May 15, 1973 F. R. ANDERSON 3,733,211

RIBBON-INKING METHOD

Original Filed Oct. 27, 1969 2 Sheets-Sheet 1

FIG. 2.

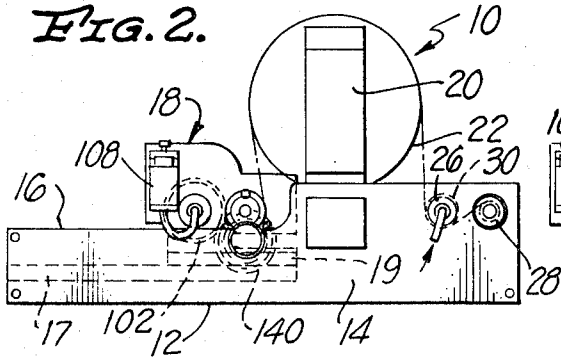


FIG. 1.

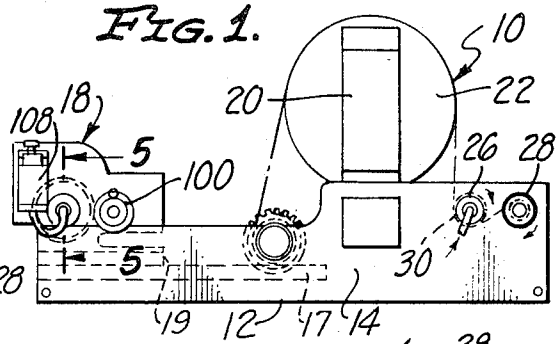


FIG. 3.

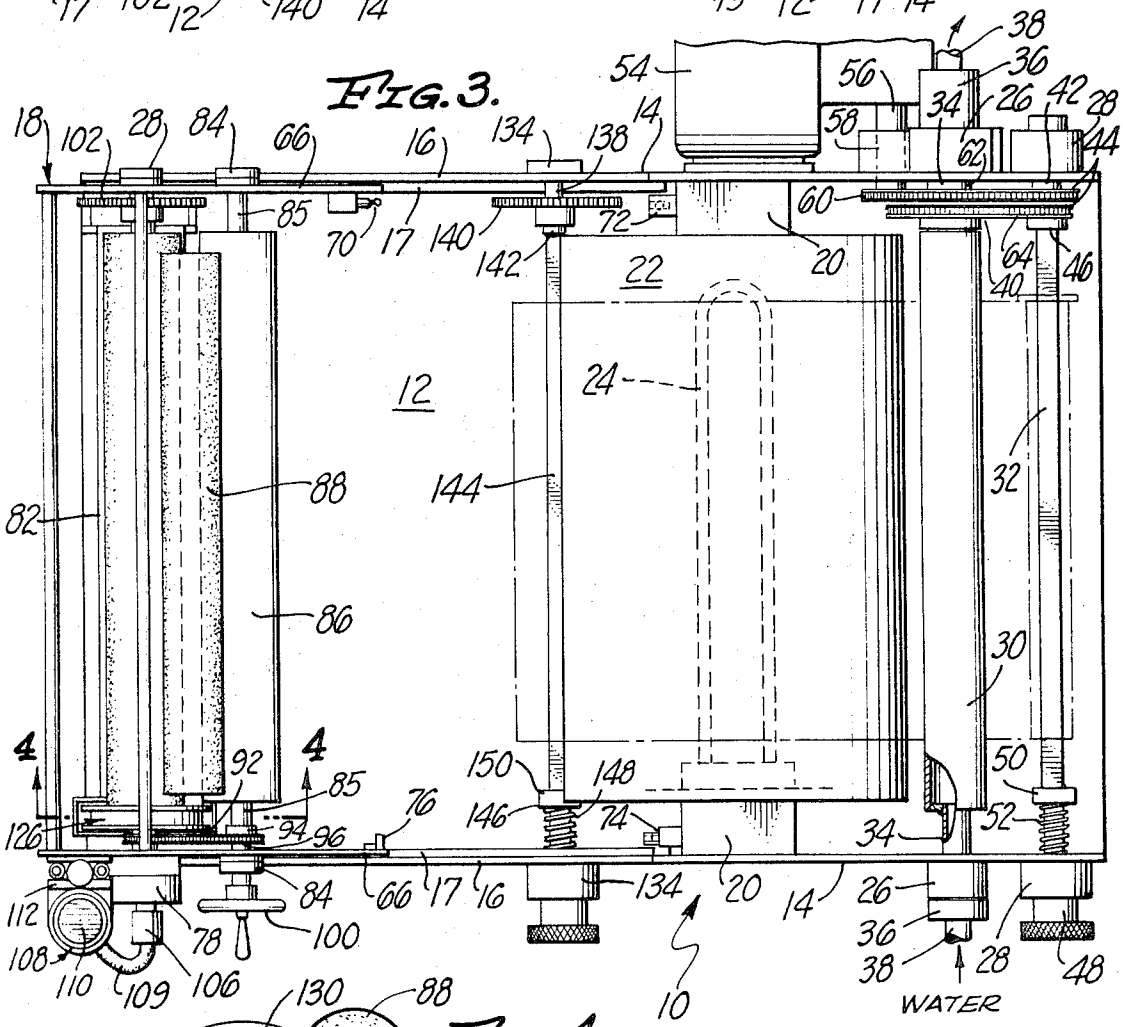
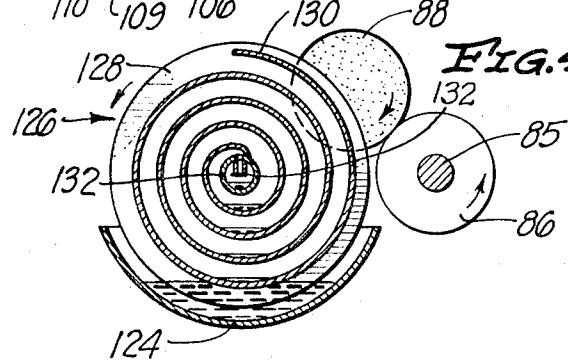


