

# PATENT SPECIFICATION

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## (54) IMPROVEMENTS IN AND RELATING TO RIBBON CARTRIDGES

(71) We, SCM CORPORATION, a corporation of the State of New York, United States of America, of 299 Park Avenue, New York, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to ribbon cartridges for printing machines, such as typewriters.

The present invention provides a ribbon cartridge for a printing machine, the cartridge having a housing with a chamber for the ribbon and an entrance opening for the ribbon, and two rotatable members journaled in the housing adjacent the entrance opening for feeding the ribbon between the said members, eccentrics mounted for rotation with said rotatable members, and fingers engaging the eccentrics for oscillation by the eccentrics to strip the ribbon from the rotatable members and pack the stripped ribbon in the chamber.

A preferred form of ribbon cartridge is very simple in structure because it obviates the need for supply and take-up spools and their interrelated drives; eliminates the need for a separate, variably-positionable ribbon support mechanism, and incorporates a ribbon feed which stores the ribbon in the cartridge in random folds and may precrease it for more compact storage. The cartridge may contain inked ribbon, carbon ribbon, or the like and is readily interchangeable with similar cartridges. "Spool" herein refers to a flanged ribbon bobbin. "Spoolless" herein refers to an endless ribbon supported in a cartridge in random folds (without a spool or bobbin) as well as to a ribbon supported in a cartridge in the form of a roll on a flangeless coil or bobbin. By providing interfitting pivot members on each cartridge and on a support in the typewriter, an old cartridge can be lifted out of the support and a

replacement cartridge dropped on to the latter with an easy, simple motion and pressed into position for print-operation controlled rocking of its supported ribbon to alternate upper and lower positions as determined by a ribbon lift mechanism. Further, ribbon feed members are built into the cartridge and operated by a mechanism forming part of the ribbon lift mechanism.

The ribbon cartridge is preferably spoolless and prethreaded and adapted to use a single-pass carbon ribbon to provide a low-cost, "throw-away" type of cartridge for such ribbons requiring little skill for insertion and removal.

Features and advantages of the invention will be apparent from the following description of preferred embodiments of the invention given by way of example with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a ribbon cartridge and a lift and feed mechanism for use with the present invention;

Figure 2a is an enlarged perspective view of the ribbon feed entrance of the cartridge of Figure 1, showing the ribbon disposed between dual feed gears with oscillating packing fingers for moving the entered ribbon away from the feed gears, while Figure 2b is a plan view of same including a feed ratchet, pawl and detent;

Figure 3 is a perspective view of a further embodiment of a ribbon cartridge again including the lift and feed mechanism shown in Figure 1; and

Figure 4 is an enlarged perspective view of the ribbon supply exit of the cartridges of Figure 1 or Figure 3, showing the integral ribbon guides within the cartridge housing.

Referring now to Figures 1 to 4, these show the typewriter ribbon supply and its left and feed mechanism as particularly applied to a typewriter having a single multi-character print element movable laterally over the surface of a document supported on a laterally-fixed platen, although the concept is equally applicable to typewriters

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5 having a laterally movable document carriage and multiple typebars. A fabric ribbon cartridge 1 is shown generally in Figure 1 and a carbon ribbon cartridge 61 is shown in Figure 3, the cartridges being interchangeably insertable in a support bracket 3 rigidly mounted on a support (not shown) for the print element 42 (shown in dotted outline) of the example, or forming part of the typewriter frame if applied to a typewriter having multiple typebars supported in a fixed segment of the typewriter frame. Cartridges 1 are each pivotable about pivot studs 4, 5 fixed to vertical side flanges 2a, 2b of support bracket 3. The studs 4, 5 enter notches 9 (only one shown in Figure 1) formed in the sidewall of each cartridge 1, 61 to allow ready insertion and removal by a simple "drop-in/lift-out" technique and for locating the ribbon with respect to the platen. A latch (not shown) may lock the cartridge down.

