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SUPERINTENDENCIA

DIVISION DE MARCAS Y CREACIONES

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EL EXTRATO DE LA PRESENTE LEY DE PATENTE DE INVENCIÓN

FUE PUBLICADO EN LA GACETA DE PROPIEDAD INDUSTRIAL No. 374 DE

FECHA 30 DE MARZO DE 2007 EL FIRMANTE HABIENDO POR LA LEY

EXPRESA EL 03 DE JULIO DEL 2007

NOTA: El presente instrumento se ha suscrito en la ciudad de Bogotá, D.C., a los 03 días del mes de julio del 2007, en la forma prescrita por la Ley de Procedimiento Industrial, y se ha otorgado el extracto de la presente para que sea publicado en la Gaceta de la Propiedad Industrial, de acuerdo con lo establecido en el artículo 15 de la Ley 1773 de 2000.

SE REPRESENTARON CREACIONES POR PARTE DE TERCEROS

NO X

SI

United States Patent [19]

Rees

[11] Patent Number: **4,813,219**[45] Date of Patent: **Mar. 21, 1989**[54] **METHOD AND APPARATUS FOR MAKING CONDUCTIVE YARN**[75] Inventor: **John J. M. Rees, Toccoa, Ga.**[73] Assignee: **Coats & Clark Inc., Toccoa, Ga.**[21] Appl. No.: **208,172**[22] Filed: **Jun. 17, 1988****Related U.S. Application Data**

[62] Division of Ser. No. 47,776, May 8, 1987, Pat. No. 4,776,160.

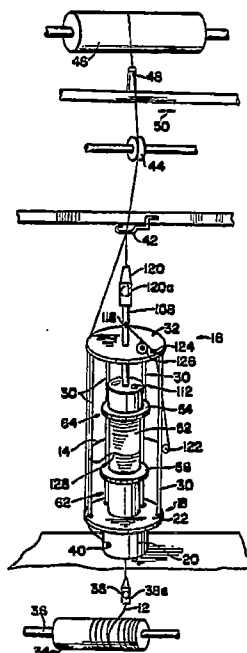
[51] Int. Cl.⁴ **D07B 3/00; D02G 3/12; D02E 3/44**[52] U.S. Cl. **57/3; 57/6; 57/901**[58] Field of Search **57/200, 210, 212, 216, 57/229, 901, 3, 6, 9, 12; 174/126 R, 128 R, 192**[56] **References Cited****U.S. PATENT DOCUMENTS**

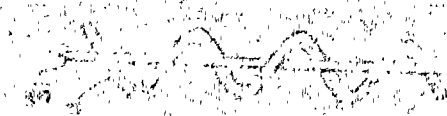
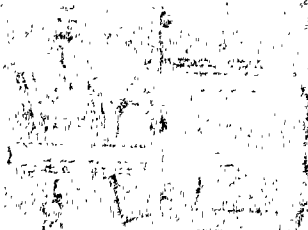
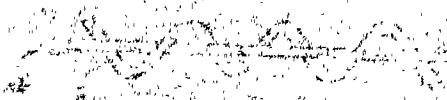
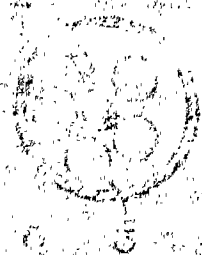
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Primary Examiner—Donald Watkins*Attorney, Agent, or Firm*—Burgess, Ryan & Wayne[57] **ABSTRACT**

A conductive yarn includes a continuous non-conductive carrier thread having a relatively low modulus of elasticity; a continuous metal thread; and the carrier thread being wrapped around the metal thread. A process for making such conductive yarn includes the steps of pulling the continuous metal thread off a first package; pulling the continuous carrier thread off a second package; applying a relatively high tension to the carrier thread with respect to the tension on the metal thread as both threads are being pulled off their respective packages; and wrapping the tensioned carrier thread around the pulled metal thread. Apparatus for performing the method is also provided.

14 Claims, 3 Drawing Sheets



METHOD AND APPARATUS FOR MAKING CONDUCTIVE YARN

This is a division of application Ser. No. 047,776, filed 5 May 8, 1987, now U.S. Pat. No. 4,776,160.

BACKGROUND OF THE INVENTION

This invention relates generally to yarns, and more particularly, is directed to a conductive yarn and a 10 method and apparatus for making the same.

In many instances, it is desirable and often necessary to provide fabric which is conductive or which at least has some portions thereof that are conductive. For example, such conductive fabric can be used in transcu- 15 taneous transducer garments sold by Bio-Stimu Trend Corp. of Opa Locka, Fla. In such garments, electrodes are attached to the garments to stimulate the muscles of a patient. In the past, such electrodes have been applied directly to the skin of the patient with a wire attached 20 from each electrode to a source of electric potential. However, when the electrodes are constructed into the garments, portions of the garment can be made of a conductive yarn so as to connect the electrodes to the source of electric potential without the numerous loose 25 wires and the like previously used.

As a result, patient mobility is not restricted by cables, wires or tapes. There is also no separation or disconnection of the electrodes from the body parts by movement or after prolonged wear. Still further, several garments may be worn and simultaneously supplied with current. Also, because the electrodes are built into the garments, they do not require adhesives thereby eliminating certain types of allergic skin reactions, hair removal is not required, skin burns are reduced and problems with skin perspiration and oily skin are effectively eliminated.

Another use for fabric made of a conductive yarn is as a lightning strike arrester, for example, in any air- 40 borne vehicle. Still another use is in a conductive wrist band as disclosed in U.S. Patent Application Ser. No. 794,755, filed Nov. 4, 1985, now Pat. No. 4,654,748, by John J. M. Rees, entitled Conductive Wrist Band, the entire disclosure of which is incorporated herein. Still, other examples are in use on medical garments, gar- 45 ments for an antistatic clean room, and as an antistatic sewing thread.

Of course, in order for such yarn to be conductive, the yarn must include a conductive material. In this regard, Bekaert NVSA sells a metal thread consisting 50 only of stainless steel under the trademarks "Bekinox VS" and "Bekinox VN". However, such threads generally have little or no stretch and break easily. Therefore, the utility of such threads is extremely limited.

