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[54] **METHOD OF MAKING PRINTING RIBBON SPOOL**

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[52] **U.S. Cl.** **427/177;** 118/264; 118/267; 118/268; 197/171; 197/175

[51] **Int. Cl.** **B41j 31/14**

[58] **Field of Search** ..... 197/171, 175; 117/2 R, 117/112; 118/264, 267, 268

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[57] **ABSTRACT**

A method of making a printing ribbon spool is disclosed for maintaining the original print-out density or consistency of a printing ribbon by contact between a pad on the spool and a side edge of the ribbon. Ink is communicated to the pad from a sealed reservoir by way of a wick which communicates with the reservoir through a hole substantially smaller in diameter than the normal uncompressed diameter of the wick.

5 Claims, 4 Drawing Figures

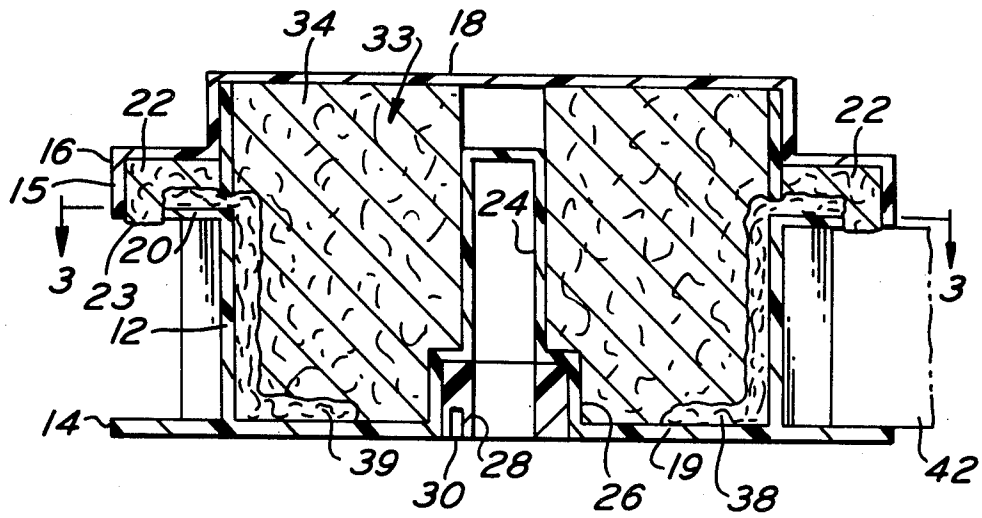


FIG. 1

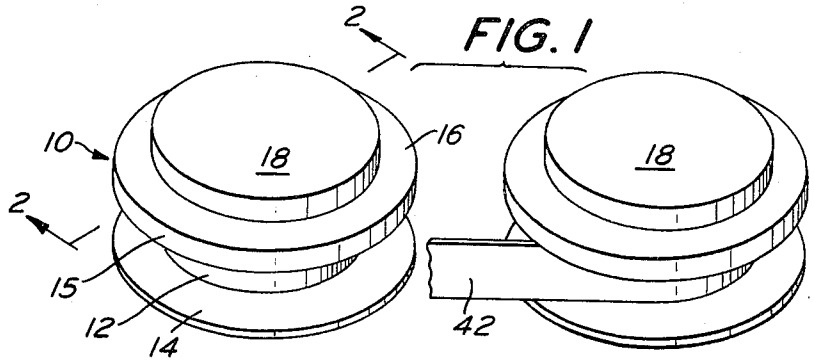


FIG. 2

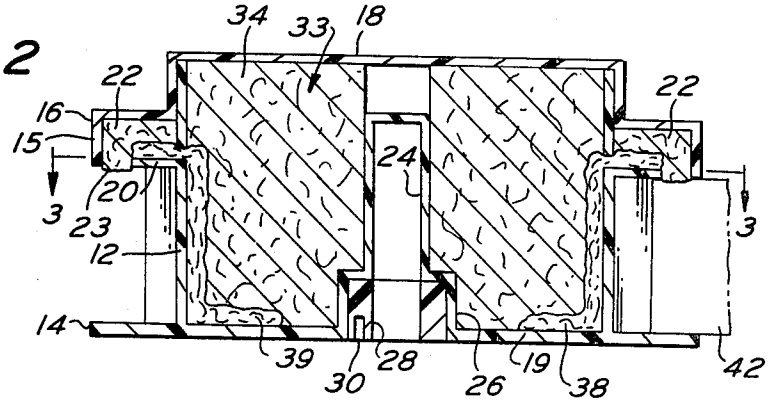


FIG. 3

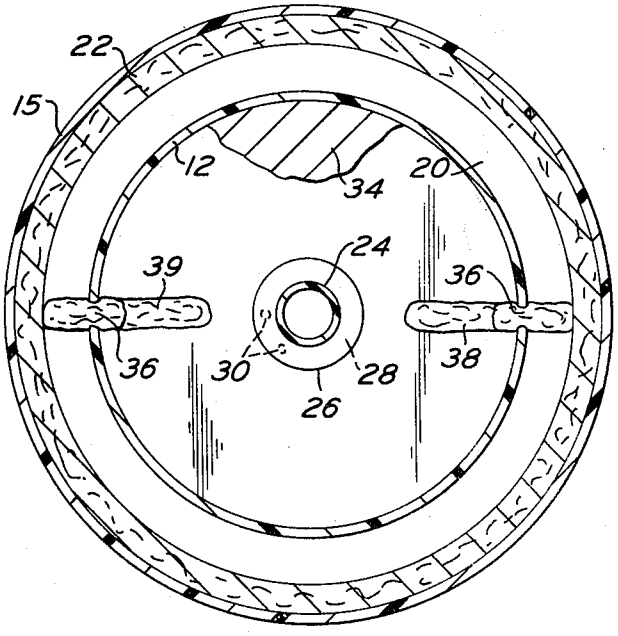
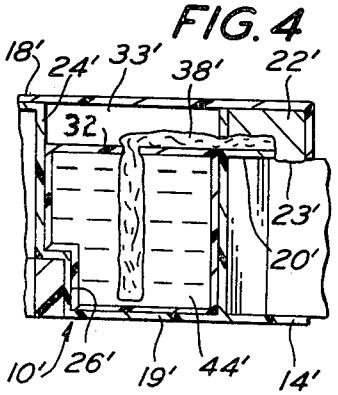


FIG. 4



METHOD OF MAKING PRINTING RIBBON SPOOL

This application is a division of copending application Ser. No. 195,710, filed Nov. 4, 1971 and now U.S. Pat. No. 3,819,026.

The present invention is directed to a method of making a printed ribbon spool whereby a printing ribbon wound around the spool is replenished with ink to maintain consistency of ink density. The present invention is particularly adapted for use in connection with Teletype ribbons. Teletype or other slave type machine ribbons have a useful life of about 24 to 48 hours. Initially, the Teletype ribbons print too dark. After about 24 hours of use, the Teletype ribbons print too lightly and have to be replaced.

