Dec. 2, 1969 V. D. ENGLE ET AL 3,481,445

CARTRIDGE RIBBON SUPPLY

Filed Oct. 14, 1965

FIG. 1

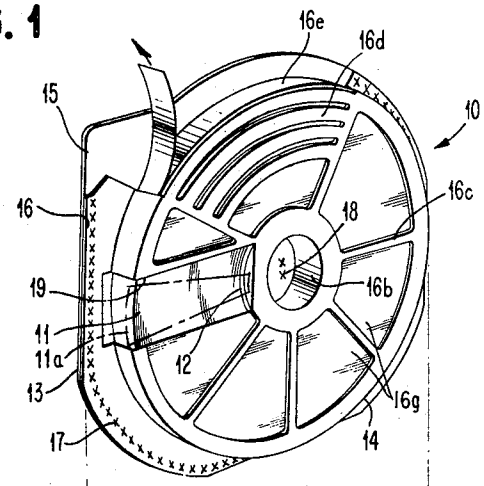
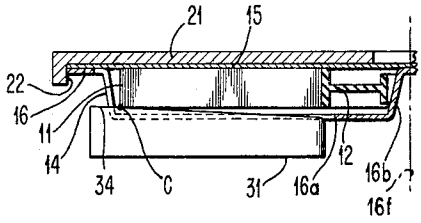


FIG. 2



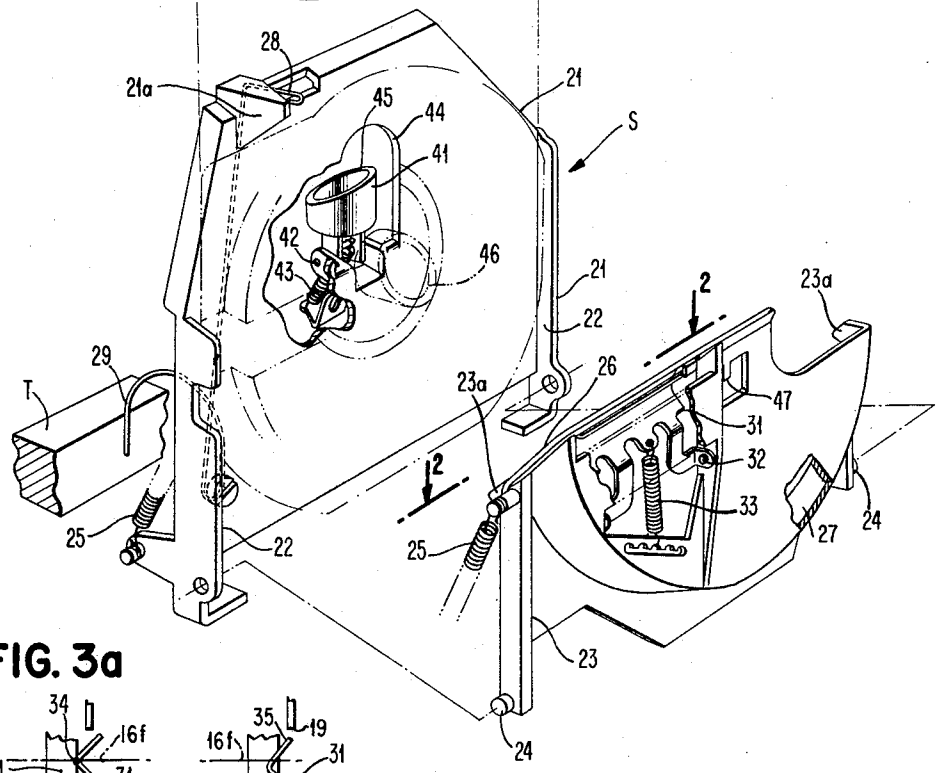


FIG. 3a

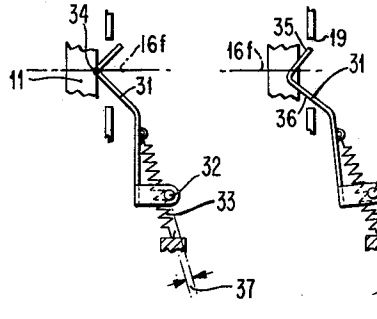


FIG. 3b

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CARTRIDGE RIBBON SUPPLY

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U.S. Cl. 197—151 9 Claims

ABSTRACT OF THE DISCLOSURE

A ribbon handling cartridge and cooperating typewriter mechanism are provided to facilitate one hand ribbon insertion and withdrawal. Reliable machine operation is retained by provision of a drag brake that engages the side edge of the ribbon for tension control without interference to the one hand insertions. The cooperatting typewriter mechanism comprises a pivotally mounted, spring biased clamping plate, a frame plate cooperable therewith, a shock absorbing, electrically grounded spring guide arm to bleed off any static charge on the ribbon, and a selectively usable, pivotally mounted ribbon spool support shaft held in either of two positions by an overcenter spring. The cartridge comprises a vacuum formed encasement plate having an annular cavity, an axle and strengthening ribs, and a planar backing plate.