Bekaert NVSA also sells a spun yarn including 55 chopped up fibers of intertwined polyester and metal under the trademarks "Bekitex L80/1" and "Bekitex BK50/3". Because a spun yarn is used wherein the polyester and metal threads are chopped up and intertwined, there is no continuous metal along the thread length and therefore, the conductivity throughout the fiber is not continuous. Further, there is an insufficient shock absorbing quality of the polyester yarn in such arrangement because of the chopped up nature of the spun yarn. Still further, because of the spun yarn, shed- 60 ding occurs, resulting in a loss of stainless steel fibers in the Bekaert material due to washing, stretching and the like. As a result, the final product is weaker and loses

some of its original desirable properties. More impor- 2 tantly, when using such a conductive yarn in garments, for example, in an electrical clean room, contamination of semiconductors and other electrical components may occur due to shedding of the stainless steel fibers. Still further, in order to produce the Bekaert material, multi- ple steps are required because of the nature of the spun yarn. Most importantly, however, there is not a high conductivity and the fiber is not consistent and uniform throughout its length that there may be faults in the materials, such as slubs and the like. It is also important that such materials be launderable and, as aforesaid, this results in a loss of some stainless steel fibers with the Bekaert Bekitex material.

A high conductivity graphite material with electri- cally conductive filaments wrapped around the fila- ments is also known from U.S. Pat. No. 4,590,122, as- signed to Fiberite Corp. of Winona, Minn. In this pa- tent, a metal thread is twisted about a carbon thread.

However, another important property that is needed in conductive yarns is stretchability. With the mater- 20 ial of this U.S. Patent, since carbon has a high modulus of elasticity, the material has a low stretchability. For example, for a conductive yarn to be used in the applica- tions described above, it is preferable that the percent elongation at break be at least about 3%, and preferably within the range of 10 to 15%. The average percent elongation at break for carbon is usually 1.5% or less.

Still further, carbon is a difficult material to work 30 with since it is not very flexible. Therefore, carbon tends to shed and the fibers thereof tend to break. Also, because of the smooth surface of carbon, metal threads wrapped thereabout tend to slip on such smooth surface and group together in spaced apart bunches. Stil further, because carbon fibers tend to break when flexed, the material of U.S. Pat. No. 4,590,122 is generally not 35 launderable.

OBJECTS AND SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a conductive yarn that is highly conductive.

It is another object of the present invention to provide a conductive yarn that is substantially non-shed- 45 ding.

It is still another object of the present invention to provide a conductive yarn that is easily and readily launderable.

It is yet another object of the present invention to provide a conductive yarn that is abrasion resistant and has high shock absorbing qualities.

It is a further object of the present invention to provide a conductive yarn that can be easily and economi- cally manufactured, with a minimum of processing time and equipment.

It is a still further object of the present invention to provide a conductive yarn that is consistent and uni- form throughout its length.

It is a yet further object of the present invention to provide a conductive yarn having low twist torque or liveliness so as to resist kinking.

It is another object of the present invention to provide a conductive yarn in which the non-conductive element thereof has a low modulus of elasticity and thereby a high stretchability.

It is still another object of the present invention to provide a conductive yarn that is extremely flexible, yet stable and comfortable.

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It is yet another object of the present invention to provide a conductive yarn that substantially prevents slipping of the conductive thread on the non-conductive thread, and protects the metal component from damage.

It is a further object of the present invention to provide a conductive yarn that allows subsequent processing on weaving, knitting and sewing machines.

In accordance with an aspect of the present invention, a conductive yarn includes a continuous carrier thread having a relatively low modulus of elasticity; a continuous metal thread; and the carrier and metal threads being wrapped relatively around each other.

In accordance with another aspect of the present invention, a process of making a conductive yarn includes the steps of pulling a continuous metal thread off a first package; pulling a continuous carrier thread having a relatively low modulus of elasticity off a second package; applying a relatively high tension to the carrier thread with respect to the tension on the metal thread as both threads are being pulled off their respective packages; and wrapping the tensioned carrier thread around the pulled metal thread.

In accordance with still another aspect of the present invention, apparatus for making a conductive yarn includes means for pulling a continuous metal thread off a first package and for pulling a continuous carrier thread having a relatively low modulus of elasticity off a second package; means for applying a relatively high tension to the carrier thread with respect to the tension on the metal thread as both threads are being pulled off their respective packages; and means for wrapping the tensioned carrier thread around the pulled metal thread.

The above and other objects, features and advantages of the present invention will become readily apparent from the following detailed description thereof which is to be read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of apparatus for making a conductive thread according to the present invention;

FIG. 2 is a cross-sectional view of a portion of the apparatus of FIG. 1;

FIG. 3 is a cross-sectional view of a portion of the apparatus of FIG. 1;

FIG. 4 is a perspective view of a portion of the apparatus of FIG. 1, in partially exploded view;

FIG. 5 is an elevational view of the conductive yarn being formed according to the present invention with the carrier thread wrapped about a metal thread; and

FIG. 6 is an elevational view of a conductive yarn according to the present invention, formed from the intermediate product of FIG. 5, with the metal thread wrapped about the carrier thread.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings in detail, and initially to FIG. 6 thereof, a conductive yarn 10 according to the present invention includes a continuous carrier thread 12 and a continuous metal thread 14 wrapped thereabout.

Metal thread 14 is preferably made from at least one of the following materials: fine diameter metals such as nickel; copper; stainless steel; nickel chromium; nickel alloys; copper alloys; aluminum; aluminum alloys; nickel coated copper; silver coated nylon, such as that

sold by Bekaert in Belgium; copper coated acrylic, such as that sold by Thunderon in Japan; nickel coated acrylic, such as that sold by Asahi Chemical in Japan; or any suitable combination of the above. Metal thread 14 can be a single filament metal wire or a multi-filament metal wire having, for example, 3, 4 or more ends of wire. Regardless of the type of metal thread used, each filament thereof is continuous and preferably has a diameter in the range of 0.0005 to 0.05 inch, with a preferred diameter of approximately 0.002 inch. Thus, for a monofilament metal thread, the diameter of the metal thread 14 is in the range of 0.0005 to 0.05 inch. For a multifilament metal thread, the number of filaments can range from between 2 and 1000 filaments.

Because metal thread 14 will not stretch, that is, it will break before stretching, some form of stretchability, that is, a shock absorbing quality must be built into conductive yarn 10. For this reason, metal thread 14 is preferably wrapped about carrier thread 12.

However, carrier thread 12 must have sufficient stretchability also. Thus, carrier thread 12 preferably has an elongation at break in the approximate range between 10% and 15%, although the percent elongation at break can be as little as 3%. This is in sharp distinction to carbon fibers which have an average percent elongation at break of 1.5% or less. In other words, carrier thread 12 according to the present invention has a relatively low modulus of elasticity, and therefore has a high stretchability.

