July 13, 1965 E. R. McKEAG 3,194,154

PUNCH CARD CONTROLLED WEB FEEDING AND PRINTING APPARATUS

Filed July 3, 1961 4 Sheets-Sheet 1

Fig. 1

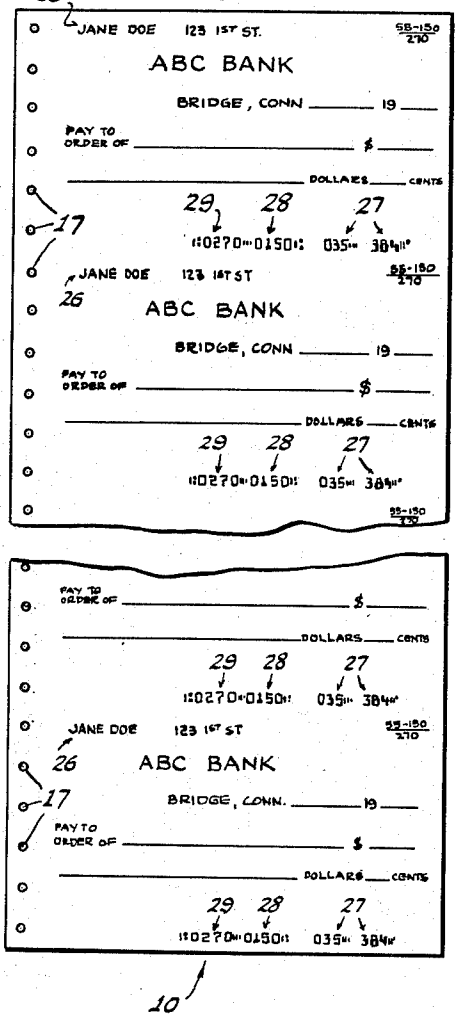
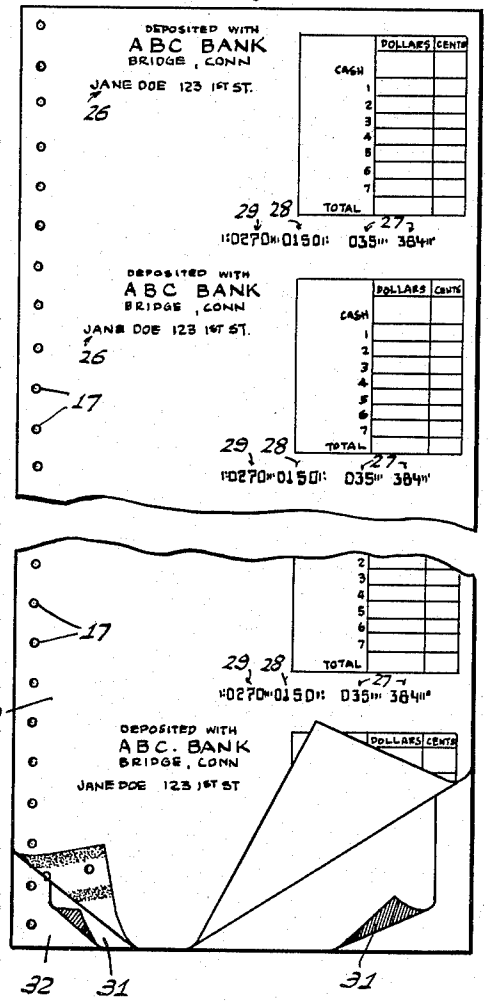


