United States Patent [19]

Caudill et al.

[11] **3,731,781**

[45] **May 8, 1973**

[54] RIBBON SUPPLY CARTRIDGE

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[22] Filed: **June 2, 1971**

[21] Appl. No.: **149,267**

Related U.S. Application Data

[60] Division of Ser. No. 752,096, July 16, 1968, Pat. No. 3,604,549, which is a continuation-in-part of Ser. No. 609,136, Jan. 13, 1967, abandoned.

[52] **U.S. Cl.** **197/151**

[51] **Int. Cl.** **B41j 33/14**

[58] **Field of Search** 197/151, 157, 172, 197/173, 175, 187; 206/52; 242/57.1, 58, 67.3

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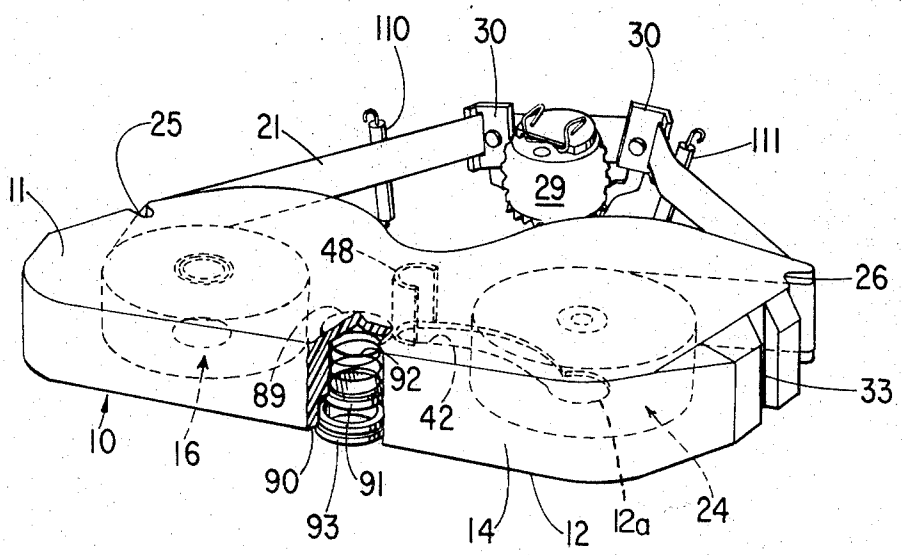
[57] **ABSTRACT**

A cartridge, which is removably mounted on a base plate, has a supply spool and a take-up spool rotatably mounted therein with the ends of the single pass ribbon attached thereto. The bottom wall of the cartridge has a curved slot to receive a resiliently biased drive roller, which is rotatably mounted on a pivotal arm on the base plate and has pointed projections thereon for penetrating the inked ribbon on the take-up spool to linearly advance the ribbon past its printing position. The cartridge has a cylindrical recess to receive a portion of the gear train. When the ribbon is a solvent coated plastic transfer matrix whereby overstriking is desired, then resiliently biased means is disposed within the recess in the cartridge to render the change means operative to reduce the amount of rotation of the drive roller. If a total release ribbon is used wherein no overstriking is desired, then the recess in the cartridge is empty and the larger amount of rotation of the drive roller occurs because the change means is not rendered operative.

