INK TRANSFER RIBBON

George G. Neidich, Rochester, N. Y., assignor to
The Todd Company, Inc., Rochester, N. Y., a
corporation of New York

Application November 19, 1949, Serial No. 128,409

7 Claims. (Cl. 197-172)

This invention relates to ink transfer ribbons and, more particularly, to ribbons of this character made from paper and impregnated throughout with transfer material to serve as type impression transfer media.

Ink transfer ribbons have more commonly been made of woven fabrics because of their strength and capacity for absorbing a large volume of transfer material but such fabric ribbons have been subject to various defects. Such ribbons are sufficiently elastic to stretch and elongate, with corresponding transverse shrinkage, as well as being subject to distortion under the cutting action of many type impressions, thus varying their dimensions with the result, in the case of ribbons having zones of different colors, in printing from the wrong color zones. In such ribbons also the ink tends to spread in all directions, requiring zones or bands of different colors to be separated by a barrier of gelatin, paraflin, or some plastic material which adds to the cost of manufacture and, to be effective, involves an objectionable line between the color bands. Such fabric ribbons have been subject to the further objections that, because of their thickness and texture, they tend to produce a blurred impression and one containing fabric marks; they require substantial traverse or feeding movement between successive printing impressions because of the slow rate of spread of the ink, so that the ribbon feed must be repeatedly reversed to obtain full use of the ribbon and they are much more expensive to produce than paper ribbons.

Ink transfer ribbons have been made of paper coated on one surface with a waxy medium, such as found in the known carbon paper, but such transfer materials do not afford the desired number of impressions, or the type of impression desired, for example, in protectingly marking monetary instruments and other commercial papers.

Ink transfer ribbons have also been known employing absorbent papers made from pulps of cotton rags, chemical wood such as sulfite and the like, having short fibers of irregular shape and random direction, impregnated with oil soluble dyes, the paper being stiffened by a coating on one side of impervious lacquer or the like, with a coating on the other side of metallic powder to impede the transfer of the ink. Such papers are adapted for the limited transfer of hand-written impressions but not for the transfer of type impressions, nor for making protective impressions, such as referred to, because of the ready solubility of the dye materials employed. Such papers are not adapted, further, for making a ribbon having zones of different colors because of the tendency of the ink to spread in all directions and intermingle the different colors where dyes and oil soluble colors are used.

One object of the invention, therefore, is to provide an improved ink transfer ribbon of a more efficient character for making type impressions and capable of being manufactured at a substantially reduced cost.

Another object is to provide such a ribbon made of paper material and adapted for making type impressions of a substantially indelible and highly protective nature.

Another object is to produce a transfer ribbon on an improved base of strong, tough, substantially uncoated paper, impregnated throughout with a large volume of suitable printing medium and capable of supplying a large number of sharp type impressions.

Another object is to provide such a ribbon capable of yielding a substantially increased number of impressions for each unit of area, so that the ribbon may be fed through a machine but once and then discarded, thereby obviating the necessity for reversing the feeding movement and traversing the ribbon through the machine a number of times, as is done in connection with woven ribbons. A related object is to provide a ribbon of thinner material so that a substantially increased length may be accommodated on ribbon spools of the usual diameter.

A further object is to provide such a ribbon having a clean, unimpregnated end shaped to facilitate ready insertion in the machine without soiling the hands.

Still a further object is to provide a ribbon having the above advantages and capable of being readily and economically manufactured and conveniently manipulated in use.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a plan view, partly broken away, of a multi-colored ink transfer ribbon embodying the present invention and having a portion of the surface layers enlarged to show the fiber arrangement, and Fig. 2 is a sectional view on the line 2—2 in Fig. 1.

