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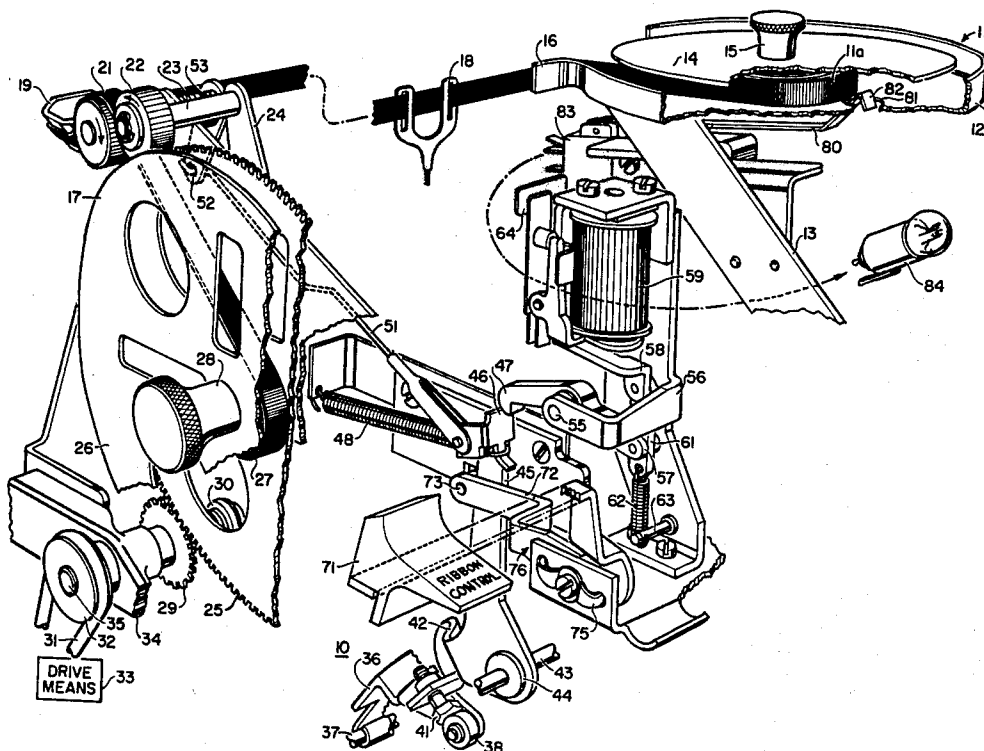
[54] **PROPORTIONAL CARBON RIBBON FEED MECHANISM**
4 Claims, 2 Drawing Figs.

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 B41j 35/36, B41j 29/42
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ABSTRACT: A mechanism for conserving carbon ribbon in a proportional spacing printer wherein the ribbon may be selectively set for movement in a proportional spacing mode during printing of print characters lying with two width groups or for movement in a monospacing mode during printing of both of said groups through a bellcrank limited in movement by a solenoid in the proportional spacing mode and by an operator-controlled stop member in the monospacing mode.



