Oct. 31, 1967 W. GOFF, JR 3,349,887

RIBBON MECHANISM

Filed Dec. 28, 1964 2 Sheets-Sheet 1

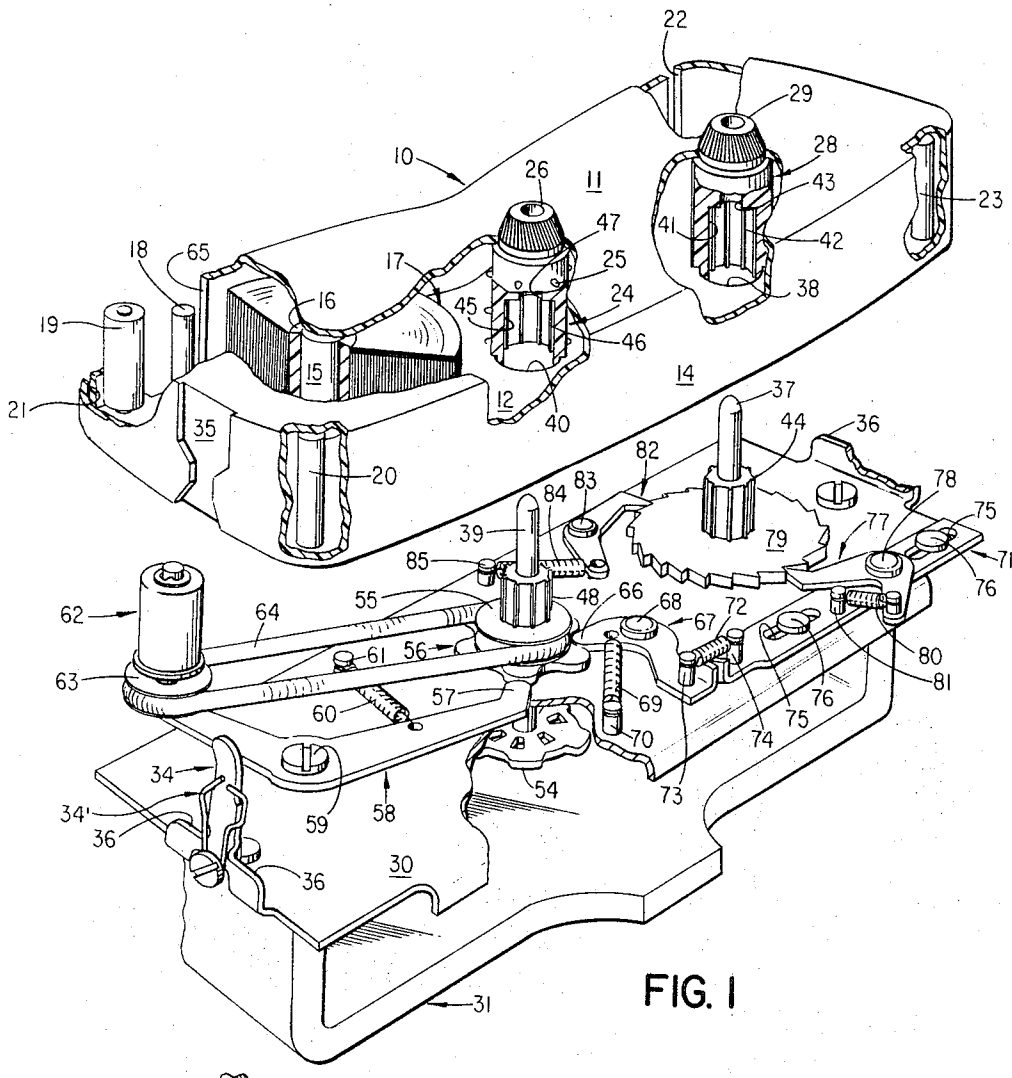


FIG. 1

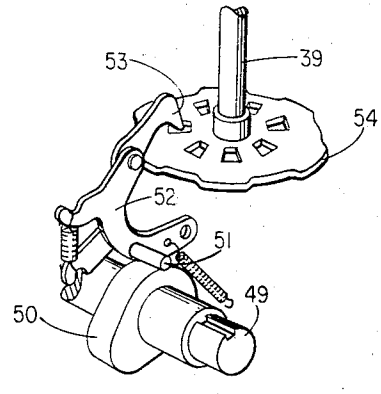


FIG. 2

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RIBBON MECHANISM

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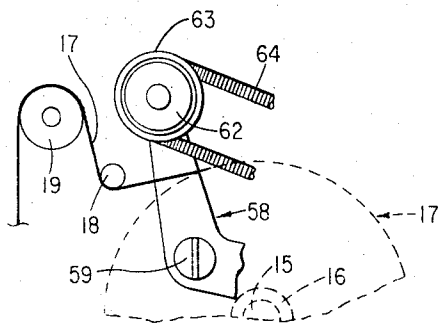