Carrier thread 12 can be made from any suitable non-conductive material having a low modulus of elasticity. For example, carrier thread 12 can be a thermoplastic material, such as nylon, polyester, rayon acrylic, PEEK (polyetheretherketone), PPS (polyphenylene sulfide), PBI, polyolefin such as polyethylene or polypropylene, a liquid crystal polymer, or polycarbonate. Alternatively, a polyvinyl alcohol (PVA) which dissolves in water or an aramid fiber can be used. All of these materials have a relatively low modulus of elasticity and elongation in the 10 to 20% range in accordance with the present invention.

The sizes of carrier thread 12 can vary preferably within the range of 20-5000 denier, with a preferable range of 100-1500 denier.

With this arrangement, because threads 12 and 14 are continuous, there is a continuous and high conductivity of yarn 10. Further, because of the relatively low modulus of elasticity of carrier thread 12, conductive yarn 10 is abrasion resistant and has good shock absorbing qualities. Still further, because of the continuous nature of threads 12 and 14, there is no shedding thereof. Also, because of the low modulus of elasticity of carrier thread 12, and because of the continuous nature of the threads, conductive yarn 10 can be easily processed, is consistent and uniform throughout its length, and is launderable. Further, because of the carrier thread that is used, such as the thermoplastic material, for example, a polyester, the carrier thread 12 includes a number of interlaced surface loops which prevent metal thread 14 from slipping thereon.

In order to form conductive yarn 10, carrier thread 12 is initially wrapped about metal thread 14, as shown in FIG. 5, with the elongation or tension force applied to carrier thread 12 during such wrapping operation being less than the elongation or tension force on metal thread 14. When the tension forces are relieved, the end result is that of Fig. 6, that is, where metal thread 14 is

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1. The first step in the process of the investigation is the identification of the problem. This involves a thorough review of the available information and a clear definition of the issue at hand. Once the problem is identified, the next step is to gather relevant data and information. This can be done through various methods, including interviews, surveys, and document analysis. The third step is to analyze the data and information gathered. This involves identifying patterns, trends, and relationships that may be relevant to the problem. The fourth step is to develop a hypothesis or a proposed solution. This is based on the analysis of the data and information. The fifth step is to test the hypothesis or the proposed solution. This can be done through experiments, simulations, or other methods. The final step is to evaluate the results of the investigation. This involves comparing the results to the original problem and determining the effectiveness of the proposed solution.

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1. The first step in the process of the investigation is the identification of the problem. This is done by the investigator who is responsible for the study. The next step is to collect data. This is done by the investigator who is responsible for the study. The next step is to analyze the data. This is done by the investigator who is responsible for the study. The next step is to interpret the results. This is done by the investigator who is responsible for the study. The next step is to draw conclusions. This is done by the investigator who is responsible for the study. The next step is to report the findings. This is done by the investigator who is responsible for the study. The next step is to discuss the implications. This is done by the investigator who is responsible for the study. The next step is to recommend further research. This is done by the investigator who is responsible for the study. The next step is to conclude the study. This is done by the investigator who is responsible for the study.

2. Once the problem is identified, the next step is to define the objectives and goals of the project. This helps to clarify what needs to be achieved and provides a clear direction for the team.

3. The third step is to develop a plan or strategy to address the problem. This involves breaking down the problem into smaller, manageable tasks and determining the resources needed to complete each task.

4. The fourth step is to implement the plan. This involves putting the strategy into action and monitoring progress regularly to ensure that the project is on track.

5. Finally, the fifth step is to evaluate the results of the project. This involves assessing the outcomes against the objectives and goals and identifying any areas for improvement or further action.

1. The first step in the process of the investigation is the identification of the problem. This involves a thorough review of the available information and a clear definition of the issue at hand. Once the problem is identified, the next step is to gather relevant data and information. This can be done through various methods, including interviews, surveys, and document analysis. The third step is to analyze the data and information gathered. This involves identifying patterns, trends, and relationships that may be relevant to the problem. Finally, the fourth step is to develop and implement a solution. This involves creating a plan of action and putting it into practice. The process of investigation is a continuous one, and it may be necessary to revisit previous steps as more information is gathered and the problem evolves.

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wrapped about carrier thread 12 to form conductive yarn 10.

Referring now to FIGS. 1-4, apparatus 16 for forming conductive yarn 10 will now be described. As shown, a spindle housing 18 is rotated by a motor drive (not shown), for example, at the rate of 3,000-10,000 rpm. Specifically, spindle housing 18 includes a spindle whorl 20 rotatably driven by the motor drive and having a circular bottom spindle plate 22 secured thereon for rotation therewith. Bottom spindle plate 22 is circular and has a plurality of circumferentially spaced apertures 24 therein in which are positioned bearing assemblies 26. Bottom spindle plate 22 further includes a frusto-conical aperture 28 at the center thereof, the reason for which will be apparent from the discussion which follows.

As shown best in FIGS. 1 and 2, a plurality of traverse rods 30 have their lower ends rotatably secured within bearing assemblies 26 so as to extend vertically upward from bottom spindle plate 22 and so as to be rotatably mounted therein.

A circular top spindle plate 32 is provided in substantially parallel spaced relation from bottom spindle plate 22, top spindle plate 32 also including a plurality of circumferentially spaced apertures (not shown) having bearing assemblies (not shown) therein for rotatably fitting the upper ends of traverse rods 30 therein. In other words, traverse rods maintain bottom spindle plate 22 and top spindle plate 32 in substantially parallel, spaced relation, while being rotatably mounted with respect to bottom spindle plate 22 and top spindle plate 32 by reason of the bearing assemblies.

Carrier thread 12 is mounted on a spool 34 which is freely rotatable on a shaft 36. Carrier thread 12 extends from spool 34, through a spring tension device 38, into the interior of spindle whorl 20 and out through a side hole 40 therein. Carrier thread 12 then passes around the outer peripheries of bottom spindle plate 22 and top spindle plate 32, whereupon it enters a balloon control guide 42, passes on to a pretake-up roller 44 and is guided onto a doff package 46 by a traverse guide 48. Doff package 46 is rotated by a motor (not shown) so as to pull carrier thread 12 from spool 34 and conductive thread 14 from spool 52, and traverse guide 48 reciprocates in the direction of arrow 50 so as to evenly distribute carrier thread 12 combined with conductive thread 14 into yarn 10 on doff package 46.