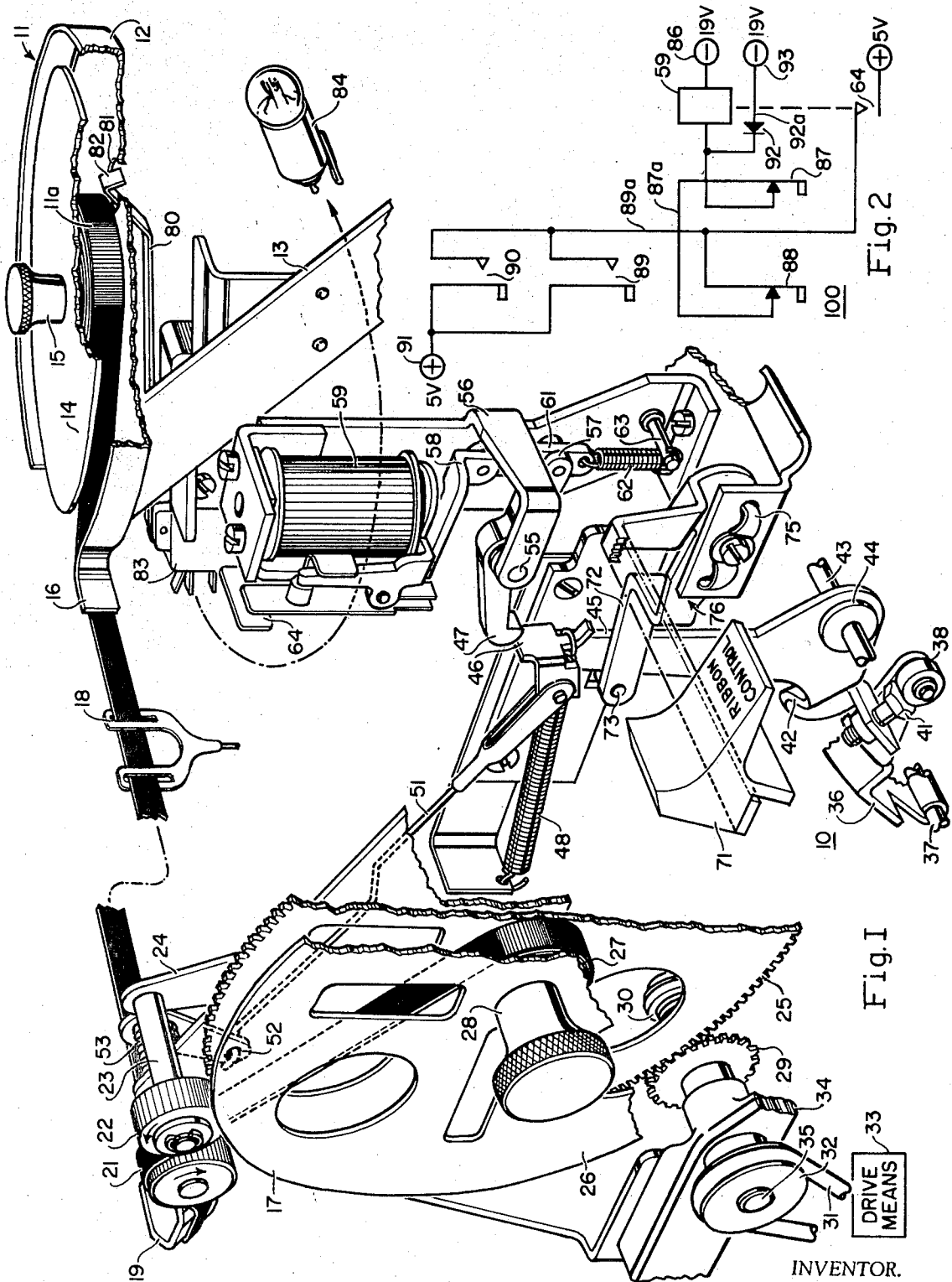


Fig. 1

Fig. 2

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PROPORTIONAL CARBON RIBBON FEED MECHANISM

The present invention relates to a ribbon feed mechanism for a business machine and the like and, more particularly, to a ribbon feed mechanism for a proportional spacing printer.

Although the present invention is suited for more general applications such as in a monospacing typewriter, it is particularly adapted for use in a proportional spacing printer such as a Justewriter automatic composing machine and a Flexowriter automatic writing machine, manufactured by The Friden Division of the Singer Company. In a proportional spacing printer, each character is spaced according to its width—large characters like *m* and *w* receive more space than smaller ones like *i*. For example, the characters *m* and *w* may receive escapement values of 5 or 6 units while the *i* and other smaller characters may receive 2 or 3 units of escapement value. Proportional spacing printers are desirable since vertical lines which distract the reader's eye are eliminated when each character is correctly spaced. The page is easily read and has the printed look.

One of the problems in proportional spacing machines is that of carbon ribbon utilization. For example, if the ribbon is moved in a monospacing mode and is geared to a 5 or 6 unit escapement, carbon ribbon is wasted when the 2 or 3 unit characters are printed.

In the past, attempts have been made to proportionally space or move the carbon ribbon in a proportional spacing printer. Such attempts have been found to be rather complex and expensive. Further, there are no known attempts to provide both a monospacing and proportional spacing carbon ribbon mechanism in the same printer. This capability is particularly desirable since the printing of rough drafts may be made by moving the ribbon in a monospacing mode consisting of the 2 or 3 units of escapement during printing of all characters and then be converted to the proportional spacing mode for final drafts, thus saving ribbon during printing of the rough draft.

Accordingly, it is an object of the present invention to provide a novel carbon ribbon mechanism.

It is another object of the present invention to provide a novel carbon ribbon mechanism for use in both proportional spacing and monospacing printers.

It is still another object of the present invention to provide a carbon ribbon mechanism which may be selectively set for movement in a proportional spacing mode during printing of print characters lying within two width groups or for movement in a monospacing mode during printing of both of the groups.