Fig. 2



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PUNCH CARD CONTROLLED WEB FEEDING AND PRINTING APPARATUS

Filed July 3, 1961 4 Sheets-Sheet 2

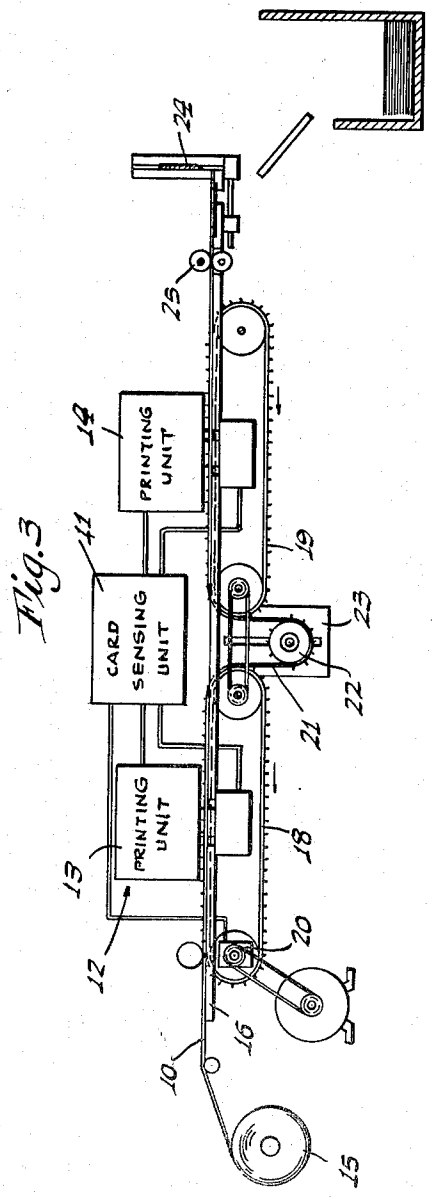


Fig. 3

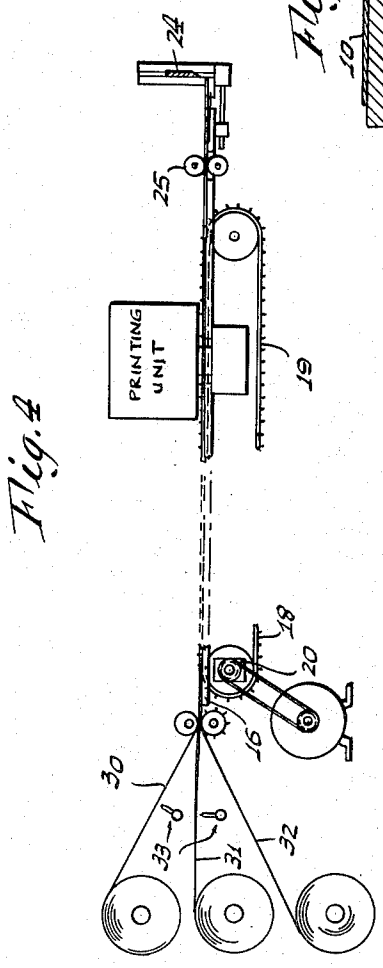


Fig. 4

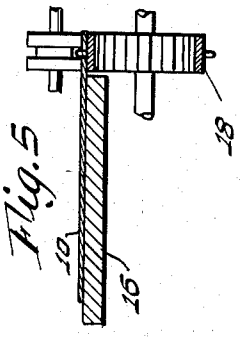


Fig. 5

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PUNCH CARD CONTROLLED WEB FEEDING AND PRINTING APPARATUS

Filed July 3, 1961 4 Sheets-Sheet 3

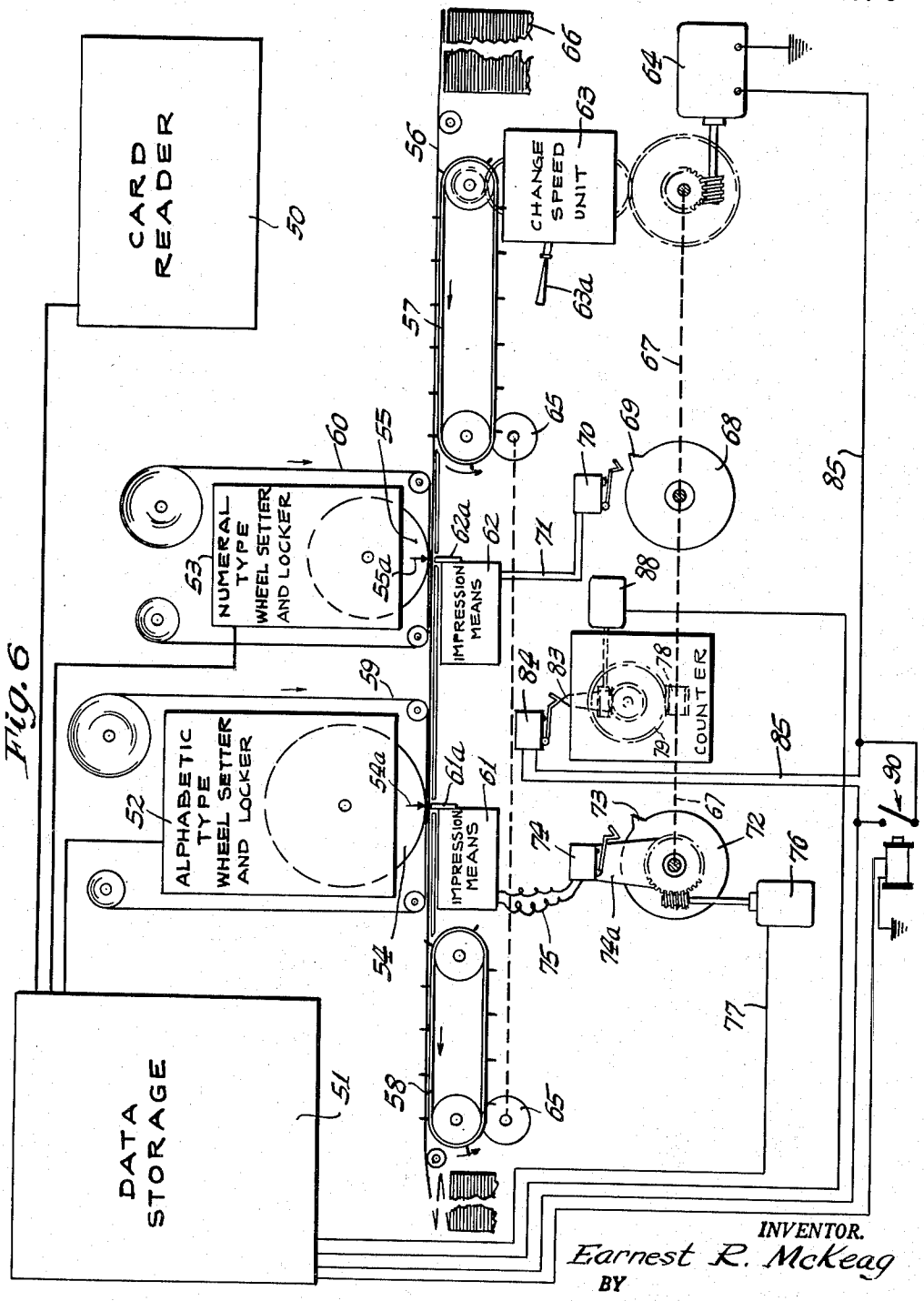


Fig. 6

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PUNCH CARD CONTROLLED WEB FEEDING AND PRINTING APPARATUS

Filed July 3, 1961 4 Sheets-Sheet 4

Fig. 7

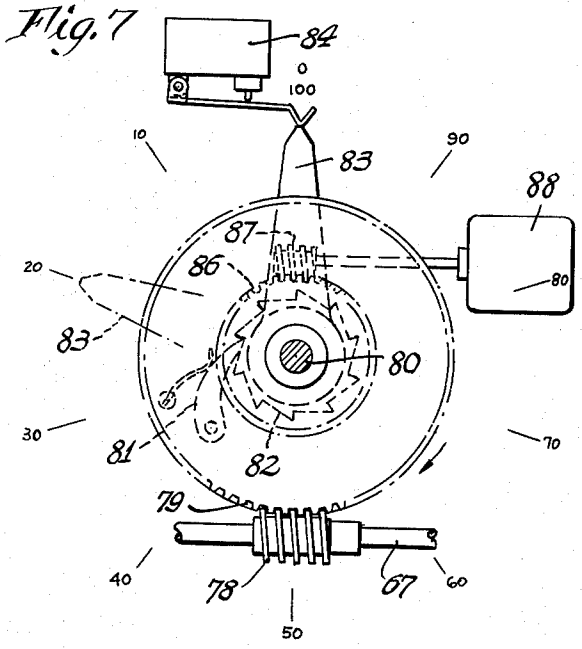
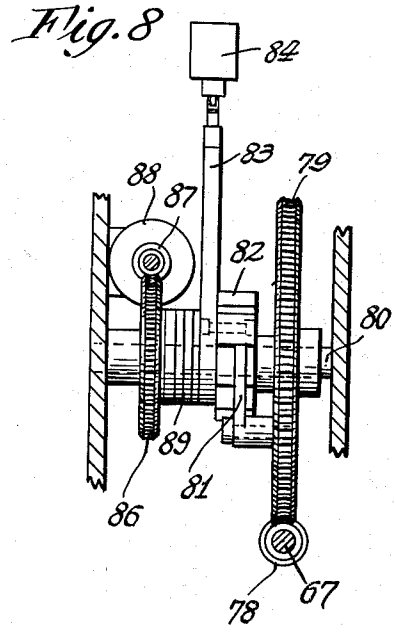


