with the prefix LCL in Fig. 5
- 10 are closed while cards are passing the lower brushes.

An intermediate control circuit extends through upper contacts LCL2—A, a switch S3, a switch S2, relays R22 and R23 and the contacts

- 15 R23—B, R21—B and LCL3—B.

- A major control circuit extends through the contacts LCL2—A, the switch S3, relays R20 and R21 and the contacts R21—B and LCL3—B. The intermediate and major circuits once set up remain set up until the last card has passed through the machine. The minor control circuit is, however, broken during each card feed cycle by the opening of the contacts T—3. When there has been no change in the group designation between two successive cards, the circuit is maintained in parallel with the contacts T—3 through contacts 100. These contacts are closed in a known manner by relay coils, plugged between the upper and lower brushes, so long as the group designation does not change. As many of them as are required are connected by a plug wire 104 connected between a plug socket 101 and a plug socket 105. If there is a group designation change, one pair of the contacts 100 opens and the minor control circuit breaks down, the relay R25 being deenergized and the contacts R25—B opening.

- The machine is provided with a number of cycle relays of which four are shown in Fig. 5. These relays comprise coils C1, C2, and C3, C4. As described in the prior specification aforesaid each of these relays can be connected by means of plugging or otherwise to cause the machine to perform a particular cycle of operations during a cycle in which the relay is energized. Thus the relay C2 can be arranged to cause the machine to print the total in a particular accumulator or to transfer the total in one accumulator into another accumulator during the cycle in which the relay C2 is energized.

- Further, unlike the machine of the prior specification, each of the relays can cause the machine to reset a particular accumulator in the cycle in which the relay is energized. In the present instance it will be assumed that the relay C2 is arranged to cause the machine to print the total obtained in a particular accumulator and the relay C1 is arranged to cause the machine to reset that accumulator. The relays are further arranged so that when any one of them is energized, it remains energized for one cycle and then causes the relay with the next lower numerical suffix to become energized in the next cycle. Thus if the relay C4 is energized four cycles will occur during which the relays will be energized, each in one cycle, in the order C4, C3, C2, and C1.

- On the failure of the minor control circuit, as previously explained, the relays R24 and R25 become deenergized and the contacts R24—B shift to the position shown (left contact). At this time the major and intermediate control circuits are still made and the relays R20 and R22 are energized and hold their contacts R20—B and R22—B in the opposite position from that
- 75 (right contact) shown. Thus a circuit can be

completed through lower contacts R23—A (which are now closed as will be explained later), the right hand contacts R20—B, the right hand contacts R22—B, the left hand contacts R24—B, a socket 108, a plug wire 109, a socket 110, right hand contacts R32—B (which are as shown), contacts C3—A and the relay coil C2. The relay C2 closes its holding contacts C2—C to provide a holding circuit which extends through a line 111 and cam contacts P10. The contacts P—10 open to deenergize the relay C2 at the end of the cycle. The relay C2 adjusts the machine to print the total.

The relay C2 also opens its contacts C2—A to prevent energization of the relay C1 while the relay C2 is energized. The relay C2 also closes its contacts C2—D so that a circuit may be completed through cam contacts P—3, a line 112, the contacts C2—D, and relay coils R32 and R31. The relay R32 shifts its contacts R32—B from the position shown so as to provide a holding circuit for itself and the relay R31 through the plug wire 109 and the connections previously traced. The shifting of the contacts R32—B also breaks the energizing circuit previously traced to the relay C2 which therefore becomes deenergized when the contacts P—10 open. When the relay C2 is deenergized, its contacts C2—A reclose and a circuit is completed through the relay C1, the contacts C2—A, contacts MIR—4—B, which are now closed due to R25 being deenergized, a line 113, the left hand contacts R32—B which are now shifted, the plug wire 109, left hand contacts R24—B, right hand contacts R22B and R20B and lower contacts R28A. The relay C1 provides a holding circuit for itself through contacts C1—C, the line 111 and the contacts P—10. The relay C1 being energized, the machine performs the cycle in which the accumulator is zeroized or reset.