FIG. 4.



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FIG. 5.

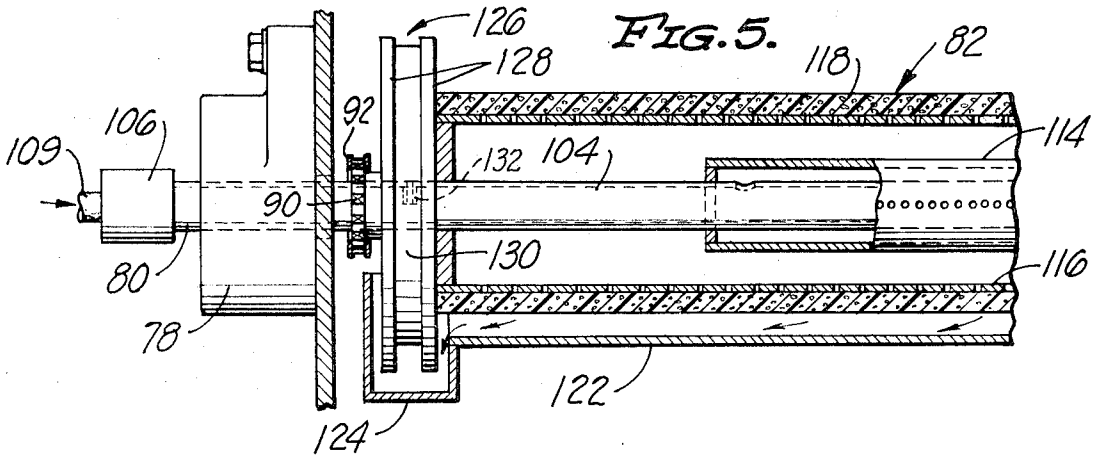
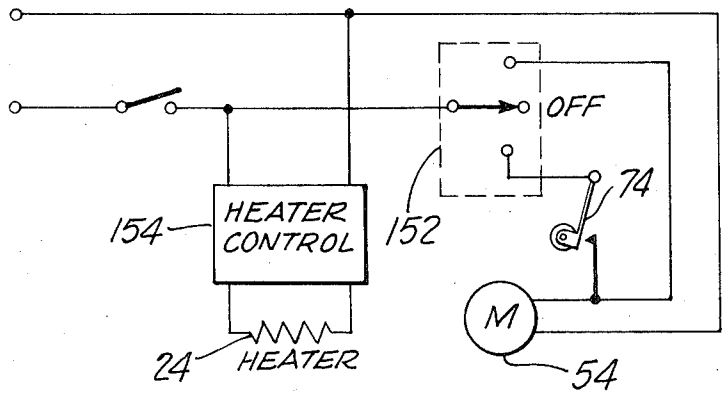


FIG. 6.



