United States Patent [19]

Brown et al.

[11] **3,838,983**

[45] **Oct. 1, 1974**

[54] **VELVET FABRIC**

[75] Inventors: **Perry H. Brown**, Norwell; **Maurice H. Tremblay**, Westboro, both of Mass.

[73] Assignee: **Brunswick Corporation**, Skokie, Ill.

[22] Filed: **Nov. 21, 1973**

[21] Appl. No.: **418,116**

Related U.S. Application Data

[63] Continuation of Ser. No. 212,468, Dec. 27, 1971, abandoned, which is a continuation of Ser. No. 861,024, Sept. 25, 1969, abandoned.

[52] **U.S. Cl.** ..... **29/191.6**, 28/72 P, 29/419, 139/425, 264/174

[51] **Int. Cl.** **D03d 27/02**

[58] **Field of Search** 29/191.6

[56] **References Cited**

UNITED STATES PATENTS

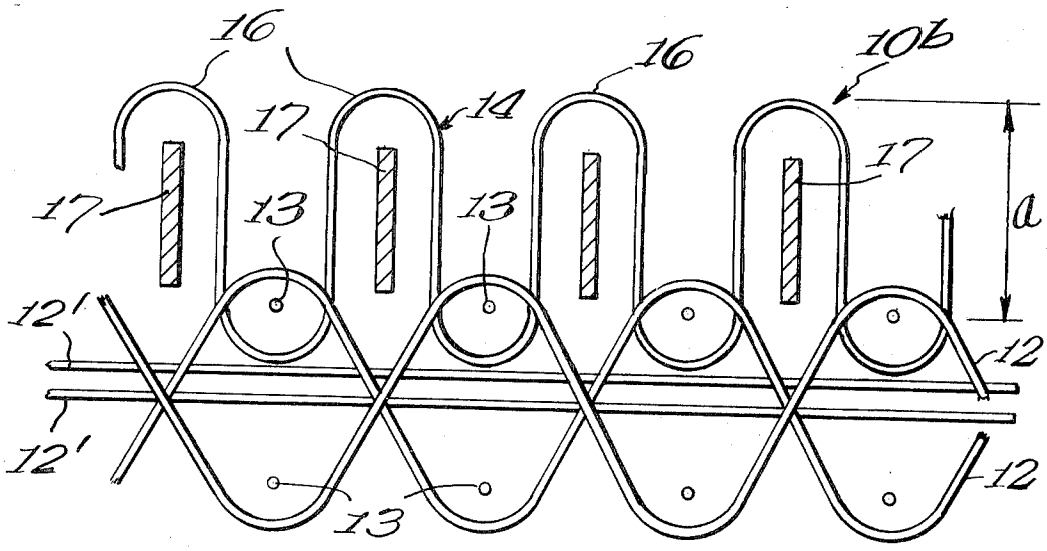
2,695,441	11/1954	Runton	139/403 X
3,255,047	6/1966	Escoffery	136/89
3,277,564	10/1966	Webber et al.	139/425
3,288,175	11/1966	Valko	139/425
3,388,448	6/1968	Lovett	29/419
3,394,213	7/1968	Roberts et al.	264/174
3,461,513	8/1969	Guard et al.	28/72 P X