Towards the end of this cycle, cam contacts P—3 close and complete a circuit through contacts C1—D which are closed by the relay C1, the relays R25 and R24, the switch S1, and the contacts T—3 so as to recomplete the minor control circuit. This circuit is held by the contacts R25—B closed by the relay R25. The relay R24 is thus energized and shifts its contacts R24—B so as to break the energizing circuit for the relay C1 and also the holding circuits for the relays R31, R32, R33 and R34, and the relay R41 when the cam contacts P1 open.

It should be mentioned that the relays R33 and R34, R41 become energized concurrently with the energization of the cycle relay C2. The relay R33 is energized over a circuit extending from the plug wire 109 through a line 114 to the relay. The relay shifts its contacts R33—B so that a parallel circuit is completed from the line 114 through these contacts, a line 115 and the relay coil R34. This coil shifts its contacts R34—B so that a further parallel circuit extends from the line 115 through the now closed left hand contacts R34—B, a relay R41 and a line 116. The relay coil R41 closes its contacts R41—B to provide a holding circuit for itself through cam contacts P—7. These open once in each totaling cycle but are shunted by right hand contacts R24—A which are now closed since the relay R24 in the minor control circuit is deenergized. When the minor control circuit is completed as just described, the contacts R24—A open so that the cam contacts P—7 can deenergize the relay R41.

The contacts R28—A through which the re-

lay C2 is energized are closed by a relay coil R28 which is energized together with a relay coil R27 through cam contacts L—15 and contacts LCL2—B during the cycle in which the first card of a group is read. The relay R28 closes contacts R28—B to provide a holding circuit through normally closed cam contacts P—6. These remain closed during card feeding cycles but open during totaling cycles. A holding circuit is, however, maintained, while the contacts P—6 are open, through contacts R41—A which are closed by the relay R41. As just explained this relay remains energized until the minor control circuit is set up so that the relay R28 remains energized and its lower contacts R28—A close during the sequence of totaling cycles resulting from the change in group control.

The automatic control circuit cannot operate properly until the first card has reached the lower brushes and energized the lower card lever relays so that the contacts LCL3—B are closed. The machine is arranged to perform a reset cycle at this time in order to complete the automatic control circuits. At this time the relays R27 and R28 are deenergized since, when the cam contacts L—15 closed in the preceding cycle, the contacts LCL2—B were still open owing to there being no card in the lower brushes. Consequently the contacts R28—A are in the upper position shown and no circuit can be completed in the cycle relays C1 to C4. Further the relay R27 is deenergized and its contacts R27—A are closed so that the closure of the cam contacts P—8 during the reset cycle completes the minor, intermediate and major control circuits. So long as cards are passing the lower brushes, however, the relays R27 and R28 are energized during all totaling cycles so that the contacts R27—A are open to prevent the completion of the minor control circuit except when the contacts C1—D close in the last of a sequence of totaling cycles, and the contacts R28—A are shifted to allow completion of circuits to the relays C1 to C4. When the minor control circuit is broken and the relays R25 deenergized, its contacts R25—A close to energize relays MIR—1, MIR—2 and MIR—3 and MIR—4. This circuit is maintained during the two totaling cycles but is broken when the minor control circuit is re-established. The relay MIR—4 closes contacts MIR—4—A to include cam contacts P11 in the circuit in parallel with the contacts R25—A. The cam contacts P11 time the breaking of the circuit.

The relay MIR—4 also closes the contacts MIR—4—B previously referred to in the circuit of the relay C1. Similar relays IR—1 to IR—3 and MAR—1 to MAR—3 are controlled respectively by contacts R23—A and R21—A of the relays R23 and R21 in the intermediate and major control circuits. Since these circuits have not been broken the relays R21 and R23 are energized and their contacts open so that the relays IR—1 and MAR—1 etc. are deenergized. The relays MIR, IR and MAR serve in conjunction with the relays C1 to C4 to determine the operation of the machine during totaling cycles.

It will be seen that with the setting shown a group change will result in two totaling cycles occurring. During the first totaling cycle the relay C2 is energized and the total in the accumulator is printed. During the second cycle the relays C1 and R31 are energized and the accumulator is reset. Further this cycle re-

sults in the minor control circuit being re-established which in turn allows of the resumption of card feeding in a known manner. Further, during both these cycles the relays MIR—3 and MIR—4 are energized.

