March 31, 1964 W. G. SCHARF 3,126,698

METALLIZED YARN FOR USE IN LANE FABRICS

Filed Dec. 2, 1960

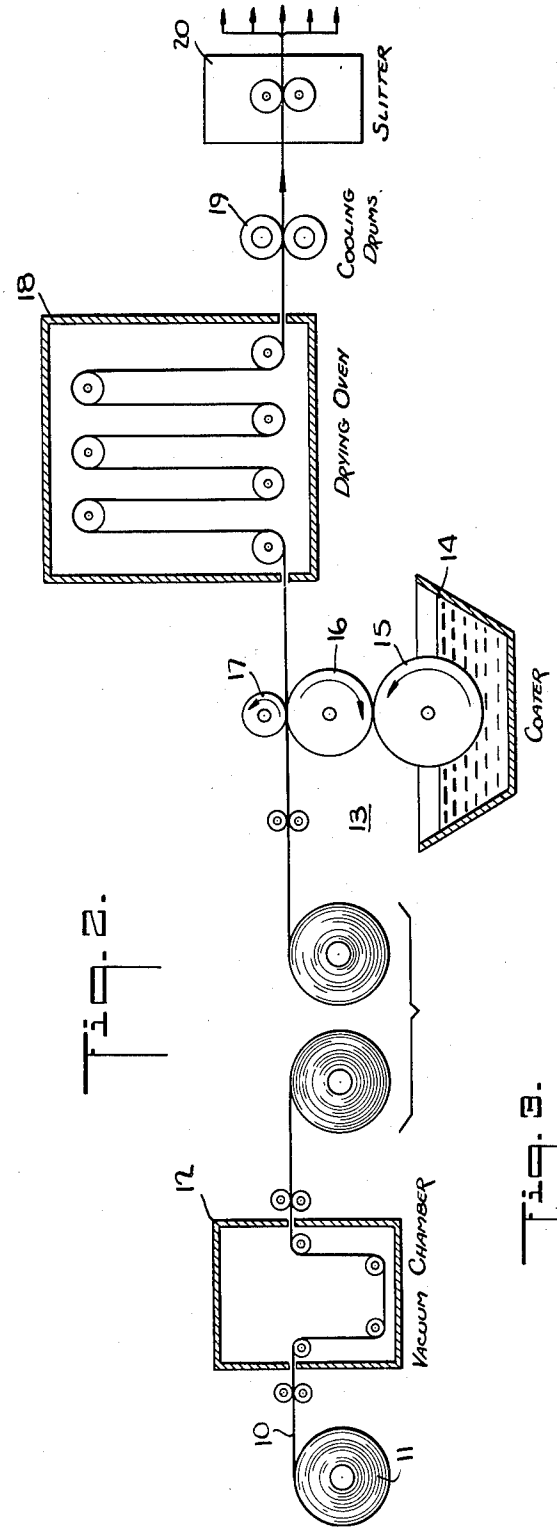


Fig. 2.

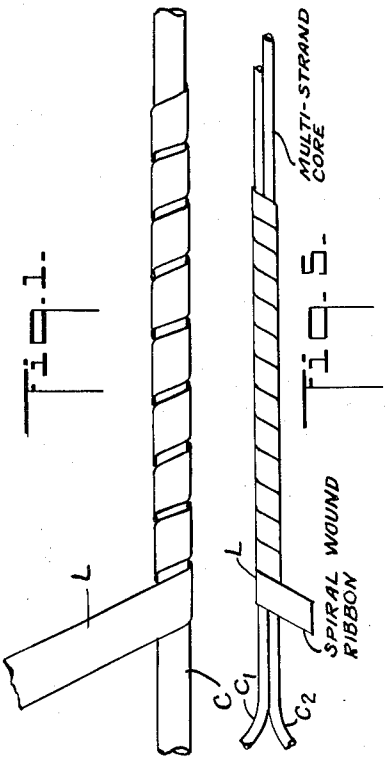


Fig. 1.

Fig. 5.

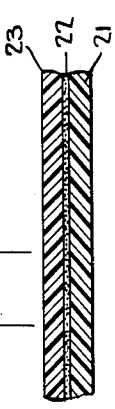


Fig. 3.

