

Aug. 8, 1961

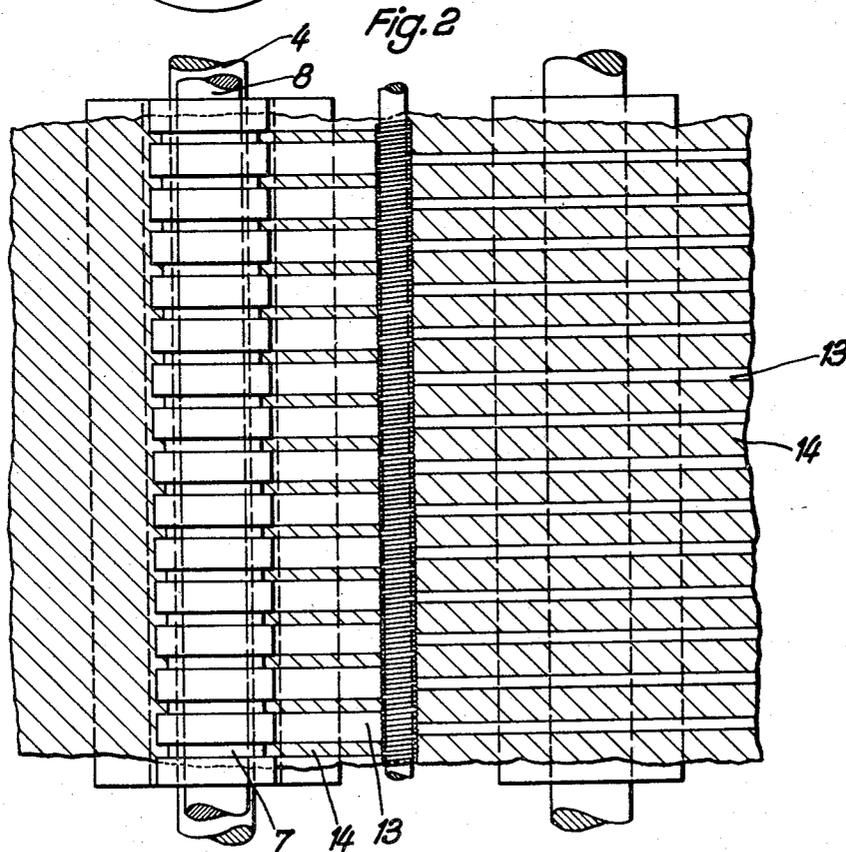
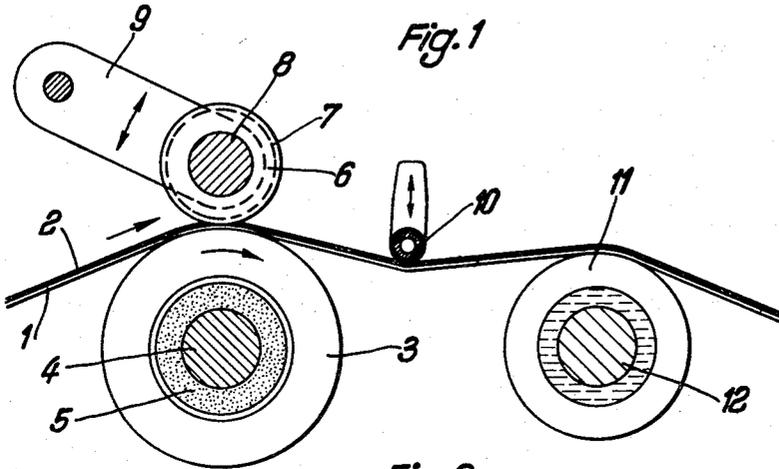
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2,995,460