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RIBBON-INKING METHOD

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Original application Oct. 27, 1969, Ser. No. 869,461. Divided and this application June 28, 1971, Ser. No. 157,769

Int. Cl. B23p 7/00

U.S. Cl. 117—2 R 2 Claims

ABSTRACT OF THE DISCLOSURE

A used previously inked ribbon for which ink has been removed as a result of use can be effectively reinked so as to be capable of reuse by applying ink to a surface of the ribbon from a roller and then by subsequently ironing the ribbon. Such ironing involves applying heat to the ribbon while holding the ribbon under tension; preferably the ironing is followed by cooling the ribbon.

CROSS-REFERENCES TO RELATED APPLICATIONS

This application is related to the copending Frank R. Anderson and Albert J. Castro application entitled "Ribbon Inking Machine" Ser. No. 869,461 filed Oct. 27, 1969, now abandoned, and claims subject matter subject to a restrictive requirement in the copending application.

BACKGROUND OF THE INVENTION

Inked ribbons are commonly utilized in connection with various types of computing, calculation, addressing and related machine in order to print different indicia such as numbers, names and the like. As such ribbons are used, the ink within them becomes exhausted. Because of wear characteristics it is normally preferred that such ribbons be formed of a thermoplastic material such as nylon. As ribbons of such materials are used they tend to stretch in the areas where they are contacted most frequently. Such stretching can lead to the ribbon having an undesired shape or configuration.

As a result of these and related problems it has been conventional to discard ribbons of the type indicated after the ink supply within them has been exhausted. This is considered to be economically undesirable. However, the industry has followed this procedure of replacing used ribbons rather than rejuvenating them because of a lack of a satisfactory procedure for restoring them substantially to their initial condition.

SUMMARY OF THE INVENTION

From this it will be seen that there is a need for a satisfactory treatment of used inked ribbons so that such ribbons may be reused. An objective of this invention is to supply this need. Further objectives of the invention are to provide a new and improved process for treating used ink ribbons so as to restore them to substantially their initial condition. Other objectives of this invention are to provide a process of the class described which is relatively simple, which may be easily and conveniently carried out, which is effective for its intended purpose and which may be carried out in various different manners.

These objectives are achieved my first applying ink, such as conventional ink, to a surface ofa used, previously inked, ribbon and then by ironing the inked ribbon and then finally by rewinding the inked ribbon on a core so that it may be further used. The process of the invention contemplates further steps of a more detailed nature than can be satisfactorily indicated in this brief summary of the principal features of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Further details of the invention as well as the manner in which the objectives of the invention are achieved will be apparent from a careful consideration of the remainder of this specification and of the accompanying drawings in which:

FIG. 1 is a side-elevational view of a presently preferred embodiment of a ribbon-inking machine, for use in practicing the process of this invention, in a position in which this machine may be loaded with a used ribbon upon a core;

FIG. 2 is a side elevational view corresponding to FIG. 1 showing the machine in a running position;

FIG. 3 is an enlarged top plan view of the machine shown in FIG. 1 in the position in which it is shown in FIG. 1;

FIG. 4 is a fragmentary cross-sectional view taken at line 4—4 of FIG. 3 showing a part of the construction of the machine illustrated;

FIG. 5 is a further fragmentary cross-sectional view shown in section showing a part of the construction of the machine illustrated. Those parts of this view shown in section are illustrated as they would appear if a sectional view was taken at line 5—5 of FIG. 1; and

FIG. 6 is a schematic view of the electric circuit used in the machine shown.

It will be realized that the accompanying drawings are only intended to illustrate for explanatory purposes the construction of a machine for use in practicing the process of this invention. Other differently appearing and somewhat differently constructed machines serving the same function as the illustrated machine for use in practicing the process of the invention may be easily designated on the basis of the disclosure embodied herein through the use or exercise of routine engineering skill.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawing there is shown a ribbon-inking machine **10** of this invention which has a base **12** holding or including two spaced, parallel sides **14**. These sides **14** are formed so as to include parallel edges **16** located in the same plane above the base **12**. These sides **14** carry the pot bottom portions **17** of a conventional movable drawer slide, the inside portions **19** of which are attached to a movable feed carriage **18**.