The typewriter ribbon supply mechanism of our invention is capable of receiving either a clean handling ribbon cartridge of novel self-supporting construction, or an unpackaged spool of ribbon, and controlling the withdrawal of ribbon therefrom.

High quality typewritten material is currently prepared through the use of a so-called total release ribbon that is fed from a supply, past a printing station, and to a takeup reel or other disposal means. Ribbon changes are relatively frequent as the ribbon passes only once through the machine. Also, it is occasionally necessary to change ribbon colors. The ease and cleanliness of changing ribbons thus represent significant economic considerations to the commercial acceptability of both typewriters and the ribbons themselves.

One obvious approach to the improvement of ribbon handling is to package the ribbon in a cartridge by which the ribbon can be manipulated without risk of unspooling, or soiling the operator's hand. However, the economic success of such a cartridge supply mechanism depends not upon this concept, but upon its practical implementation, taking into consideration both the pertinent technical and the pertinent economic factors.

Accordingly, it has been an object of our invention to devise and develop a ribbon supply mechanism for ribbon impact printers, such as typewriters, that is capable of receiving and utilizing a self-supporting cartridge ribbon supply with a minimum of manipulative effort.

Another object of the invention has been to devise and develop a ribbon cartridge and supply mechanism cooperable therewith capable of maintaining adequate tension control on the ribbon, whereby the cost of tension control is borne principally in the typewriter, as a one-time cost, rather than in the cartridge, which would be a repeated cost.

A further object of this invention has been to devise and develop a ribbon supply mechanism for ribbon impact printers that is capable in the alternative of receiving either a self-supporting cartridge ribbon supply, or unpackaged spooled ribbon, to thus maintain a maximum versatility in the printer of which the ribbon supply mechanism is only a part.

One phase or concept of our invention involves packaging the spooled ribbon in a so-called blister pack cartridge that inherently lends itself to low material and assembly cost. The cartridge has a pre-formed thin plastic encasement plate that receives the spooled ribbon, and includes an integral center bearing projection for rotatably receiving the ribbon core. A planar backing plate is heat sealed to the encasement plate trapping the ribbon inside and providing a near total enclosure. The pre-formed encasement plate includes radial and concentric ribs for planar rigidity. A ribbon exit slot is provided along a peripheral edge through which the ribbon is linerally dispensed. The encasement plate has concentric circular arc-shaped ribs adjacent the ribbon exit slot to provide a degree of axial flexibility and thereby prevent pinching of the roll if the cartridge becomes deformed. Also, the concentric ribs provide radial weakness lines by which the cartridge can be torn open if it is desired to use cartridge packaged ribbon in a typewriter not adapted to receive it.

Successful ribbon feeding requires a controlled drag on the ribbon supply to prevent unspooling and untracking at one extreme, or inadequate ribbon feed, or ribbon breakage at the other extreme. A cartridge constructed as herein disclosed could, theoretically, provide closely controlled internal friction for drag purposes. However, cost added to the cartridge to achieve required tolerances must be encountered with each ribbon purchase, whereas a drag control embodied in the printer need be provided only once.

Existing non-cartridge typewriter ribbon supplies employ drag brakes that engage the outer periphery of the ribbon and ride radially inwardly as the ribbon is dispensed. We have determined that such radial movement of a drag brake is not readily compatible with minimum-effort cartridge insertion. We have devised an axially moving drag brake having a tapered brake surface that engages only the outer periphery of the ribbon and thus provides a drag mechanism similar in operation to that of existing ribbon supplies. The axial movement of the drag brake is readily compatible with a simple plug-in insertion of the cartridge. A simple radially extending window or slot in the cartridge permits complete coperation between the contained ribbon and the drag brake without requiring a separate manipulative step for bringing these parts together, or for separating the parts for cartridge removal.