METHOD AND APPARATUS OF MAKING AN INK RIBBON

Filed June 19, 1958

3 Sheets-Sheet 1



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METHOD AND APPARATUS OF MAKING AN INK RIBBON

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3 Sheets-Sheet 2

Fig. 3

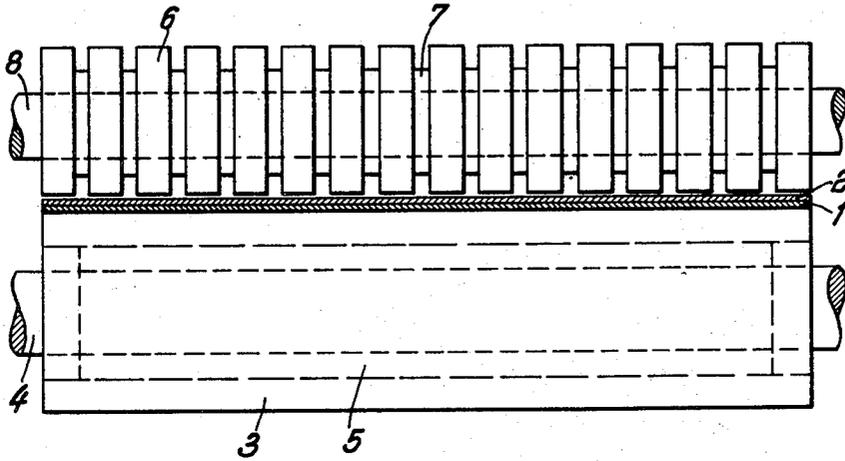


Fig. 4

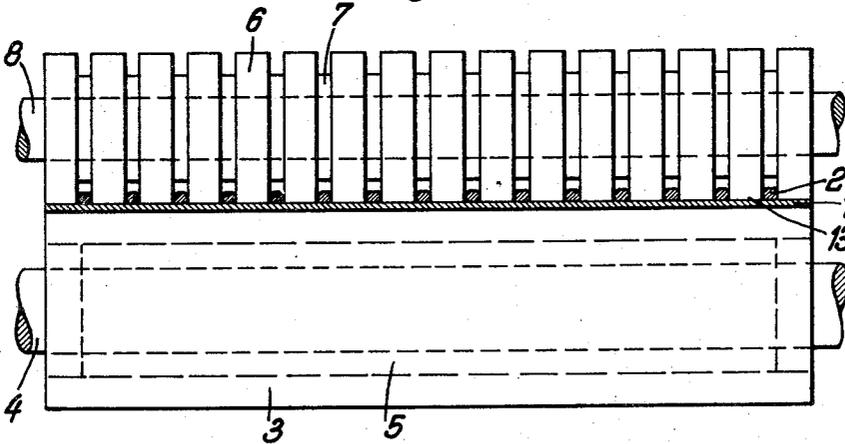
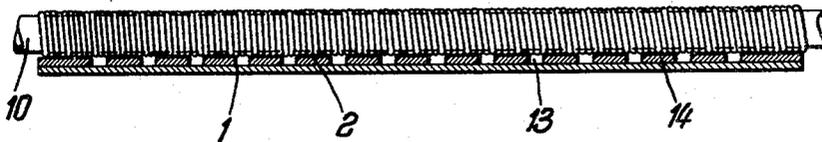


Fig. 5



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3 Sheets-Sheet 3

Fig. 6

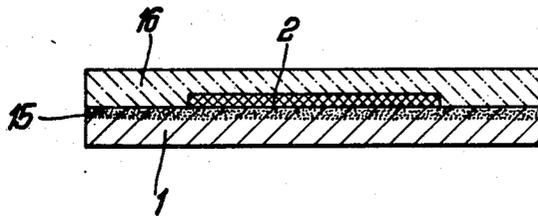
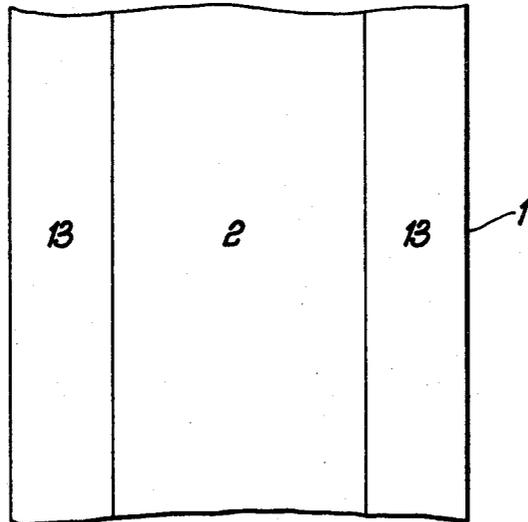


Fig. 7



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2,995,460

## METHOD AND APPARATUS OF MAKING AN INK RIBBON

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11 Claims. (Cl. 117-4)

The present invention relates to an ink ribbon and to a method and apparatus for making the same.

