Oct. 27, 1959 V. M. ANDREWS ET AL 2,910,164

AUTOMATIC PROGRAMMING DEVICE

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FIG. 1

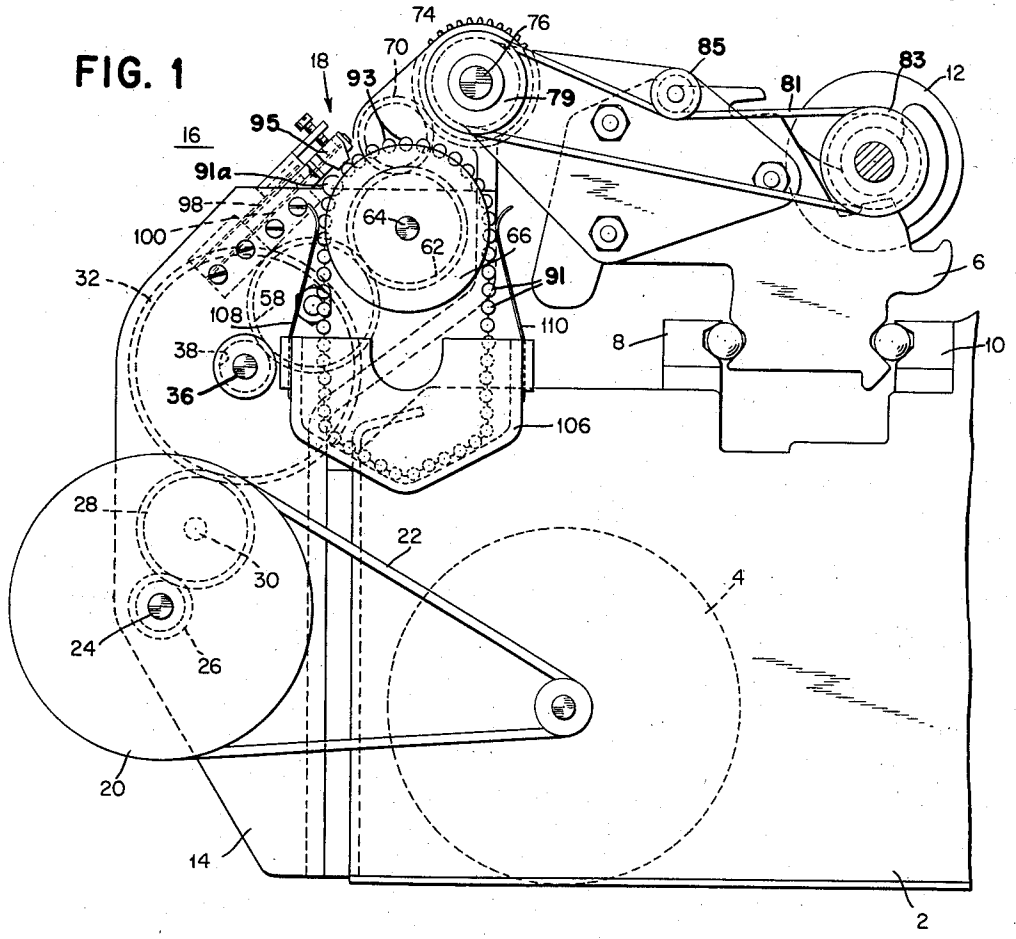
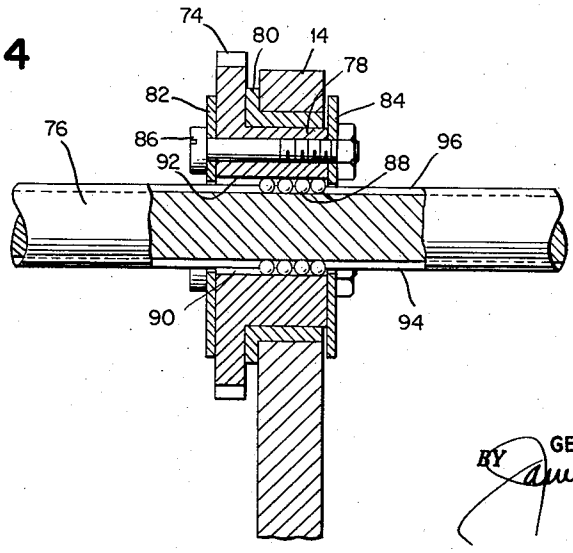