5 Claims, 13 Drawing Figures



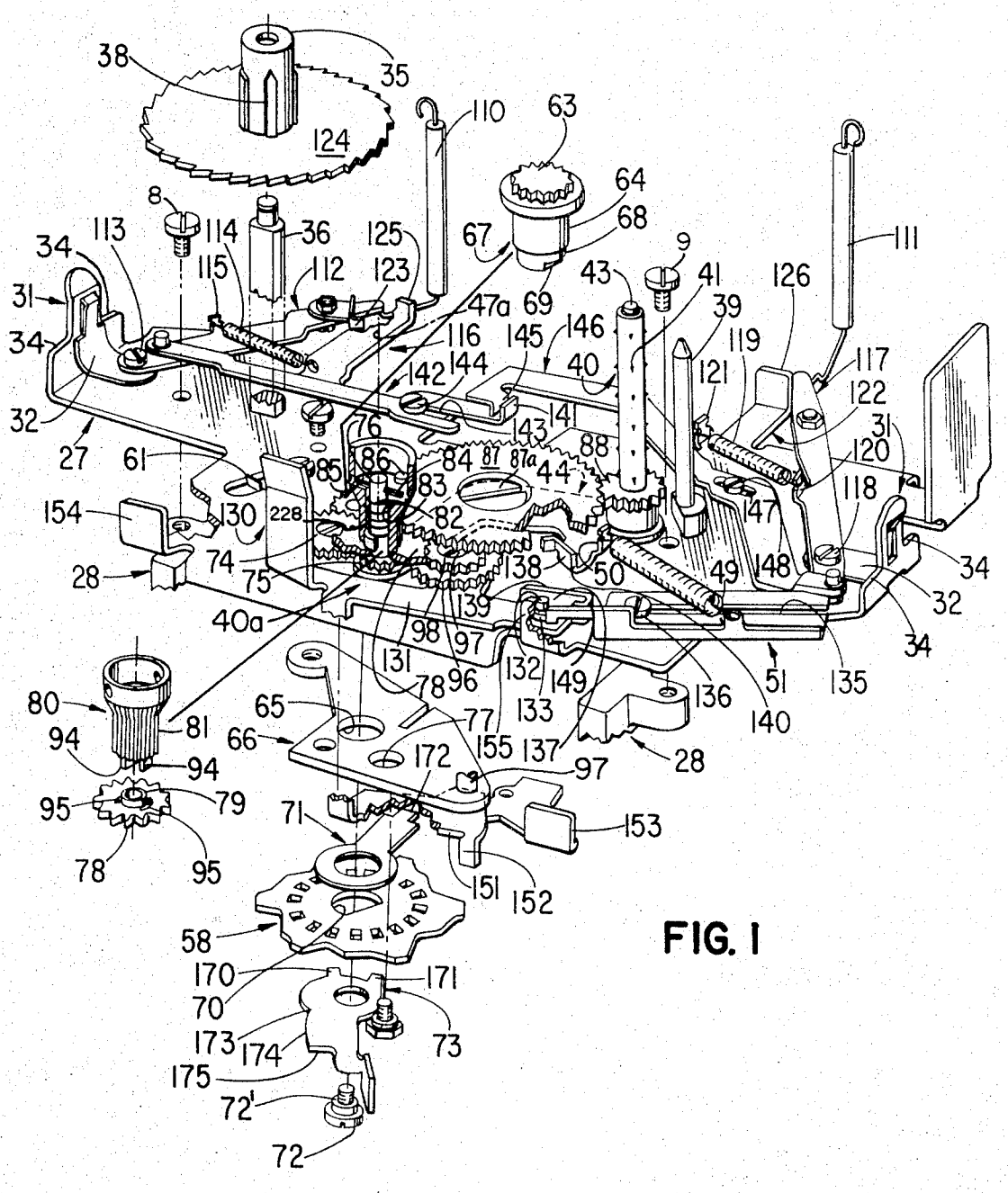


FIG. 1

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BY

ATTORNEY

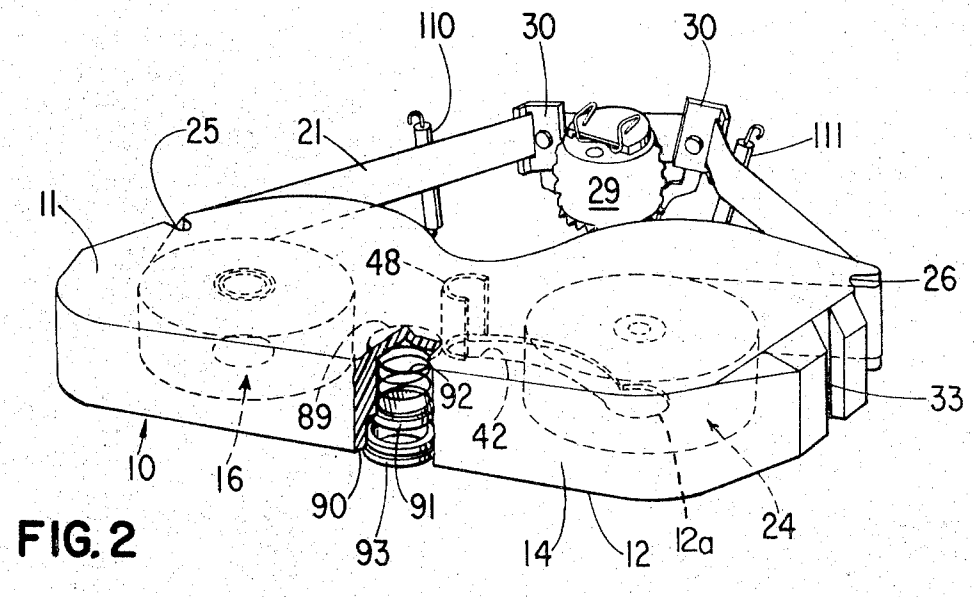

FIG. 2

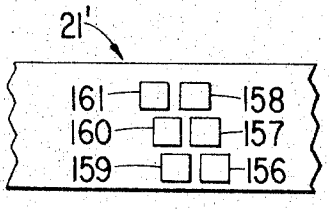

FIG. 6

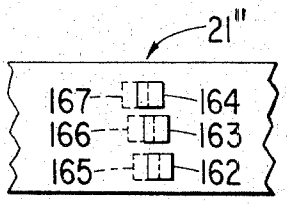

FIG. 7

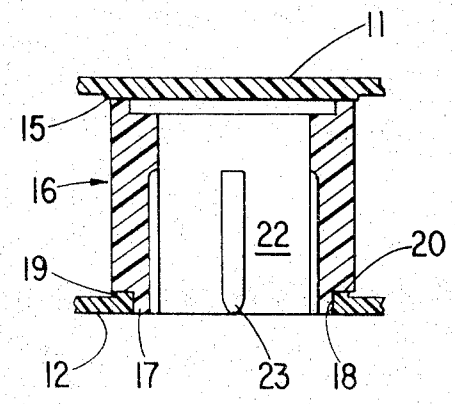

FIG. 3

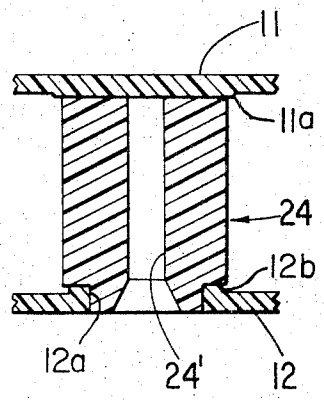

FIG. 4

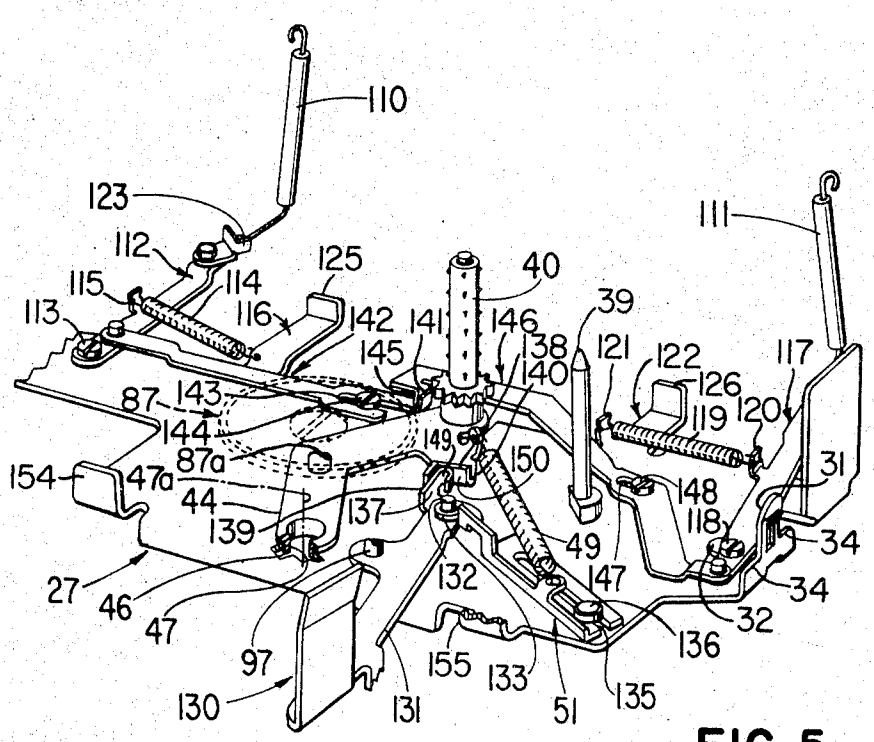
110
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FIG. 5