The preferred embodiment of the invention, herein disclosed by way of illustration, comprises
a ribbon, indicated generally at 10 in the drawing made with a paper base of specially adapted characteristics of strength, extensibility or pore arrangement, weight, thickness and suitable capacity for absorbing the printing ink. Ribbons made of fibrous and other absorbent papers made from pulps of cotton rags, chemical wood such as sulfite and the like, have fibers of generally flat, non-cylindrical, or other irregular shape in cross section and tend to curl, twist and crinkle in a longitudinal direction so that they tend to produce irregularly shaped interstices between the fibers providing only capillaries of a random direction and a discontinuous nature, particularly when formed on a Fourdriner machine adjusted, as usual, to equalize the tensile strength of the paper in the longitudinal and cross directions of the machine. Such capillary structure results in an erratic and inefficient flow of ink in the paper when equilibrium in the supply of ink is disturbed by the removal of a quantum at any particular point at which an impression is made. Furthermore, even the permitted flow is in all directions so as to cause objectionable interflow and intermixing of inks of different colors in adjoining bands of the ribbon.

I have found that best fibers such as manila hemp, jute, linen, the bast fibers of yoshino or mitumata paper and the like have a generally round or cylindrical shape in cross section and tend to lie relatively straight longitudinally, as distinguished from cotton and sulfate fibers, for example, being thus adapted to be laid on a cylinder machine so that a definite preponderance of the fibers lie generally parallel to one another in a direction extending longitudinally of the machine with only occasional fibers lying transversely thereof. Such fiber arrangement is illustrated schematically in the enlarged section 11, Fig. 1, showing the preponderantly longitudinal positioning of the fibers. Such fibers, having the relatively straight, stiff nature characteristic of bast fibers, as distinguished from the fibers of cotton and wood pulp, when laid as described, tend to afford capillary interstices of a substantially regular and longitudinally continuous nature throughout which the ink material may freely spread. Such construction also affords a paper of high longitudinal strength, a ratio of 10 to 1 between the longitudinal and transverse strength of the paper having been found preferable, although a lesser ratio yields results superior to those of the known papers herefore employed for ink ribbons.

One sufficient sizing should be employed to bind the fibers against slipping and such sizing should not be soluble in the ink materials employed. For example, an emulsion of the melamine resins and the like, such as used in the production of the known wet strength paper, has been found satisfactory for this purpose. Further characteristics of such a paper are as follows:

Fiber, bast or equivalent
Thicknes, 0.203 to 0.2035 kilo
Weight, 24 to 26 lb. (24 x 26—500 basis)
Strength, 7.0 to 8.0 kilo longitudinally—0.7 kilo across; Schooper paper tester 4.5 cm. between jaws
Sizing, melamine resins or the like in sufficient quantity only to bind fibers against slipping
Oil absorbency, 80 to 90%

Fibers of synthetic plastic materials such as rayon and nylon, having straight cylindrical shape, are generally similar to the natural bast fibers referred to above which are produced in such straight shape during growth of the plants from which they are obtained. Bundles of these fibers, laid as described in the making of the paper, afford substantially continuous capillary tubes by which the longitudinal flow and migration of the ink is facilitated, while the few fibers lying in transverse or random directions form only irregular interstices in which the capillary flow is retarded, so that spreading of the ink in a transverse direction is substantially inhibited.

It has been found that the longitudinal strength of paper so formed, as determined on the Schopper tensile strength tester, as compared to the strength transversely of the web, is an approximate measure of the lay of the fibers and this quality of the paper may be determined with great accuracy by testing in this manner.

In the making of my ribbon, I preferably employ inks which are either composed of pigments in colloidal dispersion alone, or in conjunction with oil soluble coloring materials such as aniline dyes, in order that they may migrate longitudinally of the ribbon into areas from which quanta of ink have been extracted by printing impressions, thus obviating the necessity for more than a small feeding movement of the ribbon, say, 1/4 of an inch, between impressions. An ink is preferably employed composed of an oil base or vehicle containing pigments of suitable color in colloidal dispersion in conjunction with oil soluble coloring materials, such as aniline dyes, the following being a typical example of such ink:

<table>
<thead>
<tr>
<th>Inks</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red pigment</td>
<td>10</td>
</tr>
<tr>
<td>Rhodamine Blue base</td>
<td>0.2</td>
</tr>
<tr>
<td>Oleic acid</td>
<td>0.2</td>
</tr>
<tr>
<td>Oil medium</td>
<td>25</td>
</tr>
</tbody>
</table>