FIG. 3

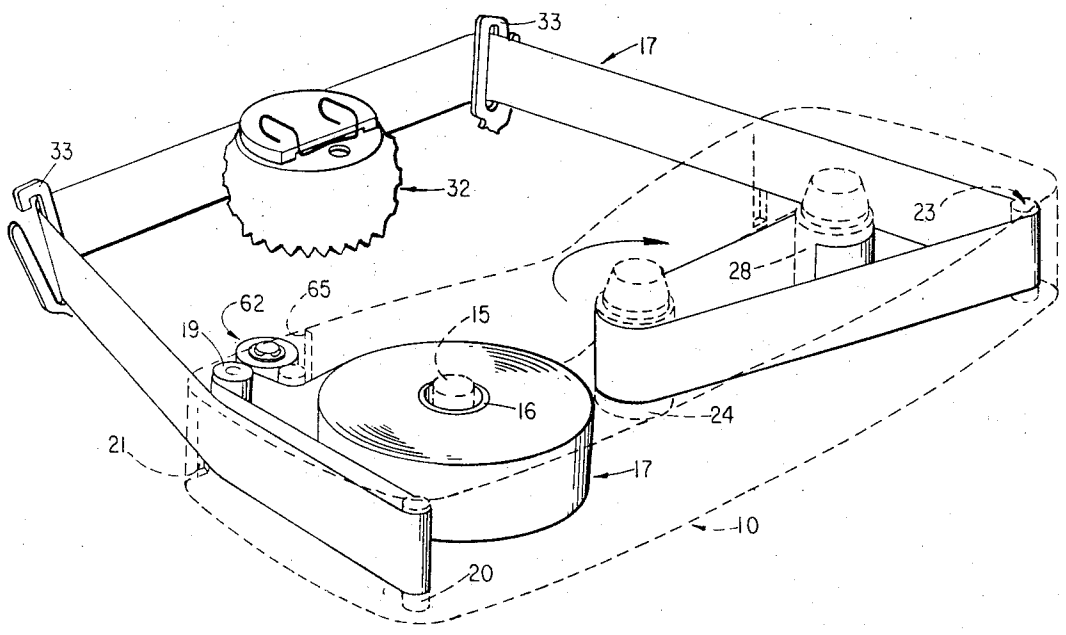


FIG. 4

United States Patent Office 3,349,887 Patented Oct. 31, 1967

3,349,887

RIBBON MECHANISM

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18 Claims. (Cl. 197—151)

This invention relates to a ribbon mechanism and, more particularly, to a feed mechanism for an inked ribbon and a cartridge therefor.

In ribbon feed mechanisms used with typewriters, one mechanism for feeding the ribbon to its printing position rotates the take-up spool a predetermined angular amount during each actuation of a character key. Thus, the ribbon is pulled from the supply spool through its printing position to the take-up spool by rotation of the take-up spool.

While the foregoing construction is satisfactory for a fabric ink ribbon in which the ribbon is passed through its printing position a plurality of times, it leads to a large waste of inked ribbon when a single pass ribbon such as a carbon ribbon, for example, is employed in the typewriter. This is because the amount of ribbon, which is pulled from the supply spool to its printing position, varies in accordance with the amount of ribbon on the take-up spool. As the amount of ribbon on the take-up spool increases, the same amount of angular rotation of the take-up spool will pull more ribbon through its printing position for each feed cycle of the ribbon than when there is a small amount of ribbon on the take-up spool because of the difference in circumference of the ribbon. Thus, when the foregoing mechanism of driving the take-up spool a constant angular amount is employed with a single pass ribbon, a large amount of the single pass ribbon is not utilized after the initial turns of the take-up spool.

The present invention satisfactorily solves the foregoing problem by providing a mechanism in which a constant linear amount of ribbon is metered from the supply spool to its printing position during each ribbon feed cycle. Thus, the present invention insures that only a constant linear amount of ribbon is fed to its printing position during each feed cycle of the ribbon so that there is no waste of any of the single pass inked ribbon.

A mechanism, which has been employed to pull a single pass inked ribbon through its printing position, has passed the ribbon through a pair of rollers just prior to the ribbon being wrapped on the take-up spool. One of these rollers is a drive roller while the other roller is a friction or pressure roller. The pulling or driving of the inked ribbon depends on the friction between the pressure roller and the drive roller. Due to the inherent feature of the friction roller and the build up of carbon on the friction rollers, there is the possibility of slippage of the inked ribbon between the friction roller and the drive roller. Accordingly, this system of driving or pulling the inked ribbon does not provide positive engagement between the drive roller and the inked ribbon so that a constant linear amount of inked ribbon will pass through its printing position during each ribbon feed cycle.

The present invention satisfactorily solves the foregoing problem by providing a drive roller with sharp projections on its surface for positively engaging the inked ribbon across the entire width of the ribbon so that there can be no slippage. This insures that the drive roller meters a constant linear amount of inked ribbon through its printing position during each ribbon feed cycle. Because of the sharpness of the projections on the drive roller, the pressure or friction roller may be eliminated.

Since the present invention provides a positive engagement drive roller for driving or pulling the inked ribbon adjacent the take-up spool and means for unspooling a constant linear amount of inked ribbon from the supply spool during each ribbon feed cycle, the amount of mass of inked ribbon being pulled through the ribbon lift guides is only the inked ribbon between the unspooling means and the drive roller. Thus, a substantially constant low value ribbon drag exists as the ribbon passes through the ribbon lift guides. This substantially eliminates flaking off of carbon particles of the inked ribbon at the ribbon lift guides. Therefore, the present invention also eliminates the drag problem since the drag is independent of either the thickness of the inked ribbon or the size of the ribbon supply on the supply spool.

Single pass inked ribbons such as carbon ribbons, for example, must presently be installed on the typewriter by the typist. This necessitates handling of the single pass inked ribbon by the typist whereby the hands of the typist become soiled and the possibility of damage to the inked ribbon exists.

The present invention satisfactorily solves the foregoing problem by providing a cartridge for containing a single pass inked ribbon. The cartridge of the present invention allows complete installation of an inked ribbon without the typist having to touch the ribbon. The cartridge includes suitable means to eliminate any slack in the inked ribbon after it has been disposed within the ribbon lift guides. Thus, when the cartridge of the present invention is employed, the entire operation of intsalling a single pass inked ribbon may be performed by the typist without contacting the ribbon.

An object of this invention is to provide an inked ribbon mechanism for metering a substantially constant linear amount of inked ribbon from the supply spool during each feed cycle of the ribbon.

Another object of this invention is to provide an inked ribbon cartridge having both the drive roller and takeup spool mounted therein and positively driven.

A further object of this invention is to provide an inked ribbon mechanism having a drive roller with projections thereon for penetrating the inked ribbon to provide positive engagement therewith.

Still another object of this invention is to provide an inked ribbon cartridge having control knobs on the exterior of the cartridge to permit seating of the cartridge and to remove any slack from the inked ribbon.

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

In the drawings:

FIG. 1 is an exploded perspective view of the ribbon mechanism of the present invention including the cartridge and the drive roller.