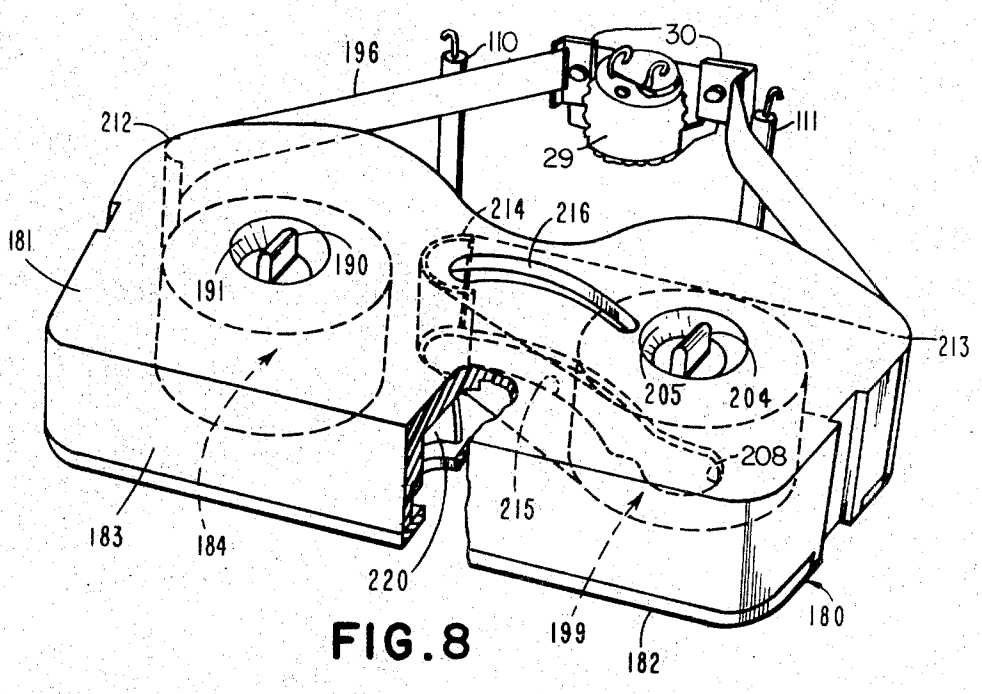

FIG. 8

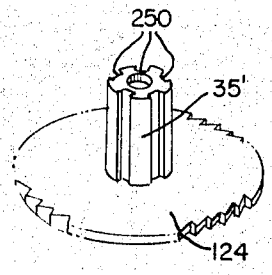

FIG. 13

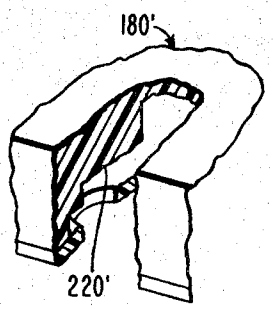

FIG. 12

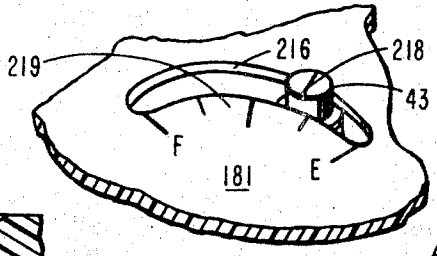

FIG. 9

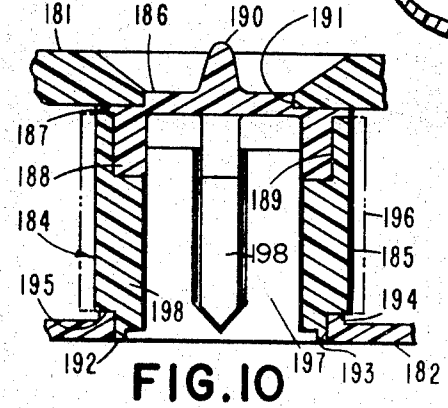

FIG. 10

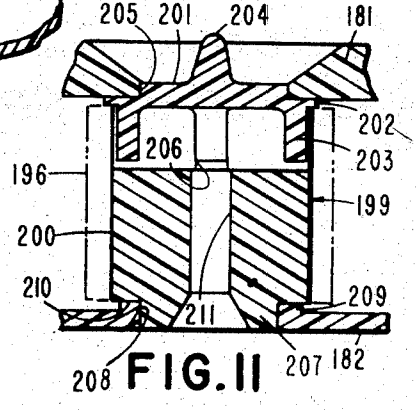

FIG. 11

RIBBON SUPPLY CARTRIDGE

This application is a divisional application of application Ser. No. 752,096 filed July 16, 1968 now U.S. Pat. No. 3,604,549, which is a continuation-in-part of application Ser. No. 609,136, filed Jan. 13, 1967, now abandoned.

When a total release ribbon such as a carbon ribbon, for example, is employed with a typewriter for printing purposes, it is desired that maximum utilization of the ribbon be obtained since the ribbon makes only a single pass through a printing position. However, there can be no overstriking of a previously printed area of a carbon ribbon for satisfactory printing. Thus, when a carbon ribbon is to be fed by a ribbon feed mechanism through a printing position, it is desired that a substantially constant linear or longitudinal amount of the ribbon be metered past the printing position during each ribbon feed cycle with the amount of linear movement being sufficient to insure that there is no overstriking.

When employing a single pass ribbon of the solvent coated plastic transfer matrix type such as that shown and described in the application of H. T. Findlay et al., Ser. No. 536,557, filed Mar. 7, 1966, now U.S. Pat. No. 3,413,184, and owned by the same assignee as the assignee of the present application, print operations may take place on the ribbon in overlapping areas. A small amount of ink is forced from small pockets in which it is entrapped. Since no time is needed for recovery after each print operation, the ribbon can be utilized in a singe pass through a printing position. Thus, to obtain maximum utilization of a plastic ribbon during its single pass through the printing position, the amount of linear movement of the ribbon past the printing position is substantially smaller than that required when a carbon ribbon is employed.

In order to wind a ribbon on its take-up spool, a force is applied to the take-up spool. In the prior ribbon feed mechanisms, this force has been selected to provide the force required to wind the ribbon on its take-up spool when the maximum diameter of the ribbon is wound on the take-up spool. Thus, in the prior ribbon feed mechanisms, when only a small amount of the ribbon has been wound on the take-up spool, the force applied to the take-up spool is much greater than required whereby a greater tension exists on the ribbon.

When a plastic ribbon is being wound on its take-up spool, the application of the relatively large force of the prior ribbon feed mechanisms to the take-up spool during initial winding of the plastic ribbon on the take-up spool may cause breaking of the ribbon. This is because the plastic ribbon is thin and relatively weak.

The present invention satisfactorily overcomes this problem by applying the ribbon winding force to the outer periphery of the ribbon, which is being wound on the take-up spool. As a result, the increasing diameter of the ribbon on the take-up spool does not affect the tensile load on the ribbon as in the prior ribbon feed mechanisms. Accordingly, the problem of a plastic ribbon breaking due to a relatively large force applied thereto is eliminated.