More particularly, the present invention relates to the manufacture of an ink ribbon and to an ink ribbon for hectographic purposes.

Hectographic ink ribbons are used for producing on hectographic master sheets a mirror image of the text which is to be reproduced. The master sheet is inserted into a typewriter and the hectographic ink ribbon is passed behind the master sheet so that the hectographic ink coating on the ribbon faces the back side of the master sheet. Upon operating the typewriter, the keys of the same will contact the front face of the master sheet and the pressure exerted by the typewriter keys on the master sheet will be transmitted through the same to the ink coating on the hectographic ribbon and will cause a portion of the ink coating to adhere to the back face of the master sheet, forming thereon a mirror image of the type. Positive copies are then produced from the thus-formed master sheet.

The hectographic ink ribbon is passed in the typewriter behind the master sheet over guiding rolls and brakes of a ribbon guiding device. Thereby it has been found that hectographic ink ribbons having one face which is completely coated with ink will deposit ink from its longitudinal edge portions, particularly at the reversing and braking portions of the ink band guiding device. The ink portions which are thus removed from the ink band and which adhere to parts of the band guiding device cause considerable soiling of the band guiding device and the typewriter in general, and impair the movement of the ink band due to the adhesive action of ink portions adhering to parts of the band guiding device which come in contact with the ink band.

It has been attempted to overcome the foregoing disadvantages by providing hectographic ink bands formed with ink free longitudinal edge portions. Such bands are produced by forming an ink coating only at the longitudinal center portion of a supporting band or strip. However, in view of the difficulties of so applying ink to an ink band, i.e., forming in the center portion of the ink band a relatively small strip of ink coating, it has not been possible up to now to produce such hectographic ink bands with ink-free edge portions in a satisfactory manner.

It is therefore an object of the present invention to overcome the aforementioned difficulties and disadvantages.

It is another object of the present invention, to provide an hectographic ink band which will not cause dirtying of the band guiding device or of other portions of the typewriter by deposition of ink, and which can be produced in a simple and economical manner.

It is a further object of the present invention, to provide an apparatus for producing in a simple and economical manner ink ribbons free of ink coating along their longitudinal edge portions.

It is yet another object of the present invention to provide an ink ribbon blank and a method of producing the same, from which a plurality of ink ribbons can be cut each of which having ink coating free longitudinal edge portions.

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It is still a further object of the present invention to provide an ink ribbon particularly for hectographic purposes and the like, having an ink coating along a longitudinal center strip and having ink coating free longitudinal edge portions, wherein the ink coating will firmly adhere to the longitudinal center portion of the supporting strip or ribbon.

Other objects and advantages of the present invention may become apparent from a further reading of the description and the appended claims.

With the above and other objects in view, the present invention comprises in a method of producing ink ribbons the steps of forming on one face of a backing sheet a coating of thermoplastic ink substance heated to a temperature at which the ink substance is plastic, forcing the ink substance from spaced first strip-shaped surface portions of the backing sheet into second strip-shaped surface portions located in between and alternating with the first strip-shaped surface portions, so as to remove the ink substance from the surface of the first surface portions, and cutting the backing sheet into independent ink ribbons by cuts located within each of the first surface portions and spaced from adjacent second surface portions, so that each of the ink ribbons consists of a ribbon-shaped backing sheet carrying one inked center surface portion spaced from the edges thereof.

According to a preferred manner of carrying out the present method, the same comprises in the production of ink ribbons the steps of forming on one face of a backing sheet a coating of thermoplastic ink substance, heating the coating to a temperature at which the ink substance is plastic, forcing the ink substance from spaced parallel first strip-shaped surface portions of said backing sheet into parallel second strip-shaped surface portions located in between and alternating with said first strip-shaped surface portions by passing the coating of heated thermoplastic ink substance in contact with a plurality of spaced pressure roller portions having a circumferential speed slower than the forward speed of the coated backing sheet, so as to remove the ink substance from the surface of the parallel first surface portions; applying pressure to the ink substance on the second strip-shaped surface portions so as to increase the width of the parallel ink covered second surface portions and reducing the width of the parallel first surface portions separating the second surface portions; and cutting the backing sheet into independent ink ribbons by parallel cuts located within each of said first surface portions and spaced from adjacent second surface portions, so that each of said ink ribbons consists of a ribbon-shaped backing sheet carrying one inked center surface portion spaced from the parallel edges thereof.