These proportions may be varied in accordance with the desired consistency, which, in turn, is dependent on the oil absorption of the pigment used and the method of application, as well understood in the art. The foregoing is a typical formula in which the "recovery" of the ribbon, that is, the migration of the ink, is accelerated by the presence of the excess oleic acid and the hydrophilic salt of the aniline dye. Such inks, which would migrate between adjoining color zones or bands of a ribbon, except in a paper constructed in accordance with my invention, may be successfully employed in making ribbons having such color zones without any barriers other than such construction of the paper itself. The ribbon 10 shown in the drawing comprises, for example, a main area 12 impregnated with an ink of, say, black color, with a band 13 of the same color between bands 14 and 15 impregnated with, say, red ink. By the use of my invention such adjacent ribbon portions may be impregnated with inks of different colors in close proximity to one another, without the barriers commonly interposed and without substantial intermingling of inks of different colors.

Ribbons constructed in accordance with my invention are particularly advantageous when used in printing machines for printing value or other legends on monetary instruments and similar papers, to protect them against alteration, since the pigments, such as carbon and the like, are relatively insoluble and incapable of removal by chemical treatment, while the oil soluble dyes
readily penetrate throughout the fibers of the paper, protecting the printed matter against alteration by either chemical or abrasive treatment. The dye ingredient may also be used to modify or improve the color or tone of the associated pigment, as in affording a bluer tone for carbon pigments.

A ribbon constructed as described is preferably formed with end portions, as 16, free of ink and having converging sides 17 forming extremities 18 of narrow width by which the ribbon may be handled without soiling the fingers and by which the ribbon may be readily inserted in slotted feed rolls.

It is apparent from the above description that my invention provides an ink transfer ribbon of a thin, flexible character adapted for making sharp, clear type impressions on the work. It has great longitudinal strength and stability in dimensions, adapting it for the production of ribbons having two or more adjoining zones or bands of different colors which may be readily maintained in position and which may be employed in printing and in various other operations. Such a ribbon is tough and durable and capable of withstanding many printing impressions in closely repeated relation, say, % of an inch apart, without appreciable wear. My ribbon has been successfully employed, for example, in a machine such as disclosed in the patent to Payne, No. 2,092,882, between the type and a paper to be printed above a plate having a serrated face, for embossing the paper to be printed, without appreciable cutting of the ribbon. Such advantageous features combined with a characteristic thickness enable the use of a ribbon having, for example, a length of about 45 ft. and capable of affording 10,000 sharp impressions in a single traverse of the ribbon. In view of this large capacity and its relatively inexpensive nature, my improved ribbon may be practically discarded after one such traverse, thus obviating the necessity for recollecting and attending to the repeated reversal of the direction of feed commonly required in connection with the use of woven ribbons. In view of the relatively simple construction and arrangement of the parts, it is contemplated that various modifications in the construction and arrangement of the parts will readily occur to those skilled in the art, within the spirit of the invention and the scope of the appended claims.

1. An ink transfer ribbon comprising a thin, flexible, tough, substantially uncoated paper ribbon made of relatively straight, cylindrical fibers having the size and shape characteristic of bast fibers, laid mainly longitudinally of said ribbon to afford greater strength longitudinally than transversely thereof and to produce a multiplicity of substantially continuous, longitudinally extending capillaries, said paper ribbon being impregnated with an ink transfer material adapted to spread freely longitudinally of said ribbon through said capillaries between said fibers.

2. An ink transfer ribbon comprising a thin, flexible, tough, substantially uncoated paper ribbon made of substantially unsize bast fibers laid mainly longitudinally of said ribbon to afford greater strength longitudinally than transversely thereof and to produce a multiplicity of substantially continuous, longitudinally extending capillaries, said paper ribbon being impregnated with an ink transfer material adapted to spread freely longitudinally of said ribbon through said capillaries between said fibers.