Fig. 8



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United States Patent Office 3,194,154 Patented July 13, 1965

3,194,154

PUNCH CARD CONTROLLED WEB FEEDING AND PRINTING APPARATUS

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Filed July 3, 1961, Ser. No. 125,029
13 Claims. (Cl. 101—288)

This invention relates to an improved method of printing checks, deposit slips, and other business and like documents.

This application is a continuation-in-part of my copending application Serial No. 21,313, filed April 11, 1960, now abandoned.

At the present time, it is customary to base print a supply of checks and like documents with the name of a bank and other indicia which is common to all checks in use by such bank, and later to print limited quantities of such items with indicia such as the name, address, and the account number of an individual bank customer. This has been done conventionally by locking up in a press chase rigid type or printing plates made therefrom relating to the individual bank customer, then, printing the number of checks required, for example 100 units, and then removing the type or printing plates from the chase of the printing press and inserting newly prepared type or plate material required by and related to the next bank customer. It is not practical, however, by this conventional printing and preparatory method, to produce personalized and account numbered checks or deposit slips in quantities less than 100 units because of the cost of the preparatory work and the press make-ready in relation to the quantity of documents produced therefrom and for the reason that the manufacturer must set the selling price of the product and service so produced higher than the purchaser will pay. However, there exists a great demand for such small quantities of personalized and account numbered bank documents. Up to the present time, this demand cannot be satisfied.

An object of this invention is to provide an economically practical method of personalizing and account numbering of any quantity of checks or deposit slips in multiples of ten units, for instance, with the minimum quantity to be ten units.

It is a further object of this invention to eliminate the need for all conventional preparatory work common to conventional printing methodology such as typesetting, proofing, platemaking, and press make-ready. As will be seen in the disclosure to follow, this objective has been met without the usual wastage of type and/or printing plate material common to conventional printing methodology resulting from the necessity of changing from one press make-ready to another upon completion of the small quantity of personalized and account numbered batch run and without the necessity for preliminary typesetting, proofing, and platemaking.

Another object of this invention in making the methods of this invention possible and practical is to avoid the necessity for interrupting the printing process for the purpose of making the type change required upon completion of one small batch quantity run to the start of the next.

A yet still further object of this invention is to provide a practical mechanically and electronically controlled mechanism whereby wheels bearing on their periphery the alphabetic and numeric characters are automatically set up according to predetermined instructions to electronic storage and memory units forming an integral component part of the equipment represented by the invention, in less than ten seconds of time and once so set according to these predetermined instructions, such as bank customer name and assigned account number, such type is locked in all respects in accurate alignment and positioned for the highly precise printing requirements of the type of printing to be referred hereinafter to as magnetic ink character recognition.

In order to reduce the effort and time required in banks, means have been devised and are now in use whereby indicia on checks, deposit slips, etc. may be optically, magnetically, or electrically sensed for the purpose of sorting, routing, and identification with the customer as by bank number, branch number, or account number respectively.

For this purpose, certain areas are designed to receive the respective indicia and certain standardized characters known as magnetic ink recognition characters, numeric in format, are used, and these, having been imprinted with magnetic ink, may be sensed by automatic equipment and be translated thereby into various kinds of actions or responses in machinery such as sorting, computing, and/or high speed data processing machines. However, such indicia, for the purpose required by the banks, must be unique to each bank customer separately and different from required indicia for each other bank customer.

What has been said about bank checks applies also to deposit slips and other documents which must be identified with one customer and one customer only. In the majority of cases, each bank customer requires only small quantities of documents such as deposit slips for use over a period of many months. To obtain such small batch quantities, each different from all others, is a problem solved by this invention. Here, again, the deposit slips and other pieces are preprinted in large quantities in general or standard form with some indicia applicable to all individuals and banks or bank branches, etc., and the indicia unique to and identifying each customer is afterprinted on a limited number of pieces by the methods and with the apparatus of this invention in the same manner as with checks.

Another object of this invention is to provide a simple and expedient method of printing and after-printing such pieces with such individual and/or general indicia without the necessity of feeding such workpieces one by one to a printing press.

To do this according to the present invention, the checks or other pieces are printed in continuous form with the standard indicia, and while still in such form are afterprinted seriatim by one or more printing units. The printing units may be provided with the usual font of characters or with special characters and the printing may be performed with ordinary and/or special ink or transfer material according to the requirements. Thereafter, the continuous strips are severed into separate checks or pieces and are stacked and bound for distribution and use. The after-printing is preferably performed by settable wheels carrying on their peripheries letter and/or number and/or symbol type faces.

According to the present invention, the after-printing for each kind of workpiece is controlled by a prepared card such as a tabulating card having punch holes so positioned that when presented to an interpreting or sensing mechanism they will control the setting of the printing wheels in one or more printing units and determine the number of checks or pieces to be after-printed. The cards for the various kinds of workpieces are stacked so that after the wheel setting is performed according to one card the next card is presented to the scanning mechanism.

In one form of my invention, the continuous strip is accurately and positively advanced intermittently to the printing unit or units by a longitudinal row of feed perforations usually in one margin of the strip engaging suitable pin bearing devices such as a wheel or belt. The feeding operations of the strip may be controlled coordinately with the operations of printing units so that the strip of workpieces is stationary while the after-printing is being done.

Thus it is merely necessary, according to this invention, for the printer to have on hand a supply of preprinted checks or pieces with indicia general to all accounts and a punched card for each account and use the latter when filling an order for personalized checks or a reorder thereof at any time.

According to the present invention, the position of the lines of after-printing on the checks may be controlled by adjusting the printing unit or units longitudinally along the path of travel of the strip, or by forming a loop in the web between adjacent printing units. Thus the imprints may be located in any desired position of a check for instance, from the uppermost transverse margin to the lowermost.