It is yet another object of the present invention to provide a carbon ribbon mechanism which is relatively simple, easy to manufacture, and overcomes the aforesaid problems of the prior art.

A feature of the invention is a bellcrank limited in movement by a solenoid in the proportional spacing mode and by an operator-controlled stop member in the monospacing mode.

Briefly described, the present invention accomplishes the above and other objects in one embodiment of the invention in a carbon ribbon mechanism for a proportional spacing printer. The printer includes a plurality of printing characters falling within first and second width groups. The carbon ribbon mechanism includes a source of carbon ribbon, a takeup spool, and guide means disposed between the source and the takeup spool for guiding the ribbon across a printing point for the characters. The mechanism has means including a pair of rollers frictionally engaging the ribbon therebetween for moving the ribbon longitudinally in response to rotation of at least one of the rollers. Also included is a bellcrank for rotating the one roller in response to printing of all the characters. The bellcrank is movable through a maximum displacement for printing of characters falling in one of the first and second width groups and is limited in movement between two other displacements—one of which is for characters falling within the other one of the first and second width groups and for a

third displacement which is less than the width of the characters within the first and second width groups. A solenoid means is included for limiting the bellcrank in response to the printing of characters in the first group so that the one roller rotates a first increment for the first group and a second increment for the second group. The mechanism also includes a stop means which is controllable by an operator for limiting movement of the bellcrank so that the one roller moves the carbon ribbon longitudinally a third increment which is less than the first and second increments. Thus, a carbon ribbon may be moved in first and second increments in response to characters falling within the first and second width groups and a third increment which is less than the first and second increments when selected by an operator.

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

FIG. 1 is a fragmentary perspective view to illustrate a carbon ribbon mechanism in accordance with the invention; and

FIG. 2 is a schematic view of a circuit utilized in the carbon ribbon mechanism of FIG. 1.

The present invention may be embodied in different printers and is shown by way of example in FIGS. 1 and 2 in one embodiment of the structure shown in U.S. Pat. No. 2,700,446 entitled "Tape Controlled Typewriter" issued Jan. 25, 1955, to E. O. Blodgett, and assigned to the assignee as the present invention. Only the structure necessary to show the invention is illustrated in FIGS. 1 and 2. For a more complete description of the structure, reference may be made to the above-mentioned patent.

Referring now to FIG. 1, a carbon ribbon mechanism 10 is shown in accordance with the invention. The carbon ribbon mechanism 10 includes a source of carbon ribbon 11 which may be a roll of carbon ribbon 11a rotatably mounted on a horizontal supply spool 12 which is fixed to a bracket 13. The supply spool 12 includes a retaining plate 14 and a captive screw 15 for retaining the carbon ribbon 11a. Although a horizontal spool 12 is shown, it should be understood that the spool 12 may be vertically mounted without departing from the invention. The carbon ribbon 11a is free to rotate on the supply spool 12 and is guided therefrom by a guide at 16.

The carbon ribbon mechanism 10 also includes a takeup spool 17 upon which the carbon ribbon 11a is reeled in a manner to be described hereinafter. Disposed between supply spool 12 and the takeup spool 17 are ribbon guides at 18 and 19 for guiding the ribbon through a printing area at 18. The ribbon guide 18 lifts the ribbon 11a during each printing cycle in a manner well known to those skilled in the art. A ribbon drive means including a pair of rollers, such as, a drive roller 21 and an idler roller or pulley 22 which are disposed on opposite sides of the ribbon 11a for frictionally holding the ribbon 11a and for longitudinally moving the ribbon 11a in increments of escapement value depending on the width of the type characters in response to the rotation of the drive roller 21 in a clockwise direction. The escapement values may be 5 or 6 units for characters like *m* and *w* and 2 or 3 units of escapement value for the smaller characters like *i*. During printing in a proportional spacing mode the escapement value may be 1 unit when the carbon ribbon 11a is moved in a monospacing mode during printing of rough drafts. The escapement value may be 5 or 6 units for printing of all upper case characters. The idler pulley 22 is free to rotate on a shaft 23 mounted on a bracket 24. The bracket 24 is spring biased and pivotally mounted on a shaft (not shown) so that the idler pulley 22 may be moved away from the drive roller 21 during the threading of the ribbon 11a on the takeup spool 17. The drive roller 21 is coupled to a one-way clutch 53 so that the drive roller 21 can only rotate in one direction during movement of the ribbon 11a.