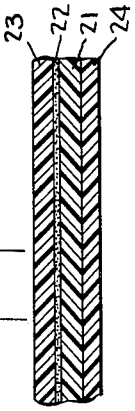


Fig. 4.

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METALLIZED YARN FOR USE IN LAMÉ FABRICS

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5 Claims. (Cl. 57—144)

The present invention relates generally to fabrics of the lamé type and more particularly to an improved filé yarn for use in lamé. This application is a continuation-in-part of my earlier application filed June 18, 1956, issued March 7, 1961 as Patent No. 2,974,055.

A lamé is any fabric using metallized threads in the warp or filling and forming either the ground of the fabric or the pattern. Such fabrics are used principally for evening wear, the term being derived from the French word lamé which means trimmed with leaves of gold or silver.

In existing lamé fabrics, use is made of filé which is a yarn made by spiralling a flat metal ribbon, called lamé, about a filamentary core which may be formed of nylon, silk or other known synthetic or natural material. The filé used in lamé fabrics is generally flattened out to form a so-called "laminette" yarn.

Conventionally, the flat metal ribbon or lamé is formed by a thin copper base, on which is plated silver or gold, the surface layer being protectively lacquered. Filé formed with such metal ribbon is relatively stiff and tends also to tarnish, since the lacquer has a limited life. At best such filé can only be called tarnish resistant.

Accordingly, it is the main object of the present invention to provide a relatively soft filé yarn which is permanently non-tarnishable. A significant advantage of the present invention resides in the fact that the filé yarn, when woven into a lamé fabric provides a fine fabric of improved appearance and hand, the fabric being soft and silky to the touch in contrast to harsh and stiff tactile qualities heretofore produced.

More specifically it is an object of the invention to provide a filé in which a metallized ribbon surrounding the core is formed by a transparent plastic base having a metal layer of molecular thickness deposited thereon and coated with a transparent film which is related structurally to and has an affinity for the base ribbon.

Also an object of the invention is to provide a lamé or filé having superior textile qualities and which may be fabricated at relatively low cost as compared to purely metallic threads.

Briefly stated, these objects are accomplished by a filé comprising a non-metallic filamentary thread or threads having spiralled thereabout a non-laminated metallized yarn formed by a base layer of synthetic material having a metal deposit thereon coated by a plastic film.

For a better understanding of the invention, as well as other objects and further features thereof, reference is had to the following detailed description to be read in connection with the accompanying drawing, wherein

FIG. 1 is a longitudinal view of a filé thread in accordance with the invention.

FIG. 2 schematically shows the process for making the lamé for the filé.

FIG. 3 is a longitudinal section taken through one preferred form of lamé.

FIG. 4 is a longitudinal section taken through another form of lamé.

FIG. 5 shows a filé having a multi-strand core.

Referring now to the drawings, there is shown a filé in accordance with the invention comprising a core C and a metallized ribbon or lamé L wrapped thereabout. Core C may be constituted by any known synthetic or natural thread providing adequate tensile strength, such

as filamentary nylon or silk thread, fiber glass thread or any other suitable material. While a single filamentary core is shown, it is to be understood that two or more core filaments may be used for increased bulk and strength. This is shown in FIG. 5, wherein the lamé L is coiled about core filaments C_1 and C_2.

Ribbon L is spiralled flat about core C to form a helical winding thereabout providing a metallic appearance suitable for lamé fabrics. It is to be understood that while a flat ribbon is shown, the ribbon, if preferred, may first be twisted before coiling it about the core to provide different effects. It is also possible to spiral more than one metallized ribbon about the core in overlapping or counter twist relation to achieve further decorative effects as well as differences in hand and bulk.

The nature of the non-laminated lamé or ribbon and method for making same will now be described.

Referring to FIG. 2, there is shown a process in accordance with the invention for producing a metallized web which may be slit to form relatively narrow ribbons. A continuous web of transparent thermoplastic material **10** is drawn from a supply roll **11** and is caused to travel through a high vacuum chamber **12** wherein one surface of the film is metallized. The web may be constituted by cellophane, acetate, tri-acetate, acetate butyrate, polymerized ethylene glycol terephthalate (Mylar) or any other suitable transparent and flexible material capable of being vacuum-plated. The thickness of the web for ordinary yarn should not exceed 2 mils and is preferably of ½ mil thickness.