The sides **14** also include mounting brackets or standards **20** which support a drum **22** having a metal surface. Conventional electric heating elements **24** are held by the standards **20** so as to supply heat to the interior of the drum **22** during its operation so that the drum **22** and the heating elements **24** together act as an ironing means.

In the particular machine **10** illustrated the drum **22** is rigidly mounted on the standards **20** so that it does not rotate during the operation of the machine. However, this drum **22** may be made so as to rotate, although this is not preferred in accordance with the invention. When the drum **22** is rigidly supported as shown it effectively places a "drag" upon a ribbon being treated by friction so as to facilitate obtaining satisfactory results with the machine. Also when the drum **22** is rigidly mounted as shown the expense of a structure rotatably supporting it can be eliminated.

Bearings **26** and **28** are mounted on the sides **14** adjacent to the drum **22** for the purpose of carrying a cooling roller **30** and a take-up bar **32**, respectively, so that the axis of this roller **30** and the bar **32** are parallel to the axis of the drum **22**. The cooling roller **30** is hollow and includes hollow shafts **34** which projects through conventional rotary seals **36** as shown. It will be noted that these shafts **34** are used in connection with the bear-

ing 26 for mounting purposes. These seals 36 carry tubes 38 through which water or other cooling fluid may be circulated during the operation of machine 10. One of the shafts 34 carries a conventional sprocket 40.

The take-up bar 32 is capable of fitting within and holding a core or spool for a ribbon so as to cause such a core or spool to rotate. It is directly connected to a bearing 28 by a shaft 42 carrying other sprockets 44. This shaft 42 includes a nonround socket 46 into which the bar 32 fits. The other end of this bar 32 is retained by means of a conventional plunger 48 mounted in the other of the bearings 28. This plunger 48 includes a socket end 50 which is adapted to engage and support an end of the bar 32. A conventional coil spring 52 is biased between one of the sides 14 and the end 50 so that the plunger 48 will be operative for its intended purpose. With this construction the bar 32 may be replaced by pulling on the plunger 48.

One of the sides 14 also carries a conventional gear head motor 54 from which there projects a shaft 56. This shaft 56 extends through a bearing 58 mounted on this side 14 and carries another conventional sprocket 60. Roller chains 62 connect the sprocket 60 with one of the sprockets 44; another roll chain 64 connects the other sprocket 44 with the sprocket 40. With this construction when the motor 54 is operating both the take-up bar 32 and the cooling roller 30 is rotated. Both this roller 30 and the bar 32 are rotated in the same direction; however, it will be noted that the sprocket 40 is larger than the sprockets 44. This will serve to rotate the periphery of the roller 30 at a different velocity than the bar 32.

The carriage 18 includes interconnected side plates 66 carrying the drawer slide portions 19 so that this carriage 18 may be moved to the positions as shown in FIGS. 1 and 2 of the drawing. When this carriage is moved to the running position as shown in FIG. 2 a small retaining dog or pin 70 on one of the side plates 66 engages a conventional holding detent 72 so as to lock the carriage 18 in a running position. This detent 72 is mounted upon one of the sides 14. The other of these sides carries a small microswitch 74 which is adapted to be engaged by a projection 76 on the other of the side plates 66 so as to be closed in this running position.

The side plates 66 carry bearings 78 which rotatably support shafts 80 of a composite ink feed roller 82. The construction of this roller 82 will subsequently be described in more detail. The side plates 66 also carry other bearings 84 which rotatably support shafts 85 of a ribbon roller 86. This roller 86 preferably has a metal surface so as to facilitate uniform transfer of ink to a ribbon. The two rollers 82 and 86 are mounted in this manner so that their axes are always parallel to the axes of the cooling roller 30 and the take-up bar 32. The rollers 82 and 86 are further mounted sufficiently close to one another so as to rotatably support between them an ink spreading roller 88. This spreading roller 88 is "free floating" on the two rollers 82 and 86; hence, it will roll during the operation of the machine 10 in a reverse direction to the direction in which the rollers 82 and 86 rotate.