FIG. 4



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FIG. 2

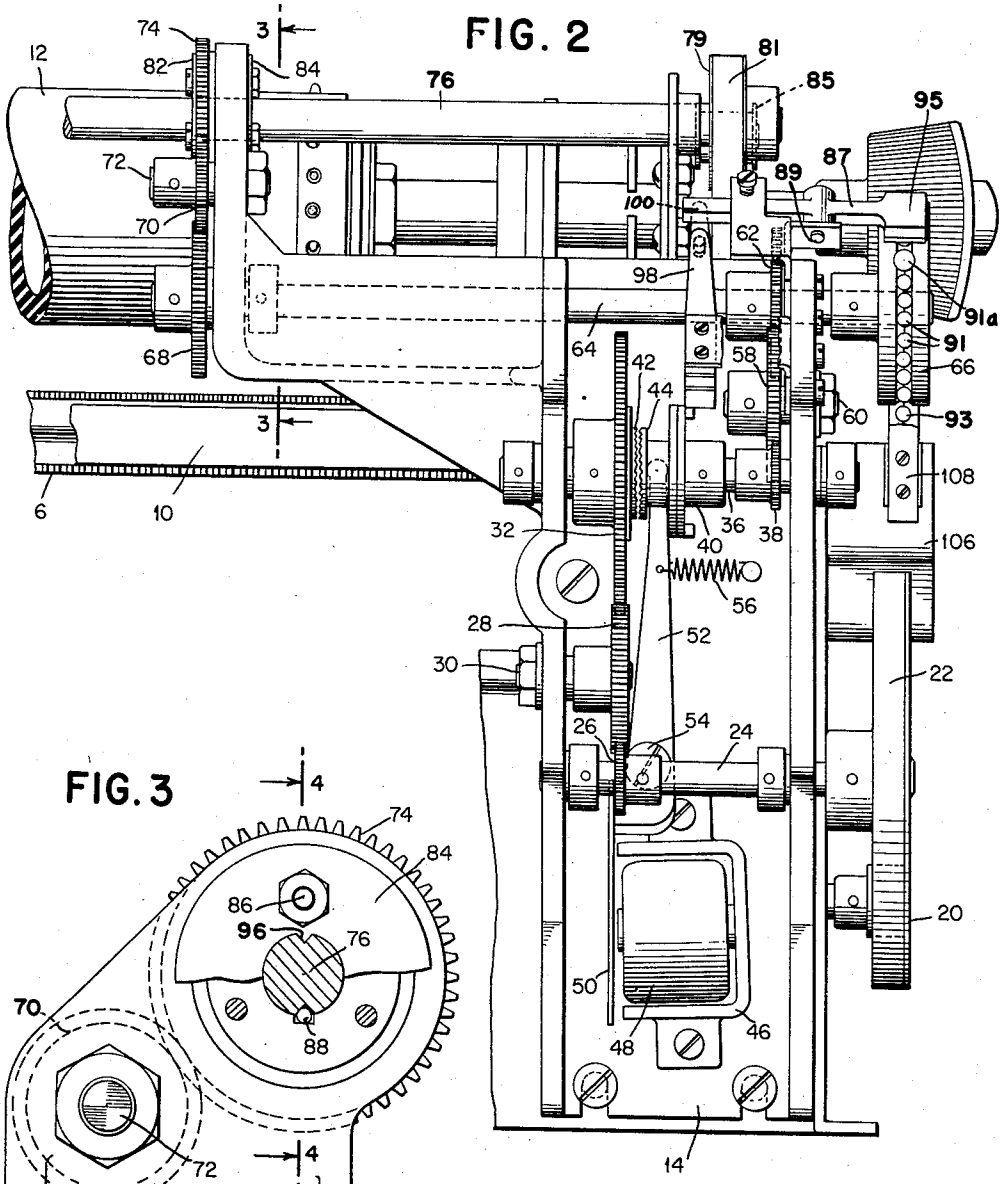


FIG. 3

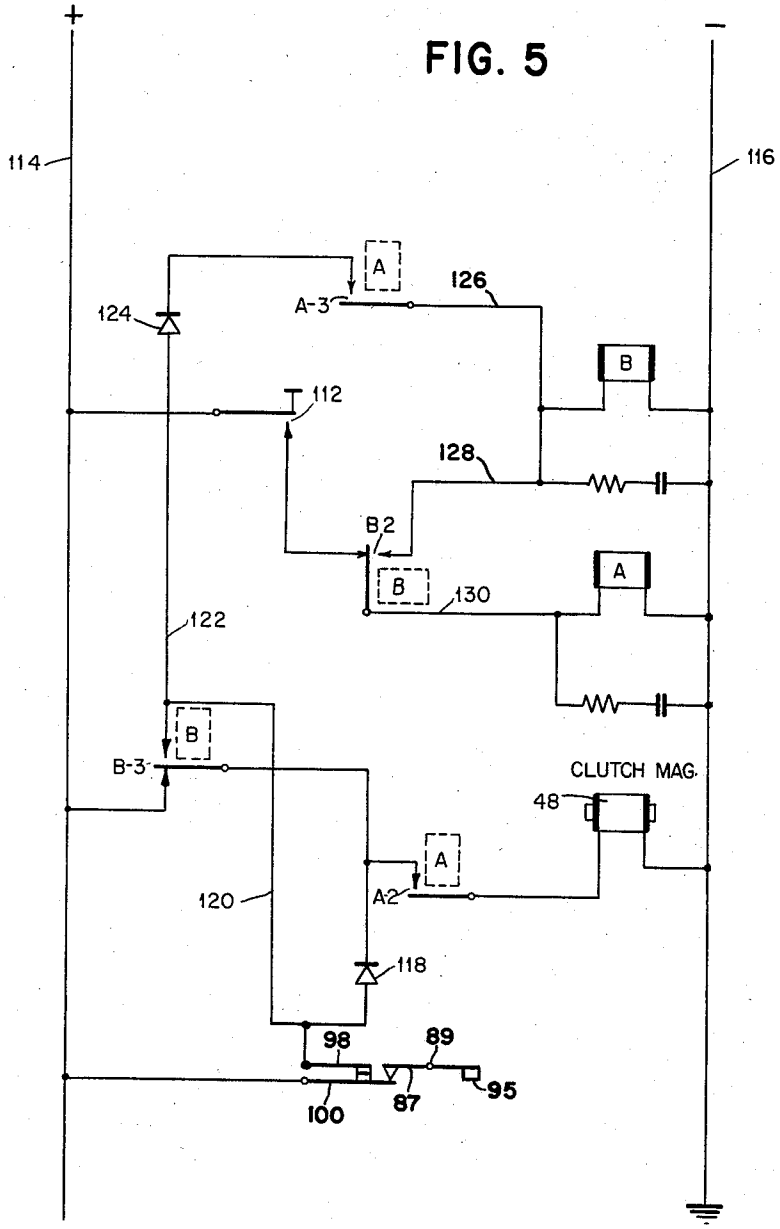
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FIG. 5



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AUTOMATIC PROGRAMMING DEVICE

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Application December 30, 1954, Serial No. 478,615

1 Claim. (Cl. 197—133)

This invention relates to typewriters and more particularly to an automatic programming device for advancing a form with the typewriter platen sequentially to preselected lines for printing.