This arrangement of applying the ribbon winding force to the outer diameter of the ribbon, which is wound on the take-up spool, also permits a tighter winding of the ribbon on the take-up spool so that a greater amount of the ribbon may be wound on the take-up spool for a given diameter. This is due to

preventing any slippage of the ribbon wound on the take-up spool.

As a result of the tighter winding of the ribbon on the take-up spool, the take-up spool may be substantially the same diameter as the supply spool rather than substantially larger as in prior ribbon feed mechanisms. When using a cartridge with the supply and take-up spools rotatably mounted therein, this permits a more efficient use of the space within the cartridge housing.

In order to rotatably support a spool within a cartridge housing, openings have previously been formed in both the top and bottom walls of the cartridge housing to provide bearing surfaces. In one embodiment, the present invention eliminates the need for any openings in the top wall of the cartridge housing so that a substantially smooth top wall is provided whereby manufacturing costs of the cartridge are reduced.

When using a cartridge, the typist is not able to see the amount of ribbon that has been advanced from the supply spool to the take-up spool. Therefore, the typist does not know when the single pass ribbon within the cartridge will be completely utilized. Thus, the possibility exists that the typist may fail to order other cartridges containing single pass inked ribbons in sufficient time.

One embodiment of the present invention satisfactorily solves the foregoing problem by providing indicating means on the cartridge to show the amount of inked ribbon that has been advanced from the supply spool to the take-up spool. Thus, the typist may easily discern the amount of ribbon still available for use within the cartridge.

An object of this invention is to provide an improved cartridge for a single pass ribbon.

Another object of this invention is to provide a cartridge for an inked ribbon that is relatively inexpensive, easy to manufacture, and well adapted for plastic molding techniques.

A further object of this invention is to provide a cartridge for a single pass inked ribbon in which the cartridge has indicating means to show the amount of ribbon still available for use within the cartridge.

The foregoing and other objects, features, and advantages of the invention will be apparent from the following more particular description of preferred embodiments of the invention, as illustrated in the accompanying drawing.

In the drawing:

FIG. 1 is an exploded perspective view of the portion of the ribbon mechanism attached to the typewriter, on which the cartridge may be used.

FIG. 2 is a perspective view of one embodiment of a removable cartridge used in conjunction with the structure of FIG. 1.

FIG. 3 is a fragmentary sectional view of a portion of the cartridge of FIG. 2 and showing the mounting of one of the spools therein.

FIG. 4 is a fragmentary sectional view of another portion of the cartridge of FIG. 2 and showing the mounting of the other of the spools therein.

FIG. 5 is a perspective view showing portions of the structure of FIG. 1 in a cartridge loading and unloading position.

FIG. 6 is a plan view of a portion of a carbon ribbon and showing the pattern of printing thereon.

FIG. 7 is a plan view of a portion of a plastic ribbon and showing the pattern of printing thereon.

FIG. 8 is a perspective view of another embodiment of the removable cartridge used in conjunction with the ribbon advancing mechanism of FIG. 1 but slightly modified.

FIG. 9 is an enlarged perspective view of a portion of the cartridge of FIG. 8 and showing the details of the indicating device.

FIG. 10 is a fragmentary sectional view of a portion of the cartridge of FIG. 8 and showing the mounting of one of the spools therein.

FIG. 11 is a fragmentary sectional view of another portion of the cartridge of FIG. 8 and showing the mounting of the other of the spools therein.

FIG. 12 is a fragmentary perspective view of a modified cartridge similar to that shown in FIG. 8 but arranged to be particularly suited for containing an overstrike type ribbon.

FIG. 13 illustrates a form of the supply spool shaft with slots therein.

For a complete description of and the operative relationships of ribbon feed mechanism elements **40***a*, **61**, **63–72**, **72***f*, **73**, **74**, **77**, **83**, **85**, **87**, **87***a*, **88**, **96–98**, **112–122**, **125**, **126**, **132**, **133**, **135–155**, and **170–175**, which are detailed and explained in co-pending application Ser. No. 752,096, now U.S. Pat. No. 3,604,549, the parent application of this application and reference is made thereto. Screws **8**, **9** serve to attach the base plate **27** to the carrier **28** of the typewriter. All of the above elements are related to the ribbon feed assembly which is the subject of the parent application, and is not essential to the understanding of the invention in this specification and claims.

Referring to the drawing and particularly FIG. 2, there is show a cartridge, which is formed by housing **10**. The housing **10**, which is preferably formed of a lightweight plastic material, includes an upper wall **11**, a lower or bottom wall **12**, and a continuous side wall **14** joining the upper wall **11** and the lower or bottom wall **12**.

As shown in FIG. 3, the upper wall **11** has a raised or projecting portion **15** extending from its surface within the housing **10**. A supply spool **16** is disposed within the housing **10** and has an annular end engaging the raised portion **15** of the upper wall **11**.

The other end of the supply spool **16** has an annular portion **17**, which is disposed within an opening **18** in the lower wall **12** of the housing **10**. A raised portion **19** extends from the surface of the bottom wall **12** within the housing **10** for cooperation with a shoulder **20** on the supply spool **16**.

The raised portions **15** and **19** insure that an inked ribbon, **21**, which has one end attached to the supply spool **16**, does not contact either the upper wall **11** or the lower wall **12** of the housing **10**. The only support for the supply spool **16** within the housing **10** is at the lower wall **12**. The cooperation between the raised portion **15** on the upper wall **11** and the end of the supply spool **16** is merely a bearing surface.

The supply spool **16** has a cylindrical passage or recess **22** extending therethrough. The wall of the passage **22** has a plurality of equally angularly spaced longitudinal passages or keyways **23** formed thereon.

As shown in FIG. 4, the housing **10** has a take-up spool **24** rotatably mounted therein in the same manner as shown for the supply spool **16** in FIG. 3. The take-up spool **24** has a cylindrical passage **24'** much smaller in diameter than passage **22** and does not have any keyways formed therein. The other end of the ribbon **21** is attached to the take-up spool **24**.

The upper end of the take-up spool **24** bears against a raised portion **11***a* extending from the lower surface of the upper wall **11**. This is the only contact for the upper end of the take-up spool **24**. The lower end of the take-up spool **24** is disposed within an opening **12***a* (and bears on a raised portion **12***b*) of the lower wall **12** of the housing **10**.

The ribbon **21** extends from the supply spool **16** to the exterior of the housing **10** through a slot **25**, which is formed in the side wall **14**. The ribbon **21** returns to the interior of the housing **10** through a second ribbon slot **26**, which is formed in the side wall **14** of the housing **10**, for attachment to the take-up spool **24**.