The present invention also contemplates in an apparatus for producing an ink ribbon, in combination, heating means for heating an ink-coated backing sheet to a temperature sufficiently high to plastify the ink coating thereon; pressure means cooperating with the heating means for exerting pressure on a plurality of spaced parallel portions of the ink coating so as to push the ink coating from the spaced parallel portions onto spaced parallel portions separating the pressure exposed parallel portions from each other; flattening means cooperating with the heating means for flattening the thus formed spaced parallel ink coating portions and to reduce the height and increase the width of the same while reducing the width of the parallel portions separating ink coated portions from each other; and transport means for transporting the ink coated backing sheet in operative contact with the heating, pressure and flattening means.

Thus, according to the present invention, an ink ribbon is produced, comprising, in combination, a backing

strip having a longitudinal center portion flanked by two longitudinal edge portions, the backing strip containing ink at least within a region adjacent to one face thereof; an ink coating covering the longitudinal center portion of the one face of the backing strip; and a protective layer of wax-like material covering the ink coating and the longitudinal edge portions of the one face of the backing strip.

The present invention is also concerned with a blank for cutting ink ribbons, particularly for hectographic purposes and the like, comprising, in combination, a backing sheet containing ink at least within a region adjacent to one face thereof, a plurality of spaced parallel ink coating strips on the one face of the backing sheet, and a protective layer of wax-like material covering the free portions of the circumferences of the ink coating strips and the free portions of the one face of the backing sheet.

According to the present invention, a coating of thermoplastic ink substance is first applied to one face of a backing sheet. Thereby, and particularly on heating of the coating to plastic condition, a small portion of the ink substance will penetrate into the region of the supporting sheet adjacent to the coated face thereof. When during further processing, the coating is removed from portions of the coated face of the backing sheet, the ink which has penetrated into the backing sheet will remain in the same. Thereby, it is possible to achieve two important advantages, namely, the surface of the ink ribbon will be of uniform ink color, the color of the supporting sheet can be hidden by the color of the ink which has penetrated the surface region of the supporting sheet or backing slip. Furthermore, when during the processing of the blank pressure is applied to the ink substance on the strip-shaped surface portions coated with ink so that the width of the ink-coated strips will be increased and the width of the ink coating-free separating strips will be reduced, the ink coating will adhere more firmly to the backing sheet due to coming in contact with ink substance which has previously penetrated the region of the backing sheet adjacent to the partially ink-coated face thereof.

According to the present invention, the ink coating free areas are produced on a supporting sheet coated with a hectographic ink substance, by pushing away heated and thus plasticized ink coating from those areas of the supporting sheet which are to be ink coating free. This is accomplished by pressure members applied against the coating at those portions from which the coating is to be removed. Thereby, a plurality of parallel ink coating ribs will be formed on the backing sheet, spaced from each other by surface portions of the backing sheet which are free of superposed ink coating. The thus formed ink coating ribs have a relatively narrow width and the interposed coating free surface portions of the backing sheet are relatively wide. In order to increase the width of the ink coated strips and to reduce the width of the ink coating free surface portions of the backing sheet, pressure is then applied to the ink coating ribs so as to flatten and widen the same whereby, however, care is taken so as to retain ink coating free separating areas of reduced width. Finally, the thus formed blank is cut into individual ink ribbon rolls having ink coating free longitudinal edge portions and an ink coating along the longitudinal center portion of one face of the ink ribbon. It has been found particularly advantageous, to form the ink coating ribs by passing the completely ink coated heated sheet in contact with a plurality of spaced pressure roller portions which turn in the same direction but with a slower circumferential speed than the forward speed of the coating backing sheet. Thereby, a sliding movement of the pressure roller portions on the backing sheet is accomplished which facilitates removal or sidewise squeezing away of the softened ink coating from the portions of the backing sheet face which are contacted by the spaced pressure roller portions. Simultaneously,

wear of the pressure device is reduced thereby and a self-cleaning effect of the pressure rollers is accomplished.