Another phase of our invention involves the provision of an auxiliary ribbon spool shaft that is held in either of two positions by an overcenter spring for selective use to support an unpackaged ribbon. Installation of an unpackaged ribbon is facilitated by a cam surface on the auxiliary shaft such that axial force on the ribbon core by the shaft, lifts the core into concentric alignment therewith. The above mentioned drag brake cooperates with the unpackaged ribbon in a manner substantially identical to the cooperation with the cartridge packaged ribbon to assure uniform results.

These and other objects, features, and advantages of our invention will be apparent to those skilled in the art from the following more particular description of a preferred embodiment of our invention, wherein specific reference is made to the accompanying drawing, of which:

FIGURE 1 is an exploded perspective view of a typewriter ribbon supply mechanism including a ribbon cartridge therefor, constructed in accordance with the concepts of our invention.

FIGURE 2 is a fragmental cross-sectional view of a cooperational detail of the mechanism shown in FIGURE 1 and taken along lines 2—2 thereof; and

FIGURES 3*a* and 3*b* are schematic explanatory illustrations of two operational positions of a construction feature of the mechanism shown in FIGURE 1.

More specifically, in FIGURE 1 there is shown an ink ribbon supply mechanism generally indicated at S for a typewriter or other ribbon impact printer shown only by a portion of its frame T.

The typewriter and overall ribbon feed mechanism may be like that described in the IBM Customer Engineering Instruction Manual entitled "Model C–1 Standard Typewriters," Form 241–5065–0, copyright 1960 by International Business Machines Corporation.

The ribbon supply mechanism S is constructed to receive an ink ribbon supply or handling cartridge **10** containing a disc of wound ink ribbon **1** mounted on an annular center spool, core, or hub **12**. The supply mechanism S includes a frame plate or bracket **21** extending at least partially vertically and having lateral supporting edges **22** cooperable with corresponding lateral locating edge surfaces **13** of the cartridge **10** for alignment and support thereof. A lug **21***a* having a downwardly facing camming surface, releaseably locks the cartridge **10** in its proper position.

A clamping plate **23** is pivotally connected to the frame plate **21** by opposed pin shafts **24** and is resiliently urged towards the frame plate **21** by a coil spring **25**. Frame plate **21** and clamping plate **23** define a well or cavity therebetween having an upwardly facing opening for edgewise receiving cartridge **10** as shown by the chain lines in FIGURE 1. The clamping plate **23** includes an upwardly-outwardly facing inclined lip surface portion **26** that is engagable by the lower edge portions of the cartridge **10** to assist in camming out the clamping plate **23** during cartridge insertion. A receiving or cradle surface **27** is provided in the clamping plate **23** to assist location and support of the cartridge **10** by engaging a substantially complementary cylindrical locating surface or peripheral edge **14** thereof. A pair of diametrically opposed lugs **23***a* press against the backing plate **15** of the cartridge **10** to partially remove any warp or bow thereof that could cause the ribbon to bind. It will be seen that the cartridge **10** is readily insertable into and removable from the space between the opposed plates **21** and **23** of the ribbon supply mechanism S by a simple one hand operation, and will be supportedly held securely therebetween.

The outer housing of cartridge **10** includes a vacuum formed encasement plate **16** made of a common resin such as acrylic, acetate, vinyl, high-impact styrene, etc., and the generally planar backing plate **15**. The plates **15** and **16** are heat sealed or glued together along binding line **17** and at zone **18**. The encasement plate **16** has a depression **16***a* forming an annular cavity, and a projection or axle forming part **16***b*. The wound ribbon **11** and core **12** are trapped in the annular cavity and are rotatably received by the projection **16***b* defining rotational axis **16***f*. For planar rigidity, a major portion of the encasement plate surface is provided with suitable radial and concentric strengthening ribs **16***c* that project outwardly from flat islands **16***g*. Concentric flexure permitting ribs or corrugations **16***d* are provided adjacent a peripheral edge ribbon exit opening **16***e*. The corrugations **16***d* also provide radial weakness lines to assist tearing the cartridge open, if the ribbon is to be used on a non-cartridge machine.

When the cartridge **10** is assembled into the supply mechanism S, the ribbon **11** is threaded through a shock absorbing spring guide arm **28** and carried to the printing point of the typewriter through suitable tracking guides (all not shown). The spring guide **28** preferably is grounded electrically through a portion **29** to the typewriter frame T to bleed off any static charge on the ribbon that otherwise would cause undesirable dispersion of carbon particles throughout the machine.