As the ribbon **21** passes through the slot **25**, it passes around an edge of the slot **25** so that this forms a guide for the ribbon **21** as it leaves the housing **10**. Likewise, as the ribbon **21** passes through the slot **26**, it engages an edge of the slot **26** so that this forms a guide for the ribbon **21** as it returns to the interior of the housing **10**.

The housing **10** is releasably supported on a base plate **27** (see FIG. 1). The base plate **27** is mounted on a support member **28**, which is movable along a member (not shown) across the typewriter when the present invention is employed with a single element printing head **29** (see FIG. 2) of the type described in U.S. Pat. No. 2,919,002 to Palmer. Both the single element printing head **29** and ribbon lift guides **30** (see FIG. 2), which support a portion of the ribbon **21** exterior of the housing **10**, are carried by the support member **28** for movement therewith. If the present invention is used on a typewriter having a movable platen, then the base plate **27** will be attached to the typewriter as would the ribbon lift guides **30**.

The base plate **27** has ears **31** on opposite sides thereof. Resilient elements **32**, supported on the base plate **27**, cooperate with each of the ears **31** to retain the housing **10** on the base plate **27** during operation of the typewriter. The resilient elements **32** cooperate with the walls of slots or recesses **33** (one shown in FIG. **2**) in the side wall **14** of the housing **10**.

When the housing **10** is moved downwardly on to the base plate **27**, a hollow shaft **35**, which is rotatably mounted on a stud or spindle **36** fixed to the base plate **27**, extends into the cylindrical passage **22** in the supply spool **16**. The shaft **35**, which is retained on the stud or spindle **36** by a retaining clip, has splines **38** thereon for cooperation with the passages **23** in the supply spool **16** to insure that the supply spool **16** and the shaft **35** rotate together.

At the same time, a stud, rod or spindle **39**, which is stationarily fixed to the base plate **27** and extends upwardly therefrom, extends into the cylindrical passage or smooth centerbore **24'** within the take-up spool **24**. There is no connection between the take-up spool **24** and the stud **39** so that the take-up spool **24** freely rotates or spins on the stud **39**.

When the housing **10** is moved downwardly on to the base plate **27**, a drive roller **40**, which has pointed pro-

jections 41 formed thereon spaced along lines parallel to its rotational axis and around its entire periphery, extends into the housing 10 through a curved slot 42, which is formed in the bottom wall 12 of the housing 10. The drive roller 40 is rotatably mounted on a stud 43, which extends upwardly from one end of a drive roller arm 44. A retaining clip retains the drive roller 40 on the stud 43. The drive roller arm 44 is mounted at its other end on the base plate 27 through a cylindrical boss 46 being disposed within an opening 47 in the base plate 27 for pivoted movement about an axis 47*a*.

When the housing 10 is moved downwardly on to the base plate 27, the drive roller 40 has been pivotally moved from the position shown in FIG. 1 to the position shown in FIG. 5. As a result, the drive roller 40 extends into the curved slot 42 in the bottom wall 12 of the housing 10 adjacent the end of the slot 42 remote from the take-up spool 24. To prevent the pointed projections 41 on the drive roller 40 from engaging the ribbon 21 on the supply spool 16 at the time that the housing 10 is moved downwardly on to the base plate 27, a curved shield 48 is disposed within the housing 10 adjacent the end of the slot 42 closest to the supply spool 16. The curved shield 48 preferably extends the entire distance between the upper wall 11 and the bottom wall 12 of the housing 10.

The drive roller 40 is disposed adjacent the take-up spool 24 during feeding of the ribbon 21 from the supply spool 16 to the take-up spool 24. Resilient means such as a spring 49, which has one end attached to an ear 50 on the drive roller arm 44 and its other end attached to a movable spring anchor 51, constantly urges the pointed projections 41 of the drive roller 40 into engagement with the ribbon 21 on the take-up spool 24 to positively drive the take-up spool 24 across the width of the ribbon 21.

A longitudinal two-position control member 80, which has a longitudinal or cylindrical gear 81 milled on the lower portion of its outer surface, has a hollow chamber therein. This permits mounting of the longitudinal member 80 on axis 47*a* over both the shaft 76 of the gear 75 and the bearing lug 79 of the gear 78. As hereinafter described, member 80 has both an upward position as shown in FIG. 1 and a depressed position.

A resilient spring 82 surrounds the shaft 76 of the gear 75.

In order to permit loading and unloading of the cartridge 10 on the base plate 27, the drive roller 40 must be positioned so as to not engage the ribbon 21, which is on the take-up spool 24, when the housing 10 is removed from the base plate 27. Likewise, in order to permit both removal and installation of one of the housings 10 on the base plate 27, the ribbon spring guides 110 and 111 must be removed from engagement with the ribbon 21. Furthermore, in order to permit alignment of the passages 23 of the supply spool 16 with the splines 38 on the shaft 35, it is necessary to remove the detent 123 from engagement with the ratchet wheel 124.

Thereafter, another of the housings 10 may be installed on the base plate 27. Because the detent 123 is not engaged with the ratchet wheel 124, the shaft 35 can easily turn to permit alignment of the passages 23 of the supply spool 16 with the splines 38 on the shaft 35.

When the housing 10 is positioned on the base plate 27, the drive roller 40 is disposed to enter the end of the curved slot 42 in the bottom wall 12 of the housing 10 remote from the take-up spool 24. Because of the curved shield 48, there is no danger of the projections 41 on the drive roller 40 engaging the ribbon 21 on the supply spool 16.

After the housing 10 is positioned on the base plate 27, the load lever 130 is moved from the position of FIG. 5 to the position of FIG. 1. The spring 49 causes the drive roller arm 44 to follow the pivotal movement of the arm 131 of the load lever 130 to the position of FIG. 1.

The drive roller 40 is moved into engagement with the portion of the ribbon 21 on the take-up spool 24 by the spring 49. The engagement of the drive roller 40 with the ribbon 21 on the take-up spool 24 stops movement of the drive roller arm 44 by the spring 49.

Considering the operation of the present invention, the cartridge has the housing 10 assembled with the ribbon 21 wound on and having one end attached to the supply spool 16, which is rotatably mounted within the housing 10. The ribbon 21 extends from the supply spool 16 through the ribbon slot 25 in the side wall 14 of the housing 10 to the exterior of the housing 10. The ribbon 21 is returned through the ribbon slot 26 in the side wall 14 of the housing 10 and around the take-up spool 24 to which it is attached.

With the cartridge so packaged, it is ready for use by a typist. The ribbon 21 is positioned in the ribbon lift guides 30 through maneuvering the cartridge so that it is not necessary for the typist to grasp the ribbon 21. The ribbon 21 is disposed in front of the single element printing head 29 as shown in FIG. 2.