Heretofore, the printing ribbon spools on a Teletype printer such as a Teletype Corporation Model 28 Teletype printer, are carried on a vertical ribbon spool post which has a pivotable toggle at the top. When the spool is mounted on the post, the toggle is pivoted from an axial position to a radial position so that it acts as a stop shoulder against which the upper surface of the spool contacts. However, the platform which carries the spool vibrates to a substantial extent, notwithstanding the aforesaid toggle stop shoulder. The spools of the present invention use a magnet to prevent such vibration.

The present invention solves the above-mentioned disadvantages in connection with Teletype printing ribbons and has other advantages. The present invention has a life span of approximately 6 weeks or longer instead of the usual 24 to 48 hours. At the same time, the present invention provides a spooled ribbon wherein the ribbon writes with a constant density from the beginning to the end of its life span. Further, the present invention utilizes a printing ribbon which is substantially shorter than that on a conventional Teletype machine. A conventional Teletype machine has a ribbon whose length is about 12 yards as compared with the present invention wherein the ribbon has a length of about 1 to 2 yards.

In accordance with the present invention, ink is withdrawn from a reservoir by capillary action using a wick of compressible material having one end communicating with said reservoir by way of an opening substantially smaller in dimensions than the transverse dimensions of said wick in its uncompressed state. Except for said wick opening, the reservoir is hermetically sealed. Ink is transferred from the wick to a pad and from the pad to a printing ribbon by contact between the pad and an extreme side edge of the ribbon only during relevant movement between the pad and ribbon.