The printing units may include a printing wheel for each letter-space across the check and therefore the after-printing may be done on any place on the check from one edge to the other.

In many cases only a single ply preprint strip is after-printed. However, in the other cases, particularly deposit slips, it is desired to have several copies of each transaction and, therefore, the strip will be multi-ply.

In another form of my invention disclosed herein, the punch cards representing the data applicable to individual accounts are stacked in a card reader. When the first card is read, the data therefrom is stored in a data storage unit and, when the storing is completed, the printing wheels are set according to the data stored for that particular card. When this is completed, the feed mechanism for the continuous printed strip is started to advance the strip, the starting position of the strip having been predetermined manually. When the strip has advanced a predetermined distance, the printing mechanism for that line is operated and one line of printing is produced on the strip without stopping the strip. As the strip continues to move and the place on the strip to receive the second line of printing reaches the printing line of the second group of type wheels, the second line is printed while the strip is still moving, and these printing operations are repeated as check after check on the continuous strip passes under the printing wheels until the desired number of checks with that particular indicia has been printed. The number of checks printed having been counted on a descending counting device which was set to a predetermined position by the data storage unit according to data on the first card, when the descending counter reaches zero the printing operation stops.

In the meantime, the second account card has been read and the data has been stored in the storage unit, ready to be transferred to the printing wheels and descending counter. Immediately after the printing wheels have been reset and the descending counter set to the number of checks to be imprinted, the feed mechanism is again started and the advancement of the preprinted strip and printing operations, as determined by the second account card, again resumes until the descending counter reaches zero position and a predetermined number of checks with the indicia for the second account has been printed. These operations continue as long as cards are presented to the card reader and data is stored in the data storage unit.

This second form of my invention is advantageous and usually preferable because with it a great deal of time is saved in the printing operations, since the advancement of the strip of checks does not have to be interrupted for the printing operations. Another advantage of this second form is that by controlling the point in the cycle of operations at which the printing is performed, the positions of the lines of printing on the check may be varied relative to each other and relative to the check itself, thus adapting the machine to different styles of check format. A further advantage is that by changing the linear speed at which the printed strip of checks passes through the printing units, checks or other documents having different dimensions from leading to trailing edge may be handled in the same machine and the printed lines may be caused to fall where desired.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

FIGURE 1 shows a continuous strip of workpieces printed according to the present invention and before the workpieces have been severed from the continuous strip.

FIG. 2 is a view like FIG. 1 but shows superposed continuous strips to provide a plurality of sets of assembled workpieces.

FIG. 3 is a schematic view of apparatus that may be employed for printing strips of checks or the like, such as the strip shown in FIG. 1 according to one form of the present invention.

FIG. 4 is a fragmentary view showing apparatus which may be used for printing and assembling the strips shown in FIG. 2—only the introductory and delivery ends of the apparatus being shown, the intermediate portions being the same as in FIG. 3.

FIG. 5 is a detail sectional view showing the belt for feeding the continuous strip and the driving means therefor.

FIG. 6 is a schematic view showing another form of apparatus which may be employed for printing continuous strips of checks and the like according to the present invention.

FIG. 7 is a front elevation of a descending counter and switch which may be used with the form of the invention shown in FIG. 6.

FIG. 8 is a side view of the descending counter and switch shown in FIG. 7.

The method of this invention as it applies to printing bank checks will first be described.

The first step is to print by conventional means a large supply of continuous strips, such as the strip 10 shown in FIG. 1 which contains a succession of printed checks having indicia which is common to the individual checks of many kinds for instance, the name of the bank and other indicia such as shown. The continuous strips of checks are stored until needed.

The second step is to prepare a printing control card, such as a tabulating card, having punch holes indicative of specific indicia relating to a particular customer or account and indicative of the number of checks to be printed successively for that customer or account.

A similar control card is prepared for each customer or account and these are stacked in a card-sensing unit indicated by the reference number 11 in FIG. 3 Any suitable card sensing unit, such as those disclosed and described in detail in the patents to Daly, No. 2,531,873, issued November 28, 1950, or Nolan, No. 2,770,188, issued November 13, 1956, will suffice to sense the necessary items of data from the punch cards and transmit this data to printing units. The continuous preprinted strip 10 is then fed into an auxiliary printing machine 12 having a plurality of printing units one for each line to be printed.

FIG. 3 is a schematic view in which there are shown two printing units 13 and 14 to which the preprinted strip 10 may be fed to receive the after-printing as controlled by the punched cards. These printing units may be of the type disclosed and described in detail in the patent to Rabenda, No. 2,569,829, issued October 2, 1951, either as disclosed therein or as modified to operate in the manner disclosed and described in detail in the aforementioned Daly patent in which an impression member strikes the strip for effecting printing contact with the type wheels rather than shifting the type wheels relative to a stationary platen as disclosed in the Rabenda patent. The end of the strip 10 may be taken from a supply roll 15 and may be guided through the printing machine 12 by a paper table 16. Preferably the feeding of the strip is controlled by marginally punched holes 17 therein which engage pin-carrying feeding bands 18 and 19. The strip 10 is advanced step-by-step at check-length intervals by

intermittently operated feeding means 20 and is initially placed on the feeding band 18 so that the line of the check to be imprinted will register with the printing elements of the printing unit 13 when the strip comes to rest. It is preferable that both printing units 13 and 14 operate simultaneously, and in order that the line of print from the unit 14 may fall on the desired printing line of the check, the apparatus is arranged so that the relative position between the check to be printed and the printing unit 14 can be varied.

This may be accomplished as shown in FIG. 3 by providing a loop 21 in the strip between the printing units 13 and 14 and regulating the length of the loop so that the position of the check to be printed by the unit 14 can be advanced or retracted when threading the web through the printing machine to cause the line of print and the printing line to coincide. The extent of the loop may be controlled by a pin wheel 22 adjustably carried in a slotted bearing plate 23.

The printing units 13 and 14, as seen in the aforementioned Rabenda or Daly patents, are preferably of the type comprising a row of wheels bearing type faces on their peripheries and suitable mechanism to position the type wheels under the control of a punched card so that at each operation of the printing units 13 and 14 a single line of type impressions is made by each of the printing units. When the type wheels are positioned, impact devices, such as disclosed in the aformentioned Daly patent, function to cause ink carried by the type faces or transfer material carried by an interposed ribbon to print the lines on the check. After the first and second lines, in the example given, have been printed on the check, the feed mechanism may advance the strip of checks one check-length and bring the next checks into position to be printed.