The shaft 80 carries a sprocket 90 which is connected by roller chain 92 to another sprocket 94 mounted upon a short shaft 96. This shaft 96 is carried by a bearing 84 on one of the side plates 66. This shaft 96 carries a small hand wheel 100 which may be utilized to adjust the position of the ink feed roller 88 when a machine is not being used so as to alleviate any loss of ink from this roller. This wheel 100 may also be turned so as to spread out and distribute ink prior to the use of the machine 10. The other of the shafts 80 carries a normally driven spur gear 102.

The shaft 80 which carries the sprocket 90 is hollow and is connected to and forms a part of a hollow perforate tube 104 which extends completely across the interior of the ink feed roller 82. An end of this shaft 80 is secured to a conventional rotary seal 106 similar to the seals 36 previously described so that ink may be conveyed to the interior of the tube 104 from a conventional ink reservoir 108. In the embodiment of the invention shown this reservoir 108 consists of an inverted container such as a jar connected directly to the tube 104 by a tube 109. A mounting bracket 112 upon one of the side plates 66 is used so as to support the container 110.

The roller 82 is constructed so as to utilize a secondary tube 114 which is mounted on and spaced from the tube 104 so as to receive ink from the perforations in the tube 104. This tube 114 is also perforated as shown and is used so as to distribute the ink received by it during the rotation of the entire roller 82 and the tube 104 to the interior of a perforate cylinder 116. This cylinder 116 preferably supports and holds a somewhat resilent microporous cylindrical pad 118 of a known polymer composition. The pad 118 is of the general category used in conventional preinked type stamps which can be used to directly print an image without being separately inked each time used because of an ink storage capacity within such a pad. The particular pad 118 is of such a nature so as to have interconnecting cells so that ink can be transferred through it at what may be regarded as a controlled, metered rate. The pad 118 can be made of any material which will evenly distribute and convey ink in substantially the same manner as the material described.

During the operation of machine 10 ink is conveyed from the reservoir 108 into the tube 104 and into the tube 114 and finally into the interior of the cylinder 116 from the reservoir 108. The ink within the interior of the cylinder 116 will move out through the pad 118 so as to be transferred from it to the ink spreading roller 88. Preferably this roller 88 has a known or conventional surface to which ink will readily adhere. The ink on the roller 88 will be transferred to a significant degree to the ribbon roller 86 from which it will be applied as subsequently described. The method of causing rotation of the ink feed roller 82 and the other rollers 86 and 88 will be more fully apparent from the subsequent discussion.

In any event as the ink is transferred some ink will fall off of the ink fed roller 82. Such ink will be received in a sloping drip pan 122 located under the roller 88 and will flow to a sump 124. With the present invention ink accumulating in the sump 124 will be picked up by a spiral type of pump 126 carried by the tube 104 so as to be conveyed back into the interior of this tube.

This pump 126 includes side walls 128 of a disc-like shape between which there is an enclosed spiral wall 130 leading to a short feed tube 132 extending partially into the interior of the tube 104. This tube 132 is utilized so as to minimize any opportunity for ink draining out of the tube 104 when the machine 10 is at rest. The wheel 100 may be turned so as to position the feed roller 82 so that this tube 132 extends downwardly in such a manner that nothing can drain through it. The tube 132 also serves to prevent ink draining out of the tube 104 as the machine 10 is operated.

The machine also includes adjacent to the drum 22 but on the side of it remote from the cooling roller 30 and the take-up bar 32 adjacent to the carriage 18 aligned bearings 134 which carries a first shaft section 138. This section 138 carries a drive spur gear 140 which is adapted to mate with the gear 102 when the carriage 18 is moved to a running position. The shaft section 138 also includes a nonround socket 142 which is adapted to receive a bar 144 corresponding to bar 32. The end of the bar 144 remote from the shaft section 138 fits into a plunger 145 corresponding to the plunger 38 previously described. This plunger 146 is mounted in one of the bearings 134 and is loaded by means of a spring 148 bearing against one of the side plates 66 so that a head 150 of it is secured with respect to the bar 144.

With this construction when the carriage 18 is in a position as shown in FIG. 1 the bar 144 may be easily

removed by pulling on the plunger **146** so that a tube or core or spool containing ribbon to be reinked may be located upon it. Once such a winding of ribbon is located on the bar **144** this bar may be reinserted as shown. The end of such a ribbon may then be passed upwardly around the drum **22** and under the cooling roller **30** where it can be attached to a core, spool or the like located upon the take-up bar **32**. The take-up bar **32** may be removed and replaced in the same manner as the bar **144** so as to locate such a core upon it.