Spools in accordance with the present invention are preferably utilized in pairs with each end of a ribbon secured to one of the spools. The terminal end portion comprising about 2 inches at each end of the ribbon is either of reduced width or ink impermeable so as to prevent ink build-up in said terminal portion from which ink is never withdrawn during operation. It is desirable to prevent ink on said terminal portion from being transmitted to the hub of the spool. A grommet is preferably secured to each ribbon end portion to effect reversing the spools in a conventional manner on a Teletype printer. While the present invention is particularly adapted for use on Teletype printers, it has wide application to other types of printing ribbons in a variety of types of printing equipment wherein long life and uniform density of printing are desired.

It is an object of the present invention to provide a novel method for replenishing ink in a printing ribbon as it is wound and/or unwound from a spool by contact between a source of ink and a side edge of the ribbon during relevant movement between said source and the ribbon.

It is another object of the present invention to provide a method of replenishing ink in a printing ribbbon spool having long life, uniform printing density during its life span, while utilizing a ribbon which is substantially shorter than those utilized heretofore.

Other objects will appear hereinafter.

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. **1** is a perspective view of a pair of spools in accordance with the present invention.

FIG. **2** is a sectional view taken along the line **2—2** in FIG. **1,** but on an enlarged scale.

FIG. **3** is a sectional view taken along the line **3—3** in FIG. **2,** but on an enlarged scale.

FIG. **4** is a partial sectional view, similar to FIG. **2,** but showing another embodiment of the present invention.

Referring to the drawing in detail, wherein like numerals indicate like elements, there is shown in FIG. **1** a pair of printing ribbon spools in accordance with the present invention, each designated generally as **10.**

The spool **10** has a body which includes a circular hub **12** having a radially outwardly directed flange **14** at one end and a radially outwardly directed flange **16** at its other end. The flanges **14** and **16** are spaced from one another and parallel to one another. However, flange **16** has an inturned end **15** projecting toward flange **14.** Flanges **14** and **16** are of the same diameter. The flange **14** is integral with the side wall **19** and flange **16** is integral with stepped side wall **18.**

The hub **12** is preferably provided with flats when being utilized on a Teletype printer. These flats are directly opposite one another. One of the flats serves to provide an acceptable surface for attachment, in any convenient manner such as by ultrasonic welding, to one end of an inked ribbon. The other flat is utilized to provide take-up space for the metal reversing eyelet which effects reversing of the ribbon on the Teletype printer. The terminal end portion of the ribbon constituting a length at least equal to the circumference of the hub **12** is either of reduced width or rendered ink impregnable, such as by use of an ink impervious plastic shield, so as to prevent ink from accumulating in said terminal end portion.

The hub **12** has a third flange **20** which extends radially outwardly. The length of flange **20** in a radial direction is substantially less than the radial length of flanges **14** and **16.** Further, flange **20** as shown more clearly in FIG. **2** is substantially closer to flange **16.** The radial length of flange **20** exceeds the radial thickness of ribbon which will accumulate on a fully wound spool. A highly absorbent annular felt pad **22,** which is readily deformable and to some extent compressible, is supported by the flange **20** and projects downwardly between the in-turned end **15** on the flange **16** and the outer periphery of flange **20.** Thus, a portion **23** of the felt pad **22** is exposed and faces flange **14.**

The spool body includes a core **24** which is hollow and adapted to receive a mounting post. Core **24** has a concentric and enlarged diameter portion **26** within which is fixedly secured a driver **28.**

The driver **28** is preferably a plastic annular member impregnated with magnetizable material. Driver **28** is force-fit or otherwise secured to the enlarged diameter portion **26.** If desired, driver **28** may be adhesively secured to the enlarged diameter portion **26.** Driver **28** is provided with one or more holes **30** to effect rotation of the spool about the longitudinal axis of core **24.**