According to the present invention, the next step in the method is to separate the continuous strip into individual checks which may be stacked as shown in FIG. 3 where checks of the same kind may be collected in groups and bound together or otherwise disposed of. This may be accomplished by providing a cutter 24 which may be adjusted to register with the line (delineated or not) between adjacent checks.

The marginal edge of the strip having the feed holes 17 may be removed before the strip is cut into check lengths by known cutter mechanism 25 or it may be allowed to remain on the checks and be used for binding the checks into book form.

As indicated above, the number of checks to be printed is also controlled by the punched cards, and this may be accomplished by having the punching on the card control a descending totalizer, as more fully described hereinafter, for each printing unit operated by the impressions made by its printing unit so that if twenty checks of the same kind are required the descending totalizer will be set for twenty and when it reaches zero it will temporarily interrupt the operation of the printing unit.

The data interpreting machine 11 within which the punched cards are placed is set up so that after the printing wheels have been set on the unit, the setting remains locked. When the desired number of impressions has been made by the first printing unit 13, the next card can be positioned to be sensed to set the descending totalizer and to set the type wheels for the first printing unit 13 for the next group of checks to be afterprinted. When the desired number of impressions has been made by unit 14 the type wheels for the unit 14 are reset for the next group of checks.

Thus, by successively setting the printing units, no loss of checks will be incurred by the change-over from one kind of check to another.

According to the present invention, one of the printing units 13 or 14 has on its type wheels printing characters which are specially formed for "magnetic ink character recognition" and the other unit may have type faces or ordinary characters. Thus, in the examples shown in

FIG. 1, the name and address of the bank customer may be printed as at 26 in ordinary type with ordinary ink or ink ribbon, while the branch and account number indicated at 27, ABA bank number indicated at 28 and the routing for bank clearance purposes indicated at 29 will be printed with magnetic material so that those items can be sensed on a "magnetic ink character recognition" machine. It is a matter of choice and convenience whether the magnetic characters are printed by the unit 13 or by the unit 14.

It should be understood, of course, that while, in describing the method of this invention, bank checks are referred to, the method may be used for other purposes where a preprinted form is to have after-printing made thereon in limited quantities, and in this connection one such different use in that of preparing bank deposit slips in limited quantities. The method as it applies to such use will now be described in connection with FIGS. 2 and 4 of the drawings.

In this embodiment of the invention, the workpiece includes an original copy strip 30, a transfer strip 31 and a copy strip 32, and if additional copies are required extra transfer and copy strips may be provided. As shown, these are prepared in continuous form and contain indicia which is common to the individual deposit slips of many kinds, for instance, the name of the bank and other indicia such as shown.

The continuous strips are preferably in separate packages such as rolls or zigzag packs, and when needed the strips are guided to the auxiliary printing machine 12 where the record and copy sheet is aligned by pin wheels and the transfer strips are adhesively secured together by mechanism 33 at the margin to make joined sets of strips. The continuous strips are fed over the paper table 16 and their feeding movements are controlled by marginally punched holes 17 in the strips which engage pin-carrying feeding bands 18 and 19 as in the form of the invention shown in FIG. 3. The feeding and imprinting operations are performed in the same manner as referred to in connection with FIG. 3, the printing units 13 and 14 successively operating on the pile of strips, the original strip being printed by ink applied to the printing wheels or through a transfer member and the copy strip having the same indicia printed on it through the medium of the interposed transfer strip.

The other steps of the method are the same as described above in connection with FIG. 3, but the end product in this situation is a plurality of groups of deposit slip booklets all of the same kind and identified with a particular customer or a particular account, each top sheet of the booklet having the preprinting, one line of after-printing in ordinary type, and the other line of after-printing with "magnetic ink character recognition" type.

The method involved in the other form of the present invention may be carried out by apparatus disclosed in FIG. 6.

In this form of the invention, the punch card containing data particular to a customer or a customer's account is read by a card reader 50 and stored in a data storage unit 51. These units may be any suitable punch card reading and data interpreting components having data storage facility such as disclosed in the aforementioned Rabenda or Daly patents. At the proper time the data for a particular card is transferred to an alphabetical type wheel setter 52 and a numeral type wheel setter 53 which positions type wheels 54 and 55 respectively so that the characters to be printed are brought into printing position in lines. These components are the same as those employed in the previous embodiment of the invention and as disclosed in the Rabenda or Daly patents mentioned above. A continuous strip 56 of checks is fed by pin-bearing tractors 57 and 58 located respectively at opposite ends of the machine to engage marginal feed holes in the strip, such as the feed holes 17 shown in FIGS. 1 and 2, and thus positively control the feeding and stopping of

the preprinted strip. Between the strip 56 and the type wheels 54 and 55 there are located suitable inking means such as ribbons 59 and 60 and these may be advanced in known ways to present fresh surfaces to the printing lines 54a and 55a represented by the arrows in FIG. 6.

Impact for causing the characters to be printed on the strip 56 is provided by impression means 61 and 62 which include hammers 61a and 62a located under the printing lines 54a and 55a respectively which, through known mechanism, may be caused to strike the underside of the paper at the printing lines and cause the transfer of ink or the like from the ribbons to the paper.

The hammers 61a and 62a are moved toward and return from the strip 56 with such speed that it is not necessary to cause the strip 56 to come to rest or even to change its rate of travel during the printing operation. Thus, according to the present invention now being described the loss of time which would be incurred if it were necessary to stop and start the paper for each printing operation is avoided. Further, by properly controlling the points in the cycle at which the impression means 61 and 62 are respectively operated, the relative positions of the two lines of printing on a workpiece (a check for instance) can be optionally selected and the lines of printing may be closer together than would be otherwise possible because of the spacing of the type wheels made necessary by their size.

Suitable means for carrying out the method of this invention are shown in FIG. 6, in which the tractor 57 is driven through suitable power transmitting means 63 by an electric motor 64 so that the paper strip 56 will have a determinate linear speed. The tractor 57 may be coupled to the tractor 58 by gearing 65 to operate in unison, thereby avoiding any slack condition of the strip 56 as it passes under the type wheels.