3. An ink transfer ribbon comprising a thin, flexible, tough, substantially uncoated paper ribbon made of substantially unsize bast fibers laid mainly longitudinally of said ribbon to afford greater strength longitudinally than transversely thereof and to produce a multiplicity of substantially continuous, longitudinally extending capillaries, said paper ribbon being impregnated with an ink transfer material adapted to flow freely longitudinally of said ribbon through said capillaries between said fibers.

4. An ink transfer ribbon comprising a thin, flexible, tough, substantially uncoated paper ribbon made of substantially unsize bast fibers laid mainly longitudinally of said ribbon to afford greater strength longitudinally than transversely thereof and to produce a multiplicity of substantially continuous, longitudinally extending capillaries providing free recovery flow of ink material longitudinally of said ribbon, said paper ribbon being impregnated with an oil medium containing indelible pigment and a penetrating oil-soluble dye.

5. An ink transfer ribbon comprising a thin, flexible, tough paper ribbon made of relatively straight, cylindrical fibers having the size and shape characteristic of bast fibers, laid mainly longitudinally of said ribbon to afford greater strength longitudinally than transversely thereof and to produce a multiplicity of substantially continuous, longitudinally extending capillaries providing free recovery flow of ink material longitudinally of said ribbon and inhibiting flow of the same laterally thereof, and a plurality of bands of ink transfer materials of different colors, respectively, impregnating said paper ribbon throughout and extending longitudinally thereof in laterally spaced relation, said bands being devoid of interfering ink barriers other than the fibers of the ribbon.

6. An ink transfer ribbon comprising a thin, flexible, tough paper ribbon made of relatively straight, cylindrical fibers having the size and shape characteristic of bast fibers, laid mainly longitudinally of said ribbon to afford greater strength longitudinally than transversely thereof and to produce a multiplicity of substantially continuous, longitudinally extending capillaries providing free recovery flow of ink material longitudinally of said ribbon and inhibiting flow of the same laterally thereof, and a plurality of bands of ink transfer materials of different colors, respectively, impregnating said paper ribbon throughout and extending longitudinally thereof in laterally spaced relation without intervening ink barriers other than the fibers of the ribbon itself, each of said materials being composed of an oil vehicle containing indelible pigment and a penetrating oil-soluble dye.

7. An ink transfer ribbon comprising a thin, flexible, tough, substantially uncoated paper ribbon made of substantially unsize bast fibers laid mainly longitudinally of said ribbon to afford greater strength and permeability longitudinally.
than transversely thereof and to provide a multiplicity of substantially continuous capillaries between said fibers extending mainly longitudinally of said ribbon, and a plurality of bands of ink transfer materials of different colors, respectively; impregnating said paper ribbon and extending longitudinally thereof in laterally spaced relation without intervening ink barriers other than the fibers of the ribbon itself, each of said materials being composed of an oil vehicle containing indelible pigment and a penetrating oil-soluble dye and adapted to flow mainly longitudinally of its respective band through said capillaries.

GEORGE G. NEIDICH.

REFERENCES CITED
The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,392,458</td>
<td>Stark</td>
<td>Oct. 4, 1921</td>
</tr>
<tr>
<td>1,533,383</td>
<td>Campbell</td>
<td>Apr. 14, 1925</td>
</tr>
<tr>
<td>2,068,416</td>
<td>Neidich</td>
<td>Jan. 5, 1937</td>
</tr>
<tr>
<td>2,380,718</td>
<td>Berkovits</td>
<td>July 31, 1945</td>
</tr>
<tr>
<td>2,492,811</td>
<td>Moller</td>
<td>Dec. 27, 1949</td>
</tr>
</tbody>
</table>

FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Country</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>103,519</td>
<td>Germany</td>
<td>Mar. 27, 1907</td>
</tr>
</tbody>
</table>

OTHER REFERENCES
Printings Inks by Eller (1940); Reinhold Pub. Corp., 3310 West 42nd St., New York, N. Y. (Copy in Div. 17—pg. 223.)