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D. A. NEWMAN
NOVEL TRANSFER MEDIA
Filed Nov. 16, 1959

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Fig. 1

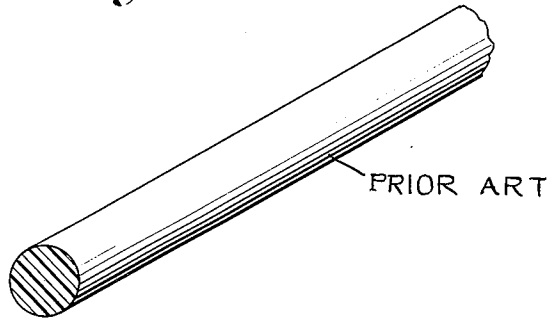


Fig. 2

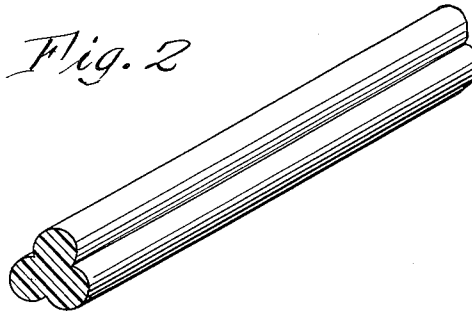
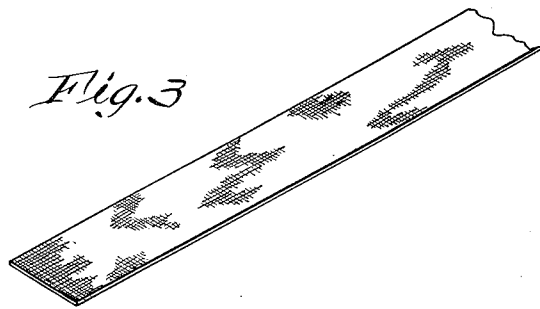


Fig. 3



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This invention is concerned with transfer elements such as sheets, webs and ribbons, and more particularly with woven cloth transfer elements such as typewriter ribbons impregnated with liquid ink to transfer the impression of a type or stylus struck or pressed thereagainst to an underlying copy sheet, forming a mark thereon.

The woven fabrics heretofore used in making ink transfer elements such as typewriter ribbons designed for repeated use have been primarily of cotton, silk, or synthetic fibers and have usually ranged in thickness or caliper from .0040 inch to .0055 inch. While such ribbons have proved to be acceptably serviceable, the art has continually sought to improve their performance, especially in the direction of obtaining either a sharper impression or longer "wear" in the sense of a longer writing life before the impression becomes too faint to be usable. One difficulty in attempting to improve these properties of the ribbon, however, is that they have heretofore appeared as essentially antagonistic. In other words, increasing the wear of the ribbon has been regarded as involving the increased thickness or mass of the ribbon in one way or another so as to provide more reservoir space for ink, a principle illustrated in a patent issued to Lentz, No. 2,334,423, dated November 16, 1943. This increase would normally result in poorer impressions if the ribbon were of the normal uniform thickness type. On the other hand, if the ribbon were made of uniform thickness, but thinner than normal in an effort to obtain a clearer impression, the reservoir capacity would, according to the teachings of the prior art, be impaired so as to reduce the wear that the ribbon is capable of furnishing. Thus it has been considered impossible, heretofore, to significantly improve either of these properties without to some extent impairing the other.

It may be noted at this point that a commercially available nylon cloth of about .0042 inch in thickness, and having a warp count of about 170, a filler count of about 115, and a strand size of about 40 denier, has also been used to some extent for typewriter ribbons as a substitute for silk. However, such nylon ribbons lack the wearing properties inherent with similarly constituted silk ribbons although the writing results were substantially equivalent. These prior known typewriter ribbons of the nylon type were prepared from nylon filaments having a uniform circular circumference of about 1.15 denier. Approximately 35 of these filaments were woven together to form strands having a denier of about 40. One disadvantage of ribbons prepared from such strands is the relatively low surface area of the strands and therefore the relatively low ink capacity and shortened "wear" of the ribbon.

The invention has for its object, therefore, the provision of an improved cloth transfer element or typewriter ribbon, preferably of uniform thickness so as to require no special weaving techniques, which demonstrates a wear or writing life materially longer than that currently expected, without impairment of the quality of the impression made on the copy sheet.