FIG. 2 is a perspective view of an actuating structure used in conjunction with the structure of FIG. 1.

FIG. 3 is a top plan view of a portion of the present invention and illustrating certain parts in a non-actuating position.

FIG. 4 is a perspective view showing the path of the ribbon with the cartridge of the present invention illustrated in phantom.

Referring to the drawings and particularly FIGS. 1 and 4, there is shown a cartridge, which is formed by a 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**.

A post 15, which is preferably formed integral with the upper wall 11 of the housing 10, extends downwardly from the upper wall 11. A core 16, which has a single pass inked ribbon such as carbon ribbon 17, for example, wrapped around and secured thereto by suitable means such as an adhesive material, is rotatably mounted on the post 15. The post 15 and the core 16 cooperate to form a supply spool for the carbon ribbon 17.

The ribbon 17 extends from the supply spool around a guide post 18, which is preferably formed integral with the upper wall 11 of the housing 10, and then around a roller 19. The roller 19 is mounted in the upper wall 11 of the housing 10.

After passing around the roller 19, which is disposed adjacent the forward edge of the housing 10, the ribbon 17 extends to the rear of the housing 10 where it passes around a guide post 20, which is preferably formed integral with the upper wall 11 of the housing 10. The ribbon 17 then passes to the exterior of the housing 10 through a slot 21 in the left front portion of the side wall 14. The guide post 20 is utilized to insure that the ribbon 17 does not pass through the slot 21 at a sharp angle.

The ribbon 17 returns to the interior of the housing 10 through a slot 22 in the right front portion of the side wall 14. The ribbon 17 passes around a guide post 23, which is preferably formed integral with the upper wall 11 of the housing 10. The guide post 23 is disposed in the right rear corner of the housing 10 and is utilized to insure that the ribbon 17 does not pass through the slot 22 at a sharp angle.

The ribbon 17 next passes around a drive roller 24, which is rotatably mounted in the housing 10. The exterior surface of the drive roller 24 has a plurality of pointed projections 25, which pierce the ribbon 17 to provide positive engagement therewith. The projections 25 are preferably arranged in parallel rows and extend a sufficient distance along the drive roller 24 to engage the entire width of the ribbon 17. The drive roller 24, which is preferably a cylindrical member, has a knob 26 extending through the upper wall 11 of the housing 10 to permit grasping thereof for manual turning of the drive roller 24.

After passing around the drive roller 24, the ribbon 17 is attached by suitable means such as an adhesive material to a cylindrical member 28, which is rotatably mounted in the housing 10. The cylindrical member 28 functions as the takeup spool for the ribbon 17. A knob 29, which is integral with the cylindrical member 28, extends through the upper wall 11 of the housing 10 to permit grasping thereof for manual turning of the member 28.

The housing 10 is releasably supported on a base plate 30. The base plate 30 is mounted on a support member 31, which is movable along a member (not shown) across the typewriter when the present invention is employed with a single element printing head 32 of the type described in U.S. Patent 2,919,002 to Palmer. Both the single element printing head 32 and ribbon lift guides 33, which support the portion of the ribbon 17 exterior of the housing 10, are carried by the support member 31 for movement therewith. If the present invention is used on a typewriter having a movable platen, then the base plate 30 would be fixed to the typewriter as would the ribbon lift guides 33.

The base plate 30 has ears 34 (one shown) on opposite sides thereof with a resilient element 34' supported on each of the ears 34 to retain the housing 10 on the base plate 30 during operation of the typewriter. The elements 34' on the ears 34 cooperate with the walls of slots or recesses 35 (one shown) in the side wall 14 of the housing 10. Each of the ears 34 has portions 36 on opposite sides thereof. The portions 36 function as stops to limit downward movement of the housing 10 by engaging the bottom of the housing 10.

When the housing 10 is moved downwardly on to the base plate 30, a stud 37, which is fixed to the base plate 30, extends through an opening 38 in the bottom wall 12 of the housing 10 into the hollow interior of the cylindrical member 28. At the same time, a shaft 39, which is rotatably mounted in the base plate 30 and extends both above and beneath the base plate 30, passes through an opening 40 in the bottom wall 12 of the housing 10 into the hollow interior of the drive roller 24.

The hollow interior of the cylindrical member 28, which has its reduced lower end disposed within the opening 38, includes a large receptacle 41, which is defined by splines 42 formed on the inner wall of the cylindrical member 28. The cylindrical member 28 has a smaller receptacle 43, which is substantially the same size as the stud 37 to provide a fit therewith, disposed above the receptacle 41 and in communication therewith. The splines 42 cooperate with an external splined member 44, which is rotatably mounted on the stud 37.

The drive roller 24 has a large receptacle 45 adjacent its end, which fits within the opening 40. The receptacle 45 is defined by splines 46, which are formed on the inner wall of the drive roller 24. The drive roller 24 has a smaller receptacle 47, which is substantially the same size as the shaft 39 to provide a fit therewith, in communication with the receptacle 45. The splines 46 of the drive roller 24 cooperate with an external spline member 48, which is atached to the shaft 39 for rotation therewith.

When the housing 10 is moved downwardly towards the plate 30, the stud 37 enters the large receptacle 41 of the cylindrical member 28 and the shaft 39 enters the large receptacle 45 in the drive roller 24. In order to align the splines 42 of the cylindrical member 28 with the splines of the member 44, the knob 29 is manually turned to rotate the cylindrical member 28 with respect to the splined member 44. In order to align the splines 46 of the drive roller 24 with the splines on the member 48, the knob 26 on the drive roller 24 is manually turned to rotate the drive roller 24 with respect to the splined member 48.

It should be understood that the rotation of the knob 29 and the knob 26 may be accomplished at the same time so that the housing 10 may be quickly positioned on the base plate 30. Furthermore, if there is any slack in the ribbon 17, the knobs 26 and 29 are actuated to remove this slack. This actuation of the knobs 26 and 29 to remove slack in the ribbon 17 occurs after the housing 10 is positioned on the base plate 30.