As previously discussed, in accordance with the present invention, when forming the conductive yarn 10 according to the present invention, a relatively high tension is applied to carrier thread 12 with respect to the tension on conductive thread 14. Accordingly, spring tension device 38, which is a conventional device, has two ceramic discs (not shown) therein that pinch carrier thread 12 therebetween, one disc being spring loaded to vary the pinching force on carrier thread 12 and to thereby vary the tension on carrier thread 12. The spring loading force is variable by a control dial 38a on the outside of spring tension device 38.

In accordance with the present invention, metal thread 14 is wound on a spool 52 having upper and lower circular flanges 54 and 56, respectively, although metal thread 14 could be wound on a cheese package (not shown). As is conventional, spool 52 is hollow and flanges 54 and 56 have central frusto-conical apertures 58 and 60, respectively, as shown in FIG. 2. In order to support spool 52 in a freely rotatable manner with respect to spindle housing 18, a ball bearing tension device

62 for cheese packages is provided for supporting spool 52 on bottom spindle plate 22 in a freely rotatable manner and a ball bearing tension device 64 for spools is provided for freely rotatably guiding spool 52 with respect to top spindle plate 32.

Specifically, as shown in FIG. 2, ball bearing tension device 62 includes a cylindrical bearing cap 66 formed with a lower outer cylindrical ledge 68 having a downwardly inclined outer surface 69 includes a tension cap 71 at its lower end which rotates within a bearing assembly 73 in bottom spindle plate 22.

A cylindrical adaptor spacer 78 fits on ledge 68 of bearing cap 66 and has an annular inner shoulder 82 formed at its lower end that sits on the upper surface of bearing cap 66. Adaptor 78 has a central aperture 84 at its upper, closed end in which is fit a bearing assembly 86 that holds a substantially conical bearing support 88. Bearing supports 88 fits within frusto-conical central aperture 60 of lower circular flange 56, whereby ball bearing tension device 62 is freely rotatable with respect to bottom spindle plate 22 and spool 52.

In the embodiment shown in FIGS. 1 and 2, spool 52 fits on top of ball bearing idler 88. On the other hand, when a cheese package is used, the cheese package (not shown) fits about ball bearing tension device 62 and sits on top of lower outer cylindrical ledge 68, as shown by dashed lines 79. Therefore, as metal thread 14 is pulled off of spool 52, and spool 52 rotates slightly, ball bearing tension device 62 would also rotate with spool 52. During such rotation, balls 90, which sit on inclined outer surface 69, rotate along the outer periphery at the inside of tension device 62 and provide a drag on such rotation. The amount of drag depends upon the number of balls 90 within tension device 62, and accordingly, tension device 62 can be used for smoothly applying tension to metal thread 14, which tension can be finely tuned by adding or taking away from the number of balls 90 within tension device 62.

Tension device 64 is constructed in a similar manner to tension device 62 and includes a cylindrical bearing cap 92 having a central aperture 96 in the upper end thereof in which is fit a bearing assembly 98. An inverted, substantially conical bearing support 100 is secured to the lower surface of bearing cap 92, and fits in central aperture 58 of upper circular flange 54 of spool 52, whereby bearing cap 92 is rotatably supported on spool 52. A cylindrical assembly top 102, open at its lower end, is fit over bearing cap 92 and spaced slightly therefrom, so as to define an enclosure 104. Specifically, a shaft 106 has its lower end centrally fixed within the upper, closed end of assembly top 102 by an allen screw 103 and extends further so as to be rotatably supported on bearing cap 92 by bearing assembly 98. The opposite end of shaft 106 is freely rotatable through top spindle plate 32 and into a shaft guide bar 108 that extends centrally from top spindle plate 32. In this manner, spool 52 is freely rotatable with respect to top spindle plate 32.

A plurality of balls 110 are provided within enclosure 104 of tension device 64, so that during rotation thereof, balls 110 are forced outwardly toward the outer circumference of enclosure 104 to provide a drag on rotation thereof and to thereby provide a tensioning force on spool 52. As with tensioning device 62, the greater the number of balls 110, the greater the drag that is produced. In order to increase the drag, a stop 114 can be inserted within a slot 116 in assembly top 102 to

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US005927060A

United States Patent [19]
Watson

[11] **Patent Number:** **5,927,060**
[45] **Date of Patent:** **Jul. 27, 1999**

- [54] **ELECTRICALLY CONDUCTIVE YARN**
- [75] **Inventor:** Douglas L. Watson, Dunwoody, Ga.
- [73] **Assignee:** N.V. Bekaert S.A., Belgium
- [21] **Appl. No.:** 08/954,164
- [22] **Filed:** Oct. 20, 1997
- [51] **Int. Cl.⁶** D02G 3/02
- [52] **U.S. Cl.** 57/210; 57/212; 57/213;
57/222; 57/230; 337/163; 337/166
- [58] **Field of Search** 57/210, 212, 213,
57/222, 230, 901; 337/161, 163, 164, 166

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Primary Examiner—William Stryjewski
Attorney, Agent, or Firm—Nixon & Vanderhye P.C.

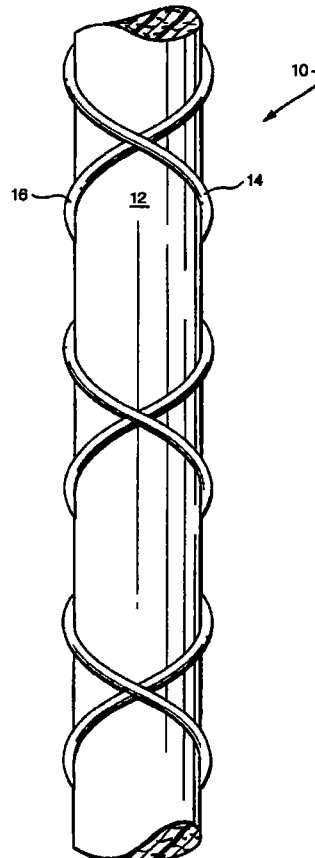
[57] **ABSTRACT**

A composite longitudinally balanced electrically conductive yarn has a textile fiber core yarn wrapped with a minimum of two, and a maximum four, filaments. One to four of the filaments are metal filaments with the remainder being synthetic filaments. Each metal filament has an equivalent diameter of between 20 and 80 microns, and a wrap frequency of between 200 and 600 turns per meter. At least one of the metal filaments is wrapped in one direction, and at least one of the remaining filaments is wrapped in the opposite direction. The composite yarns of this invention is capable of elongation to accommodate tensile stresses under use, without experiencing a change in conductivity.