Another object of the invention is the provision of an improved cloth transfer element or typewriter ribbon, preferably of uniform thickness, which demonstrates the ability to provide sharper definition of the edges of the impression, and capable of preserving a high order of cleanliness in the background areas immediately adjacent

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the impression without impairment of the property of wear or writing life.

A further object of this invention is the preparation of a ribbon which has an increased ink capacity and useful life and yet which is no thicker than prior known typewriter ribbons.

These and other objects are effected according to the procedure set forth herein.

It has been found that the ink capacity of a nylon ribbon is dependent in part upon the surface area of said ribbon. The surface area of the ribbon depends upon the surface area of the nylon strands which in turn depends finally upon the surface area of the nylon filaments.

It would be expected that the increase in the surface area of these filaments would bring about a corresponding increase in the diameter of the filament and strand and therefore a greater thickness in the ribbon and poorer impressions.

According to the present invention, however, the surface area of the nylon filaments is greatly increased but the thickness of the ribbon is not necessarily increased at all.

In the drawing:

FIGURE 1 is a diagrammatic side view, to an enlarged scale, of a circular nylon filament.

FIG. 2 is a diagrammatic side view, to an enlarged scale, of a nylon filament which is longitudinally ridged.

FIG. 3 shows a typewriter ribbon.

The manner of carrying out the present invention will now be described with reference to the drawing and with respect to the preferred forms which may be considered as exemplary.

Filaments of nylon material are prepared which are longitudinally ridged and which have a lobular or protuberant circumference. By the term "protuberant" is intended any circumference which contains a series of lobes or protuberances, regardless of the shape of the protuberance. For instance, the cross-section of a protuberant filament having three rounded edges or lobes resembles a three-leaf clover while the cross-section of a protuberant filament having five points resembles a star. Of course it is understood that the shape of the protuberances depends upon the shape of the implement used to form the longitudinal ridges of the filament. The form of the invention exemplified by FIG. 2 of the drawing shows the use of trilobular or clover-shaped filaments but it should be understood that protuberant filaments having two lobes, or a number greater than three lobes, may also be used, it being recognized that the filament surface area increases as the number of lobes increases. Thus, filaments having four, five, six or more lobes or protuberances are very well suited to the preparation of the present transfer media and are prepared by increasing the number of longitudinal ridges on the nylon filaments.

A number of these protuberant filaments are twisted into a strand of the desired denier caliper. It has been found that although conventional circular filaments cannot intermesh with each other in the strand, the present protuberant filaments may intermesh and therefore a larger number of protuberant filaments of a given denier may be combined in a given area than circular filaments of the same denier.

In exemplifying the present typewriter ribbons, strands of nylon filaments were prepared by twisting together a number of trilobular filaments of 2.4 denier. To produce a strand denier of about 40, 16 filaments were twisted. It was found that since each filament is trilobular, its surface area resembles that of a composite of three circular filaments having a denier of 0.8 and the overall strand has the approximate surface area of over

40 circular filaments of a caliper of 0.8 denier. On the other hand, strands prepared from 16 conventional circular nylon filaments having a caliper of 2.4 denier had the same strand denier of about 40, but a greater strand thickness and a surface area of less than one-half the surface area of the protuberant strands and a correspondingly less ink receptivity and wear. Of even greater importance, it has been found that the ribbons of the present invention have a greater ink volume due to the increased volume of the interstices formed in each strand. Whereas rounded nylon filaments hold ink principally on their surfaces, the present filaments are ridged and thus allow for the ink to penetrate into these ridges which act as reservoirs and hold the ink apparently by capillary attraction.

The nylon strands prepared according to the present invention are then supplied to the looms for weaving into cloth usually in the form of a broad web. For most purposes, trilobular filaments of from about 1 to 3 denier are suitable. The multi-filament strands may contain from about 10 to 40 filaments and have a denier of from about 20 to 50. It should be understood that there is no particular criticality in the filament, strand or ribbon caliper and these may be adjusted to suit the particular need. Both the warp and filling are of nylon strands and are preferably, but not necessarily, of the same basic strand diameter. Normally the weaving will be so controlled that the finished cloth has a square inch count of about 275 to 335, e.g. a warp count of about 165 to 195 and a filling count of about 110 to 140. It will be understood that the warp strands will normally be arranged to run lengthwise of the ribbon and the filler strands crosswise thereof in case the cloth is to be converted into typewriter ribbon strips.