In many typing installations, forms of uniform length attached end to end are employed and work is to be typed on identical pre-selected lines of each of those forms. In such a situation, it is obviously advantageous to be able to automatically position a form at the pre-selected line thereby avoiding the necessity of the operator manually positioning the preselected line for typing. Accordingly, it is a first object of this invention to provide an improved automatic programming device operable with a business machine carriage for advancing a form to a preselected line.

Since the device would be used with continuous web forms, it is a still further object of this invention to provide an automatic programming device operable after a starting point has been reached to position selected lines of a first form at printing position, and then operable to advance corresponding lines of succeeding forms to printing position, as each form is completed.

It is a still further object of this invention to provide an automatic programming device that may be remotely controlled to position pre-selected lines of a form in printing position.

It is a still further object of this invention to provide an improved more efficient and less expensive automatic programming device for advancing pre-selected lines of a form to printing position.

Other objects of the invention will be pointed out in the following description and claim and illustrated in the accompanying drawings, which disclose by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a side elevation of the components of the improved automatic programming device.

Fig. 2 is a rear elevation of the components shown in Fig. 1.

Fig. 3 is an end elevation partly in section taken from the plane 3—3 in the direction of the arrows of Fig. 2.

Fig. 4 is a rear elevation partly in section taken from the plane 4—4 in the direction of the arrows in Fig. 3; while

Fig. 5 is a schematic wiring diagram.

Briefly, this invention relates to an improved automatic programming device, operable under the control of a typewriter power driving means to advance a form to preselected lines. An electrically operated clutch is interpositioned between the power driving means of a typewriter and the platen in such a manner that the platen will advance a form whenever the electric clutch is energized. A circuit is provided whereby the energization of the clutch by one switch means will be interrupted by a second switching means responsive to the positioning of selected lines at printing positions.

With reference to the drawings, and particularly to

Figs. 1 and 2, a typewriter 2 is shown having a motor or other power driving means 4, a carriage 6 slidable in the usual carriage rails 8, 10 transversely of the machine, and a platen 12 for holding a work sheet in the conventional fashion.

The automatic programming device comprises a frame 14 secured to the rear of the typewriter 2, a gear and pulley mechanism 16 interconnecting the motor 4 with the platen 12 and a switch operating mechanism 18 operable to control selectively the driving relationship between motor 4 and the pulley mechanism 16.

A program driving gear or pulley 20 is shown connected by a belt or other suitable driving mechanism 22 to the shaft of the motor 4 for continuous rotation whenever the motor is energized. Pulley 20 is mounted on a shaft 24 rotatably secured in the program frame 14 and carries a pinion 26. The latter is meshed with an idler 28 carried by a stub shaft 30 supported by the frame 14, and idler 28, in turn, is engaged with a clutch gear 32 freely supported for rotation about a clutch shaft 36 mounted in frame 14. A pinion 38 is mounted on clutch shaft 36 for rotation therewith.

A clutch 40 is provided having one toothed portion 42 secured to and rotatable with the clutch gear 32 and the second portion 44 secured to and rotatable with the clutch shaft 36. The toothed portion 44 is axially slidable on the clutch shaft 36 by splines or other securing devices so that movement to the left, as viewed in Fig. 2, will engage the clutch portions 42 and 44 to drive the clutch shaft 36 in response to rotation of the clutch gear 32.