At this point the wheel **100** may be turned so as to uniformly distribute ink. Next, during the use of the device the carriage **18** is moved from the position shown in FIG. 1 of the drawing to a running position as shown in FIG. 2 of the drawing. When it reaches such a running position the pin **70** will be locked by the holding detent **72** so as to secure it in place. Also in this position the ribbon roller **86** will engage the ribbon being inked so as to force this ribbon out of a normal path as indicated in FIG. 1 of the drawing in phantom to a position as indicated in phantom in FIG. 2 of the drawing. The movement of the carriage **18** will also close the microswitch **74** so as to place the machine in condition for operation. Such movement will also cause the gears **140** and **102** to mate.

At this time the machine **10** is ready to operate. To achieve such operation an on-off switch **152** is closed. As shown in FIG. 5 of the drawing this will cause current to flow in parallel to a conventional thermostat **154** connected to the heating elements **24** and to flow to the motor **54**. The operation of this motor will cause rotation of the take-up bar **32**. Such rotation of the take-up bar **32** will cause the ribbon to be wound upon it from the bar **34** from the bar **144**.

As this occurs several things happen. The bar **144** will be caused to rotate. Rotation of the bar **144** will be transmited through the gear **140** to the gear **102**. This will cause rotation of the ink feed roller **82** so that ink will move outwardly to the surface of the cylindrical pad **118**. From this surface the ink will be transferred to the roller **88** since this roller **88** will operate by frictional contact with the roller **82**.

As this occurs ink will be spread about by the roller **88** and will be transferred to the ribbon roller **86**. This ribbon roller **86** will transfer ink to the ribbon being rejuvenated as it turns. Such a ribbon will tend to take up from the roller **86** approximately the amount of ink that it needs to replace that which has been used from it. As this occurs the ribbon roller **86** will turn past the spreading roller **88** where it will pick up additional ink to replace that which has been transferred to the ribbon and where the ink upon it will be uniformly proportioned. From this it will be apparent that the amount of ink transferred to a ribbon will be dependent upon the nature and sizes of the various rollers described. It will also vary with the speed at which a ribbon is moved.

The ribbon traveling past the ribbon roller **68** will move under tension around the drum **22**. As this occurs the ribbon will, of course, be heated and the heat from within the drum **22** and the tension applied to the ribbon will tend to iron this ribbon as the ribbon passes in contact with the curved surface of the drum **22**. Such heat and tension will not only tend to create an ironing effect as the ribbon is treated as indicated. Such heat and tension will tend to cause stretched areas of the ribbon to shrink back into an initial, flat configuration. This is particularly pronounced when the ribbon being treated has a ribbon base of a thermoplastic material such as a nylon or the like. In practicing the invention it would appear that ribbons employing a ribbon base of such thermoplastic materials have a memory of their initial flat configuration which is, so to speak, activated by the heat applied during this ironing operation. Shrinkage to other than this initial flat configuration is apparently prevented by the tension on the ribbon and the contact with the drum **22**.

As a ribbon being treated in the manner described travels past the drum **22** the ink in the ribbon will be heated by the heat applied through the surface of the drum **22**. Such heat will reduce the viscosity of what may be termed or considered as "normal" or "conventional" inks such as are normally employed in ribbons as described and such as will normally be used in the apparatus **10**. Such a decrease in viscosity will cause such inks to "flow" and/or move in the ribbon being treated in such a manner as to tend to cause a reasonably uniform ink distribution throughout the ribbon and in such a manner as to tend to cause a reasonably effective blending of both the ink already in the ribbon prior to its treatment, as herein described, and the ink applied as herein indicated.

Some ink or ink solvent may be vaporized by the heat utilized, but in general the amount of volatile material lost will be so small as to be negligible. It is, however, possible to use the apparatus **10** with inks containing highly volatile solvents which will be vaporized to a significant degree by the application of virtually any amount of heat. It is not considered desirable to utilize such highly volatile inks or inks containing highly volatile solvents in practicing the invention. Conventional inks such as are commonly utilized in linked business machine ribbons are satisfactory for use in practicing the process of the present invention.