Preferably, the blank comprising a backing sheet containing ink at least within the region adjacent to one face thereof, and a plurality of spaced parallel ink coating strips on said face, is then coated prior to being cut into individual ink ribbons, with a non-coloring protective layer consisting of a natural or synthetic wax-like substance such as wax or paraffin.

As described further above, it is another characteristic of the product of the present invention that the coating free longitudinal edge portions of the face of the ink ribbon carrying an ink coating strip along its longitudinal center portion, has been penetrated by ink substance which however has been removed from the surface of the longitudinal edge portions so that only a small portion of ink is retained within the region of the backing sheet or strip adjacent to the operating face thereof. In addition to production economies, it is thereby also achieved that the entire working face of the ribbon will be of the same color as the ink coating thus not requiring separate dyeing of the backing strip and, furthermore, a firmer adherence between the flattened out ink coating center strip and the center portion of the backing strip is achieved by, so to say, fusion between the ink coating and the ink substance which previously has penetrated into the backing sheet or strip.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIGURE 1 is an elevational schematic view of the apparatus of the present invention;

FIGURE 2 is a plan view of the apparatus shown in FIG. 1;

FIGURE 3 is an elevational front view of the pressure and heating means according to the present invention which form coating ribs of the ink coating on the backing sheet, taken in an inoperative position;

FIGURE 4 is an illustration of the device shown in FIG. 3 in operating position;

FIGURE 5 is an elevational view of the flattening means according to the present invention;

FIGURE 6 is a cross sectional view of the ink ribbon according to the present invention; and

FIGURE 7 is a plan view of the ink ribbon according to the present invention.

Referring now to the drawings and particularly to FIG. 1, it can be seen that the backing sheet 1 having a coating 2 of an ink substance on its upper face, passes over heating roller 3 rotating about axis 4 and formed with free space 5 into which a heating medium may be introduced. Heating roller 3 cooperates with pressure roller 6 formed with circumferential grooves 7 and mounted on shaft 8. Shaft 8 is movably supported by lever 9 so that shaft 8 can swing together with lever 9 about the axis of the latter. After passing between heating rollers 3 and pressure rollers 6, the backing sheet which now carries on its upper face a plurality of parallel spaced ribs formed of ink substance, is passed under tension underneath a heated flattening roller 10 and from there over a guide roller 11. Guide roller 11 is mounted on shaft 12 which is driven in the direction of the movement of the backing sheet. Preferably, guide roller 11 is water cooled.

FIGURE 2 shows a top plan view of the device illustrated in FIGURE 1, and illustrates clearly grooves 7 in pressure roller 6 and the outwardly extending pressure members separating grooves 7 from each other.

The ink coating rib forming pressure roller 6 is further illustrated in combination with cooperating heated roller 3 in FIGURES 3 and 4 of the drawing. FIGURE 3

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shows pressure roller 6 spaced from backing sheet 1 and coating 2, while FIGURE 4 shows pressure rollers 6 in contact with backing sheet 1 and thereby squeezing ink coating 2 into the groove portions of pressure roller 6 thereby forming ink coating ribs spaced from each other by ink coating free surface portions of backing sheet 1 formed in such areas where pressure roller members 6 contact backing sheet 1. The ink coating-free portions of the upper face of backing sheet 1 indicated in FIGURE 4 with reference numeral 13 and are shown to be of relatively great width as compared with the width of ink coating ribs 2.

FIGURE 5 illustrates a flattening roller 10 which pushes down on the outer face of ink coating ribs 13 thereby flattening the same into strips 14 spaced from each other by ink coating free surface areas 13 of backing sheet 1, the width of which has been greatly reduced by the flattening out of ink coating ribs 2 into ink coating strips 14.

After allowing ink coating strips 14 to solidify by suitably cooling the same, the thus formed blank is cut into ribbons along cut lines located in ink coating free areas 13 spaced from ink coating strips 14. Preferably, prior to thus cutting the blank into individual ink ribbons, the entire operating face of the blank is coated with a wax or wax-like substance such as paraffin, in order to avoid dirtying of the hands of the operator or any color transfer from the ink ribbon prior to being used. The protective coating may consist of any suitable wax-like synthetic or natural material known per se in the art.