As mentioned above, it has been found too impractical to maintain proper drag control on the ribbon **11** by close tolerance design of the cartridge **10**. Instead, drag is created externally and under controlled conditions by ribbon tension control means includiny a drag brake

bar **31**. The brake bar **31** is pivoted to the clamping plate **23** by pin shafts **32** and is resiliently urged towards the frame plate **21**, and any ribbon therein, by a coil spring **33**. The brake bar **31** has an inclined leading edge **34**, as best seen in FIGURE 2, whereby only the outer peripheral edge of the tape **11** is engaged thereby. As the wound ribbon supply dwindles, the brake bar **31** will pivot inwardly in rotational planes substantially parallel to the ribbon rotational axis **16***f*, and the point of contact C will move radially inwardly with the ribbon periphery. A brake communication opening or window **19** is formed in the encasement plate **16** of the cartridge **10**, and extends radially and axially along the depression **16***a* to expose an entire radial segment **11***a* of the ribbon **11** to permit continuous engagement of the brake bar **31** therewith.

As shown in FIGURE 3*b*, the brake bar **31** further has an upwardly-outwardly facing inclined or tapered lip surface portion **35** to facilitate sliding insertion of the cartridge **10** therepast. A downwardly-outwardly facing inclined lip surface portion **36** is also provided on the brake bar **31** to facilitate the sliding removal of an expended cartridge **10** therefrom. Thus, it can be appreciated that insertion and removal of a ribbon cartridge **10** can be a simple one-hand operation giving no regard to the existence of the external drag brake **31** or any other part, except the simple ribbon guide **28**.

It has been determined that optimal operation of the ribbon supply requires an increase in drag torque as ribbon is withdrawn, to compensate for radius change induced internal frictional inertial variations. The required increase in drag force is accomplished by the geometrical relationship between brake bar **31**, its pin shaft **32**, and the spring **33**. In FIGURE 3*a*, the brake bar **31** is shown cooperating with a relatively full disc of wound ribbon **11** and the spring **33** thus acts through a moment arm **37** that is relatively small. As ribbon is withdrawn from the cartridge **10**, the drag brake **31** pivots inwardly and, as shown in FIGURE 3*b*, the moment arm **37** increases due to inclined leading edge **34**, thus increasing the urging effect of the spring **33**.

It is desirable that a typewriter not be limited to a single source of ribbon supply and to this end we have provided a selectively operable auxillary bearing or ribbon spool support shaft **41** pivotally mounted by pin shaft **42** on the frame plate **21** and held in either of two operative positions by an overcenter spring **43**. The shaft **41** is maintained as shown in its full line position whenever a ribbon cartridge **10** is employed. When it is desired to mount an unpackaged ribbon, or a ribbon requiring a central bearing for its support, the shaft **41** is pivoted to its broken line position by finger deflection through a window or finger port **44** in the frame plate **21**. A ribbon hub is thus readily insertable over the shaft **41**, held between the plates **21** and **23**, and engaged by the drag brake **31** to supply ribbon under control substantially the same as if a cartridge were employed.

Insertion of an unpackaged ribbon is assisted by an upwardly facing, inclined cam surface **45** provided on the outwardly-directed end of the shaft **41**. An annular ribbon hub is placed generally opposite the shaft **41** with the leading edge of cam surface **45** entering the hub bore. Clamping plate **23** forces the hub bore axially against the surface **45** and thereby lifts the hub into concentricity with the shaft **41**. The cam surface **45** also provides a lower lip **46** which engages a key projection **47** of the clamping plate **23** to positively retain the shaft **41** in its operative position. This retention becomes important at the end of an unpackaged ribbon where the spool could become lost in the typewriter if it became inadvertently separated from the shaft **41**.

From the foregoing description of our invention and the specific illustration thereof, those skilled in the art will appreciate that we have provided a particularly easy-to-manipulate ink ribbon cartridge mechanism, and a particularly clean, simple, and inexpensive ribbon car-

tridge for use therein. It will also be recognized that we have provided a versatile ribbon supply mechanism which is not limited to use of a cartridge packaged ribbon, but can also employ an unpackaged ribbon as is conventional in present machines.

We claim:

1. In combination with a typewriter, an ink ribbon supply mechanism for receiving a disc of wound ink ribbon carried within a handling cartridge and supported thereby for rotation about an axis defined by the cartridge, said cartridge having a housing extending radially outwardly to a peripheral edge to cover a substantial portion of said ink ribbon disc but exposing at least an entire radial segment thereof, said housing further having external locating surface means thereon, said supply mechansim comprising:

means defining an unobstructed support well mounted on the typewriter and having an opening for edgewise receiving the cartridge, said well having support surface means therein cooperable with the locating surface means of the cartridge to retain it in a substantially fixed position within said well,

a brake bar mounted adjacent said well and extending radially along the exposed segment of a wound ribbon when positioned therein for cooperative engagement therewith, said brake bar being movable laterally across said well in planes parallel to the rotational axis of said wound ribbon, and

means resiliently urging said brake bar toward engagement with said wound ribbon.