When it is desired to position the cartridge housing 10 on the base plate 27, the load lever 130 is in its loading and unloading position (see FIG. 5). In this position, the guides 110 and 111 are moved away from the path of the ribbon 21 so that the typist may easily maneuver the ribbon 21 within the ribbon lift guides 30.

With the ribbon 21 positioned within the ribbon lift guides 30 and in front of the printing head 29, the housing 10 is moved downwardly with the cylindrical passage 22 in the supply spool 16 positioned above the shaft 35, the cylindrical passage 24′ in the take-up pool 24 positioned above the stud or spindle 39, and the curved slot 42 positioned in alignment with the drive roller 40. Shaft 35 is free to rotate to permit alignment between the passages 23 of the supply spool 16 and the splines 38 on the shaft 35. This permits the passages 23 and the splines 38 to be aligned so that the housing 10 may be moved downwardly.

As the housing 10 moves downwardly, the ears 31 on the base plate 27 enter the slots 33 in the side wall 14 of the housing 10. Downward movement of the housing 10 is stopped by engagement of the housing 10 with the portions 34 on each of the ears 31.

With the housing 10 abutting against the portions 34 of the ears 31, the shaft 35 is disposed within the cylindrical passage 22 of the supply spool 16, the spindle or stud 39 is disposed within the cylindrical passage 24′ in the take-up spool 24, and the drive roller 40 extends within the housing 10 through the slot 42. At this time, the drive roller 40 is adjacent the curved shield 48. The

resilient elements **32** hold the housing **10** on the base plate **27** to prevent movement of the housing **10** during typing operations.

As the housing **10** is moved downwardly on the base plate **27**, the longitudinal member **80** extends upwardly through the opening **90** in the bottom wall **12** of the housing **10** into the cylindrical recess **89** within the housing **10**. It will be assumed that the cylindrical recess **89** is empty. This is the arrangement when the ribbon **21** is a carbon ribbon and no overlapping of printing on the ribbon **21** is to be permitted. As a result, the longitudinal member **80** is biased by the spring **82** to the position in which the pin **84** will engage the disc **86** to cause a direct connection between the gear **75** and the longitudinal gear **81** for rotation.

Referring to FIG. **6**, there is shown the pattern of characters imprinted on the ribbon **21'** during each actuation of the ribbon feed mechanism with the ribbon **21'** being a carbon ribbon. With the ribbon **21'** assumed to be moving to the right and being viewed from the printing element side of the ribbon **21'** six printing positions **156–161** are shown on the ribbon **21'**.

It is assumed that the printing area **156** is the first. This occurs with the ribbon lift guides **30** in their uppermost position whereby the lowermost position of the ribbon **21'** is disposed for engagement by the printing head **29**. The printing area **157**, which is next, occurs with the lift guides **30** in their intermediate position while the printing area **158** occurs with the ribbon lift guides **30** in their lowermost printing position.

With the width of the type characters assumed to be 0.100 inch, each of the linear movements of the ribbon **21'** past the printing position due to angular rotation of the drive roller **40** is 0.037 inches. Accordingly, when the ribbon lift guides **30** are returned to their uppermost position from their lowermost position, the area **159** is linearly or longitudinally spaced from the area **156** because the three linear movements of the ribbon **21'** are greater than the width of a type character. This insures that there is no overstriking of a ribbon area, which has already been utilized for printing.

If the ribbon **21** within the housing **10** is a plastic ribbon in which overstriking or overlapping of the print areas on the ribbon **21** is desired, then the housing **10** has the disc **91** and the spring **92** mounted therein. Accordingly, when the housing **10** is moved downwardly to be locked on the base plate **27**, the disc **91** engages the top of the longitudinal member **80** to urge it downwardly. Since the force of the spring **92** is greater than the force of the spring **82**, the member **80** is moved downwardly provided that the teeth **94** on the member **80** are disposed in alignment with the slots **95** in the gear **78** at this time. Disc **91** is retained by retaining ring **93**.

When the teeth **94** are disposed within the slots **95**, the gear ratio is changed to substantially reduce the angular rotation of the drive roller **40** during each rotation of the ratchet wheel **58**. This reduces the linear movement of the ribbon **21** past its printing position.

Accordingly, with the ribbon **21''** being plastic, the positioning of the various print areas on the ribbon **21''** will be as shown in FIG. **7**. Areas **162–167** designate six areas on the ribbon **21''** in which printing occurs with the first occurring at the area **162** and the last at the area **167** when the ribbon **21''** moves to the right.

The linear movement of the ribbon **21''** past the printing position is substantially reduced due to the substantially smaller constant angular amount of rotation of the drive roller **40**. Of course, this linear amount of movement is substantially constant.

With the type character width being approximately 0.100 inch, the linear movement of the ribbon **21''** is only 0.006 inch, which is approximately one-sixth of the movement when the ribbon **21** is carbon. Thus, by the time that the area **165** is engaged by the printing head **29**, the leading edge of the area **165** is disposed only 0.018 inch from the leading edge of the area **162**. As a result, there is a substantial overlap of the print areas when the ribbon **21** is a plastic. The leading and trailing edges of the areas **165–167** have been shown dotted to emphasize the overlapping.

After the ribbon **21** has been fully used, it is only necessary to again move the load lever **130** to its loading and unloading position. As previously mentioned, this removes the detent **123** from one of the teeth of the ratchet wheel **124**, the drive roller **40** from engagement with the ribbon **21** on the take-up spool **24**, the ribbon spring guides **110** and **111** from engagement with ribbon **21**, and raises the ribbon lift guides **30**. This permits the housing **10** to be easily removed from the base plate **27**, and another of the housings **10** to be disposed thereon.

While the housing **10** has been described as being utilized until all of the ribbon **21** therein has been used, it should be understood that the housing **10** may be removed at any stage of use of the ribbon **21** therein. This permits the typist to make a quick and easy change from a plastic ribbon **21''** to a carbon ribbon **21'** and vice versa without having to touch the ribbon **21** and without having to waste any of the carbon ribbon **21'** or the plastic ribbon **21''** since the unused portion of the ribbon **21** may be readily employed when the housing **10** is again disposed on the base plate **27**.

Because the spring **49** constantly urges the drive roller **40** so that the pointed projections **41** penetrate the inked ribbon **21** on the take-up spool **24**, a positive engagement is always provided between the drive roller **40** and the inked ribbon **21** on the take-up spool **24** irrespective of the diameter of the ribbon **21** on the take-up spool **24**. As the diameter on the take-up spool **24** increases, the drive roller **40** moves along the curved slot **42** in the housing **10** away from the take-up spool **24**.