As shown in FIGURE 6, the ink ribbon according to the present invention consists of a backing strip 1 of paper or any other suitable material, the region adjacent to its upper surface being penetrated by and containing ink substance. On the longitudinal center portion of backing strip 1 is superposed ink coating strip 2 and the free portions of the circumference of ink coating strip 2 as well as the ink coating-free edge portions 13 of the upper face of backing strip 1 are covered by protective wax-like layer or coating 16. FIGURE 7 shows in a top plan view the ink substance coated center portion 2 and the ink coating free lateral edge portions 13 of backing strip 1. As previously stated, the area adjacent to the entire upper face of backing strip 1 is penetrated with ink substance 15, so that a ribbon is obtained which contains ink substance within its coating-free edge portions 13 without, however, being capable of giving up color from these edge portions.

The apparatus of the present invention is then operated as follows:

Backing sheet 1 which in customary manner has been coated with coating 2 of ink substance passes between heating rollers 3 and pressure rollers 6. Thereby, ink coating 2 is pushed sidewise from the surface portions of backing sheet 1 which come in contact with pressure rollers 6. Ink coating 2 is thus divided into a plurality of ink ribs which are formed on the face of backing sheet 1 in the areas corresponding to grooves 7 of pressure device 6. FIGURE 3 shows pressure rollers 6 in inoperative position, while FIGURES 2 and 4 illustrate the effect of the pressure rollers 6 on backing sheet 1 and coating 2. Thus, by action of pressure rollers 6, at first relatively wide coating free areas 13 are formed while, corresponding to the groove zones 7 of the pressure roller, relatively high ink substance ribs are formed. These ribs are then flattened in contact with the flattening roller 10. Simultaneously, flattening roller 10 which preferably is provided with conventional cooling means, will cool the ink substance below the temperature at which the same becomes plastic. Subsequent cutting of the thus formed blank, with or without previous coating of the same with a protective layer 16, is then carried out in conventional manner as is well known in the art.

It will be understood that each of the elements described above, or two or more together, may also find a useful

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application in other types of ink ribbon forming apparatus and ink ribbons differing from the types described above.

While the invention has been illustrated and described as embodied in an apparatus for forming a hectographic ink ribbon and the product obtained therein, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a method of producing hectographic ink ribbons the steps of forming on one face of a backing sheet a coating of thermoplastic ink substance heated to a temperature at which said ink substance is plastic; forcing the ink substance from spaced first strip-shaped surface portions of said backing sheet into second strip-shaped surface portions located in between and alternating with said first strip-shaped surface portions, so as to remove said ink substance from the surface of said first surface portions substantially without deforming said backing sheet; applying pressure to the ink substance on said second strip-shaped surface portions so as to increase the width of the ink covered second surface portions and reducing the width of the first surface portions separating said second surface portions; and cutting said backing sheet into independent ink ribbons by cuts located within each of said first surface portions and spaced from adjacent second surface portions, so that each of said ink ribbons consists of a ribbon-shaped backing sheet carrying one inked center surface portion spaced from the edges thereof.

2. In a method of producing ink ribbons the steps of forming on one face of a backing sheet a coating of thermoplastic ink substance heated to a temperature at which said ink substance is plastic; forcing the ink substance from spaced parallel first strip-shaped surface portions of said backing sheet into parallel second strip-shaped surface portions located in between and alternating with said first strip-shaped surface portions, so as to remove said ink substance from the surface of said parallel first surface portions substantially without deforming said backing sheet; applying pressure to the ink substance on said second strip-shaped surface portions so as to increase the width of the parallel ink covered second surface portions and reducing the width of the parallel first surface portions separating said second surface portions; and cutting said backing sheet into independent ink ribbons by parallel cuts located within each of said first surface portions and spaced from adjacent second surface portions, so that each of said ink ribbons consists of a ribbon-shaped backing sheet carrying one inked center surface portion spaced from the parallel edges thereof.