25 The ribbon cartridge 1 is in the form of a generally U-shaped housing forming a chamber 7. Side-wall 6 of cartridge 1 is of sufficient depth to permit a vertically-oriented ribbon 8 to be accommodated in the chamber 7. The base 10 of chamber 7 is of sufficient area to accept a predetermined length to fabric ribbon 8. Two projecting members or parts 13a, 13b of cartridge 1—which form the arms of the U—function as supports and guides for the active portion 8a of fabric ribbon 8. The spacing between portions 13a, 13b and their length is such as to accommodate the entry of print element 42 into printing position relative to the active ribbon portion 8a. In cartridge 1, ribbon 8 is an endless ribbon supplied with and prethreaded in cartridge 1 so that during a typing operation, ribbon 8 is pulled to the right (as shown by the arrow on portion 8a in Figure 1) through an exit 56 of cartridge 1 to present successive fresh surfaces of ribbon 8 as the active ribbon portion 8a between the multi-character single print element 42 and the usual record medium 14 supported on a platen 15, the ribbon movement resulting from rotation of feed gears 11 and 12, described in detail subsequently. Gears 11, 12 serve as the inlet to chamber 7 and their rotations stuff the recently used, now inactive section of ribbon 8 into chamber 7.

55 In addition to chamber 7, cartridge 1 contains within it fixed, integral pairs of exit guide members 45, 46 and 47, 48 (best seen in Figure 4), oriented to ensure smooth egress of ribbon 8 from cartridge 1, and to prevent previously entered sections of ribbon 8 from being prematurely forced out of the chamber 7. Guide members 47, 48 have a gap 56 between them equivalent to the thickness of ribbon 8, which gap 56

forms the exit of cartridge 1. The inner guide members 45, 46 are spaced slightly further apart than the exit guide members 47, 48 so that the exiting portion of ribbon 8 is funnelled from a multiple ribbon thickness at the entrance to guide members 45, 46 to a single ribbon thickness at guide members 47, 48 to ensure proper egress.

75 As mentioned previously, after passage through exit gap 56 in the left projection 13b of cartridge 1, the active portion 8a of ribbon 8 passes between print element 42 and record medium 14 to the right projection 13a of cartridge 1, where it is subsequently picked up by the feed gears 11, 12. Ribbon 8 may be guided in this traverse by means of two chutes 58a, b, a respective one of the chutes forming part of sidewall 6 in the area of projections 13a, 13b. Chutes 58a, b may be provided with flanges 59 for better control, if desired (see Figure 2a). Ribbon feed-in gear 11 (see Figure 2b), fixed on a vertical shaft 55a, has two spaced eccentrics 49 in its periphery (for a purpose explained subsequently) and its teeth 17a mesh loosely with teeth 17b of a gear 12, fixed on a parallel shaft 55b, and identical to gear 11 except that gear 12 has an extra two teeth. The distance between the shafts and the gear sizes is such that space 16 between gears 11, 12 is approximately the thickness of ribbon 8 so as to insure proper feeding of ribbon 8 between gears 11, 12 during the gear drive operation for re-entry of now inactive ribbon 8 into chamber 7. Fixed to shaft 55a is a drive ratchet 53, the teeth 50 of which cooperate with a feed pawl 38 to rotate feed gear 11 in the counterclockwise direction. Re-entry of ribbon 8 into chamber 65a could be achieved with a pair of plain rollers (not shown), but ribbon 8 tends to stick to such rollers. The problem of sticking is solved by use of the loosely-meshed gears 11, 12 as drive members and, furthermore, precreasing of ribbon 8 by action of teeth 17a, 17b provides better packing of ribbon 8 within chamber 7, as explained subsequently.

115 Maintenance of proper tension on the active portion 8a of ribbon 8 during a print operation is assured by a spring member 57 (see Figure 4 for best view) positioned near ribbon exit gap 56. Spring member 57 has a formed end 60 adjacent feed-out guide chute 58b and is fastened to sidewall 6 by rivets 62, or the like, the length of end 60 being such that spring 57 is under stress when fastened to sidewall 6. If cartridge 1 is plastic, spring 57 may be integrally molded. Ribbon 8, inserted between the formed end 60 and guide chute 58b, is therefore clamped between the two and subject to friction force exerted by spring 57. Ribbon 8 is thus held substantially taut since on the other side, feed gears 11, 12 are locked

against reverse rotation by interaction of a detent 63 and ratchet 53 on top of gear 11.