Preferably, the continuous strip 56 of preprinted checks is supplied to the machine in a zigzag folded stack 66 placed at the introductory side of the machine. In introducing the strip 56 from a stack to the apparatus, the strip is placed on the pins of the tractor feed 57 with the blank lines of the strip to be imprinted in predetermined positions relative to the tractor feed, as will be more fully explained below. When the apparatus is to be started, the data storage unit causes the wheels 54 and 55 to be set and locked in alignment, and when this has been done the motor 64 is started and shortly thereafter the impression means 62 is operated to print the lower line (numeral line) on the check. When the strip 56 has traveled a predetermined distance, the upper line (alphabetical line) is brought to the printing line 54a and the impression means 61 is actuated, thus completing the imprinting of that particular check.

As the strip 56 continues to travel without interruption, the operations are repeated until the required number of checks has been printed, at which time the feeding of the strip 56 is stopped and the data storage means become operative to reset the numeral type wheel 55 and the alphabetical type wheel 54 in accordance wtih the data read from the second punch card. In this situation, the lower line on the next check has not quite reached the numeral wheels 55 and the upper line of printing on the first check has just passed the printing point 54a.

According to the embodiment of the present invention now being described, the imprinting operations may advantageously be controlled by the same means which controls the advancing of the strip 56. This is accomplished as shown by providing control means operated by the motor 64 which, it will be remembered, drives the tractors 57 and 58. As diagrammatically shown in FIG. 6, the control means comprises a shaft 67 driven by the motor 64 which makes one revolution for each workpiece (check) imprinted. Switch operating means including a disk 68 having a lobe 69 is secured to the shaft 67. The lobe 69 which engages a switch 70 connected by a circuit 71 to the impression device 62 causes the latter to operate and thus, if the leading edge of the strip 56 has been placed in the proper position on the tractor 57, the lower line on the check will be printed when the lobe 69 closes the switch 70. The disk 68 may be adjustably mounted on the shaft 67 to determine the point in the cycle of operations at which the impression device 62 is actuated. However, since this can be controlled by the selective initial positioning of the strip 56 on the tractor 57, the provision for the adjustment is not essential.

To control the operation of the imprinting device 61 (for the top line in the example given), there is a disk 72, similar to the disk 69, having a lobe 73, similar to the lobe 69. However, in order to permit variation in the spacing between the upper and lower lines on the check, as diagrammatically shown in FIG. 6, a switch 74 connected to the impression means 61 by a circuit 75 and mounted on an arm 74a rotatable on the shaft 67 is adjustable arcuately about the axis of the shaft 67. Thus the point in the cycle of operations (the position of the strip 56) at which the impression device 61 operates may be varied by adjusting the position of the switch 74 causing the upper line to be printed sooner or later depending upon whether the space between the lines is to be decreased or increased.

The position of the switch 74 may be adjusted relative to the lobe 73 by manual operation, or its position may be controlled remotely by an electric motor 76 through a circuit 77 leading to the data storage unit or elsewhere.

As stated above, when a number of checks for a particular customer or account as determined by the data on that particular customer's punch card has been imprinted, the feeding of the strip 56 is stopped, the printing operation is interrupted and the setting of the type wheels for the customer's checks next to be printed takes place. This may be accomplished by a descending totalizer mechanism shown in block form in FIG. 6 and shown in detail in FIGS. 7 and 8.

As shown in these figures, the control shaft 67 is provided with a worm 78 which drives a worm wheel 79 rotatably mounted on a supporting shaft 80. The worm wheel 79 carries a spring-pressed pawl 81 which engages a ratchet wheel 82 also rotatably mounted on the shaft 80. A switch-operating arm 83 is secured to the ratchet wheel 82 and extends to a position where it engages a stationary switch 84 adapted, when operated, to open a circuit 85 leading to the motor 64 which drives the control shaft 67 and also the strip feeding mechanism. When the shaft 67 rotates, the ratchet wheel 82 and switch arm 83 are moved clockwise as shown in FIG. 7 from the switch-opening position and returning thereto after a 360° revolution.

For the purpose of determining the number of checks to be printed for a particular customer, the switch arm 83 is movable independently of the worm wheel 79 in a clockwise direction, this being permitted by reason of the pawl and ratchet connection. The ratchet wheel 82 and switch-operating arm 83 may be moved for such purpose by a worm wheel 86 driven by an irreversible worm 87 operated by astepping motor 88 which is under the control of the data storing unit. To permit the ratchet 82 and switch arm 83 to be advanced by the pawl 81 when the worm wheel 79 is rotated, a friction drive 89 is provided between the worm wheel 86, the switch-operating arm 83 and the ratchet wheel 82.

Assuming that the apparatus is designed to print a maximum of one hundred checks for any customer or account, the ratio between the worm 78 and worm wheel 79 is 100:1. It follows, therefore, that if the switch-operating arm is in a zero position with the switch 84 open and that the motor 64 is energized by other means, for every one hundred revolutions of the shaft 67, the worm wheel 79, ratchet wheel 82 and switch-operating arm 83, the latter will make one revolution, the switch arm returning to its zero position, and one hundred checks

will have been imprinted, since one check is printed for each revolution of the shaft **67**.

It also follows that if the switch-operating arm **83** is advanced independently of the worm wheel **79** more or less, before the motor **64** is started and the shaft **67** is rotated, a fewer number of checks will be printed depending on how far the switch-operating arm **83** has been advanced clockwise before the shaft **67** begins to rotate. When the switch-operating arm **83** again reaches its zero or circuit-opening position, during the rotation of the shaft **67** the strip-feeding stops and a determinate number of checks will have been printed.

As a practical matter, it is convenient to imprint checks in multiples of ten for each particular customer, i.e., ten for some customers, twenty for others, and so forth, and hence the ratchet wheel **82** is provided with ten teeth and the stepping motor **88** is controlled by the data storing unit to move the worm wheel, switch-operating arm and ratchet wheel in increments of 36° in determining the number of checks to be printed.

To give an example, let it be assumed that the switch-operating arm **83** is in its zero position (to which it always returns when the shaft **67** stops) and that it is desired to imprint twenty checks for the customer, the data of whose card has been stored in the storage unit. The type wheels having been set to print indicia pertinent thereto, the data storage unit will cause the stepping motor to operate eight steps during which time the pawl **81** will click over eight teeth on the ratchet wheel **82** to the position shown in dotted lines in FIG. 7, thereby in effect cancelling out the printing of eighty checks and leaving the switch arm to advance 72° resulting in the printing of twenty checks before the switch **84** is opened.