When the weaving is complete, the above cloth will caliper from about 0.0025 to about 0.006 inch depending upon the thread count, twist per inch and the tension applied. The thickness of the cloth or ribbon depends upon the diameter of the strands used, and may be adjusted to suit the particular need. The preferred caliper ranges from 0.0035 to 0.004 inch.

The cloth thus prepared is put on a slitter and subdivided into ribbons of, for example, about one-half inch in width. This may be done by heated cutters which are maintained at a temperature just high enough to seal the cut edges of the ribbon as they are formed, and prevent fraying, or the edges may be separately heat treated by special heating elements which operate thereon just beyond the slitting point. It will be understood, however, that adhesive or solvent application may be employed to the same end, or if conditions warrant, the strip may be woven to the exact width required so as to have a selvage on each edge. Likewise, where the type of use dictates, the web may be slit into long strips of writing-sheet width, or chopped into individual transfer sheets. When in ribbon or strip form the product is stored by winding into rolls.

When the cloth has been subdivided to the desired condition, e.g. strips of typewriter ribbon width, it is impregnated with a suitable liquid transfer ink of the type normally employed for use on typewriter ribbons, wound on standard types of typewriter spools and cut off as each spool is filled.

A typewriter ribbon according to the invention is wound on the spools of a typewriter. The spools are placed on the typewriter in position to receive the blows of the type bars. The resulting marks made on an underlying sheet will be noticeably sharper and the sheet will be significantly cleaner in the adjoining background areas than is the case with marks resulting from use of the ordinary ribbons.

A typewriter ribbon prepared according to the present invention and a conventional rounded nylon typewriter ribbon were compared in the following manner.

Both ribbons were produced from 2.4 denier nylon fila-

ments, the ribbon according to the present invention being formed from trilobular cross-section filaments and the conventional ribbon being formed from rounded or circular cross-section nylon filaments. In each case, 16 filaments were twisted together to form strands of about 40 denier. Ribbons were woven from the above prepared strands which had a warp count of 170, a filler count of 115 and a square inch count of 285. The caliper of the ribbon of the present invention was 0.0034 inch in thickness whereas the caliper of the rounded nylon ribbon was 0.004 inch in thickness. The difference in thickness is due to the intermeshing of the lobular nylon filaments and strands.

Both ribbons were then impregnated to capacity with conventional liquid typewriter ribbon ink and it was found that the ribbon of the present invention absorbed much more ink than the rounded nylon ribbon. The ribbons were then inserted in identical typewriters and compared. It was found that the ribbon of the present invention outlasted the rounded nylon ribbon and produced over 30% more clear copy than the conventional ribbon.

It should be understood that the present invention is not primarily concerned with the number of filaments per strand of nylon, or with the final caliper in thickness of the prepared cloth or ribbon, these values being variable according to the particular need. The principal discovery of the present invention is the use of non-circular, multi-lobular or multi-protuberant filaments in the production of such cloth or ribbon, with the attendant advantages of ease of production and increased ink receptivity due to increased surface area. Filaments may be used having a denier of from 1 to 3, and from 10 to 40 filaments may be twisted to make each strand.

While the invention has been described with particular reference to nylon as the material of which the filaments and strands are made, it will be understood that the principles herein stated apply with equal force to any synthetic fiber-forming polymer material having physical properties of filament formation, toughness and cut-resistance approximately the equivalent of or superior to those of nylon, and such materials will be understood as comprehended within the invention. Such other materials are dacron polyester fiber, Saran thread and the various polyamide fibers, among others.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. A typewriter ribbon of uniform thickness comprising an inked strip of woven multi-filament strands of fiber-forming polymer, in which the individual filaments are of uniform and equal denier, uniformly longitudinally ridged along their entire length, and are intermeshed in said strands to provide the ribbon with increased ink capacity.

2. A typewriter ribbon of uniform thickness and increased ink capacity comprising an inked strip of woven multi-filament strands of nylon, the individual filaments being of uniform and equal denier and being intermeshed in said strands to provide the ribbon with increased ink capacity, said ribbon having a uniform caliper of between about 0.0025 and 0.006 inch and said strands being composed of from 10 to 40 filaments of from 1 to 3 denier each.

References Cited in the file of this patent

UNITED STATES PATENTS

2,054,091	McElrath	Sept. 15, 1936
2,167,990	Neidich	Aug. 1, 1939
2,746,839	Terry et al.	May 22, 1956
2,750,653	White	June 19, 1956
2,918,160	Thompson	Dec. 22, 1959

FOREIGN PATENTS

582,693	Great Britain	Nov. 25, 1946
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