In the vacuum chamber **12**, one surface of the film is metal-plated by gold, silver, aluminum, magnesium, titanium, nickel or any other metal, the thickness of the metal layer being molecular and not exceeding $\frac{1}{50,000}$ of an inch. The deposition may be carried out by known thermal evaporation or cathodic sputtering techniques. In thermal evaporation, metal vapor is generated by direct heat such as an electric arc source or a glowing filament. To effect maximum adherence of the plated film, the metal atoms should pass linearly from their source to the surface to be coated and this requires the maintenance of pressures of about 10^{-4} of mercury in the vacuum chamber.

In cathode sputtering, a high voltage is impressed between an anode and a cathode of the plating metal. The cathode is vaporized by positive-ion bombardment, some of the vapor diffusing away from the cathode and depositing on the web to be plated. The voltage requirements depend on the nature of the cathode metal. At pressures of 0.01 to 0.10 mm. of mercury necessary to maintain the glow discharge, the ordinary laws of diffusion prevail. After plating, the web is re-rolled on take-up drum **11'** in preparation for the next step.

To produce a yarn having the color properties of the metal deposit, the metallized web is then coated on the metal side with a transparent plastic in solution or suspension which is related structurally to and has an affinity for the web which is metallized. That is to say, the plastic coating must have substantially the same tensile strength and elongation characteristics as the web material. Since the metal layer is of molecular thickness it is inherently permeable to the liquid plastic coated thereon.

The plastic coating can be applied by a roller coater, a reverse roller coater, or by the flexographic or rotogravure process. By way of illustration, FIG. 2 shows a direct three roll coater. The coater, generally designated by numeral **13**, includes a bath **14** for containing the liquid, a first roller **15** which is rotatable within the bath and acts to apply the liquid to a second roller **16** which engages the metallized surface of the web **10**, the

web being pressed against the second roller by means of a third roller **17**.

The wet plastic coating formed on the web **10** is then dried and cured by passing the web through a suitable oven **18** which is properly heated and vented to drive off all solvents and at the same time to effect the curing of the coated material. For heating purposes, steam, gas heat or infra-red radiation may be employed, as desired. The temperature of the oven and the travel time therethrough are determined by the specific web and coating materials. The coating is further cured by cooling drums **19** disposed at the opposite end of the oven. Cooling may be accomplished by a circulating water system or a refrigerant. Thereafter the metallized and coated web is longitudinally severed or slit in a conventional slitter **20** into ribbons of a width appropriate to lamé.

In FIG. 3 there is shown a section taken through the ribbon. The ribbon is composed of a thermoplastic base strip **21**, a thin metal coating **22** being deposited thereon and a plastic film **23** being intimately bonded to the surface of the metallized strip to form an integral structure. Preferably the strip is about ½ mil in thickness and the film is about ⅕ mil thickness, the thickness of the deposit being negligible. Thus the total thickness is less than one-thousandth of an inch.

The color or luster of the ribbon produced in the above-described technique is determined by the natural color of the metal deposition. However, it is also possible to generate other colors by adding a dye or pigment to the plastic coating fluid, in which event the resultant color in the finished tape is the combination of the metal and pigment hues. For example, as shown in section in FIG. 4, a gold effect may be realized by a silver or aluminum metal deposit **22** in combination with a plastic covering **23** having an amber dye or translucent pigment therein. To have the gold effect on either side it is also necessary to color the non-metallized surface of the base strip and this is best accomplished by applying the pigmented or dyed liquid plastic **24** to this side as well as the metallized side, so that a film is formed on both sides of the base strip.