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4,057,774	11/1977	Arilawa et al.	337/164
4,122,426	10/1978	Maruo	337/163
4,297,666	10/1981	Asdollahi	337/163
4,445,106	4/1984	Shah	337/163
4,517,544	5/1985	Spaunhorst	337/164
4,545,835	10/1985	Gusack et al.	57/901
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11 Claims, 1 Drawing Sheet



5,927,060

1

ELECTRICALLY CONDUCTIVE YARN**FIELD OF THE INVENTION**

The present invention relates to a composite yarn with a predetermined electrical conductivity, flexibility and elongation behavior and which comprises metal fibers.

BACKGROUND OF THE INVENTION

The blending of broken metal fibers, e.g. stainless steel fibers with natural or synthetic textile fibers to produce conductive yarns is well known. The conductive fibers are dispersed throughout the cross section of the yarn during spinning. However, since the modulus of elasticity of metal and textile fiber differ significantly, it is difficult to reach and retain a permanently homogeneous metal distribution in the yarn. In particular, when repeatedly loading the yarns under tensile and/or bending or torsion stresses, the initial fiber distribution may alter in the yarn cross section as well as along the yarn length. As a consequence its conductivity may change in an uncontrollable manner.

SUMMARY OF THE INVENTION

It is now an object of the invention to design a composite yarn comprising metal fibers and having a predetermined electrical conductivity which remains constant during use, i.e. under different stress or strain conditions. In particular, it is an object to design such a yarn which properly can elongate to accommodate tensile stresses under use, without changing its conductivity.

It is another object of the invention to design such a yarn of controlled rigidity. For certain uses a high flexibility is required, i.e. having a flex life of at least 30,000 bending cycles and preferably at least 40,000 cycles.

According to an additional object of the invention, the composite yarn must have a torque which is fully balanced along its length so that it can be easily incorporated e.g. into woven, knotted, braided or knitted fabrics. A balanced yarn thus means here a yarn with almost no or without any residual torsion. The invention relates also to fabrics, in particular textile fabrics, wherein at least one such composite yarn is incorporated.

Yet, a further object of the invention deals with the provision of a rapid ignition and burn through capacity for the yarn. This means that the metal filaments therein can ignite already at relatively low temperatures.

In summary, in a preferred embodiment, the composite yarn according to the invention should thus enable a balancing of the needs for a proper conductivity, flexibility, elongation, low residual torsion and low ignition energy.

These objects are met by providing a textile fiber core yarn or core bundle which is wrapped with minimum two and maximum four filaments of which one to four are metal filaments and the rest are synthetic filaments and wherein each metal filament has an equivalent diameter of between 20 and 80 microns and wherein the wrap frequency of each filament is between 200 and 600 turns per meter, at least one of said metal filaments being wrapped in one direction, and at least one of the remaining filaments being wrapped in the opposite direction. The equivalent diameter of the metal filaments is preferably between 30 and 55 micron and most preferably between 30 and 40 micron. The metal is preferably stainless steel.

The fiber core yarn is preferably a multifilament synthetic yarn and has a size of between 250 and 2400 denier and preferably between 250 and 800 denier. The helical wrap-

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ping is not very tight so that the yarn can elongate quite easily up to e.g. five %. This means that the core yarn can elongate 5% and take up the initial tensile stresses under elongation before the metal filaments are loaded under tensile stress.

Actually, the choice and range of parameters just described enable to fulfill the need to properly balance conductivity, flexibility, elongation capacity, low torque and low ignition energy. This need is thus fulfilled by properly adjusting the numbers and diameters of the metal filaments, their spacing, the wrapping tension and the composition of the metal.

If desired, the yarn that is wrapped with the metal filaments can further be covered by another layer (e.g. by extrusion) that can act as a protective or isolating cover or sheath. This cover can comprise another textile fiber layer. One or more series of parallel composite conductive yarns, which series can cross each other, can be sandwiched between two plastic foils to form a laminated sheet capable of shielding electromagnetic waves, e.g. microwaves.

In a preferred embodiment, the composite yarn according to the invention comprises one metal filament wrapped in one direction (S-, respectively Z-direction) and one filament wrapped in the opposite direction (Z-, respectively S-direction). The filament wrapped in the opposite direction is preferably also a metal filament and has the same or a similar wrap frequency as the metal filament in the one direction.

In another preferred embodiment the composite yarn comprises two metal filaments wrapped in the one direction and two metal filaments wrapped in the opposite direction, the wrap frequency of all four filaments being either the same or similar.

**BRIEF DESCRIPTION OF THE
ACCOMPANYING DRAWING**

The accompanying Drawing FIGURE shows one preferred composite yarn according to the present invention as being comprised of a core yarn wrapped in opposite direction by respective metal filaments.

**DETAILED DESCRIPTION OF THE
PREFERRED EXEMPLARY EMBODIMENTS**

A first conductive yarn was produced for use as a long safety circuit or fuse running alongside a conventional electrical wire circuit to interrupt incidental short circuits therein. At the occurrence of a sudden undesired short in the circuit, the metal filaments in the yarn of the invention that runs alongside the circuit act as a fuse. They burn through (melt down) at the place of the short in the main circuit and thereby give a signal to the power supply unit to shut off the current flow in the wire circuit. This feature can be used e.g. for protecting electrical heating circuits in blankets, in foot warmers, quilts, mattresses, mattress pads and comforters, i.e. for preventing the generation of fires therein or electrical shocks or other injuries to the user.

For this purpose, the yarn of the invention comprised a polyester core yarn of 600 denier. This core yarn was wrapped by two stainless steel filaments in Z-direction and two such filaments in S-direction to balance the overall torque alongside the yarn, i.e. to produce a yarn with almost zero residual torsion. The steel filaments had an equivalent diameter of 35 micron. They can be produced either by direct drawing, by a bundle drawing technique or by a shaving technique as disclosed in U.S. Pat. No. 4,930,199.

The steel filaments were quite loosely wrapped with 350 turns per meter. In this way they only start to contribute to bearing tensile stresses in the overall yarn after the core yarn has already elongated by about 5%. The yarn had a resistivity of about 180 Ohm/m and, when used as a safety circuit in a heating blanket, the burning-through time was less than 20 sec. The flex life of the yarn was 40,000 cycles as determined by the test UL 964, 10th edition.