To start the operations, even though the switch **84** is in open circuit position, a relay switch **90** is energized by the data storage unit to shunt the switch **84** momentarily or at least until the end of the switch-operating arm **83** clears the switch **84** and permits the latter to take control of the circuit to the motor **64**.

It should be understood that, in the broader aspects of this invention, other mechanism for counting the number of checks being imprinted and interrupting the imprinting operations than that above described may be employed.

Of course, if it should be desired that the number of checks to be printed for a customer should be in units of five, for instance, ten, fifteen, twenty, twenty-five, etc., the ratchet wheel **82** would be provided with twenty teeth and the stepping motor would move the latter and the switch arm **83** in increments of 18°.

One of the features of the present invention, particularly the form being described, is the provision of a method whereby checks and the like of different lengths, i.e., different distances from the top edge to the bottom edge, may be imprinted.

According to the present invention, this is accomplished by selectively varying the relative speed of travel of the preprinted strip and the cycle of operations of the control means **67** so that while the control means makes one revolution for each check or the like, the amount of the strip which is fed during the time required for the control means to make one revolution may be increased or decreased. In other words, if the relative speed between the strip and the control shaft results in advancing the strip 3½", for a check having a length of 3½" and it is desired to imprint on a workpiece having 7", it is merely necessary to double the speed of travel of the strip. If this is done, the only other matter which need be taken into consideration is the adjustment of the switch **74** which controls the operation of the impression means **61** in order to cause the "second" line of imprinting to occur at the proper place on the 7" check, for it will be remembered that the position of the "first" line to be imprinted is controlled by the initial positioning of the strip on the tractor feed **57**.

The switch **74** and its carrying arm **74***a* may be adjusted remotely by operation of the motor **76** and the change speed power transmitting unit **63** may be adjusted in known ways by operation of a lever **63***a* for instance.

To avoid confusion in describing the method of the present invention referred to in connection with FIG. 6, the worksheet strip has been referred to in the singular. It should be understood, of course, that the strip may be composed of superposed layers of paper with interposed strips of transfer material to make multiple copies; and while checks have been referred to for convenience, it should be understood that deposit slips and other workpieces may be imprinted both in a single strip or multilayer strips.

After a punch card has been read by the card reader **50** and the data stored in the data storage unit **51**, the card is removed from the card reader and placed in a convenient receptacle where it may be stored, along with other cards, in order for instance according to the name of the customer. When a customer requires another batch of checks, it is merely necessary for the operator to remove the customer's card from the receptacle and place it on the stack in the card reader so that when it is reached it will be read and data stored and the other operations performed to print the new batch of checks for the customer.

Thus it will be seen that the present invention completely obviates the necessity for preliminary and preparatory work such as typesetting, proofreading, platemaking and make-ready which would be required by previous methods of afterprinting checks and the like.

By employing settable type-carrying wheels and locking means therefor, the printing characters are automatically positioned in perfect alignment for the precise requirements for printing operations. This is an important consideration in connection with mechanized check handling, otherwise referred to as magnetic ink character recognition, and thus the method and apparatus of this invention is able to fulfill standard requirements set by the American Bankers Association as standard practices which are increasingly coming into universal use in the banks of this country. The requirements so laid down are of such a precise nature that they cannot be met by normal printing methods and equipment. The methods and apparatus disclosed herein meet these strict and precise requirements on a fully automated basis and in a practical and economical manner and at a substantially lower cost.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. Apparatus for printing a plurality of groups of items each having indicia common to all the groups and also unique indicia of a different kind for each group in relatively small quantities for each group, said items being joined to form a continuous strip, said apparatus comprising: means for continuously feeding said continuous strip to a printing position and beyond, means for receiving a plurality of punch cards and for sensing therefrom data determinative of the unique indicia of one group of items and data determinative of the number of items of said group from one of said cards, printing means including a plurality of individually settable non-traveling type carrying elements and including means responsive to the indicia determinative data from said sensing means for setting up said type elements to indicate a line of unique indicia to be printed, impression means for causing momentary printing contact between said non-traveling type elements and said continuously moving strip, power means responsive to operation of said sensing means for causing operation of said feeding means and said impression means to print consecutively a plurality of items of said one group, on succeeding portions of said strip, with said

indicia unique to said one group in predetermined relation with said common indicia, and means responsive to the number determinative data from said sensing means and responsive to operation of said power means for predetermining the number of items of said group to be printed, and for interrupting the operation of said power means after said predetermined number of items has been printed, said sensing means being operative, upon interruption of said power means to sense another of said punch cards having data determinative of the unique indicia of another group of items and data determinative of the number of items of said other group for causing another setting of said type carrying elements and another setting of said predetermining and interrupting means, and for causing resumption of operation of said power means to print a predetermined number of items of said other group.

2. Apparatus as set forth in claim 1 further including data storage means for receiving the various data from said sensing means and for storing said data for subsequent use, said sensing means being operable to transmit said data to said data storage means one printing cycle in advance of the indicia being printed at any given moment, whereby a subsequent punch card is being sensed and the data therefrom being stored while said printing means is printing the unique indicia indicated by the data from a preceding punch card.

3. Apparatus for printing a plurality of groups of items each having indicia common to all the groups and also unique indicia of a different kind for each group in relatively small quantities for each group, said items being joined to form a continuous strip, said apparatus comprising: means for continuously feeding said continuous strip to a printing position and beyond, means for receiving a plurality of punch cards and for sensing therefrom data determinative of the unique indicia of one group of items and data determinative of the number of items of said group from one of said cards, printing means including a plurality of individually settable non-traveling type carrying elements and including means responsive to the indicia determinative data from said sensing means for setting up said type elements to indicate a line of unique indicia to be printed, impression means for causing momentary printing contact between said non-traveling type elements and said continuously moving strip, pre-settable counter means responsive to the number determinative data from said sensing means for predetermining the number of items of said group to be printed, power means responsive to operation of said sensing means for causing operation of said feeding means, said impression means and said counter means to print a predetermined number of items of said one group, on succeeding portions of said strip, with said indicia unique to said one group in predetermined relation with said common indicia, and means responsive to operation of said counter means for interrupting said power means after said predetermined number of items has been printed, said sensing means being operative to sense another of said punch cards having data determinative of the unique indicia of another group of items and data determinative of the number of items of said other group for causing another setting of said type carrying elements and another setting of said counter means, and for causing resumption of operation of said power means to print a predetermined number of items of said other group.