Since the advancement of the ribbon **21** from the supply spool **16** to the take-up spool **24** is governed by the angular rotation of the drive roller **40**, the diameter of the increasing ribbon **21** on the take-up spool **24** does not affect the linear movement of the ribbon **21** past the printing head **29**. Accordingly, the same linear amount of the ribbon **21** is advanced during each actuation of the ratchet wheel **58** because of the projections **41** having positive engagement with the ribbon **21**.

Furthermore, the engagement of the projections **41** with the ribbon **21** on the take-up spool **24** provides the only force to wind the ribbon **21** on the take-up spool **24**. Since the force of the spring **49** is applied toward the center of the take-up spool **24**, it does not affect the tension of the ribbon **21** but merely squeezes the ribbon **21** toward the center of the take-up spool **24**.

Referring to FIG. 8, there is shown another form of cartridge, which is formed by a housing 180. The housing 180, which is preferably formed of a lightweight plastic material, includes an upper wall 181, a lower or bottom wall 182, and a continuous side wall 183 joining the upper wall 181 and the lower or bottom wall 182.

The housing 180 has a supply spool 184 rotatably mounted therein between the upper wall 181 and the lower wall 182. The supply spool 184 includes a main body 185 (see FIG. 10) and a removable upper portion 186. The removable upper portion 186 includes a circular plate 187, which bears against the lower surface of the upper wall 181. Fingers 188 extend downwardly from the lower surface of the circular plate 187 for disposition within recesses 189 in the main body 185. Thus, when one of the portions of the supply spool 184 is rotated, the other portion must rotate because of the cooperation between the fingers 188 on the circular plate 187 and the recesses 189 in the main body 185.

The upper surface of the circular plate 187 has a knob 190 projecting through an opening 191 in the upper wall 181 of the housing 180. Thus, when the knob 190 is rotated, the supply spool 184 is rotated.

The lower end of the main body 185 has a reduced annular portion 192, which is disposed within an opening 193 in the lower wall 182 of the housing 180. A raised annular portion 194 extends from the upper surface of the bottom wall 182 within the housing 180 for cooperation with a shoulder 195 on the main body 185 of the supply spool 184. Thus, the raised portion 194 and the circular plate 187 insure that an inked ribbon 196, which has one end attached to the main body 185 of the supply spool 184, does not contact either the upper wall 181 or the lower wall 182 of the housing 180.

The main body 185 of the supply spool 184 has a cylindrical passage or recess 197 extending therethrough. The wall of the passage 197 has a plurality of equally angularly spaced longitudinal splines or ribs 198 formed thereon. It should be understood that the splines or ribs 198 cooperate with passages or grooves 250, which would be formed in the shaft 35'. Thus, the same type of arrangement exists between the shaft 35' and the main body 185 of the supply spool 184 as exists between the shaft 35 and the supply spool 16. However, instead of the supply spool 184 having passages or grooves formed therein for cooperation with splines 38 on the shaft 35 as the supply spool 16 does, the supply spool 184 has the splines 198 formed on the main body 185 with the passages 250 formed in the shaft 35' receiving the splines 198.

The upper end of each of the splines or ribs 198 forms the bottom of one of the recesses 189 that receive the fingers 188. Accordingly, when the knob 190 is turned, the shaft 35' is turned when the splines 198 are disposed in the passages 250 in the shaft 35'.

The housing 180 has a take-up spool 199 rotatably mounted therein. As shown in FIG. 11, the take-up spool 199 includes a main body 200 and a removable upper portion 201. The removable upper portion 201 is the same as the removable upper portion 186 of the supply spool 184. That is, it includes a circular plate 202 having fingers 203 extending downwardly therefrom and a knob 204 extending upwardly from the circular plate 202 through an opening 205 in the upper wall 181. The fingers 203 are disposed within slots 206 in the main body 200.

The lower end of the main body 200 of the take-up spool 199 is formed with a reduced annular portion 207, which is disposed within an opening 208 in the lower wall 182 of the housing 180. An annular raised portion 209 extends from the upper surface of the bottom wall 182 within the housing 180 for cooperation with shoulder 210 on the main body 200 of the take-up spool 199. Thus, the lower end of the main body 200 of the take-up spool 199 is supported in the same manner as the main body 185 of the supply spool 184. The main body 200 has a cylindrical passage 211 therein of much smaller diameter than the passage 197 and does not have any splines formed therein. The other end of the ribbon 196 is attached to the main body 200 of the take-up spool 199.

The ribbon 196 extends from the supply spool 184 to the exterior of the housing 180 through a slot 212, which is formed in the side wall 183 of the housing 180. The ribbon 196 returns to the interior of the housing 180 through a second ribbon slot 213, which is formed in the side wall 183 of the housing 180, for attachment to the take-up spool 199.

As the ribbon 196 passes through the slot 212, it passes around an edge of the slot 212 so that this forms a guide for the ribbon 196 as it leaves the housing 180. Likewise, as the ribbon 196 passes through the slot 213, it engages an edge of the slot 213 so that this forms a guide for the ribbon 196 as it returns to the interior of the housing 180.

However, after entering the housing 180 through the ribbon slot 213, the ribbon 196 passes around a curved shield or guide means 214, which is the same as the shield 48 in the housing 10, before being attached to the take-up spool 199. Thus, this arrangement of the path of the inked ribbon 196 produces more angular wrap around the take-up spool 199 of the ribbon 196 before it is engaged by the drive roller 40 than the arrangement of FIG. 2.

When the inked ribbon 196 passes around the convex surface of the shield 214, the inked side of the inked ribbon 196 is in engagement with the convex surface of the shield 214. Since this inked side of the ribbon 196 will have an uneven surface due to its previously having been utilized at the printing position, this uneven surface may cause an accumulation of particles on the convex surface of the shield 214. If such an accumulation of particles on the surface of the shield 214 were to occur, the build up of the particles on the shield 214 would result in drag on the ribbon 196.

Accordingly, the convex surface of the shield 214 may have a coating of a material with a smooth surface such as Teflon, for example, thereon to eliminate any build up of particles. Thus, drag due to such particles is eliminated by using a material having a smooth surface. The coating of Teflon may be a tape, for example. Of course, any other suitable means for applying the coating may be utilized.

It should be understood that the housing 180 is releasably supported on the base plate 27 in the same manner as is the housing 10. Furthermore, the lower wall 182 of the housing 180 has a curved slot 215 which extends generally radially outward from opening 208, and which is similar to the curved slot 42 in the housing

10, therein to receive the drive roller 40 in the same manner as the drive roller 40 is received in the housing 10.