The takeup spool 17 includes a flat spool gear 25, a side plate 26 substantially parallel to the flat spool gear 25, and a

hub 27 rotatably mounted on a shaft (not shown). The sideplate 26 is fixed to the hub 27 by a spool release knob 28. Coupled to the spool gear 25 is a drive pinion 29 which is coupled to a clutch 30. The clutch 30 is connected to a pulley 32. The pulley 32 is connected to a drive means 33 by a belt 31. The drive means 33 may be, for example, the main drive of the printer or the structure disclosed in the aforesaid patent. The pulley 32 is rotatably supported on a frame 34 by a shaft 35.

The printer described in the aforesaid patent includes a ribbon lift bar 36 which is pivotally mounted on a shaft 37. The ribbon lift bar 36 includes a roller 38 which is swung in an arc about the shaft 37 each time a type character is printed. The arc is constant for all type characters printed whether upper case or lower case or whether in the proportional spacing mode or in the monospacing mode. Coacting with the ribbon lift bar 36 and the roller 38 through an adjustable bolt 41 is a bellcrank 42. The bellcrank 42 is pivotally mounted on a shaft 43 by a hub 44. The bellcrank 42 includes a body portion 45 which is normally at rest in a vertical position. The bellcrank 42 includes a latch portion 46, part of which coacts with an armature stop member 47 and with a biasing spring 48 which biases the bellcrank 42 in a counterclockwise direction. Connected to the bellcrank 42 is a link 51. The link 51 is connected to a rocker arm 52. The rocker arm 52 is coupled to the drive roller 21 through a one-way spring clutch 53 so that a force is translated to the drive roller 21 when the rocker arm 52 is moved in a clockwise direction and slips in the counterclockwise direction.

In accordance with the invention, the carbon ribbon mechanism 10 includes a solenoid 59 which includes the aforesaid armature stop member 47. The armature stop member 47 is pivotally mounted on a pin 55 which is fixed to a bracket 56. One end 57 of the armature stop member 47 is coupled to an armature 58 of the solenoid 59 through a linkage 61. The solenoid 59 is shown in a deenergized state and the armature 58 is biased away from the solenoid 59 by a spring 62 acting on the link 61. The other end of spring 62 is secured to pin 63. The solenoid 59 is of the latching type and includes latching contacts 64. The solenoid 59 is energized during the printing of characters requiring 2 or 3 units of escapement and is deenergized during printing of characters requiring 5 or 6 units of escapement or during printing of all upper case letters or characters. The solenoid 59 may be energized or deenergized when the ribbon 11a is moved in a monospacing mode as will now be described.

In accordance with the invention, an operator-controlled means 76 is provided for monospacing movement of the carbon ribbon 11a in 1 unit escapement values. The means 76 includes a ribbon control button 71 connected to a stop member 72 which includes a stop button 73. The carbon ribbon control button 71 and the stop button 73 are movable between operated and nonoperated positions to define a monospacing stop for the bellcrank 42 and more specifically with the body portion 45 of the bellcrank 42. The ribbon control stop member 72 and the ribbon control button 71 are retained in either of the aforesaid two positions by a detent spring 75.

It is conventional in some printers to notify the operator when the supply of carbon ribbon 11a is exhausted. This is accomplished by a ribbon supply arm 80 having a portion 82 protruding through an aperture 81 of the supply spool 12. Normally the supply arm 80 is held in the downward position by the carbon ribbon 11a so that as the carbon ribbon 11a is unreeled from the supply spool 12, portion 82 enters the supply spool 12 through the aperture 81 to close the normally open switch 83. It should be understood, of course, that the switch 83 may be normally open. A lamp 84 is connected in circuit with the switch 83 and is energized when the carbon supply ribbon 11a is exhausted.

Referring now to FIG. 2, a circuit 100 utilized in the carbon ribbon mechanism of FIG. 1 is shown. The solenoid 59 is in circuit with a source of DC power 86 which may be, for example, a -19V and in series with normally closed contacts 87 and 88 through lead 87a. The series normally closed contacts 87

and 88 are connected in parallel to normally open contacts 89 and 90 to a source of positive voltage 91 which may be +5V DC. It should be understood, of course, that the source of positive voltage 91 may be ground. The latching contact 64 of the solenoid 59 is connected in series with the normally open contacts 89 and 90 through lead 89a. A back-biased diode 92 is connected by lead 92a to a source of negative voltage 93 which, of course, may be the same source as voltage source 86.