The accompanying drawing FIGURE shows a composite yarn 10 according to the present invention. The composite yarn includes a core yarn 12 wrapped in opposite directions by respective metal filaments 14, 16.

Since the burn-through time for the composite yarn is a quite critical parameter for the use in safety circuits, a simple ignition test was applied to it. The composite yarn described above was put above a candle flame and the four stainless steel filaments burned through almost instantly although a candle flame can be considered to simulate a relatively low temperature when it generates an immediate ignition. Similarly, a single stainless steel filament of 35 micron diameter burns through instantaneously. It ignites and burns for a few centimeters like a fuse on a firecracker before extinguishing. A stainless steel filament with a diameter of 43 microns doesn't burn through as rapidly but still within less than one second. On the contrary, a 140 micron filament did not burn through within a time span of 20 seconds.

The stainless steel filaments used in this invention offer also the advantage that they properly withstand laundering operations of the fabrics in which they are incorporated.

A similar type of yarn was used for carrying the electrical current in electrically heatable outerwear fabrics. The synthetic core was a 150-300 denier yarn and was wrapped with 4 stainless steel filaments of each 35 microns as described above. The yarn was knitted into the outerwear fabric.

Another type of yarn (600 denier core and 4 wraps of stainless steel of each 35 microns) was used as a suitable lead wire for medical electrode applications (electromassage). The yarn then carries the current flow between the electrode or sensor and the current source or—in a bio-feed back device—between the sensor and the measuring or test device.

It is also possible to replace one or more of the metal wrap filaments by a synthetic filament, in view of balancing the torsion in the overall conductive yarn structure. As an example, synthetic core yarns (70 denier polyester) were wrapped with one stainless steel filament of e.g. 35 microns diameter in S-direction and one 40 denier polyester filament in Z-direction. They were interwoven in apparel fabrics

usable to render them antistatic and in tent fabrics to shield them against electromagnetic waves.

I claim:

1. An electrical safety circuit or fuse which includes a composite longitudinally balanced electrically conductive yarn, said yarn comprising a textile fiber core yarn wrapped with minimum two and maximum four filaments of which one to four are metal filaments and the rest synthetic filaments and wherein each metal filament has an equivalent diameter of between 20 and 80 microns and wherein the wrap frequency of each filament is between 200 and 600 turns per meter, at least one of said metal filaments being wrapped in one direction, and at least one of the remaining filaments being wrapped in the opposite direction.

2. An electrical safety circuit or fuse according to claim 1, wherein the composite yarn has a flex life of at least 30,000 cycles.

3. An electrical safety circuit or fuse according to claim 1, wherein said core yarn of said composite yarn has a size of 250 to 2400 denier.

4. An electrical safety circuit or fuse according to claim 1, wherein said equivalent diameter of each said metal filament is between 30 and 55.

5. An electrical safety circuit or fuse according to claim 4, wherein the equivalent diameter of each said metal filament is between 30 to 40 micron.

6. An electrical safety circuit or fuse according to claim 1, wherein the metal is stainless steel.

7. An electrical safety circuit or fuse according to claim 1, wherein said composite yarn comprises a covering of a non-conductive material.

8. An electrical safety circuit or fuse according to claim 1, wherein said composite yarn comprises one metal filament wrapped in one direction and one metal filament wrapped in the opposite direction.

9. An electrical safety circuit or fuse according to claim 8, wherein the filament wrapped in the opposite direction is also a metal filament and has the same wrap frequency as the metal filament in the one direction.

10. An electrical safety circuit or fuse according to claim 1, wherein said composite yarn comprises two metal filaments wrapped in the one direction and two metal filaments wrapped in the opposite direction, the wrap frequency of all four filaments being the same.

11. An electrical safety circuit or fuse according to claim 1, wherein said yarn has a burn-through time of less than 20 seconds.

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**SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISIÓN DE NUEVAS CREACIONES**

2020

Bogotá, D.C., 31 de enero de 2008

Abogado(a)

LUZ HELENA ADARVE GÓMEZ

ASUNTO

Radicación 05-108155

Trámite 002

Evento 001

Actuación 430

Oficio -

Folios 013 1633

Patente de Invención

☒

Patente de Modelo de Utilidad

☐

Vía Nacional

☐

Vía PCT (fase nacional)

☒

Cap. I

☒

Cap. II

☐

No. Sol. Internacional:

PCT/US2004/011738

Fecha de Presentación Internacional:

abril 16 de 2004

Como resultado del examen de fondo, realizado con fundamento en el artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le comunica:

1. Documentos estudiados

1.1. Descripción: Folios: 04 a 32

1.2. Reivindicaciones: Folios: 33 a 42

1.3. Dibujos: Folios: 44 a 64

1.3. Prioridad: 25 de abril de 2003, US. No. 60/465,571

2. Objeto de la invención

- La Invención se titula **"HILAZA ELÉCTRICAMENTE CONDUCTIVA ELÁSTICA Y COMPUESTA, LOS MÉTODOS PARA FABRICAR LA MISMA, Y ARTÍCULOS QUE INCORPORAN LA MISMA"** (folio 1)

En la **reivindicación independiente 1** se define "una hilaza compuesta elástica eléctricamente conductora..."

En la **reivindicación independiente 23** se define "un método para formar una hilaza elástica compuesta eléctricamente conductiva..."

En la **reivindicación independiente 27** se define "un método para formar una hilaza compuesta elástica eléctricamente conductiva..."

En la **reivindicación independiente 31** se define "un método para formar una hilaza compuesta elástica eléctricamente conductiva..."

En la **reivindicación independiente 35** se define "un método para formar una hilaza compuesta elástica eléctricamente conductiva..."

En la **reivindicación independiente 39** se define "un tejido que comprende una pluralidad de hilazas compuestas elásticas eléctricamente conductivas..."

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- El problema planteado en esta solicitud consiste en desarrollar un hilo eléctricamente conductor con propiedades de estiramiento y recuperación.

La solicitud en estudio presenta un hilo compuesto elástico eléctricamente conductor que comprende un elemento elástico y un filamento de recubrimiento conductor, el cual rodea dicho elemento elástico. La solicitud también comprende el procedimiento de fabricación y un artículo textil que incluye tal hilo compuesto elástico.

- El objeto de la invención se catalogó como D02G 3/32, D02G 3/44, D02G 3/22 según la Clasificación Internacional de Patentes (IPC).