After the last of a group of items has been printed on the strip on line 0 of Fig. 6, a minor group change occurs and two totaling cycles follow. During the first of these cycles the contacts C2—E and contacts MIR—3—B are closed. Early in this cycle a circuit is completed through the contacts R41—A, the contacts R28—B, a line 120, cam contacts L27, a switch S4 which is now closed as shown, the contacts MIR—3—B, a plug wire 121, the contacts C2—E, a relay coil R45 and the sheet feed clutch magnet S.

As previously described, the energization of the magnet S causes the sheet feeding mechanism to feed the sheet to a variable extent. As shown in Fig. 6, the extent of feed is from line 0 to line 1, this extent being indicated by the dimension line marked "Space" in Fig. 6. While this spacing movement is taking place, the printing mechanism is being set to print the total and, after it has been completed, the total is printed in the line 1 as indicated by the reference T1, Fig. 6.

The relay R45 closes its contacts R45—B to provide a holding circuit for itself and the magnet S through cam contacts L—26 which time the opening of the circuit.

During the second cycle the relay contacts MIR—3—B and R31—A are closed. A circuit is now completed through the cam contacts L—27 as before, switch S4, the contacts MIR—3—B, a plug wire 122, the contacts R31—A, a relay coil R46 and the head space clutch magnet H. The relay coil R46 closes its contacts R46—B to provide a holding circuit through the cam contacts L26 which time the deenergization of the magnet H. The magnet H also causes the head spacing mechanism to operate as previously described, so that the strip is fed from line 1 to line 2 through the distance indicated by the dimension line marked "Head" in Fig. 6. The machine then resumes card feeding operations.

The first three cards of the next group contain the name and address of the customer to whom that group relates and this information is printed on the three lines 2, 3, 4 in Fig. 6. The last card of the three address cards is provided with a special hole in the 9 position of a suitable pre-selected column.

The lower brush LB which reads this column is plug connected through a contact maker 99 to one coil R68 of the double wound relay. The contact maker 99 is adjusted to close only while the 9 positions on the cards are passing the lower brushes. Thus, when the third address card having the special 9 hole passes the lower brushes, a circuit is completed through circuit breakers CB, contacts T—6, which are at this time shifted from the position shown, lower card lever relay contacts LCL4—A, the lower brushes in question, the contact maker 99 and the relay coil R68. This coil closes its contacts R68—B to connect its second winding R68' in circuit with cam contacts L—19. These contacts maintain the relay R68 energized until the cam contacts L—27 close in the next cycle. When this occurs, a circuit is completed through the contacts L—27, contacts R68—A, closed by the relay R68, contacts MIR—4C, which are now closed since the relay MIR—4 is deenergized owing

to the minor control circuit being established, the relay R46 and the magnet H. As just explained the magnet H causes the head spacing mechanism to head space the strip. The movement in this case is from the line 4 to the line 5, Fig. 6. This occurs while the first item card is passing the lower brushes and while the items it carries are being entered into the accumulator and the printing mechanism is being set to print the items. The head spacing movement is, however, completed before the first item is actually printed on line 5.

In Fig. 6 it is assumed that the group in question comprises four item cards and the items on these cards are printed in lines 5, 6, 7 and 8. A minor group change then occurs with the result that the magnet S is energized in the manner just explained and the paper strip is spaced to the line 9. It will be observed that the amount of this spacing movement is the difference between the distance through which the strip has been fed between lines 1 and 8 and the length of sheet which is indicated by the dimension line "Sheet" in Fig. 6.

The sequence of operations described above is repeated for each succeeding group of cards.