2. Mechanism as defined in claim 1 wherein said brake bar has a leading edge inclined along its length to engage substantially only the radially outwardmost edge of the wound ribbon disc.

3. Mechanism as defined in claim 1 wherein said well defining means comprises a frame plate, a clamping plate parallel to said frame plate and spaced therefrom, said clamping plate being mounted for movement away from said frame plate and having an inclined lip surface portion defining a portion of said cartridge receiving opening, and means resiliently urging said clamping plate towards said frame plate.

4. An ink ribbon supply mechanism as defined in claim 1 wherein said brake bar further comprises an outwardly facing inclined lip portion for engagement with the cartridge peripheral edge to facilitate sliding cartridge movement therepast.

5. An ink ribbon supply mechanism as defined in claim 4 wherein said brake bar is pivotally mounted to said well defining means, said brake bar and said resilient urging means being geometrically constructed to exhibit a significantly greater force when said brake bar is engaging a partially exhausted supply of ribbon than when engaging a full supply of ribbon.

6. An ink ribbon supply mechanism comprising a frame plate, a clamping plate mounted for movement relative to said frame plate, and means resiliently urging said clamping plate toward said frame plate, said clamping plate and said frame plate defining therebetween a well for receiving an ink ribbon, and wherein the improvement comprises:

a support shaft pivotedly mounted on one of said frame and clamping plates and manually movable either to an operative position wherein it projects outwardly from its associated plate to receive a ribbon core and alternatively to an inoperative position to permit the free entrance and removal of a ribbon cartridge into and out of said well.

7. An ink ribbon supply mechanism as defined in claim 6 further comprising a brake bar movably mounted adjacent one of said frame and clamping plates, said brake bar extending along the radial extent of a wound ribbon received in said well and having a leading edge inclined along its length to engage substantially only the radially outwardmost edge of the wound ribbon, and

means resiliently urging said brake bar inwardly of said well.

8. In combination with a typewriter, an ink ribbon supply mechanism and a disc of wound ink ribbon carried within a handling cartridge received in said ink ribbon supply mechanism, said handling cartridge having means supporting said ink ribbon disc for rotation about an axis and having a housing extending radially outwardly, to a peripheral edge to cover a substantial portion of said ink ribbon disc but exposing at least an entire radial segment thereof, said housing further having external locating surface means thereon, said supply mechanism comprising:

means defining an unobstructed support well mounted on the typewriter and having an opening for edgewise receiving the cartridge, said well having support surface means therein cooperable with the locating surface means of the cartridge to retain it in a substantially fixed position within the well,

a brake bar mounted adjacent said well and extending radially along the exposed segment of a wound ribbon when positioned therein for cooperative engagement therewith, said brake bar being movable laterally across said well in planes parallel to the rotational axis of said wound ribbon, and

means resiliently urging said brake bar toward engagement with said wound ribbon.

9. In combination with a typewriter, an ink ribbon supply mechanism and a disc of wound ink ribbon carried within a handling cartridge received in said ink ribbon supply mechanism, said handling cartridge having means supporting said ink ribbon disc for rotation about an axis and having a housing extending radially outwardly, to a peripheral edge to cover a substantial portion of said ink ribbon disc but exposing at least an entire radial segment thereof, said housing further having external locating surface means thereon, said supply mechanism comprising:

means defining an unobstructed support well mounted on the typewriter and having an opening for edgewise receiving the cartridge, said well having support surface means therein cooperable with the locating surface means of the cartridge to retain it in a substantially fixed position within the well.

a brake bar mounted adjacent said well and extending radially along the exposed segment of a wound ribbon when positioned therein for cooperative engagement therewith, said brake bar being movable laterally across said well in planes parallel to the rotational axis of said wound ribbon,

means resiliently urging said brake bar toward engagement with said wound ribbon, and

a support shaft pivotedly mounted adjacent said well and manually movable either to an operative position wherein it projects across said well to receive a ribbon core and alternatively to an inoperative position to permit the free entrance and removal of said ribbon cartridge into and out of said well.

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U.S. Cl. X.R.

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