In the operation of the carbon ribbon mechanism 10, the ribbon lift bar 36 and its associated roller 38 moves through a given arc for each and every character printed, including upper case characters. As was mentioned previously, characters like *m* and *w* may fall in a first group, while smaller characters like *i* fall in a second group. In accordance with the invention, the bellcrank 42 pivots about the shaft 43 during the printing of each character. When the roller 38 moves in a clockwise direction, the bellcrank 42 rotates in a counterclockwise direction at its maximum travel for all characters selected. The spring 48 yieldingly biases the bellcrank 42 in a counterclockwise direction to a rest position. In accordance with the invention, the rest position of the bellcrank 42 may be varied depending upon the unit of escapement required. As was previously mentioned, the 1, 3, or 6 units of escapement may be required. However, other units of escapement may be selected if desired. For example, when 6 units of escapement are required, all the contacts 87-90 in the circuit 100 are disposed as shown in FIG. 2. That is, contacts 89 and 90 are in the open position, while contacts 87 and 88 are in the closed position. Contacts 87-90 are part of the selector mechanism of the aforesaid patent which is hereby incorporated by reference. Contact 88 is associated with 6 units of escapement, while contact 87 is for upper case characters. Contacts 89 and 90 are for 2 or 3 units of escapement. When contacts 89 and 90 are open, solenoid 59 is deenergized so that the armature stop 47 is positioned above the latch portion 46 of the bellcrank 42. Further, when the ribbon control button 71 is depressed in a downward position as shown in FIG. 1, the bellcrank 42 moves through its maximum travel to move the rocker arm 52 in a clockwise direction and its associated drive roller 21 a maximum of 6 units of escapement.

When only 1 unit of escapement is required, such as in the typing of rough drafts, the ribbon control button 71 is elevated in an upward position so that the stop 73 engages the body portion 45 of the bellcrank 42 to limit the rotation of the bellcrank 42 to a new rest position. By limiting the rotation of the bellcrank 42, the rocker arm 52 is moved through only 1 unit of escapement and drives the drive roller 21 a corresponding amount. Thus, the carbon ribbon 11a is only moved in 1 unit of escapement.

When 3 units of escapement are desired, such as in the typing of characters like *i* in the second group, the contacts 89 or 90 are closed upon the selection of a character in this group to thereby provide a sufficient potential across the solenoid 59. As was previously mentioned, the closure of contacts 89 and 90 may also provide a ground for the solenoid 59. When the solenoid 59 is energized, the armature 58 is moved towards the coil in the solenoid 59 rotating the armature stop 47 in a counterclockwise direction so that the bellcrank 42 is limited to a third rest position when the latch portion 46 engages the armature stop 47.

From the foregoing description, it may be seen that the bellcrank 42 is limited in travel to a rest position in one of three positions, two of which are determined by the energization or the deenergization of the solenoid 59 while the third position is operator controlled by a stop member 72 and its associated stop 73. Thus, carbon ribbon 11a may be moved in a proportional spacing mode or in a monospacing mode selectively.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein without departing from the spirit and scope of the invention.

I claim:

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1. In a printer for selectively printing characters falling within first and second width groups, a carbon ribbon mechanism comprising:

- a. a source of carbon ribbon;
- b. a takeup spool;
- c. guide means disposed between said source and said takeup spool for guiding said carbon ribbon across a print area for said characters;
- d. means including a pair of rollers frictionally engaging said carbon ribbon therebetween for moving said carbon ribbon longitudinally in response to rotation of at least one of said rollers;
- e. first means including a bellcrank for rotating said one roller in response to the printing of each of said characters;
- f. solenoid means coupled to said bellcrank for defining first and second stop positions for said bellcrank in response to the printing of a character from either of said first and second width groups, respectively, so that said one roller rotates a first increment and a second increment when characters within said first and second width groups are printed, respectively; and

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g. operator-controlled stop means selectively positioned in cooperative relationship with said bellcrank for defining a third stop position for said bellcrank to limit the rotation of said one roller to a predetermined third increment which is less than either of said first and second increments irrespective of the width group to which the printed character, initiating the rotation, belonged.

2. The invention defined in claim 1 and further including takeup means coupled to said takeup spool for continuously and yieldingly urging the rotation of said takeup spool so that said ribbon is wound on said takeup spool only when said one roller rotates.

3. The invention defined in claim 1 wherein said solenoid means includes a solenoid normally deenergized during the printing of characters falling within one of said first and second width groups and energized during the printing of characters falling within the other one of said first and second width groups.

4. The invention defined in claim 1 and further including means connected to said source of carbon ribbon for indicating when said carbon ribbon is exhausted.

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