In order to control the inter-engagement of the toothed portions 42, 44 of the clutch 40, an electromagnet 46 having a coil 48 is mounted on the frame 14 to attract an armature 50 of a clutch shifting lever 52 which is pivotally supported on the frame 14 by a bolt or other suitable device 54. The clutch shifting lever 52 is biased by the spring 56 into the right hand limit shown in Fig. 2, wherein the toothed portions 42 and 44 are disengaged. Upon energization of the coil 48 of the electromagnet 46, the armature 50 will be attracted to rock the shift lever 52 counterclockwise about its supporting stud 54 in opposition to the spring 56 so as to engage the toothed portions 42 and 44 of clutch 40 thereby driving the clutch shaft 36 and hence the pinion 38 in response to the rotation of the clutch gear 32. The pinion 38 drives through an idler 58 carried by a stub shaft 60 supported in the frame 14, a gear 62 which is attached to and rotatable with an intermediate shaft 64 which is rotatably supported in the frame 14. The intermediate shaft 64 carries at its right hand end, as viewed in Fig. 2, a bead chain sprocket 66, the purpose of which will be hereinafter described, and at its left hand end a platen drive gear 68 which is interconnected through an idler 70 carried by the stub shaft 72 supported by the frame 14 to a spline gear 74, which is supported, as shown in Fig. 4, in the frame 14 so that the cross shaft 76 can slide axially through it. More specifically, the gear 74 (Fig. 4) has a hub 78, which is rotatably supported by bearing 80 carried by the frame 14. A pair of face plates 82, 84 having diameters greater than that of the bearing 80 are interconnected by a plurality of bolts 86 so as to control end movement of the gear 74. The face plate 84 serves a dual function in that it acts as a race to position ball bearings 88 which are located in diagonally opposite grooves 90, 92 provided in the hub of the gear 74 in alignment with axial splines 94, 96, respectively, carried by the cross shaft 76. With this structure, the cross shaft 76 is easily slidable axially relative to gear 74, and the ball bearings 88 perform a secondary function of providing a driving relationship between gear 74 and the cross shaft 76. Assuming that the motor 4 is driving the pulley 20 through the belt 22 then the cross gear 74 will be rotated whenever the shift lever

52 has been rocked to its counterclockwise limit to interengage the portions 42, 44 of the clutch 40. Furthermore, with the construction of gear 74 and shaft 76 which has its ends supported in the carriage frame, the typewriter carriage is movable laterally in rails 8 and 10 whereupon irrespective of the position of the carriage relative to the typewriter printing point a driving relationship will exist between the gear 74 and the cross shaft 76.

The cross shaft 76 is provided at one end with the belt drive capstan 79 which is rotatable with the shaft 76. A belt 81 is employed to interconnect the belt drive capstan 79 and a platen drive pulley 83. A pressure pulley 85 is positioned along one side of the belt 81 to act as a tightener to insure driving relationship between the belt drive capstan 79 and the platen pulley 83.

Through the use of the belt structure, then when the belt drive capstan 79 is rotated counterclockwise as viewed in Fig. 1, the platen pulley 83 will be rotated counterclockwise so as to advance the form line by line, into printing position.

In order to regulate the stopping position of the platen 12 so that a pre-selected line will be in printing position, an electrical switching device is provided which interrupts the circuit to the magnet 48 as the predetermined line on platen 12 reaches printing position. This circuit, which will be later described, has a switch arm 87 (Fig. 2) which is pivotally supported about a pin 89 whereby it can be rocked in response to large beads 91*a* of a bead chain 93 passing under the outer end 95 of the switch arm 87. The opposite end of the switch arm 87 lies in contact with one of a pair of spring contact arms 98, 100 which are normally closed to establish electrical contact, but which are separated when the switch arm 87 is rocked about its pivot 89 in response to a large bead 91*a* passing under the outer end 95. More specifically, the large bead will rock the switch arm 87 to depress the arm 100 thereby opening the circuit across the contacts on the arms 98, 100. This bead operated switch is a well known device (for example, see U.S. Patent 2,591,335) and it is felt that a simple description of the elements will explain its structure and operation. The braking of the circuit through the contact arms 98, 100 is employed to de-energize coil 48 thereby letting the clutch 40 drop out of engagement to stop the driving relationship between the pulley 20 and the gear 74.