The connection between the internal splines 46 of the drive roller 24 and the splines of the member 48 allows a drive connection therebetween. Similarly, the internal splines 42 of the cylindrical member 28 and the splines of the member 44 cooperate to provide a drive connection therebetween.

The shaft 39 is rotated a constant angular amount during each actuation of a typewriter character key. This causes a constant linear amount of the ribbon 17 to be metered past its printing position, which is where the printing head 32 engages the paper, since the ribbon 17 is positively engaged with the drive roller 24 by the projections 25.

Whenever a character key of the typewriter is actuated, a motor (not shown) acting through a clutch (not shown) causes a revolution of a shaft 49 (see FIG. 2), which has a cam 50 fixed thereto for rotation therewith. The cam 50 cooperates with a cam follower 51 on a link 52, which is pivotally connected to a feed pawl 53. The feed pawl 53 cooperates with a ratchet wheel 54, which is fixed to the lower end of the shaft 39 beneath the base plate 30. It should be understood that the foregoing elements move with the support member 31.

The ratchet wheel 54 is rotated clockwise a constant angular amount by the feed pawl 53 during each revolution of the shaft 49. Thus, the shaft 39 is rotated clockwise a constant angular amount during each actuation of

a character key on the typewriter. It should be understood that a detent pawl (not shown) cooperates with the ratchet wheel **54** to prevent reverse rotation of the ratchet wheel **54** when the feed pawl **53** is removed from engagement with the ratchet wheel **54** to advance the ratchet wheel **54**.

It should be understood that the pawl **53** is shown in the middle of the ribbon feed cycle in FIG. 2 with the pawl **53** about to enter one of the openings in the ratchet wheel **54** to rotate the ratchet wheel **54** clockwise. Due to the configuration of the cam **50**, the pawl **53** is initially lifted out of one of the openings in the ratchet wheel **53** and moved rearwardly to the position shown in FIG. 2. Further rotation of the cam **50** causes the pawl **53** to be advanced forwardly to cause clockwise rotation of the ratchet wheel **54**.

The rotation of the shaft **39** not only causes rotation of the drive roller **24** but also causes rotation of a pulley **55** and a cam **56**. The pulley **55** is preferably secured to the shaft **39** through the external splined member **48**, while the cam **56** is attached to the shaft **39**.

The cam **56** cooperates with a pawl or cam follower **57** on one end of an arm **58**, which is pivotally mounted on the top of the base plate **30** by a pin **59**. A spring **60**, which constantly urges the pawl **57** into engagement with the cam **56**, has one end attached to the pivotal arm **58** between the pivot pin **59** and the pawl **57** and its other end connected to fixed structure such as a pin **61**, which is secured to the base plate **30**.

The other end of the arm **58** has a roller **62** mounted thereon. The roller **62** has a pulley **63**, which is disposed between the bottom of the roller **62** and the top of the pivotal arm **58**, attached thereto for rotation therewith. A continuous coil spring **64** connects the pulley **63** to the pulley **55** to cause rotation of the roller **62** whenever the shaft **39** is rotated.

When the shaft **39** is at rest, the pawl or cam follower **57** rests on a high dwell of the cam **56** as shown in FIG. 1. The spring **60** maintains the pawl **57** in contact with the cam **56**. With the pawl **57** resting on the high dwell of the cam **56**, the roller **62** is held in spaced relation with respect to the roller **19** about which the ribbon **17** passes as shown in FIG. 3.

However, as soon as rotation of the shaft **39** begins due to actuation of a character key on the typewriter, the cam **56** rotates whereby the pawl **57** rides down the surface of the cam **56** so that the spring **60** may move the arm **58** counterclockwise about the pin **59**. This results in the roller **62** moving into engagement with the portion of the ribbon **17** passing around the roller **19** whereby the ribbon **17** is pulled a substantially constant linear amount from the supply spool. The roller **62** moves through a slot **65**, which is formed in the side wall **14** and the bottom wall **12** of the housing **10**.

The roller **62** is being rotated through the pulley **55** before the roller **62** moves into engagement with the roller **19** through the ribbon **17**. Furthermore, the roller **62** is moved out of engagement with the roller **19** before it ceases being driven through the pulley **55**. Thus, the roller **62** pulls an infinitesimally smaller amount of the ribbon **17** from the supply spool than is being pulled by the drive roller **24**. This maintains the ribbon **17** under tension.

The roller **62** is moved out of engagement with the roller **19** because the rotation of the shaft **39** again moves a high dwell of the cam **56** into engagement with the pawl **57** by the time that the shaft **39** ceases to rotate. Thus, the roller **62** is oscillated into and out of contact with the ribbon **17** against the roller **19** during each actuation of a character key. The roller **62** is rotating during the entire period of contact with the ribbon **17**, which is passing around the roller **19**.

The cam **56** also cooperates with a pawl or cam follower **66** on one end of an arm **67**, which is pivotally mounted on the top of the base plate **30** by a pin **68**. A

spring **69** continuously urges the pawl or cam follower **67** into engagement with the surface of the cam **56**. One end of the spring **69** is attached to the arm **67** between the pawl **66** and the pivot pin **68** while the other end is attached to fixed structure such as a pin **70** on the base plate **30**.

The other end of the arm **67** is resiliently connected to one end of a longitudinally movable pawl carrier **71**. The arm **67** is connected to the pawl carrier **71** by a spring **72**, which has one end attached to a pin **73** on the arm **67** and its other end connected to a pin **74** on the pawl carrier **71**.

The pawl carrier **71** has a pair of longitudinal slots **75** therein with a pin **76** extending through each of the slots **75**. The pins **76** are secured to the base plate **30** and limit the movement of the pawl carrier **71** in the direction of the longitudinal slots **75**.