The spool body is preferably made in two pieces from an ink impervious lightweight material such as a polymer plastic. A suitable polymer for the body would be Celcon, which is a commercially available high crystalline acetal copolymer based on trioxane. One body portion is comprised of the hub **12,** flange **14,** wall **19,** portion **26,** and core **24.** The other body portion is comprised of wall **18** and flange **16.** The side edge portion of hub **12** adjacent wall **18** is preferably hermetically sealed thereto in any convenient manner such as by use of ultrasonic welding, adhesives, and the like. If desired, the core **24** could be extended and similarly sealed to wall **18.**

Thus, the spool body includes an annular sealed chamber **33** defined at its inner periphery by core **24** and portion **26.** The outer periphery of the chamber **33** is defined by the hub **12.** Within the sealed chamber **33,** there is provided a sealed ink reservoir. In the preferred embodiment, the sealed ink reservoir includes a carrier such as an absorbent, deformable felt pad **34** impregnated with ink.

At least one wick extends from pad **22** to the sealed ink reservoir. As illustrated, a pair of diametrically opposed wicks **38** and **39** is provided with each wick in contact with pad **34.** Pad **22** partially compresses the exposed portion of the wicks supported by flange **20.**

Each of the wicks **38** and **39** extends through a discrete hole **36** in the hub **12.** The diameter of the hole **36** is significant in terms of the diameter of the wick. The diameter of hole **36** should be approximately **80%** of the diameter of the wicks in their uncompressed state. Using a wick having a nominal diameter of one-eighth of an inch, optimum results have been obtained using holes **36** having a diameter of 0.099 inch. Except for the wick holes, the chamber **33** is hermetically sealed.

With a spool constructed as set forth above, we have observed that the portion of the wicks outside the casing **32** have a gray color indicating very little or no ink in the outer peripheral portion of the wick. An extremely small hole having a diameter of 0.004 inch was drilled through the wall **18** and immediately sealed with pressure-sensitive tape. As soon as the hole was uncovered by removing the tape, the exposed portion of the wicks immediately took on the color of the ink. Hence, we have found that it is important to have an ink reservoir which is hermetically sealed except for the wick hole.

Each wick has one end communicating with the ink reservoir and its other end in contact with the felt pad **22.** Thus, each wick has a portion extending through a hole **36** in the hub **12** with its adjacent terminal end resting on the flange **20** beneath and in contact with the undersurface of pad **22.**

A ribbon **42** having a length of approximately one to two yards extends between a pair of the spools **10.** Each end portion of the ribbon **42** is secured to one of the spools **10** as described above. The width of the ribbon **42** is equal to or slightly greater than the distance from the exposed portion **23** of pad **22** to the flange **14.** As pointed out above, the last several inches at each end of the ribbon **42** may be narrower by a distance of approximately one-eighth of an inch so as to avoid contact between the terminal end portion of the ribbon and portion **23** of pad **22.** Alternatively, the terminal end portions of the ribbon **42** may be encased in a plastic ink-impervious sleeve. The ribbon **42** is preferably a 5 caliber nylon ribbon having a minimum thread count of about 274 threads per inch. Such a ribbon is conventionally used for printing ribbons on computers.

In FIG. **4,** there is illustrated a second embodiment of the present invention designated generally as **10'.** The printing ribbon spool **10'** is identical with spool **10** except as will be made clear hereinafter. Thus, in spool **10',** the chamber **33** contains a hermetically sealed casing **32** filled with ink. Casing **32** has a hole through which wick **38'** extends and which is of the same dimensions as hole **36.** Otherwise, the embodiments are identical.

The spool **10** may be assembled as follows:

The body may be injection molded in two pieces as described above. The driver **28** may be attached in the portion **26** when desired during the initial assembly or during late stages in the assembly.

Before introducing the reservoir into the spool body, the wicks are threaded or otherwise forced through the holes **36** until they assume the disposition shown in FIG. **2,** or equivalent disposition such as the wicks extending to the wall **19.** Thereafter, the free or exposed end portions of the wicks may be extended through the holes **36** in the hub **12.**

The uninked pad **22** is placed in position overlying the flange **20** with the inner periphery of pad **22** in contact with the outer periphery of hub **12.** The impregnated pad **34** is introduced into chamber **33.** For ease of handling, pad **34** may be encased in a sleeve at one end portion wherein the sleeve would not contact the wick. Thereafter, the wall **18** is juxtaposed to the other spool body portion and sealed thereto by the use of ink impervious adhesives or ultrasonic welding. During this step the portions of the wicks on flange **20** and to some extent the pad **22** are compressed. In this manner, a spool body is produced which cannot be reused after the ink reservoir has been depleted. With the hermetically sealed spool and reservoir provided in this manner, with no moving parts, there is no occasion for a user to tamper with the contents thereof.