To facilitate the above-mentioned packing and to prevent ribbon crowding in the area near the outlet of gears 11, 12, a pair of fingers 51a, 51b are each mounted in eccentrics on shafts 55a and 55b 49 by means of their arcuate clasp members 52 (note that the upper portion of gear 11 has been removed in Figure 2a for better visibility of the members described). A sliding fit between clasp members 52 and eccentrics 49 thus tends to oscillate members 51a, 51b not only together and apart, but also back and forth as eccentrics 49 rotate with shafts 55a, 55b. Friction between clasp members 52 and eccentrics 49 and/or the pressure of the entered ribbon portion 8b keeps ends 64 of fingers 51a, 51b in contact with and therefore oscillating along, the inside of sidewall 6 and the inside of the sidewall of the projection 13a respectively (not shown in Figure 2a). In this fashion, as ribbon 8 is being creased and stuffed into chamber 7 during rotation of shaft 55a, fingers 51a, 51b projecting inwardly into chamber 7 serve to strip ribbon 8 from gear 11, 12 and oscillation of these fingers pushes the creased ribbon 8 away from the area near gears 11, 12.

As shown in Figure 3, the second embodiment provides a carbon ribbon cartridge 61 which is identical to the cartridge 1 with the exception that the base 10 is partitioned into two chambers 65a, 65b, the first chamber 65a being of sufficient area to accept the used portion 66b of the carbon ribbon 66 from a "spoolless" supply roll 67. Roll 67, confined in the second chamber 65b, has a flangeless bobbin 67a and is rotatable around a pin 69 located in a slot 68. The purpose of slot 68 is to enable the operator to judge the amount of ribbon 66 remaining on roll 67 so that its exhaustion will not catch the operator unawares. There is no need for communication between chambers 65a and 65b, since ribbon 66 is nonreusable and travels past print element 42 only once. Accordingly, when the nonreusable ribbon 66 on supply roll 67 is exhausted, cartridge 61 is discarded.

The drive means for lifting ribbon 8 and for feeding fresh ribbon to print element 42 will next be described, in relation to its use with the cartridge shown in Figure 1. An identical drive means is used for lifting ribbon 66 in cartridge 61. As seen in Figure 1, a lift bellcrank 18 is rockably supported on pivot 5, bellcrank 18 being in the form of an inverted "V" with arms 19, 22. Arm 19 of bellcrank 18 has an ear 39 formed into its upper margin (as seen in Figure 1), ear 39 being of such length as to project under and give support to cartridge 1. Location of a similar ear 40 on the upper margin of arm 22

allows the previously-mentioned "drop-in" mode of insertion of cartridge 1, abutment of ear 40 with a second point under cartridge 1 providing the necessary alignment of notches 9 and pivots 4,5. The other arm 22 of bellcrank 18 terminates in pivot disc 23 which is retained within a yoke 24 of an upward extension 25 of a bail 26. Bail 26 is pivotably supported on a stud 27 mounted on the support (not shown) for print element 42 (or on a frame member in the case of a conventional typewriter).

A lower extension 28 of bail 26 has a cam roller 29 rotatably mounted at the free end of extension 28 (i.e., remote from stud 27). Bail 26 is adapted to rock back and forth because cam roller 29 lies within the symmetrical, approximately elliptical path defined by a camming slot 30 cut into a face 31 of a gear 32. Gear 32—also mounted on the support for print element 42—is in mesh with a like-mounted actuating gear 33 driven by a power roll shaft 34. An axial slot 70 on the surface of shaft 34 and a mating tooth 71 in gear 32 provide lateral slidability of gear 33 on shaft 34 (only in the case of the single print element typewriter of the example, gear 33 being laterally fixed in the case of a conventional typewriter).

At its free end (i.e. remote from pivot 5), arm 19 supports a pivot 20 upon which is rockably mounted a feed bellcrank 21, which has two arms 35, 36. Arm 35, sinuous in contour, has a slot 37 which controls movement of feed bellcrank 21 during the latter's operation by reason of cooperation with a projecting stud 41 fixed to flange 2 of lift bracket 3. Arm 36 of drive bellcrank 21 terminates in pawl 28, previously mentioned.