The pawl carrier **71** has a ratchet feed pawl **77** pivotally mounted thereon by a pin **78**. The pawl **77** cooperates with a ratchet wheel **79**, which is preferably formed integral with the external splined member **44**. A spring **80** constantly urges the pawl **77** into engagement with the teeth on the ratchet wheel **79**. The spring **80** has one end attached to the pawl **77** and its other end attached to a pin **81** on the pawl carrier **71**.

A detent pawl **82** is pivotally mounted on the base plate **30** by a pin **83**. A spring **84**, which has one end attached to the pawl **82**, constantly urges the detent pawl **82** into engagement with one of the teeth on the ratchet wheel **79** to prevent reverse rotation of the ratchet wheel **79** after it has been advanced by the ratchet feed pawl **77**. The spring **84** has its other end connected to fixed structure such as a pin **85** on the base plate **30**.

While the pawl or cam follower **57** rests on a high dwell of the cam **56** when the cam **56** is not being rotated by the shaft **39**, the pawl or cam follower **66** of the arm **67** rests on a low dwell of the cam **56** when the shaft **39** is not rotating the cam **56**. Thus, when the shaft **39** is rotated through actuation of a character key on the typewriter, the pawl or cam follower **66** of the arm **67** rides up the surface of the cam **56** against the force of the spring **69** to cause clockwise rotation of the arm **67** about the pivot pin **68**.

Because of the resilient connection through the spring **72**, clockwise rotation of the arm **67** about the pin **68** results in the pawl carrier **71** being urged to its left to cause clockwise movement of the ratchet wheel **79** by the pawl **77** about the fixed stud **37**. Each longitudinal movement of the pawl carrier **71** results in the same amount of torque being applied to the cylindrical member **28**, which functions as the take-up spool, through the ratchet wheel **79**.

This constant torque allows the ratchet wheel **79** to be advanced at least one tooth during each feed cycle as long as the constant linear amount, which is being advanced by the drive roller **24**, is equal to or greater than the circumferential arc of the ribbon **17** wrapped on the take-up spool during rotation of one tooth of the ratchet wheel **79**. However, when the circumferential arc exceeds the linear amount, which is advanced by the drive roller **24**, due to increase in diameter of the ribbon **17** being wrapped on the take-up spool, then the ratchet wheel **79** is not advanced a tooth during each feed cycle but must wait until there is a sufficient amount of the ribbon **17** advanced by the drive roller **24** to at least equal the circumferential arc of the ribbon **17** to be wrapped on the take-up spool.

Because of the varying angular amount of rotation of the ratchet wheel **79** and the cylindrical member **28** due to the increase in diameter of the ribbon **17** on the take-up spool, the ratchet feed pawl **77** may not advance the ratchet wheel **79** a complete tooth during each longitudinal movement of the pawl carrier **71**. However, when the ratchet wheel **79** is advanced another tooth by the ratchet feed pawl **77**, the detent pawl **82** prevents reverse rotation of the ratchet wheel **79**.

Considering the operation of the present invention, the cartridge has the housing **10** assembled with the ribbon **17** wound on and having one end attached to the core **16**, which is rotatably mounted on the post **15**, and extending around the guide post **18**, the roller **19**, the guide post **20**, and through the slot **21** in the side wall **14** of the housing **10** to the exterior of the housing **10**. The ribbon **17** is returned through the slot **22** in the side wall **14** of the housing **10** and around the guide post **23** to the drive roller **24**. Because of the pointed projections **25** on the drive roller **24**, the ribbon **17** has a positive engagement therewith and its other end is attached to the cylindrical member **28**. The bottom wall **12** is then attached to the housing **10**.

With the cartridge so packaged, it is ready for use by a typist. The ribbon **17** is positioned in the ribbon lift guides **33** through maneuvering the cartridge so that it is not necessary for the typist to grasp the ribbon **17**. The ribbon **17** is disposed in front of the single element printing head **32** as shown in FIG. 4.

With the ribbon **17** positioned within the ribbon lift guides **33** and in front of the printing head **32**, the housing **10** is moved downwardly with the cylindrical member **28** positioned above the stud **37** and the drive roller **24** positioned above the shaft **39**. The stud **37** advances into the large receptacle **41** of the cylindrical member **28** and the shaft **39** advances into the large receptacle **45** of the drive member **24**.

Since the splines **42** may not be aligned with the splines on the member **44** and the splines **46** may not be aligned with the splines on the member **48**, one or both of the knobs **29** and **26** will be grasped to cause rotation of the cylindrical member **28** and/or the drive roller **24**. This results in the splines being aligned so that the housing **10** may be moved further downwardly.

As the housing **10** moves downwardly, the ears **34** on the base plate **30** enter the slots **35** 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 **36** of each of the ears **34**. With the housing **10** abutting against the portions **36** of each of the ears **34**, the stud **37** is in the smaller receptacle **43** of the cylindrical member **28**, the splines **42** mesh with the splines on the member **44**, the shaft **39** is in the smaller receptacle **47** of the drive roller **24**, and the splines **46** mesh with the splines on the member **48**. The resilient elements **34'** on the ears **34** hold the housing **10** on the base plate **30** to prevent movement of the housing **10** during typing operations.

During each actuation of a character key of the typewriter, the shaft **39** is rotated a constant angular amount through rotation of the ratchet wheel **54** by the feed pawl **53**. Because of the connection through the coil spring **64**, the roller **62** is rotated the same angular amount as the shaft **39**. The relation between the pawl or cam follower **57** on the arm **58** with the cam **56** causes oscillation of the roller **62** through the slot **65** in the housing **10** into engagement with the portion of the ribbon **17** passing around the roller **19** and then away from the ribbon **17**. The roller **62** is rotating during the entire period of engagement with the ribbon **17** to insure that a constant linear amount of the ribbon **17** is pulled from the supply spool.

Of course, because the projections **25** on the drive roller **24** provide positive engagement with the ribbon **17**, a constant linear amount of the ribbon **17** is pulled by the drive roller **24**. This linear amount is infinitesimally greater than is being pulled from the supply spool by the roller **62** so that there is no slack in the carbon ribbon **17** during its feeding past its printing position at the single element printing head **32**.