3. De la solicitud de Patente (según el caso)

3.1. Descripción (artículo 28 D. 486)

- El capítulo descriptivo no incluye las figuras o dibujos de la materia de invención; para efectos de digitalización, se sugiere enviar copia de los correspondientes folios.
- El capítulo descriptivo señala las siguientes expresiones:
 “hilazas multifilamento de **biocomponentes**” (Negrita personal)
 “hilazas de **biocomponente**”
 “**biocomponentes** sintéticos”
 Rectificar la traducción del término en negrita para la inequívoca comprensión del texto en estudio.
- La memoria descriptiva señala:
 “el alambre metálico puede esperar hecho de aleaciones de metal...”
 “el filamento de rector y miento conductor...”
 Rectificar la traducción de las citadas frases para comprender la idea que el solicitante quiere transmitir.
- La descripción establece:
 “polímero o **copoliámide**”
 “el **polietileno tereftalato, tereftalato, politetraetileno tereftalato**”
 Incluir la traducción de los compuestos en negrita de acuerdo con lo divulgado en la solicitud original.

En conclusión, el capítulo descriptivo no cumpliría con el requisito de claridad de acuerdo con el artículo 28 de la Decisión 486.

3.2. Reivindicaciones (artículo 30 D 486)

- La reivindicación independiente 1 define una hilaza compuesta elástica eléctricamente conductora que comprende un elemento elástico y un filamento de recubrimiento conductor rodeando a dicho elemento elástico, dicho filamento conductor presenta un largo mayor que el largo extendido del elemento elástico, “de tal manera, **que sustancialmente todo el estrés de elongación puesto en la hilaza compuesta luego lleva el miembro elástico**” (Negrita Personal).

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1. The first part of the document is a title page. It contains the title "THE HISTORY OF THE UNITED STATES OF AMERICA" and the author "BY JAMES MADISON".

THE UNIVERSITY OF CHICAGO

1. The first step in the process of creating a new product is to identify a market need. This involves conducting market research to understand what consumers want and what problems they are facing.

2. Once a market need has been identified, the next step is to develop a concept for a product that addresses this need. This involves brainstorming ideas and creating a prototype.

3. The third step is to conduct a feasibility study to determine if the product is viable. This involves assessing the market size, competition, and potential profitability.

4. If the feasibility study is positive, the next step is to develop a business plan. This involves outlining the company's goals, strategies, and financial projections.

5. The final step is to launch the product and monitor its performance. This involves marketing the product, distributing it, and gathering feedback from customers.

El párrafo resaltado en negrita señala el efecto de estirar un hilo compuesto elástico eléctricamente conductivo, cuyo filamento tiene un largo mayor que el largo extendido del elemento elástico. Es importante mencionar que las reivindicaciones deben caracterizar un producto por la forma o constitución del mismo, las partes que lo componen y todo lo que permita establecer de cómo se llega a dicho efecto. No se aceptan reivindicaciones que caractericen efectos, por lo tanto dicho párrafo debe eliminarse de la reivindicación en cuestión.

- Las reivindicaciones independientes 23, 27, 31 y 35 señalan un “método para formar una hilaza elástica compuesta eléctricamente conductiva **que consta de: un miembro elástico con un largo relajado; y por lo menos un filamento de recubrimiento conductivo rodeando al miembro elástico**, el método comprende los pasos de...” (Negrita personal)

El párrafo en negrita define las características estructurales de la hilaza elástica compuesta y no del método de producción. Las reivindicaciones deben caracterizar un método por la serie de etapas que buscan un fin. Por lo tanto el párrafo en negrita debe eliminarse de las citadas reivindicaciones.

- La reivindicación independiente 39 define un tejido que comprende una pluralidad de hilazas compuestas elásticas eléctricamente conductivas, “**donde cada hilaza comprende: un miembro elástico con una unidad del largo L relajado y un largo extendido de (NxL), donde N está en el rango de 1.0 a 8.0; y por lo menos un filamento de recubrimiento conductivo...**” (Negrita Personal).

El párrafo en negrita señala las características de la hilaza compuesta y no las del tejido. Por lo cual el párrafo en negrita debe eliminarse de la reivindicación en cuestión.

- La reivindicación 16 señala una hilaza compuesta que adicionalmente comprende un miembro de soporte de estrés rodeando al miembro **lasco** (Negrita Personal)

Rectificar la traducción del término resaltado en negrita para la inequívoca comprensión del texto en estudio.

- La reivindicación 40 hace referencia a un tejido donde una o más hilazas compuestas comprenden además:
“Una hilaza de polímero sintético inelástico rodeando al miembro elástico, y donde la hilaza de polímero sintético tiene un largo total menor que el largo del filamento de recubrimiento conductivo, de tal manera que una porción del estrés de elongación impuesto en la hilaza compuesta lo soporta la hilaza de polímero sintético inelástico” (Negrita Personal).

El párrafo en negrita señala las características de la hilaza compuesta y no las del tejido. Por lo cual el párrafo en negrita debe eliminarse de la reivindicación en cuestión.

En conclusión, el capítulo reivindicatorio no cumpliría con el requisito de claridad de acuerdo con el artículo 30 de la Decisión 486.

4. Determinación del Estado de la Técnica

Considerando que la fecha de presentación de la primera solicitud de patente de la cual se reivindica prioridad es: 25 de abril de 2003, se buscaron documentos del estado de la técnica relacionados, con fecha de publicación anterior a esta.

1. The first part of the report deals with the general situation of the country. It is a very interesting and informative study of the country's development and progress. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is easy to read. It is a valuable contribution to the study of the country's development.

2. The second part of the report deals with the economic situation of the country. It is a very interesting and informative study of the country's economic development and progress. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is easy to read. It is a valuable contribution to the study of the country's economic development.

3. The third part of the report deals with the social situation of the country. It is a very interesting and informative study of the country's social development and progress. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is easy to read. It is a valuable contribution to the study of the country's social development.

4. The fourth part of the report deals with the political situation of the country. It is a very interesting and informative study of the country's political development and progress. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is easy to read. It is a valuable contribution to the study of the country's political development.

5. The fifth part of the report deals with the cultural situation of the country. It is a very interesting and informative study of the country's cultural development and progress. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is easy to read. It is a valuable contribution to the study of the country's cultural development.

6. The sixth part of the report deals with the environmental situation of the country. It is a very interesting and informative study of the country's environmental development and progress. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is easy to read. It is a valuable contribution to the study of the country's environmental development.