The lift actions of bellcrank 18 which result in a corresponding ribbon drive action through bellcrank 21 will next be described (still using cartridge 1 for reference). Considering now a complete operational cycle, whenever a key button (not shown) corresponding to a selected character is depressed, a power roll single-turn clutch (again not shown, but known) is engaged with the result that power roll shaft 34 and gear 33—engagingly, but laterally movably mounted upon shaft 34—are driven one revolution clockwise. Gear 32 having a diameter exactly twice the diameter of gear 33, each clockwise revolution (one cycle) of gear 33 therefore rotates gear 32 counterclockwise one-half revolution. The first quarter-revolution, say, of gear 32 (a half-cycle of gear 33) displaces cam roller 29 from its dwell 54a to a first cam lobe 43, this lobe being the higher one of two lobes 43, 44 in camming slot 30, both these lobes including a constant radius portion at their peaks so that ribbon 8 may be held still during printing, in known

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fashion. Consequently, as bail 26 pivots clockwise about stud 27, lift bellcrank 18 pivots counterclockwise about stud 5, and cartridge 1 is urged counterclockwise by cooperation with ears 39, 40 on arms 19, 22, thereby bringing ribbon portion 8a to its uppermost position (corresponding to the peak of lobe 43), such that the character font of print element 42 selected by the key button depressed will contact the lower half of the active ribbon portion 8a and record the selected character on record medium 14, as print element 42 proceeds through a print cycle in known fashion.

Simultaneously, ribbon feed bellcrank 21 being pivotably mounted about stud 20 fixed to arm 19 of bellcrank 18, and having its pivoting motion further controlled by cooperation between camming slot 37 in its arm 35 and stud 41 fixed to bracket 3, also pivots counterclockwise, preparatory to a feeding engagement between pawl 38 and the next tooth 50a of ratchet 53. Camming slot 37 is shaped such as to aid in limiting the travel of pawl 38 to an amount sufficient to pick up just the one tooth 50a. In Figure 2b, it will be noted that during counterclockwise rotation of bellcrank 21, the furthest retracted position of pawl 38 (shown by a dotted outline) is shifted to the left—that is, behind the next tooth 50a of ratchet 53. This is accomplished through use of a resilient material (such as an acetal plastic) for bellcrank 21 or by providing stud 20 with a head portion and urging bellcrank 21 leftward in known fashion by means of a compression spring (not shown) inserted between the bellcrank and the head of stud 20.

In the second quarter-revolution of gear 32, say, the reverse sequence occurs in that cam roll 29 traverses from lobe 43 to cam dwell 54b equal in height to cam dwell 54a, resulting in return of ribbon cartridge 1 to its normal position in which the printed line on record medium 14 is visible. During this second half of the cycle, ribbon feed bellcrank 21 now rotates clockwise about pivot 20 causing pawl 38 to engage tooth 50a of ratchet 53, pawl 38 having fallen behind tooth 50a during the first half of the cycle, it will be recalled. Thus, feed gear 11 is rotated counterclockwise, in mesh with driven feed gear 12.

Because the cartridges have ribbon 8 prethreaded between feed gears 11 and 12, then during rotation of these gears, meshing ones of their respective gear teeth 17a, 17b contact ribbon 8, the different number of teeth reducing the tendency of ribbon 8 to stick to gears 11, 12. Note that the teeth 17a, 17b are the same size and shape, the teeth then induce therein an equally-spaced, vertical creasing which facilitates entry into chamber 7 in a more condensed fashion,

resulting in a greater volume of ribbon being storable in a cartridge of given size. Rotation of these gears also moves ribbon 8 across the span between supports 13a, 13b to place fresh ribbon in front of print element 42, as previously described.