This power feeding of the ribbon **17** by the drive roller **24** and the roller **62** creates a substantially constant ribbon drag through the ribbon lift guides **33**. This low valued drag is independent of the ribbon thickness or the size of the supply of the ribbon **17**. This drag reduction is highly desirable since most of the carbon "dirt" problem is due to carbon particles, which flake off at the ribbon lift guides **33**, particularly the guide first encountered.

If desired, the drag also could be made independent of the take-up tension of the ribbon **17** by adding a constant drag to the ribbon **17** after it leaves the ribbon lift guide **33**, which is to the right of the printing head **32**. One example would be to position a spring to act on the ribbon **17** as it passes around the guide post **23**.

Since each rotation of the cam **56** also affects the arm **67**, a constant torque is applied to the ratchet wheel **79** through the ratchet feed pawl **77** of the longitudinal pawl carrier **71**. Because the diameter of the cylindrical member **28** increases as the amount of the ribbon **17** thereon increases, the amount of rotation of the cylindrical member **28** varies.

When the supply of the ribbon **17** on the core **16** is exhausted, it is only necessary to remove the housing **10** from the base plate **30** by lifting the housing **10** to disconnect the resilient elements **34'** from the slots **35** in the housing **10**. Of course, the ribbon **17** must also be removed from the ribbon lift guides **33**. Thereafter, a new cartridge may be readily positioned.

While the invention has been described with respect to a carbon ribbon, it also may be utilized with a fabric ribbon or any other type of ribbon in which only a single pass of the ribbon through its printing position is desired. While this invention has been shown and described with respect to a typewriter using a single element printing head, it should be understood that it can be used with a typewriter having a movable platen.

While the control knobs have been shown on both the drive roller and the take-up spool, it should be understood that the control knob could be utilized only on the take-up spool if there were no drive roller within the cartridge. In this arrangement, the control knob would be utilized only to remove slack from the ribbon. Control knobs also could be employed on both a supply spool and a take-up spool in a cartridge having a multi-pass inked ribbon where the functions of the take-up spool and the supply spool are alternately reversed.

While the shaft **39** has been described as being rotated during each actuation of a character key, it should be understood that the present invention could be utilized with a single pass inked ribbon, which has a sufficient width to allow a plurality of printing actions to occur on each linear portion of the ribbon by vertically moving the ribbon lift guides a different amount during each character key actuation to present different areas of the linear portion of the ribbon for printing action. In this arrangement, the shaft **39** would be rotated to produce a ribbon feed cycle only when the entire width of the linear portion of the ribbon has been utilized by printing actions.

An advantage of this invention is that it eliminates a varying quantity of ribbon being fed to its printing position during each feed cycle of the ribbon. Another advantage of this invention is that it insures maximum use of an inked ribbon, which passes only once through its printing position. A further advantage of this invention is the easy positioning of the cartridge on its support structure. Still another advantage of this invention is that the ribbon may be installed without the typist having to touch the ribbon. A still further advantage of this invention is that the reliability of the feed mechanism is improved.

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 various 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 inked ribbon cartridge adapted to be removably mounted on a typewriter including:

a housing having upper and lower walls;

said housing having a side wall connecting said upper and lower walls;
said housing having means to releasably mount said housing on a typewriter;
a supply spool rotatably mounted in said housing;
a drive roller mounted in said housing;
a take-up spool rotatably mounted in said housing;
said side wall having a pair of ribbon slots therein;
an inked ribbon having one end attached to said supply spool and the other end attached to said take-up spool;
and said inked ribbon being wound around said supply spool and extending from said supply spool through one of said slots in said side wall to the exterior of said housing, said inked ribbon returning to the interior of said housing through the other of said slots and passing around said drive roller to said take-up spool.

2. An inked ribbon cartridge adapted to be removably mounted on a typewriter including:
a housing having upper and lower walls;
said housing having a side wall connecting said upper and lower walls;
said housing having means to releasably mount said housing on a typewriter;
a spool rotatably mounted in said housing and having one end of an inked ribbon attached thereto;
a drive roller mounted in said housing and cooperating with the inked ribbon to advance it;
said side wall having at least one ribbon slot therein to allow the inked ribbon to extend to the exterior of said housing;
said drive roller having manual turning means directly connected thereto and extending only above said upper wall, said manual turning means turning said drive roller when said manual turning means is turned to position said drive roller relative to its support on the typewriter when said housing is mounted on the typewriter;
and said spool having manual turning means fixedly connected thereto and extending only above said upper wall, said manual turning means turning said spool when said manual turning means is turned to position said spool relative to its support on the typewriter when said housing is mounted on the typewriter.

3. An inked ribbon cartridge adapted to be removably mounted on a typewriter including:
a housing having upper and lower walls;
said housing having a side wall connecting said upper and lower walls;
said housing having means to releasably mount said housing on a typewriter;
a spool rotatably mounted in said housing and having one end of an inked ribbon attached thereto;
a drive roller mounted in said housing and cooperating with the inked ribbon to advance it;
said side wall having at least one ribbon slot therein to allow the inked ribbon to extend to the exterior of said housing;
said drive roller having pointed projections on its exterior surface for penetrating the printing portion of the inked ribbon to provide positive engagement therewith, said projections being arranged to extend completely around the periphery of said drive roller with a plurality of said projections being disposed along the side of said drive roller in spaced portions thereof to cause a plurality of said projections to engage the ribbon across its width at any portion of the ribbon engaged by said projections;
said drive roller having manual turning means directly connected thereto and extending only above said upper wall, said manual turning means turning said drive roller when said manual turning means is turned;

and said spool having manual turning means fixedly connected thereto and extending only above said upper wall, said manual turning means turning said spool when said manual turning means is turned.