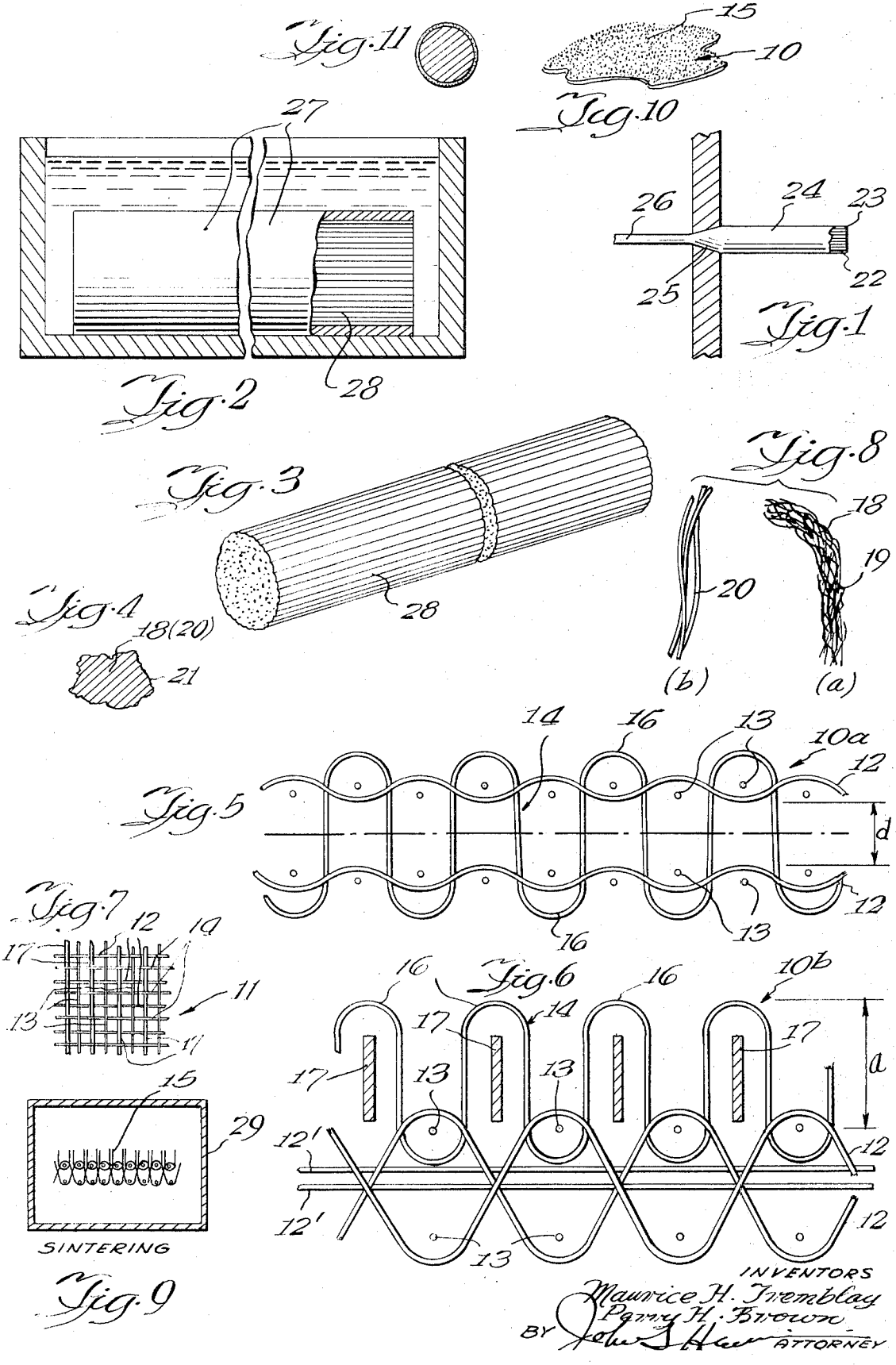
Primary Examiner—A. B. Curtis

[57] **ABSTRACT**

A metallic velvet material comprising a woven textile pile fabric wherein at least a portion of the woven base fabric and/or the velvet surface-forming pile yarns is metallic. The metallic yarn may comprise a blended yarn formed of staple metal fibers and conventional nonmetallic textile fibers, or may be formed of continuous metal filament material. The metal fibers, or filaments, are preferably formed with rough unmachined, unburnished, fracture-free outer surfaces for improved retention in the velvet pile fabric.

12 Claims, 11 Drawing Figures




Fig. 11
15
10
Fig. 10
27
26
24
23
22
25
Fig. 1
28
Fig. 2
Fig. 3
28
Fig. 8
18
19
20
(b)
(a)
Fig. 4
18(20)
21
14
16
13
10a
12
d
Fig. 5
16
13
12
Fig. 7
12
19
17
11
13
17
15
29
SINTERING
Fig. 9
16
16
10b
Fig. 6
17
14
17
17
17
13
13
a
12'
12
12'
12
13
INVENTORS
Maurice H. Tremblay
Perry H. Brown
BY
ATTORNEY

VELVET FABRIC

This application is a continuation application of our co-pending parent application Ser. No. 212,468 filed on Dec. 27, 1971, which was a continuation application of our co-pending parent application Ser. No. 861,024 filed Sept. 25, 1969, both now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to textile structures and in particular to plush or velvet structures having at least a portion of the yarns therein formed of metallic material.

2. Description of the Prior Art

In the conventional velvet textile fabrics, a pile yarn is introduced into the woven warp and filling structure. The pile yarn is caused to extend away from the face of the warp and filling weave and is cut at its outer ends to define a plush or velvet pile surface. Conventionally, such velvet is formed of organic and/or synthetic materials, such as wool, cotton, plastics, etc.