On the following selection of a key button, another clockwise revolution (one cycle) of gear 33 causes the second half-revolution of gear 32. In this second half-revolution, cam roller 29 starts at dwell 54b, progresses to the highest portion of lobe 44, which has a rise smaller than that of lobe 43; and then returns to dwell 54a, the original starting point in the foregoing description. The actions during this second cycle are similar to those described for the first cycle, except that the smaller rise of lobe 44 moves lift bellcrank 18 through a smaller arc and thus rocks cartridge 1 a correspondingly small amount so that the selected character font of print element 42 now contacts the upper portion of ribbon 8 during the print action by element 42. The alternating upper and lower impressions on the ribbon result in a more economical ribbon usage. It should also be remarked that the design of the drive mechanism may be made such that a ribbon motion of half a character space occurs in each cycle which would result in staggered arrangements of the letters H marked on the ribbon, or such that a ribbon motion of a full character space occurs only after two impressions have been made on record medium 14, that is, only in every other cycle of gear 33 which would result in the aligned arrangement of the letter H illustrated in Figure 2a. The latter type of feed motion could be achieved, for instance, by choosing dimensions of the respective bellcranks and the shape of slot 37 such that the second movement of bellcrank 18 would be insufficient to bring pawl 38 behind tooth 50a.

Between impression cycles, the power roll clutch is disengaged, of course, rendering power roll shaft 34 and lift and feed bellcranks 18, 21 stationary until another character imprint is desired, at which time the above-described operational sequence is repeated upon depression of a further keybutton.

The above description discloses a novel spoolless ribbon cartridge and a combined ribbon lift and feed mechanism therefor, adaptable to printing machines, comprising a cartridge 1 storing a supply of endless fabric ribbon 8 or a cartridge 61 storing a roll of carbon ribbon 8, and having built-in ribbon supports 13a, 13b over which the ribbon passes to built-in ribbon feed members 11, 12, 53 which crease the ribbon while returning it to the cartridge for storage therein in folded fashion, and which cooperate with a combined ribbon lift and

ribbon feed drive mechanism 18, 21, 26, 29, 30 on the machine, that mechanism being operated by a shaft 34 driven by the usual power roll.

two portions, one of said portions being arranged to receive ribbon to be used and the other of said portions being arranged to receive ribbon from said fingers. 35

5 WHAT WE CLAIM IS:—

1. A ribbon cartridge for a printing machine, the cartridge having a housing with a chamber for the ribbon and an entrance opening for the ribbon, and two rotatable members journaled in the housing adjacent the entrance opening for feeding the ribbon between the said members, eccentrics mounted for rotation with said rotatable members, and fingers engaging the eccentrics for oscillation by the eccentrics to strip the ribbon from the rotatable members and pack the stripped ribbon in the chamber.

5. A cartridge according to any one of the preceding claims, wherein the housing is provided with two projecting members arranged to support a portion of the ribbon externally of the housing in a position for use in the printing machine. 40

2. A cartridge according to claim 1, in which the housing has sidewalls, and the fingers have clasp members that mate with the eccentrics and free ends that oscillate along the sidewalls when the fingers are oscillated by the eccentrics.

6. A cartridge according to any one of the preceding claims, wherein one of said rotatable members is provided with a ratchet and pawl device for ensuring that said rotatable member can rotate in only one direction. 45

3. A cartridge according to claim 1 or 2, in which the rotatable members are gear wheels with different numbers of teeth help prevent the ribbon from sticking to the gear wheels.

7. A cartridge according to claim 6, wherein said ratchet is accessible from the exterior of the housing whereby to drive said one rotatable member. 50

4. A cartridge according to any one of claims 1 to 3, further comprising a partition in the housing dividing the chamber into

8. A ribbon cartridge substantially as hereinbefore described with reference to Figures 1, 2a, 2b and 4 or Figures 2a, 2b, 3 and 4 of the accompanying drawings. 55

9. A printing machine including a ribbon cartridge according to any preceding claim.

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2. A cartridge according to claim 1, in which the housing has sidewalls, and the fingers have clasp members that mate with the eccentrics and free ends that oscillate along the sidewalls when the fingers are oscillated by the eccentrics.

3. A cartridge according to claim 1 or 2, in which the rotatable members are gear wheels with different numbers of teeth help prevent the ribbon from sticking to the gear wheels.

4. A cartridge according to any one of claims 1 to 3, further comprising a partition in the housing dividing the chamber into

two portions, one of said portions being arranged to receive ribbon to be used and the other of said portions being arranged to receive ribbon from said fingers.

5. A cartridge according to any one of the preceding claims, wherein the housing is provided with two projecting members arranged to support a portion of the ribbon externally of the housing in a position for use in the printing machine.

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