4. An inked ribbon feed mechanism including:
a rotatably mounted supply spool;
a rotatably mounted take-up spool;
an inked ribbon having one end attached to said supply spool and the other end attached to said take-up spool;
means to drive said inked ribbon during each feed cycle of said inked ribbon;
said drive means including first means disposed adjacent the portion of said inked ribbon attached to said take-up spool for pulling said inked ribbon and second means disposed adjacent the portion of said inked ribbon leading from said supply spool for pulling said inked ribbon from said supply spool only when said first means is pulling said inked ribbon;
and means to cause said second means to pull said inked ribbon from said supply spool only after said first means is pulling said inked ribbon and said second means to stop pulling said inked ribbon from said supply spool before said first means ceases to pull said inked ribbon.

5. An inked ribbon feed mechanism including:
a rotatably mounted supply spool;
a rotatably mounted take-up spool;
an inked ribbon having one end attached to said supply spool and the other end attached to said take-up spool;
means to drive said inked ribbon during each feed cycle of said inked ribbon;
said drive means including first means disposed adjacent said take-up spool for pulling said inked ribbon and second means disposed adjacent said supply spool for pulling said inked ribbon from said supply spool only when said first means is pulling said inked ribbon;
means to cause said second means to pull said inked ribbon from said supply spool only after said first means is pulling said inked ribbon and said second means to stop pulling said inked ribbon from said supply spool before said first means ceases to pull said inked ribbon;
and means responsive to rotation of said drive means to apply a substantially constant torque to said take-up spool to wind said inked ribbon on said take-up spool.

6. An inked ribbon feed mechanism including:
a pair of cooperating rollers;
one of said pair of cooperating rollers being movable with respect to the other of said pair of cooperating rollers;
an inked ribbon passing around said other roller;
means to rotate said one roller during each of the ribbon feed cycles;
and means cooperating with said rotating means to move said one roller into engagement with said inked ribbon passing around said other roller after said rotating means is started during each of the ribbon feed cycles and to remove said one roller from engagement with said inked ribbon passing around said other roller before said rotating means is stopped during each of the ribbon feed cycles.

7. An inked ribbon feed mechanism including:
a rotatably mounted supply spool;
a rotatably mounted take-up spool;
a drive roller;
a pair of cooperating rollers;
one of said pair of cooperating rollers being movable with respect to the other of said pair of cooperating rollers;

an inked ribbon having one end attached to said supply spool and the other end attached to said take-up spool;

said inked ribbon extending from said supply spool around said other roller and around said drive roller to said take-up spool;

means to rotate said drive roller and said one roller during each of the ribbon feed cycles;

and means cooperating with said rotating means to move said one roller into engagement with said inked ribbon passing around said other roller after said rotating means is started during each of the ribbon feed cycles and to remove said one roller from engagement with said inked ribbon passing around said other roller before said rotating means is stopped during each of the ribbon feed cycles.

8. An inked ribbon feed mechanism including:

a base plate;

a cartridge removably mounted on said base plate;

a supply spool rotatably mounted in said cartridge;

a take-up spool rotatably mounted in said cartridge;

a drive roller mounted in said cartridge;

a driven roller mounted in said cartridge;

a roller pivotally mounted on said base plate;

said cartridge having a pair of ribbon slots therein;

an inked ribbon having one end attached to said supply spool and the other end attached to said take-up spool;

said inked ribbon extending from said supply spool around said driven roller through one of said slots in said cartridge to the exterior of said cartridge, said inked ribbon returning to the interior of said cartridge through the other of said slots and passing around said drive roller to said take-up spool;

driving means mounted on said base plate and cooperating with said drive roller to rotate said drive roller a substantially constant angular amount whereby a sustantially constant linear amount of said inked ribbon is advanced by said drive roller during each ribbon feed cycle;

means connecting said driving means to said pivotally mounted roller to cause rotation of said roller by said driving means;

and means cooperating with said pivotally mounted roller to oscillate said roller into and out of engagement with said inked ribbon passing around said driven roller during rotation of said driving means whereby a substantially constant linear amount of said inked ribbon is pulled from said supply spool during each ribbon feed cycle.

9. An inked ribbon feed mechanism including:

a base plate;

a cartridge removably mounted on said base plate;

a supply spool rotatably mounted in said cartridge;

a take-up spool rotatably mounted in said cartridge;

a drive roller mounted in said cartridge;

a driven roller mounted in said cartridge;

a roller pivotally mounted on said base plate;

said cartridge having a pair of ribbon slots therein;

an inked ribbon having one end attached to said supply spool and the other end attached to said take-up spool;

said inked ribbon extending from said supply spool around said driven roller through one of said slots in said cartridge to the exterior of said cartridge, said inked ribbon returning to the interior of said cartridge through the other of said slots and passing around said drive roller to said take-up spool;

driving means mounted on said base plate and cooperating with said drive roller to rotate said drive roller a substantially constant angular amount during each ribbon feed cycle whereby a substantially constant linear amount of said inked ribbon is advanced by said drive roller during each ribbon feed cycle;

means connecting said driving means to said pivotally mounted roller to cause rotation of said roller by said driving means;

means cooperating with said pivotally mounted roller to oscillate said roller into and out of engagement with said inked ribbon passing around said driven roller during rotation of said driving means whereby a substantially constant linear amount of said inked ribbon is pulled from said supply spool during each ribbon feed cycle;

means rotatably mounted on said base plate and cooperating with said take-up spool;

and means cooperating with said last mentioned means to apply a substantially constant torque to said take-up spool during each rotation of said driving means to wind said inked ribbon on said take-up spool.