3. In a method of producing hectographic ink ribbons the steps of forming on one face of a backing sheet a coating of thermoplastic ink substance; heating said coating to a temperature at which said ink substance is plastic; forcing the ink substance from spaced parallel first strip-shaped surface portions of said backing sheet into parallel second strip-shaped surface portions located in between and alternating with said first strip-shaped surface portions, so as to remove said ink substance from the surface of said parallel first surface portions substantially without deforming said backing sheet; applying pressure to the ink substance on said second strip-shaped surface portions so as to increase the width of the parallel ink

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covered second surface portions and reducing the width of the parallel first surface portions separating said second surface portions; and cutting said backing sheet into independent ink ribbons by parallel cuts located within each of said first surface portions and spaced from adjacent second surface portions, so that each of said ink ribbons consists of a ribbon-shaped backing sheet carrying one inked center surface portion spaced from the parallel edges thereof.

4. In a method of producing ink ribbons the steps of forming on one face of a backing sheet a coating of thermoplastic ink substance; heating said coating to a temperature at which said ink substance is plastic; forcing the ink substance from spaced parallel first strip-shaped surface portions of said backing sheet into parallel second strip-shaped surface portions located in between and alternating with said first strip-shaped surface portions, so as to remove said ink substance from the surface of said parallel first surface portions substantially without deforming said backing sheet; applying pressure to the ink substance on said second strip-shaped surface portions so as to increase the width of the parallel ink covered second surface portions and reducing the width of the parallel first surface portions separating said second surface portions; cooling said ink substance below the temperature at which the same becomes plastic; and cutting said backing sheet into independent ink ribbons by parallel cuts located within each of said first surface portions and spaced from adjacent second surface portions, so that each of said ink ribbons consists of a ribbon-shaped backing sheet carrying one inked center surface portion spaced from the parallel edges thereof.

5. In a method of producing hectographic ink ribbons the steps of forming on one face of a backing sheet a coating of thermoplastic ink substance; heating said coating to a temperature at which said ink substance is plastic; forcing the ink substance from spaced parallel first strip-shaped surface portions of said backing sheet into parallel second strip-shaped surface portions located in between and alternating with said first strip-shaped surface portions by passing said coating of heated thermoplastic ink substance in contact with a plurality of spaced pressure roller portions, so as to remove said ink substance from the surface of said parallel first surface portions substantially without deforming said backing sheet; applying pressure to the ink substance on said second strip-shaped surface portions so as to increase the width of the parallel ink covered second surface portions and reducing the width of the parallel first surface portions separating said second surface portions; and cutting said backing sheet into independent ink ribbons by parallel cuts located within each of said first surface portions and spaced from adjacent second surface portions, so that each of said ink ribbons consists of a ribbon-shaped backing sheet carrying one inked center surface portion spaced from the parallel edges thereof.

6. In a method of producing ink ribbons the steps of forming on one face of a backing sheet a coating of thermoplastic ink substance; heating said coating to a temperature at which said ink substance is plastic; forcing the ink substance from spaced parallel first strip-shaped surface portions of said backing sheet into parallel second strip-shaped surface portions located in between and alternating with said first strip-shaped surface portions by passing said coating of heated thermoplastic ink substance in contact with a plurality of spaced pressure roller portions having a circumferential speed slower than the forward speed of the coated backing sheet, so as to remove said ink substance from the surface of said parallel first surface portions substantially without deforming said backing sheet; applying pressure to the ink substance on said second strip-shaped surface portions so as to increase the width of the parallel ink covered second surface portions and reducing the width of the parallel first surface portions separating said second surface portions; and cutting

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said backing sheet into independent ink ribbons by parallel cuts located within each of said first surface portions and spaced from adjacent second surface portions, so that each of said ink ribbons consists of a ribbon-shaped backing sheet carrying one inked center surface portion spaced from the parallel edges thereof.