As pointed out previously, it is important that the plastic coating on the metallized web be related structurally and have an affinity for the web material. Where the web material is constituted by Mylar, it has been found that an effective coating is one in which the basic make-up of the solids is approximately as follows on a ratio basis per weight:

1 part Vinylite VAGH
1 part Vinylite VMCH
1 part Nitrite rubber
.12 ultra-violet light absorber

The ratio basis of the above constituents may be varied without materially impairing the efficacy of the mixture by reducing the Vinylite VAGH to an extent not exceeding about 30%, and by increasing the Vinylite VMCH to an extent not exceeding about 30%. Alternatively, the Vinylite VAGH may be increased by 30%, and the Vinylite VMCH decreased by 30%. However, the Nitrite rubber should be held more or less constant, as well as the ultra-violet light absorber.

The light absorber acts as an anti-oxidant relative to the rubber and in lesser amounts than above indicated is not fully effective. On the other hand, an increased amount would not significantly improve the ultra-violet light resistance of the dried film laid down with the coating composition. The light absorber prevents discoloration of the film.

The Nitrite rubber is available commercially from several sources. The Nitrite content may run between 30 to 36% and the balance made up of butadiene. This type of rubber is higher in acro-nitrite content, giving a harder polymer which is necessary to add to the composi-

tions for a non-blocking coating and one that will resist boiling of coating when the coated material is formed into metallic yarn and subjected to various dye and cleaning processes, etc.

The Vinylite VMCH is manufactured by Bakelite Corp. under their trade name, the chemical composition being as follows:

	Percent
Vinyl chloride	86
Vinyl acetate	13
Inner polymerized di-basic acid	1

Vinylite VAGH is also manufactured by Bakelite Corp., the chemical constituents being the following:

	Percent
Vinyl chloride	91
Vinyl acetate	3
Organic material having hydroxyl group (2.6 times greater when calculated as vinyl alcohol)	6

The function of the Vinylite VMCH is to effect adherence to metallic surfaces and also be plain polyester surfaces. The Vinylite VAGH gives better range for hardness and overall compatibility which allows the introduction of a wider range of colors.

The Vinylite VMCH does not tolerate the addition of many pigments or dyes, and resort is therefore had to VAGH for broader compatibility of colors to be added, as well as to good adhesion, along with a material that is hard, thereby imparting a non-blocking character to the coating film itself. Various types of light fast azo dyes, vat dyes and various types of pigment dispersions are compatible in this mixture.

This mixture may be dissolved in a straight ketone system, such as acetone or M.E.K. where high volatility and evaporation of solvents is desired. For general coating operations on reverse roll coaters, the solvent system may be ⅔ methyl ethyl ketone and ⅓ aromatic hydrocarbon, such as tuluol solvent. The solids may range between 18 to 23% for a low viscosity mixture.

A metallized ribbon formed in accordance with the above described process and including a Mylar base or web will afford increased yardage per pound of Mylar as compared with conventional laminated structures since only one ply of Mylar is entailed. And since no adhesive is employed, the plastic coating being integrally bonded to the web, the resultant ribbons cannot delaminate.

Thus when the ribbons of the above-described type are wound about a core, to provide a filé which is used to weave a lamé fabric, the resultant fabric is not stiff, as would be the case using metal ribbons, but is soft and has an appealing hand.

Moreover, the metallized filé as provided herein, cannot tarnish since the metal deposit is permanently encased and fully protected. Nor will delaminattion occur since the film on the ribbon is firmly bonded to the base. The filé may of course be flattened by pressure rolls to form a laminette.

While there have been shown what are considered to be preferred embodiments of the invention, it will be manifest that many changes and modifications may be made therein without departing from the essential spirit of the invention. It is intended, therefore, in the annexed claims to cover all such changes and modifications as fall within the true scope of the invention.

I claim:

1. A filé comprising a non-metallic filamentary core having spiralled thereabout a coil of non-laminated metallized yarn having a thickness of less than one mil and formed by a base layer of transparent synthetic material having a metal deposit thereon coated by a plastic film.

2. A filé as set forth in claim 1 wherein said core is composed of at least two threads.

3. A lamé fabric formed by a filé as set forth in claim 1, interwoven with another yarn.

4. A filé, as set forth in claim 1, wherein said base material is formed of polymerized ethylene glycol terephthalate.

5. A filé, as set forth in claim 1, wherein said core is formed of nylon.

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