SUMMARY OF THE INVENTION

The present invention comprehends the provision of such a plush or velvet pile fabric wherein at least a portion of the woven fabric and/or pile yarn is metallic. The invention comprehends the provision of the metallic portion of the textile in the form of small diameter metal filaments or fibers which may be blended with conventional textile materials or comprise the entire yarn. The metal filaments or fibers may have a diameter of down to 1 micron or smaller to provide desirable flexibility and uniformity of blend whereby the pile fabric may be formed by substantially conventional textile forming apparatus. The metal fibers may comprise staple length fibers or may comprise continuous filaments as desired. In the preferred form, the fibers or filaments may have a rough unmachined, unburnished, fracture-free outer surface for improved retention of the fibers in the pile fabric. The fibers may be metallic throughout, or may comprise nonmetallic fibers having an electrically conductive metallic coating.

The metal fibers and filaments may have further improved retention in the fabric by means of bonding thereof. Preferably, the bonding provides static discharge continuity. The bonding may be effected by metallurgical bonding means such as sintering, brazing, or welding operations and sacrificial materials may be employed for maintaining a desired association of the metal fibers and filaments. Alternatively, when adhesive bonding means are used, they may comprise electrically conductive adhesives. The particular metal material used may be preselected to provide desired color effects, wear, and abrasion, and other physical and chemical characteristics.

BRIEF DESCRIPTION OF THE DRAWING

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing wherein:

FIG. **1** is a schematic view illustrating a drawing step in the formation of metallic filaments for use in a velvet textile embodying the invention;

FIG. **2** is a schematic view illustrating a further step in the forming of the metallic filaments wherein the matrix material is removed;

FIG. **3** is a broken isometric view of a tow of filaments so formed;

FIG. **4** is an enlarged transverse cross-section of a filament illustrating the rough unmachined outer surface thereof;

FIG. **5** is a transverse section of a velvet fabric embodying the invention;

FIG. **6** is a transverse section of a modified form of velvet fabric embodying the invention;

FIG. **7** is a fragmentary face view of the fabric of FIG. **6**;

FIG. **8** is a fragmentary enlarged elevation of yarns such as used in the velvet fabrics of FIGS. **5** and **6**;

FIG. **9** is a schematic elevation of an apparatus for providing sintered bonds between the metallic portions of the fabric;

FIG. **10** is a fragmentary perspective view of a piece of velvet fabric embodying the invention; and

FIG. **11** is a transverse cross-section of a coated fiber for use in the velvet fabric.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the exemplary embodiment of the invention as disclosed in the drawing, a pile cloth generally designated **10** is shown to comprise a conventional plush or velvet textile fabric as may be formed on conventional textile forming apparatus. The velvet material **10,** however, is provided with a metallic portion for imparting desirable characteristics. In the preferred form, the metallic portion of the velvet comprises metallic filaments or fibers distributed in the yarns of the woven fabric and/or pile. As illustrated in FIG. **7,** in such velvet pile fabrics, the woven fabric generally designated **11** is formed of a plurality of vertical warp yarns **12** and horizontal filling, or weft, yarns **13.** Conventionally, the warp yarns **12** are identified as ends and the filling yarns **13** are identified as picks. In forming the velvet material **10,** a pile yarn **14** is introduced which extends outwardly from the surface of the fabric to define the plush or velvet surface **15,** as shown in FIG. **10.** The pile yarn may comprise an extra warp end or an extra filling pick as desired. Alternatively, illustratively the base fabric **11** may comprise a warp knitted fabric.

Referring to FIGS. **5** and **6,** two different methods of forming such a velvet fabric are illustrated. Thus, in the velvet fabric **10*a*** shown in FIG. **5,** the warp ends **12** are interlaced in spaced relationship to two sets of filling picks, or weft yarns, **13.** The pile yarn **14** is interlaced with the spaced filling picks **13** to define a plurality of outwardly disposed turned portions **16.** The exposed ends **16** may be cut as by shearing or other suitable conventional cutting methods to define the desired plush or velvet surface **15.**

In FIG. **6,** another form of plush or velvet material **10*b*** is shown to comprise a fabric wherein the warp ends **12** are interlaced about the filling picks **13** with additional warp ends **12'** extending generally rectilinearly through the weave. The pile yarn **14** is interlaced only with the upper set of filling picks **13** and may be formed around suitable cutting knives **17** which, in the final step of forming the material, are moved outwardly to sever the turned portions **16.** Thus, velvet material **10*a*** and **10*b*** comprises conventional forms of plush or velvet pile fabric material adapted to be manufactured on conventional textile machinery with minimum adjustment.