As shown in FIGS. 8 and 9, the upper wall 181 of the housing 180 has a curved slot 216 receiving an extension on the stud 43 on which the drive roller 40 is rotatably mounted. Since the stud 43 moves with the drive roller 40 during its movement through the curved slot 215 as the ribbon 196 is advanced from the supply spool 184 to the take-up spool 199, the extension on the stud 43 may have an indicating mark 218 thereon for cooperation with a scale 219 on the upper surface of the upper wall 181. The scale 219 may have indicia to indicate the amount of the ribbon 196 that has been advanced from the supply spool 184 to the take-up spool 199 by indicating either the amount of the ribbon 196 on the supply spool 184 or the amount of the ribbon 196 on the take-up spool 199. As shown in FIG. 9, the indicia on the scale 219 indicate the amount of the ribbon 196 on the take-up spool 199. If the indicia were to indicate the amount of the ribbon 196 on the supply spool 184, the symbol E, which indicates empty, and the symbol F, which indicates filled, would be reversed. Similarly, any suitable scale such as percentage of ribbon remaining, number of typed pages remaining, or continuous remaining typing time could be employed.

Thus, since the indicating mark 218 is on the extended end of the stud 43, the advancement of the drive roller 40 through the curved slot 216 results in the advancement of the extension of the stud 43 through the slot 216. Thus, the indicating mark 218 moves with the drive roller 40 as it advances along the curved slot 215 due to the increase in the amount of the ribbon 196 on the take-up spool 199. Slot 216 also will permit observation of the quantity of ribbon 196 on spool 199 thereunder.

While the housing 10 has been shown as having the spring 92 mounted therein for cooperation with the disk 91 to change the gear ratio for changing the linear advancement of the ribbon 21 during each cycle, the housing 180 has a different construction in which no spring is utilized within the cartridge. Instead, the housing 180 merely has a recess portion 220 therein (see FIG. 8). For ribbons capable of receiving overlapping print operations, a modified cartridge housing 180' is employed as shown in FIG. 12 and is formed with a recess 220' of lesser depth than the recess 220 employed for so called "total release" ribbons.

When the ribbon 196 is a carbon ribbon so that no overstrike is desired between the adjacent portions of the ribbon 196, the recess 220 in the housing 180 is formed with a greater depth (this is shown in FIG. 8) than if the ribbon 196 is formed of a plastic material in which overlapping of preceding print operations is permissible and desirable. However, when the inked ribbon 196 is formed of a plastic material in which overlapping of preceding print operations is permissible and desirable, the depth of the recess 220' (see FIG. 12) is less.

While the housing 180 has been shown as having the side wall 183 connecting the upper wall 181 to the lower wall 182, it should be understood that a continuous side wall is not necessary. Thus, it is only necessary that ribbon guides be provided for the ribbon 196 as it leaves the housing 180 and as it returns to the housing 180. This also would be applicable as to the housing 10.

While the housing 180 has been described as having the scale 218 on the upper wall 181 for cooperation with the extension of the stud 43 to indicate the amount of the inked ribbon 196 advanced from the supply spool 184 to the take-up spool 199, it should be understood that the indicating means could be utilized with the housing 10. Thus, it would only be necessary to provide a curved slot, similar to the curved slot 216, in the upper wall 11 of the housing 10, to extend the stud 43 to protrude through the curved slot in the upper wall 11, and to have an indicating mark on the extension of the stud 43 for cooperation with a scale, which is similar to the scale 219, on the upper surface of the upper wall 11 of the housing 10. This would indicate the amount of the inked ribbon 21 that has been advanced from the supply spool 16 to the take-up spool 24.

It should be understood that the housing 10 could have the recess 220 in the manner shown for the housing 180. Likewise, the housing 180 could have the recess 89 for use with the cooperating structure of FIG. 1 in the manner shown for the housing 10.

The drive roller 40 is driven in the same manner when the housing 180 is employed as when using the housing 10 of FIG. 2. The primary difference is that the spring 228 is now mounted on the ribbon advancing mechanism rather than the spring 92 being mounted in the housing 10 of the cartridge.

While the ribbons 21 and 196 have been described as being moved transversely as well as longitudinally or linearly during each actuation of a character key, it should be understood that the present invention could be utilized with fixed ribbon guides rather than the movable lift guides 30. Of course, this would require greater linear movement of the ribbon 21 or 196 during each fed cycle but the ratios, depending on whether the ribbons 21 and 196 are plastic or carbon, would stay the same.

While the invention has been particularly shown and described with reference to preferred embodiments 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.

What is claimed is:

1. A cartridge, packed with an inked ribbon, for use on a typewriter ribbon feed mechanism, including a cartridge housing having spaced upper and lower walls and side wall means interconnecting said upper and lower walls, a supply spool and a takeup spool positioned within the housing between said upper and lower walls and an inked ribbon having ends, connected at said ribbon ends to said supply and takeup spools for winding thereabout into the shape of a disc, said ribbon passing outwardly of said side wall means to provide an exposed span, and wherein the improvement comprises:

means rotatably supporting said supply and takeup spools within the housing comprising a first pair of coaxial openings formed respectively in said upper and lower walls for rotatably receiving said supply spool therein, a second pair of coaxial openings formed in said upper and lower walls in a location spaced from said first pair of coaxial openings for rotatably receiving said takeup spool therein,

standoff means formed integrally with at least said lower wall adjacent said openings therein for slidably engaging said supply and takeup spools to space the ribbon from said lower wall,

a further opened portion formed in said lower wall intersecting the opening in the lower wall for receiving the takeup spool and extending radially outwardly therefrom for a distance in excess of the largest ribbon disc to be wound on the takeup spool, capable of receiving a drive means and providing an arcuate path for the movement of said drive means, toward and away from said takeup spool,

said takeup spool having a smooth bore therein opening outwardly of said lower wall for receiving a stationary support member,

said takeup spool having extending outwardly of said upper wall, means for manual rotation of said spool, and

said lower wall further comprises an additional open portion capable of receiving a control part of a ribbon feed mechanism.

2. A cartridge, packed with a ribbon as defined in claim 1 further comprising an open portion formed in said upper wall adjacent one of said spools and extending radially therefrom for exposing the amount of ribbon on said spool.

3. A cartridge, packed with a ribbon as defined in Claim 1 further comprising a guide means extending between said upper and lower walls and internal to said housing and having a smooth outer surface, said ribbon being tracked into said housing, around said guide means and to said takeup spool.

4. A cartridge, packed with a ribbon as defined in claim 1, wherein said radially extending opened portion is of curved configuration and centered about a point contained within said additional open portion.

5. A cartridge, packed with a ribbon as defined in claim 3 wherein said guide means includes a friction reducing coating on said smooth outer surface of said guide means.

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