In certain cases, the length of the sheets required is greater than can conveniently be fed in one cycle of the machine. In such cases the magnet S is energized in each two succeeding cycles and the sheet spacing mechanism is adjusted to produce a sheet of half the required length. In order to energize the magnet S in each two succeeding cycles a switch S6 is closed and the plug wire 109 is connected from the socket 110 to the socket 117 which is connected through the contacts R33-B to the cycle relay C3. With this adjustment the machine performs three cycles whenever the minor control circuit fails. During the first of these cycles the relay C3 is energized and its contacts C3-E are closed. Then when the contacts L-27 close, a circuit is completed through them, through the switch S4, the contacts MIR3-B, the plug wire 121, the switch S6, the contacts C3-E, and the relay R45 and the magnet S. This results in a sheet spacing operation during the first of the three totaling cycles.

The relay C3 is energized during the first cycle with the plug wire 109 connected to socket 117 instead of socket 108, in the same manner as the relay C2 was energized during the first cycle when the plug wire 109 was connected between socket 110 and 108 as shown. At the failure of the minor group change, for example, relay R24 becomes deenergized as explained, left hand contact R24 closes and completes a circuit through lower contact R28A (now closed), right hand contacts R20B and R22B (now closed), left hand contact R24B, sockets 108 and 117 (now connected), right hand contacts R33B, contacts C4-A, cycle relay coil C3. Upon energization of coil C3, contacts C3-C are closed to effect a holding circuit through the cam contacts P10. Contacts C3-A are open by coil C3 to prevent operation of the cycle relay coil C2 and contacts C3-D are closed in the same manner and for the same purpose that contact C2-D was closed during the cycle of operation of coil C2.

The remaining two cycles are identical with those described, the sheet being again spaced during the second cycle and the total printed, while, during the last cycle, the sheet is head spaced and the accumulator is reset.

The sheet and head spacing mechanisms can also be called into action on an intermediate or

a major group change instead of on a minor group change. Thus, assume that the cards are divided into intermediate groups each preceded by address cards and that each intermediate group is divided into minor groups. The items, the minor totals and total for each intermediate group can be printed on a separate sheet, the machine being adjusted in the following manner. The intermediate control circuit is rendered operative by shifting the switch S2 to its other position shown in dotted lines and by plugging a socket 102 to the socket 101. An additional plug wire 109' shown in dotted lines is plugged into sockets 117 and 125 to connect the same in order to control an intermediate group change. With this setting the minor control circuit only will break on a minor group change while both the intermediate and minor control circuits will break on an intermediate group change. Thus on a minor group change the relays C2 and C1 will be energized in succession to enforce two totaling cycles and the relays MIR3 and MIR4 will be energized during those two cycles. On an intermediate group change, however, contacts R22-B will shift to the position shown owing to the relay R22 in the intermediate control circuit being deenergized. Then a circuit will be established through the lower contacts R28-A, right hand contact R20-B and left hand contact R22-B, a plug socket 125, a plug wire 109' shown dotted in Fig. 5, the plug socket 117, right hand contacts R33B, contacts C4 and the cycle relay coil C3. Thus three totaling cycles will take place.

During these three cycles the relays IR-1 to IR-3 will be energized as well as the relays MIR-1 to MIR-4. On a minor group change a minor total is printed in the first of the two totaling cycles and is also transferred to a second accumulator which thus accumulates the intermediate total, minor total by minor total. On an intermediate group change, the last minor total is transferred in the first cycle, in the second cycle both the last minor total and the intermediate total are printed, while in the last cycle the two accumulators concerned are zeroed.

The plug wires 121 and 122 are disconnected from the socket 123 and are connected as shown in dotted lines to a socket 124. Thus no circuits can be completed through the plug wires unless the contacts IR-3-B are closed. This occurs only on an intermediate group change. Thus the sheet spacing and the first head spacing movements occur only after an intermediate group change. The second head spacing movement is initiated under the control of a special hole in the last address card in the manner previously described.