7. The seventh part of the report deals with the international situation of the country. It is a very interesting and informative study of the country's international development and progress. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is easy to read. It is a valuable contribution to the study of the country's international development.

8. The eighth part of the report deals with the future of the country. It is a very interesting and informative study of the country's future development and progress. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is easy to read. It is a valuable contribution to the study of the country's future development.

9. The ninth part of the report deals with the conclusion of the study. It is a very interesting and informative study of the country's development and progress. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is easy to read. It is a valuable contribution to the study of the country's development.

10. The tenth part of the report deals with the bibliography of the study. It is a very interesting and informative study of the country's development and progress. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is easy to read. It is a valuable contribution to the study of the country's development.

11. The eleventh part of the report deals with the index of the study. It is a very interesting and informative study of the country's development and progress. The author has done a great deal of research and has gathered a wealth of material. The report is well written and is easy to read. It is a valuable contribution to the study of the country's development.

Nº	Documento	Título	Fecha de publicación
D1	US 4,813,219	"METHOD AND APPARATUS FOR MAKING CONDUCTIVE YARN"	21 de marzo de 1989
D2	US 5,927,060	"ELECTRICALLY CONDUCTIVE YARN"	27 de Julio de 1999

5. Análisis de patentabilidad (según requisito) (artículo 14 D486)

5.1 Novedad (artículo 16 D486)

Reivindicación 1

Respecto a la solicitud en estudio

La reivindicación independiente 1 define un hilo compuesto elástico eléctricamente conductor que comprende:

por lo menos un miembro elástico con una unidad de largo relajado L y un largo extendido de (N x L), donde N está en el rango de 1.0 a 8.0; y

por lo menos un filamento de recubrimiento conductor rodeando al miembro elástico, el filamento de recubrimiento conductor con un largo que es mayor que el largo extendido del miembro elástico.

Respecto al estado de la técnica

El documento US 4,813,219 (llamado D1 de aquí en adelante), divulga un hilo compuesto elástico eléctricamente conductor que comprende al menos un elemento elástico con una unidad de largo relajado L y un largo extendido de (N x L), donde N está en el rango de 1.0 a 1.2; y al menos un filamento de recubrimiento conductor con un largo mayor al largo extendido del miembro elástico que rodea a dicho miembro elástico (folio 261, columna 2, líneas 62-65; folio 262, columna 3, líneas 9-13; folio 262, columna 3, líneas 59-63; folio 260, figura 6; folio 262, columna 4, líneas 20-30; folio 262, columna 4 línea 67 a folio 263, columna 5, línea 2)

De acuerdo con lo anteriormente expuesto, el hilo compuesto señalado en la reivindicación 1, ya era conocido en D1, por lo tanto no puede considerarse nuevo. Es importante mencionar que al encontrarse afectada la novedad de dicha reivindicación independiente, la cual encierra el objeto de patentabilidad; sus correspondientes reivindicaciones dependientes también carecen de novedad.

En conclusión, la materia de invención de la reivindicación 1 propuesta con la solicitud en estudio se encuentra afectada en su novedad de acuerdo con el artículo 16 de la Decisión 486.

Reivindicación 39

Respecto a la solicitud en estudio

- La reivindicación independiente 39 hace referencia a un tejido que comprende una pluralidad de hilos compuestos elásticos eléctricamente conductivos.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the integrity of the financial system and for the ability to detect and prevent fraud.

2. The second part of the document outlines the specific procedures for recording transactions. It details the steps involved in the accounting cycle, from identifying the transaction to posting it to the appropriate ledger account.

3. The third part of the document discusses the role of the auditor in verifying the accuracy of the records. It explains how the auditor uses various techniques, such as sampling and vouching, to ensure that the financial statements are true and fair.

4. The fourth part of the document discusses the importance of internal controls in preventing errors and fraud. It describes the various types of controls, such as segregation of duties and authorization requirements, and how they are implemented in the organization.

5. The fifth part of the document discusses the role of the management in ensuring the effectiveness of the internal control system. It explains how management should monitor the system and make necessary adjustments to ensure that it remains effective over time.

6. The sixth part of the document discusses the importance of communication in the financial reporting process. It explains how management should communicate the results of the financial reporting process to the various stakeholders, including the board of directors and the general public.

7. The seventh part of the document discusses the importance of transparency in the financial reporting process. It explains how management should provide clear and concise information about the financial performance of the organization and the risks it faces.

8. The eighth part of the document discusses the importance of accountability in the financial reporting process. It explains how management should be held responsible for the accuracy and integrity of the financial statements and for the effectiveness of the internal control system.

9. The ninth part of the document discusses the importance of the financial reporting process in the overall business strategy. It explains how the financial reporting process can provide valuable information that can be used to make strategic decisions and to improve the performance of the organization.

10. The tenth part of the document discusses the importance of the financial reporting process in the overall corporate governance framework. It explains how the financial reporting process can help to ensure that the organization is managed in a responsible and ethical manner and that the interests of all stakeholders are protected.

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Respecto al estado de la técnica

- El documento US 5,927,060 (llamado D2 de aquí en adelante), divulga un telas constituidas por hilos compuestos elásticos eléctricamente conductivos (folio 264, resumen; folio 265, columna 1, líneas 4-6; folio 266, columna 3, líneas 1-12, líneas 31-35, folio 266, columna 4, reivindicación 1)

Así las cosas el tejido señalado en la reivindicación 39, ya era conocidos en D2, por lo tanto no puede considerarse nuevo. Es importante mencionar que al encontrarse afectada la novedad de la citada reivindicación independiente, la cual encierra el objeto de patentabilidad; sus correspondientes reivindicaciones dependientes también carecen de novedad.

En conclusión, la materia de invención de la reivindicación 39 propuesta con la solicitud en estudio se encuentra afectada en su novedad de acuerdo con el artículo 16 de la Decisión 486.

6. Conclusión:

Los requisitos de patentabilidad de la presente solicitud se encuentran afectados así:

Nº	Documento	Reivindicaciones afectadas	Requisito que afecta
D1	US 4,813,219	1-22	Novedad
D2	US 5,927,060	39-40	Novedad

En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de 60 días contados a partir de la fecha de notificación de la presente comunicación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única N° 10 de 2001.

ALIX CARMENZA CÉSPEDES DE VERGEL
Jefe de División de Nuevas Creaciones

El anterior requerimiento fue notificado por fijación en lista, de fecha

CONCEPTO TÉCNICO No. 276	EXAMINADOR TÉCNICO Código No. 202076
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