As indicated briefly above, the invention comprehends blending in of metallic, or metallic coated, fibers or filaments. Thus, as shown in FIG. 8*a*, the yarns may comprise staple length metal fibers **18** blended with conventional staple length textile fibers **19** which may comprise cotton, wool, plastics, etc.

If desired, the yarns may be formed of continuous metal filaments **20** as illustrated in FIG. 8*b*. In the preferred embodiment, the fibers **18** and filaments **20** are formed to have a rough unmachined, unburnished, fracture-free outer surface **21**, as shown in FIG. **4**, to provide an improved retention of the yarns in the velvet material **10**. Referring to FIGS. **1–3**, one highly desirable method of forming such yarns is by providing a plurality of metal rods **22** in a suitable matrix **23** to define a composite **24** which is suitably constricted. As shown in FIG. **1**, the composite may be constricted by drawing through a suitable die **25** to produce a reduced composite **26**. The composite may be successively reduced as many times as desired until the composite is reduced to a small size wherein the rods **22** are of filamentary diameter. Thus, as shown in FIG. **2**, the final composite **27** may be one having filaments **28** therein of an extremely small size, such as down to 50 microns or less. It has been found that such a process produces fine filaments down to 1 micron, or less, in continuous lengths, such small filaments providing improved flexibility and usefulness in the velvet material **10** as such fine wires permit the use of substantially conventional textile apparatus in forming fabrics utilizing such filaments and fibers formed therefrom. An excellent example of a method of forming such filaments and fibers is that disclosed in Roberts et al. U.S. Pat. No. 3,394,213 issued July 23, 1968 for a Method of Forming Filaments, and owned by the assignee hereof, to which reference may be had for a detailed disclosure of such a method of forming the desirable rough, unmachined surfaced fibers.

As indicated above, the present invention comprehends providing the velvet material **10** with at least a portion of the yarns thereof formed of such metallic filaments or fibers. Illustratively, an excellent velvet material **10** may be formed of such filaments or fibers, where the warp ends **12** and filling picks **13** of the woven fabrics **11** are formed of stainless steel, said fibers having a diameter of approximately 25 microns down to 1 micron or less. The pile yarns may incorporate such metallic filaments or fibers having a diameter similar to the diameter of the woven fabric yarns or smaller. Where the fibers are provided as staple length metal fibers, they may be blended with conventional textile fibers, such as cotton, wool, plastics, etc. The blend may be one wherein the metal fibers are present in the ratio of from less than 1 percent to 100 percent by weight.

In forming such a spun blended yarn, the yarn may be provided with twist as desired. A manufacturer's twist may be utilized to provide a highly satisfactory blended yarn for this purpose. The rough outer surface of the fibers provides an improved interlocked association of the metal fibers with the organic fibers. Alternatively, the yarn may comprise a sliver yarn.

To provide a further improved retention of the metal fibers or filaments in the velvet material **10**, the metal filaments or fibers may be metallurgically bonded such as by sintering, brazing, welding, etc., or adhesively bonded, as desired. More specifically, an improved strong woven fabric **11** may be formed by sintering the woven warp and filling yarns to form an effectively bonded joint at the points of contact. To assure a maintained distributed arrangement of the metal filaments or fibers, a sacrificial material may be blended therewith which is effectively removed during the sintering operation while maintaining the distributed arrangement of the metal filaments or fibers. Illustratively, such sacrificial material may comprise plastic material adapted to be burned out during the sintering operation. As will be obvious to those skilled in the art, other methods of removing the sacrificial material, such as chemical treatment, etc., may be employed depending upon the type of sacrificial material utilized.

The pile yarn **14** may similarly be bonded to the woven fabric yarns. The pile yarn may comprise a blend of metal filaments or fibers with suitable sacrificial nonmetallic fibers, as desired.

As will be obvious to those skilled in the art, other methods of bonding, such as brazing or nonmetallurgical securing, such as by adhesive and cements, may be utilized as desired. The adhesive material may comprise electrically conductive material as desired.

The sintering operation may be carried out in a conventional sintering apparatus, such as apparatus **29** shown in FIG. **9**. As shown therein, it is preferred that the cutting of the pile yarns to define the plush or velvet surface **15** be performed prior to the sintering operation.