10. An inked ribbon feed mechanism including:

a base plate;

a cartridge removably mounted on said base plate;

a supply spool rotatably mounted in said cartridge;

a take-up spool rotatably mounted in said cartridge;

a drive roller mounted in said cartridge;

a driven roller mounted in said cartridge;

an arm pivotally mounted on said base plate;

a roller mounted on said pivotal arm;

said cartridge having a pair of ribbon slots therein;

an inked ribbon having one end attached to said supply spool and the other end attached to said take-up spool;

said inked ribbon extending from said supply spool around said driven roller through one of said slots in said cartridge to the exterior of said cartridge, said inked ribbon returning to the interior of said cartridge through the other of said slots and passing around said drive roller to said take-up spool;

said pivotal arm having a pawl;

driving means mounted on said base plate and cooperating with said drive roller to rotate said drive roller;

means connecting said driving means to said roller on said pivotal arm for rotation of said roller by said driving means;

said driving means having means rotatable therewith for cooperation with said pawl on said pivotal arm to cause movement of said pivotal arm when said driving means rotates whereby said pivotal arm moves said roller on said pivotal arm into engagement with said inked ribbon passing around said driven roller when said roller is being rotated by said driving means to advance said inked ribbon from said supply spool as said drive roller is advancing said inked ribbon onto said take-up spool;

means rotatably mounted on said base plate and cooperating with said take-up spool;

and said rotatable means of said driving means cooperating with said last mentioned means to apply a substantially constant torque to said take-up spool during each rotation of said driving means to wind said inked ribbon on said take-up spool.

11. An inked ribbon feed mechanism including:

a base plate;

a cartridge removably mounted on said base plate;

a supply spool rotatably mounted in said cartridge;

a take-up spool rotatably mounted in said cartridge;

a drive roller mounted in said cartridge;

a driven roller mounted in said cartridge;

an arm pivotally mounted on said base plate;

a roller mounted on said pivotal arm;

said cartridge having a pair of ribbon slots therein;

an inked ribbon having one end attached to said supply spool and the other end attached to said take-up spool;

said inked ribbon extending from said supply spool around said driven roller through one of said slots in said cartridge to the exterior of said cartridge, said inked ribbon returning to the interior of said

cartridge through the other of said slots and passing around said drive roller to said take-up spool;

said pivotal arm having a pawl;

driving means mounted on said base plate and cooperating with said drive roller to rotate said drive roller;

means connecting said driving means to said roller on said pivotal arm for rotation of said roller by said driving means;

said driving means having a cam rotatable therewith for cooperation with said pawl on said pivotal arm to cause movement of said pivotal arm when said driving means rotates whereby said pivotal arm moves said roller on said pivotal arm into engagement with said inked ribbon passing around said driven roller when said roller is being rotated by said driving means to advance said inked ribbon onto said take-up spool;

means rotatably mounted on said base plate and cooperating with said take-up spool;

and said cam of said driving means cooperating with said last mentioned means to apply a substantially constant torque to said take-up spool during each rotation of said driving means to wind said inked ribbon on said take-up spool.

12. An inked ribbon feed mechanism including:

a base plate;

a cartridge removably mounted on said base plate;

a supply spool rotatably mounted in said cartridge;

a take-up spool rotatably mounted in said cartridge;

a drive roller mounted in said cartridge;

a driven roller mounted in said cartridge;

an arm pivotally mounted on said base plate;

a roller mounted on one end of said pivotal arm;

said cartridge having a pair of ribbon slots therein;

an inked ribbon having one end attached to said supply spool and the other end attached to said take-up spool;

said inked ribbon extending from said supply spool around said driven roller through one of said slots in said cartridge to the exterior of said cartridge, said inked ribbon returning to the interior of said cartridge through the other of said slots and passing around said drive roller to said take-up spool;

said pivotal arm having a pawl on its other end;

driving means mounted on said base plate and cooperating with said drive roller to rotate said drive roller;

means connecting said driving means to said roller on said pivotal arm for rotation of said roller by said driving means;

said driving means having a cam rotatable therewith for cooperation with said pawl on said pivotal arm to cause movement of said pivotal arm when said driving means rotates whereby said pivotal arm moves said roller on said pivotal arm into engagement with said inked ribbon passing around said driven roller when said roller is being rotated by said driving means to advance said inked ribbon from said supply spool as said driving roller is advancing said inked ribbon onto said take-up spool;

means rotatably mounted on said base plate and cooperating with said take-up spool;

and said cam of said driving means cooperating with said last mentioned means to apply a substantially constant torque to said take-up spool during each rotation of said driving means to wind said inked ribbon on said take-up spool.

13. The cartridge according to claim **1** in which said drive roller has manual turning means directly connected thereto and extending only above said upper wall, said manual turning means turning said drive roller when said manual turning means is turned.

14. The cartridge according to claim **1** in which said take-up spool has manual turning means fixedly connected thereto and extending only above said upper wall, said manual turning means turning said take-up spool when said manual turning means is turned.

15. The cartridge according to claim **13** in which said take-up spool has manual turning means fixedly connected thereto and extending only above said upper wall, said manual turning means turning said take-up spool when said manual turning means is turned.

16. A cartridge according to claim **1** in which at least said side wall has a slot disposed adjacent the path of said inked ribbon between said supply spool and said one slot whereby movable means on the typewriter may be moved into engagement with said inked ribbon to withdraw said ribbon from said supply spool.

17. An inked ribbon feed mechanism including:

a base plate;

a cartridge removably mounted on said base plate;

a supply spool rotatably mounted in said cartridge;

a take-up spool mounted in said cartridge;

a drive roller mounted in said cartridge;

said cartridge having a pair of ribbon slots therein;

an inked ribbon having one end attached to said supply spool and the other end attached to said take-up spool;

said inked ribbon extending from said supply spool through one of said slots in said cartridge to the exterior of said cartridge, said inked ribbon returning to the interior of said cartridge through the other of said slots and passing around said drive roller to said take-up spool;

and driving means mounted on said base plate and cooperating with said drive roller to rotate said drive roller a substantially constant angular amount whereby a substantially constant linear amount of said inked ribbon is advanced by said drive roller during each ribbon feed cycle.

18. The ribbon feed mechanism according to claim **17** including:

means rotatably mounted on said base plate and cooperating with said take-up spool;

and means cooperating with said rotatably mounted means to apply a substantially constant torque to said take-up spool during each rotation of said driving means to wind said inked ribbon on said take-up spool.

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