The amount of heat applied to a ribbon by contact with the surface of the drum **22** should be sufficient to cause any stretched thermoplastic material in the ribbon to return to an initial flat configuration and should be sufficient to cause both the ink present in the ribbon and applied to the ribbon to "flow" and to be distributed as described without this ink being detrimentally damaging by the applied heat. It will be realized that it is the intention of the present invention that an effective amount of heat be used to accomplish these objectives, which amount is sufficiently low so as to avoid a detrimental effect on the ink.

What will constitute an effective, non-detrimental amount of heat will vary in accordance with a large number of different perimeters. In general, the less volatile the inks or ink present the more heat required. In general, the higher the softening point of a thermoplastic polymer in a ribbon the greater the heat required. In general, the greater the length of time a given portion of ribbon is in contact with the drum **22** the lesser the temperature required in the drum. Factors of this type will, of course, be apparent from a consideration of routine factors applicable to the present invention. In general it is considered that satisfactory results can be achieved with the surface of the drum heated to within the range of from 200° to 350° F., but so many variables are applicable to the present invention that this range is not to be considered as particularly significant or absolute.

A ribbon ironed as described will next move past the cooling roller **30**. There it will be cooled so as to tend to "fix" the structure of the material within the ribbon rendered somewhat flexible by the heating at the drum **22**. This will also make the ink within the ribbon less mobile. The roller **30** should be cooled an effective amount to render the ink and other material in a ribbon approximately as stable or nonmobile as in a common, new business machine ribbon at room temperature. Normally the entire ribbon will be cooled to ambient temperature. The precise temperature of the cooling roller **30** necessary to accomplish this will be dependent upon a number of factors such as are indicated in the preceding discussion relative to heating a ribbon being processed. In general cooling water within the range of 32° to 50° F. may be satisfactorily used. This range is not to be regarded as being critical. Indeed, the roller **30** may be maintained at normal ambient temperature (72° F.) in which case, in effect, any ribbon treated is air cooled. The ribbon

cooled in this manner will, during the operation of the machine, be taken up and wound upon the take-up bar **32**. With the machine **10** has been operated in this manner and the ribbon is nearly all wound on the take-up bar **32** the tension on the ribbon will increase. This will cause or force to be exerted ribbon roller **86**. As this tension increases the force on the ribbon roller **86** will increase to a point where the carriage **18** will be released by the detent **72**, and will move. As this occurs the microswitch **74** will be released, cutting off power to **54**. This will stop the movement of the ribbon. Then the switch **152** is turned off and the ribbon located on the take-up bar **32** is removed from the machine.

From a careful consideration of the aforegoing it will be realized that any ribbon treated as herein described will be under a considerable amount of tension as it is treated. In this connection the various rollers on the carriage **18** in effect act as a friction brake. A further braking action is achieved by virtue of the previously described rotation of the cooling roller **30**. With the structure shown this cooling roller **30** actually goes against the direction of ribbon travel. This tension is considered quite desirable in stretching a ribbon being inked so as to achieve a smooth appearance.

During the operation of thee machine some ink will normally tend to adhere to the drum **22**. This amount of ink is normally adequate to take care of reinking a ribbon adjacent to its lead in end even though such a portion of a ribbon is not contacted by the ribbon roller **86**. If desired, however, the portion of a ribbon adjacent to its leading end may be drawn by hand past the ribbon roller **86** as the ribbon is mounted in the machine **10** so as to apply ink to it.

What is claimed is:

1. A method of inking a previously inked thermoplastic business machine ribbon from which ink has been removed from areas of the ribbon during the use of the ribbon and areas of which have been stretched from a flat configuration, which method comprises:

applying ink to a surface of said ribbon from an inked surface,

ironing the inked ribbon by the application of heat to said ribbon as said ribbon is held under tension, in

contact with a surface, said heat being applied in an amount sufficient to cause ink movement within said ribbon by decreasing the viscosity of all ink within said ribbon through the application of said heat to said ribbon and in an amount sufficient to cause said stretched areas of said ribbon to shrink back to said flat configuration, such ink movement within said ribbon tending to cause a uniform ink distribution throughout said ribbon and said application of heat tending to cause said ribbon to assume a smooth configuration as a result of contact with said surface as said ribbon is heated and

cooling said ribbon to room temperature after said ironing.

2. A method as claimed in claim **1** wherein:

said ribbon is a nylon ribbon, and

said ribbon is cooled to room temperature following said ironing by being contacted with a cooling surface.

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H. J. GWINNELL, Assistant Examiner

U.S. Cl. X.R.

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