In many cases single items are invoiced on continuous form invoices which have the name and address preprinted on the invoice by addressing machines of some kind. In such case, it is required to print only the information on each single card on a separate sheet. To do this, the head spacing mechanism is set to produce the required length of sheet at each energization of the magnet H by placing the proper gear train on the machine as previously described. The switch S4 is then opened and the switch S5 is closed. The switch S1 is shifted to the dotted line position as shown in Fig. 5. With the switch S1 in the dotted line position, group control is not effective and the relay coils R24 and R25 remain energized during successive card cycles, as do delay coils R20, R21, R22, and R23. The left

hand contacts R20B, R22B, and R24B are accordingly held open to render the coils C1, C2, C3, and C4 inoperative. Contact R25A is held open by continued energization of coil R25 resulting in the continued deenergization of coil MIR—4 which permits the contacts MIR—4—C to remain closed. Thus, with the switch S5 closed, the closure of contact L27 at the beginning of each cycle closes a circuit through the magnet H at each card cycle which causes a feeding operation from the item printing position of one sheet to the item printing position of the following sheet at each card cycle so that the information on each card is printed as a single item on separate sheets. As previously stated, the distance the sheet is fed at each energization of the clutch magnet H is governed by the gear ratios of the gear train 38 which are changeable.

Generally each group of cards falls into two sub-groups, one group containing address cards and the other containing item cards. The spacing between the address and the items is effected, as previously explained, by a perforation in a preselected column in the "9" index point position of the last card of the address card group which effects operation of clutch magnet H to effect spacing of the strip equivalent to the head spacing. Instances may occur, however, where there are more than two subgroups, that is, where there are several successive groups of items which it is desired to space apart from each other, but in which the various sub-groups do not effect a change of minor control and in which no total of the individual sub-groups is desired. In such instances, the last card in each sub-group will carry a perforation in the "9" index hole of the pre-selected column as used on the last card of the address group which will cause a strip spacing operation equivalent to the head spacing operation. The last card in the last sub-group will not carry such perforation so that the group control change will then function to effect a total printing operation as previously explained.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore to be limited only as indicated by the scope of the following claims.

What is claimed is as follows:

1. In a record card controlled machine, a sheet feeding mechanism, a cyclically operated head-spacing driving mechanism for operating said sheet feeding mechanism to a constant extent in a single cycle, a clutch for engaging said sheet feeding mechanism with said driving mechanism, a card analyzing mechanism and electromagnetic means controlled by said card analyzing mechanism for causing said clutch to engage said sheet feeding mechanism with said driving mechanism for a single cycle whereby said sheet feed-

ing mechanism will be operated to a constant extent.

2. In a machine of the class described controlled by perforated records controlling the printing on a strip of a series of items, the combination with means for analyzing group control classification perforations of said records, of a group control mechanism controlled thereby, electric means operated by the group control mechanism means controlled by the electrical means for spacing said strip to an extent predetermined by the number of items printed under control of said records, means for analyzing a special designation carried by one of a series of address records which follow in sequence to the first mentioned records for address printing operations and means controlled by said last named means for spacing said strip a supplemental amount.

3. In a machine of the class described controlled by perforated records controlling the printing on a strip of a series of items, the combination with means for analyzing group control classification representing perforations of said records, of a group control mechanism controlled thereby, means controlled by the latter for variably spacing said strip to an extent predetermined by the number of items printed under control of said records, a head spacing mechanism for said strip, means for automatically causing the operation of said head spacing mechanism to follow the operation of the variable spacing means, means for analyzing a special designation carried by one of a series of address records which follow in sequence to the first mentioned records for address printing operations, and means controlled by said last named means for spacing said strip a supplemental predetermined extent.

4. In a record card controlled machine; a sheet feeding mechanism, a cyclically operating shaft carrying a drive clutch disk, a driven clutch disk, coupling means for coupling the disks to each other, a card analyzing device, and means controlled by said card analyzing device to operate said coupling means for coupling the driven and drive disks together to cause the drive disk to rotate the driven disk for a constant and predetermined cycle, and driving means for the sheet feeding mechanism actuated by the driven clutch disk to effect a constant, predetermined extent of sheet feed during said cycle.

5. In a record controlled printing machine in which a strip is normally spaced to receive the imprint of items represented on perforated records; head-spacing means to effect a greater than normal and constant, predetermined spacing of the strip and including a rotary drive mechanism stationary during the normal spacing of the strip, electrical means for analyzing address printing control records for the presence of a special perforation therein, and electromagnetic means controlled by said analyzing means for setting the rotary drive mechanism in operation to space the strip said predetermined extent to position it for receiving the items.

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