It has been previously mentioned that the intermediate shaft 64 carries at one end a chain sprocket 66 which is provided with suitable driving means about its periphery for engaging a bead chain element which comprises a plurality of larger beads 91*a* and smaller ones 91. So long as one of the small beads 91 rides under the outer end 95 ofthe switch arm 87, there will be no change in electrical circuitry across the contact arms 98, 100, but as soon as a large ball 91*a* gets under the outer end 95 of the arm 87, the contacts 98 and 100 will be separated to interrupt the circuit to the coil 48.

It will be noted that the bead chain sprocket 66 is driven only when the intermediate shaft 64 is driven, which in turn, is driven only when the clutch 40 has been engaged by rocking the shift arm 52. Since there is a drive relationship between the intermediate shaft 64 and the platen pulley 83, it is obvious that there is a direct ratio of rotation between the chain sprocket 66 and the platen 12. This direct relationship is employed to interrupt the driving of the platen 12 when a predetermined printing line is at a printing position on the typewriter platen.

In order to accomplish this result, the bead chain is arranged to have a length equal to that of any one of the continuous forms which is to be passed along the platen 12 (when the bead chain sprocket 66 and the platen 12 have equal diameters and when the driving relationship between the two of them is one to one).

If the driving relationship between the chain sprocket 66 and the platen 12 were greater or less than one, then a corresponding change would have to be made in the length of the bead chain.

On the assumption that the bead chain is of a length equal to that of the form which is passed across the platen, then the large bead can be placed on the chain for every printing line on the form where preselected data such as a total is to be typed. Whereupon, as these pre-selected lines on the printing form reach the printing position of a platen, a corresponding large bead will be under the switch arm 87 thereby interrupting the circuit to the magnet 48 to interrupt the driving relationship between the motor 4 and the platen 12.

It is apparent that by devices well known in the art (e.g. Patent 2,120,360), the platen can be disconnected from the driving pulley 12 so that a form on the platen can be advanced to the first printing line when the corresponding bead on the bead chain is under the outer end 95 of the switch arm 87. Then, assuming the magnet 48 is energized, the platen 12 will be rotated counterclockwise, as will be the intermediate shaft 64 and accordingly, the bead sprocket 66 will be rotated counterclockwise. Since in a preferred embodiment, there is a direct ratio between the movement of the bead chain past the switch arm 87 and the movement of the form on the platen into printing position, it is apparent that the form will be advanced until the next large bead in the chain gets under the outer end 95 of the switch arm 87 whereupon the circuit to the magnet 48 will again be broken to stop the platen so that a preselected line of the form will be in printing position.

With respect to the platen and the form being advanced on the platen, it will be remembered that there is a great deal of friction between the paper feed rolls and the platen of a typewriter so that a considerable effort is needed to rotate the platen to advance a form. Accordingly, as soon as the circuit to the magnet 48 is interrupted by the large bead 91*a* getting under the switch arm 87, the platen will come to an immediate stop, and it has been found that there is little problem of the platen overshooting its mark.

For appearances sake, the bead chain 93 is normally held in a well 106 which is attached to the typewriter frame, and leaf springs 108, 110 are employed to hold the beads in peripheral contact with the chain sprocket 66 to prevent slipping.

If the circuit to the magnet 48 were such that when a large bead 91*a* were placed under the switch arm 87, the circuit to the magnet 48 would be interrupted, then it is apparent that this circuit could not be re-established until the large bead 91*a* has been moved from under the switch arm 87. This is taken care of by the normal line feed operation of the typewriter. After printing on the pre-selected line is complete the carriage is returned effecting a normal line feed operation. This moves the large bead from under arm 87 and permits the circuit to the magnet 48 to be reestablished. As the form is spaced after each line of typing a small bead is fed under the switch arm. The magnet 48, however, does not operate as its operating circuit, is not completed, until a form feed operation is requested. This may be done at any time while small beads are positioned under the arm 87. In Fig. 5, a manual switch 112 is shown, the operation of which will effect a form feed operation.