4. Apparatus for printing a plurality of groups of items each having indicia common to all the groups and also unique indicia of a different kind for each group in relatively small quantities for each group, said items being joined to form a continuous strip, said apparatus comprising: means for continuously feeding said continuous strip to a printing position and beyond, means for receiving a plurality of punch cards and for sensing therefrom data determinative of the unique indicia of one group of items and data determinative of the number of items of said group from one of said cards, printing means including a plurality of individually settable non-traveling type carrying elements and including means responsive to the indicia determinative data from said sensing means for setting up said type elements to indicate a line of unique indicia to be printed, movable impression means intermittently operable to cause momentary printing contact between said non-traveling type elements and said continuously moving strip, power means responsive to operation of said sensing means for causing continuous operation of said feeding means and intermittent operation of said impression means to print consecutively a plurality of items of said one group on succeeding portions of said strip with said indicia unique to said one group in predetermined relation with said common indicia, and means responsive to the number determinative data from said sensing means and responsive to operation of said power means for predetermining the number of items of said group to be printed and for interrupting said power means after said predetermined number of items has been printed, said sensing means being operative to sense another of said punch cards having data determinative of the unique indicia of another group of items and data determinative of the number of items of said other group for causing another setting of said type carrying elements and another setting of said predetermining and interrupting means and for causing resumption of operation of said power means to print a predetermined number of items of said other group.

5. Apparatus for printing a plurality of groups of items each having indicia common to all the groups and also having two spaced apart lines of unique indicia of a different kind for each group in relatively small quantities for each group, said items being joined to form a continuous strip, said apparatus comprising: means for continuously feeding said continuous strip to printing positions and beyond, means for receiving a plurality of punch cards and for sensing therefrom data determinative of the unique indicia of two lines of print of one group of items and data determinative of the number of items of said group from one of said cards, printing means including two spaced apart printing units each including a plurality of individually settable non-traveling type carrying elements and each including means responsive to the indicia determinative data for a selected one of the lines of print from said sensing means for setting up said type elements to indicate a line of unique indicia to be printed by each printing unit, impression means for each printing unit for causing momentary printing contact between the non-traveling type elements of each of said printing units and said continuously moving strip, power means responsive to operation of said sensing means for causing operation of said feeding means and said impression means to print consecutively a plurality of items of said one group, on succeeding portions of said strip, with the lines of said indicia unique to said one group in predetermined spaced relation with each other and in collective predetermined relation with said common indicia, and means responsive to the number determinative data from said sensing means and responsive to operation of said power means for predetermining the number of items of said group to be printed and for interrupting said power means after said predetermined number of items has been printed, said sensing means being operative, upon interruption of said power means, to sense another of said punch cards having data determinative of the unique indicia of two lines of print of another group of items and data determinative of the number of items of said other group for causing another setting of the type carrying elements of each of said printing units and another setting of said predetermining and interrupting means, and for causing resumption of operation of said power means to print a predetermined number of items of said other group.

6. Apparatus as set forth in claim 5 further including

control means operated by said power means and thereby operatively coordinated with said feeding means for causing sequential operation of said impression means of each of said printing units whereby the lines of unique indicia are printed seriatim on each of the items of said group and said lines of indicia are printed closer together on each item than the spacing between said printing units.

7. Apparatus as set forth in claim 6 further including settable means for varying the operative coordination of the impression means of one of said printing units with the feeding means relative to the impression means of another of said printing units whereby the predetermined spaced relation of the lines of indicia may be changed to vary the format of said items.

8. Apparatus as set forth in claim 7 wherein said settable means for varying the operative coordination of the impression means of said one of said printing units includes means responsive to additional data sensed from a punch card by said sensing means which additional data is determinative of the predetermined spaced relation of the line of unique indicia printed by said one printing unit.

9. Apparatus as set forth in claim 5 further including means for changing the speed of operation of said feeding means independently of said power means whereby the collective predetermined relation of the lines of unique indicia with said common indicia may be changed to permit variation of the length of the items being printed from leading to trailing edge.

10. Apparatus as set forth in claim 5 further including control means operated by said power means and thereby operatively coordinated with said feeding means for causing sequential operation of said impression means of each of said printing units to cause said printing units to print the lines of unique indicia seriatim on each of the items of said group, settable means for varying the operative coordination of the impression means of one of said printing units with the feeding means relative to the impression means of another of said printing units, and means for changing the speed of operation of said feeding means independently of said power means whereby both the predetermined spaced relation of the lines of unique indicia on a given size item, and the collective predetermined relation of the lines of unique indicia with said common indicia may be changed to vary the format of the items and to permit variation in the length of the items from leading to trailing edge.

11. Apparatus for printing a plurality of items each having common indicia and also having two spaced apart lines of unique indicia, said items being joined to form a continuous strip, said apparatus comprising: means for continuously feeding said continuous strip to a printing position and beyond, printing means including two spaced apart printing units each including a plurality of individually settable non-traveling type carrying elements and including means for setting up said type elements to indicate a line of unique indicia to be printed by each printing unit, impression means for each printing unit for causing momentary printing contact between the non-traveling type elements of each of said printing units and said continuously moving strip, power means for causing operation of said feeding means and said impression means to print consecutively a plurality of items, on succeeding portions of said continuous strip, with the lines of said unique indicia in predetermined spaced relation with each other and in collective predetermined relation with said common indicia, and control means operated by said power means and thereby operatively coordinated with said feeding means for causing sequential operation of said impression means for each of said printing units whereby the lines of unique indicia are printed seriatim on each of the items and are printed closer together on each item than the spacing between said printing units.

12. Apparatus as set forth in claim 11 further including settable means for varying the operative coordination of the impression means of one of said printing units with the feeding means relative to the impression means of another of said printing units whereby the predetermined spaced relation of the lines of unique indicia may be changed to vary the format of said items.

13. Apparatus as set forth in claim 11 further including means for changing the speed of operation of said feeding means independently of said power means whereby the collective predetermined relation of the lines of unique indicia with said common indicia may be changed to permit variation of the length of the items being printed from leading to trailing edge.

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