We do not know and cannot explain how or why the invention works with any degree of certainty. It is our belief that the use of a hole such as hole **36** through which the wick extends is an important feature of the invention. In this regard, the diameter of hole **36** must be substantially less than the diameter of the wick in its uncompressed state. As pointed out above, excellent results have been obtained wherein the diameter of the hole **36** is approximately 80 percent of the diameter of the wick in its uncompressed state.

Test results have indicated that the spooled ribbon of the present invention has a leakproof and exceptionally long storage shelf life. It is believed that the wick does not continuously transfer ink to the pad except when the pad **22** is transferring ink to the ribbon **42.**

When the spool **10** is in use, the ribbon **42** appears to wiggle or flex the exposed portion **23** of pad **22.** During winding, the ribbon **42** tends to flex exposed portion **23** of pad **22** radially inwardly. During unwinding, the ribbon **42** flexes portion **23** radially outwardly. It appears that this action primes or pumps the flow of ink through the wicks. When the spool is not in use, the capillary flow of ink along the wicks stops after a short period of time.

When assembling the spool **10,** it is not necessary for pad **22** to be pre-inked. After about 6–8 hours of shelf life, pad **22** will become inked to a certain point and thereafter absorbs no further ink from the wicks. This seems to indicate that a balance has been achieved. If the newly assembled spool is put on a machine with pad **22** still dry, the pad **22** starts transferring ink to the ribbon in less than **3** hours and will be wetter than the pad of a spool which has been sitting on a shelf for 6–8 hours.

During usage, the driver **28** magnetically exerts sufficient force to hold the spool downwardly so as to avoid the vibration to which such spools have been subjected heretofore in certain types of Teletype printers. The minimizing of vibration has a beneficial effect on proper tracking of the ribbon **42** and on the uniformity of the printing. One spool is rotated clockwise by projections entering into the holes **30** on each of the drivers, while the other spool is rotated counterclockwise.

During the single pass of the ribbon, ink will be replenished at the top edge of the ribbon **42** twice, that is, once during takeup and once during payout. As ink is withdrawn from the area on the ribbon which is hit by the key, the struck area will replenish itself by drawing through capillary action from an adjacent area thereabove. The bottom edge portion of the ribbon below the key-strike area remains relatively dry. By continuing the feeding of the top area of the ribbon due to contact between the side edge of the ribbon **42** and the portion **23** of felt pad **22,** the area struck by keys on the ribbon **42** will always have a supply of ink thereabove to draw from.

While the above-described embodiments utilize one or more wicks which are round, it will be readily apparent that wicks of other cross-sectional configurations may be utilized. If so, the ratio of transverse dimensions of the wicks and the holes which communicate the wicks with the reservoir should be maintained.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

We claim:

1. A method of replenishing ink in a printing ribbon comprising withdrawing ink from a sealed reservoir by capillary action using a wick of compressible material having one end communicating with said reservoir by way of an opening smaller in dimensions than the transverse dimensions of said wick in its uncompressed state, compressing said wick at said opening, transferring the ink from said reservoir by said wick to a deformable pad, transferring ink from the pad to a printing ribbon by contact between the pad and a side edge of the ribbon, and initiating said transfer of ink from said reservoir to said pad by flexing an exposed portion of said pad.

2. A method in accordance with claim **1** including using first and second spools with the ribbon partially wound around each spool and having a length of approximately 1 to 2 yards, rotating the first spool in a clockwise direction while rotating the second spool in a counterclockwise direction to effect relative movement between the pad on each spool and said ribbon to effect said ink transferring step.

3. A method in accordance with claim **1** including locating the reservoir in the spool hub radially inwardly of said pad.

4. A method in accordance with claim **1** including transferring ink from said reservoir to said pad at two discrete locations on the pad.

5. A method in accordance with claim **1** wherein flexing the exposed portion of said pad includes flexing said pad portion radially inwardly and radially outwardly during winding and unwinding of said ribbon.

* * * * *