Depression of the manual switch 112 to close its contacts will send a pulse from a positive line 114 through the normally closed contact B2 to pick up the relay A whereupon the pulse will go to the ground line 116. Current will now pass from the plus line 114 through the normally closed contact B3 and through the normally open (now closed) contacts A2 and through the clutch magnet coil 48 to ground, thereby energizing the clutch 40.

In the above description, it is assumed that a small bead is positioned under the arm 87 to close the contact arms 98, 100 and since the normally open contacts A3

will now be closed under the influence of the relay A, which has been picked up, current will flow from the plus side 114 through the bead contacts 98, 100 via the rectifier 118 through the normally open (now closed) contacts of A2 to hold up the clutch magnet. Simultaneously, the pulse through the contacts 98, 100 will pass along the conductor 120 and via the conductor 122 through a rectifier 124 and through the normally open, now closed, contacts A3 to pick up the relay B which action will shift the position of its contacts B2 and B3. The opening of contacts B3 will disconnect the clutch magnet from the plus terminal 114 via the normally closed contacts B3 but the clutch will remain energized through the bead contacts 98, 100 which are closed so long as small beads pass under the switch arm 87. As soon as the next large bead 91*a* passes under the switch arm 87, the contacts 98, 100 will be interrupted whereupon there will be no power to the clutch magnet 48 which will then drop out.

The opening of the contacts 98, 100 will also interrupt the circuit via the conductors 120, 122, rectifier 124, contacts A3, conductor 126, to relay B, and the circuit through conductor 128, contacts B2 normally open (now closed), conductor 130 to relay A, thereby dropping out relays A and B, whereupon the circuit will be restored to that shown in Fig. 5 of the drawings, so that the next operation of the manual switch 112, the circuit will be established, as heretofore described.

In operation, it has been found that this improved programming device is operable with forms of varying lengths since the program chain, which controls the operation of the contacts 98, 100 is inter-changeable. The length of chain is selected to correspond to the length of form that is fed around the platen 12.

It should also be noted that while the circuitry was described with respect to a manual contact 112, that it is obvious that the circuitry will also be operable if any remotely controlled means were employed to close the contacts of switch 112.

While there have been shown and described and pointed out the fundamental novel features of the invention, as applied to a preferred embodiment, 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 claim.

What is claimed is:

In a business machine having a platen supported by a carriage; an automatic programming device for positioning in succession selected lines of a work sheet carried by said platen to a printing line; comprising a first shaft with its axis parallel to that of the platen, platen driving means interconnecting said first shaft and said platen to advance the latter by the rotation of said first shaft, driving means having a second shaft interconnected via a normally disengaged clutch to said first shaft for driving the latter when said clutch has been engaged; sequentially operable circuit means comprising a switch, a contact, a first control means, a second control means, a clutch magnet, actuating circuits for said control means and an actuating circuit and a holding circuit for said clutch magnet, said switch closing said actuating circuit for said first control means, said first control means closing said actuating circuit for said clutch magnet to engage said clutch to drive said first shaft, said first control means also closing said actuating circuit for said second control means, said second control means holding said first control means energized, switching means operable in response to preselected lines of the form upon said platen reaching said printing line for interrupting said sequentially operable circuit means to disengage said clutch; said switching means comprising a switch arm for opening said contact and a member having individual elements of both a normal and greater size, and means on said first shaft for moving said member past said switch arm element by element as the platen is advanced with respect to a reference point for controlling the operation of said switch arm, said switch arm being unaffected by an element of normal size thereby preparing said holding circuit for said clutch magnet, said first control means upon being energized completing said holding circuit for said clutch magnet, said second control means upon being energized opening said actuating circuit for said clutch magnet, said switch arm being actuated by one of said elements of greater size upon reaching said reference point to open said contact whereby said holding circuit for said clutch magnet is opened disconnecting said driving means and de-energizing said first and second control means.

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