7. In a method of producing hectographic ink ribbons the steps of forming on one face of a backing sheet a coating of thermoplastic ink substance; heating said coating to a temperature at which said ink substance is plastic; forcing the ink substance from spaced parallel first strip-shaped surface portions of said backing sheet into parallel second strip-shaped surface portions located in between and alternating with said first strip-shaped surface portions, so as to remove said ink substance from the surface of said parallel first surface portions substantially without deforming said backing sheet; applying pressure to the ink substance on said second strip-shaped surface portions so as to increase the width of the parallel ink covered second surface portions and reducing the width of the parallel first surface portions separating said second surface portions; covering said first and second surface portions with a protective coating of a material selected from the group consisting of natural and synthetic wax-like substances and mixtures of the same; and cutting said backing sheet with said protective coating thereon into independent ink ribbons by parallel cuts located within each of said first surface portions and spaced from adjacent second surface portions, so that each of said ink ribbons consists of a ribbon-shaped backing sheet carrying one inked center surface portion spaced from the parallel edges thereof.

8. In an apparatus for producing an ink ribbon, in combination, heating means for heating an ink-coated backing sheet to a temperature sufficiently high to plastify the ink coating thereon; pressure means cooperating with said heating means for exerting pressure on a plurality of spaced parallel portions of said ink coating so as to push the ink coating from said spaced parallel portions onto spaced parallel portions separating said pressure exposed parallel portions from each other substantially without deforming said backing sheet; flattening means cooperating with said heating means for flattening the thus formed spaced parallel ink coating portions and to reduce the height and increase the width of the same while reducing the width of the parallel portions separating ink coated portions from each other; and transport means for transporting the ink coated backing sheet in operative contact with said heating, pressure and flattening means.

9. An apparatus for producing an ink ribbon, comprising, in combination, heating means for heating an ink-coated backing sheet to a temperature sufficiently high to plastify the ink coating thereon; pressure means cooperating with said heating means for exerting pressure on a plurality of spaced parallel portions of said ink coating so as to push the ink coating from said spaced parallel portions onto spaced parallel portions separating said pressure exposed parallel portions from each other substantially without deforming said backing sheet; flattening means cooperating with said heating means for flattening the thus formed spaced parallel ink coating portions and to reduce the height and increase the width of the same while reducing the width of the parallel portions separating ink coated portions from each other; cutting means for cutting said ink coated backing sheet into independent ink ribbons by cuts located within each of said parallel portions separating ink coated portions from each other said cuts being spaced from said ink coated portions; and transport means for transporting the ink coated backing sheet in operative contact with said heating, pressure, flattening and cutting means.

10. An apparatus for producing an ink ribbon, comprising, in combination, heating means for heating an ink-coated backing sheet to a temperature sufficiently high

to plastify the ink coating thereon; pressure means including a pressure roller having a plurality of spaced, flat, annular circumferential pressure exerting portions cooperating with said heating means for exerting pressure on a plurality of spaced parallel portions of said ink coating so as to push the ink coating from said spaced parallel portions onto spaced parallel portions separating said pressure exposed parallel portions from each other substantially without deforming said backing sheet; flattening means cooperating with said heating means for flattening the thus formed spaced parallel ink coating portions and to reduce the height and increase the width of the same while reducing the width of the parallel portions separating ink coated portions from each other; cutting means for cutting said ink coated backing sheet into independent ink ribbons by cuts located within each of said parallel portions separating ink coated portions from each other said cuts being spaced from said ink coated portions; and transport means for transporting the ink coated backing sheet in operative contact with said heating, pressure, flattening and cutting means.

11. An apparatus for producing an ink ribbon, comprising, in combination, heating means for heating an ink-coated backing sheet to a temperature sufficiently high to plastify the ink coating thereon; pressure means including a plurality of pressure rollers comprising spaced flat, annular circumferential pressure exerting portions having a predetermined circumferential speed cooperating with said heating means for exerting pressure on a plurality of spaced parallel portions of said ink coating so

as to push the ink coating from said spaced parallel portions onto spaced parallel portions separating said pressure exposed parallel portions from each other substantially without deforming said backing sheet; flattening means cooperating with said heating means for flattening the thus formed spaced parallel ink coating portions and to reduce the height and increase the width of the same while reducing the width of the parallel portions separating ink coated portions from each other; cutting means for cutting said ink coated backing sheet into independent ink ribbons by cuts located within each of said parallel portions separating ink coated portions from each other said cuts being spaced from said ink coated portions; and transport means for transporting the ink coated backing sheet in operative contact with said heating, pressure, flattening and cutting means at a forward speed greater than said predetermined circumferential speed.

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