As indicated above, the metal filaments may be made extremely small in diameter to provide desired flexibility and to provide blending characteristics in the yarn. Illustratively, the warp ends and filling picks may be formed from filaments **28** provided in tows, such as 8 micron 300 end, 12 micron 90 end, 12 micron 300 end, 25 micron 90 end, 4 micron 1,000 end, 2 micron 1,000 end, 4 micron 5,000 end, 2 micron 5,000 end tows, etc. Such tows preferably are provided with a suitable twist for facilitated weaving. The pile material, illustratively, may be formed of tows such as 2 micron 300, 1,000, 5,000, etc., end, 4 micron 300, 1,000, 5,000, etc. end, 8 micron 300, etc. end tows, which similarly may be provided with suitable twists, such as 2 to 5 turns per inch twists as desired.

As shown in FIG. **5**, and as indicated briefly above, the filling picks **13** may be provided in spaced planar arrangements which are spaced apart a preselected distance. The spacing *d* as indicated may vary from approximately 0.020 inch to approximately ½ inch. The extension of the pile fibers from the woven fabric base may, illustratively, be approximately 0.010 inch to 8 inches as desired.

The metal material of the different yarns may be varied as desired. Illustratively, the pile yarn for certain decorative purposes may be formed of a precious metal, such as gold, within the scope of the invention. The yarns may be formed of aluminum which may be selectively color anodized to provide different aesthetic effects as desired. Thus, different selections of the metallic materials may be made as desired by the user not only for mechanical properties considerations, but also for aesthetic considerations, etc.

The invention comprehends the provision of a velvet material **10** as a fabric wherein each of the pile yarn **14** and the fabric base **11** are 100 percent metallic. Alternatively, the pile yarn **14** may comprise a blended yarn having only a portion thereof metallic, for use with a

fabric base formed of 100 percent metallic yarns. Further alternatively, the invention comprehends the provision of such a velvet material wherein each of the fabric base and pile yarns are blended yarns. Still further alternatively, the invention comprehends the provision of such a velvet material wherein the pile yarn 14 is 100 percent metallic and the fabric base 11 is a blended yarn base. With reference to the fabric base 11, the warp ends and the filling picks may selectively be 100 percent metallic or blended yarns as desired. The improved interlocking of the fibers to provide an extended life velvet material is obtained as a result of the rough unmachined, unburnished fracture-free outer surfaces of the metal fibers utilized, whether the fibers comprise 100 percent of the yarn or are blended with the other nonmetallic fibers as discussed above.

For facilitated forming of the velvet where the smaller diameter filaments or fibers are utilized, such as the fibers 4 microns and smaller, it may be desirable to provide the yarn originally as an unleached composite wherein the filaments or fibers are retained in a surrounding matrix body. The composite may be woven into the velvet as a yarn and upon completion of the weaving, the matrix material may be removed as by leaching to free the individual small diameter filaments or fibers in the form of a tow. Obviously, such composite formation may be utilized in connection with the yarns of the fabric base as well as with the yarns of the pile portions of the velvet.

One of the improved features of the velvet fabric resulting from the use of the metal filaments or fibers therein is the ability thereof to dissipate static electricity and the like. To effect such dissipation, it is not necessary that the fibers be in metal-to-metal contact, as long as they are sufficiently closely spaced to permit the static electricity to discharge successively through the spaced ones of the fibers or filaments. Obviously, where the metal fibers or filaments are disposed in metal-to-metal contact, the static electricity may similarly be deposited through the resultant electrically conducted path.

Thus, as indicated above, the invention comprehends utilizing fibers and filaments which may comprise insulating core elements provided with an outer surface portion of an electrically conducting material such as a metal coating. Here, again, the static electricity discharge may be provided selectively by a discontinuous static electric discharge path provided by a distribution of the coated spaced fibers in sufficiently spaced proximity as well as by the provision of the coated fibers in metal-to-metal contact.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

We claim:

1. A velvet fabric with antistatic properties comprising:
   - a non-metallic base fabric comprising interlaced warp yarns and filling yarns;
   - pile yarns interwoven with said base fabric forming a pile surface projecting from one surface of said base fabric, each of said pile yarns having a plurality of textile metal filaments therein; and
   - means for securing said pile yarns to said base, said means including the rough, unmachined, unburnished fracture-free outer surface of said metal filaments.

2. The velvet fabric of claim 1 wherein said pile yarns include continuous filaments.

3. The velvet fabric of claim 1 wherein said pile yarns include staple metal fibers.

4. The velvet fabric of claim 1 wherein the metal filaments of said yarns each have a diameter of less than approximately 50 microns.

5. The velvet fabric of claim 1 wherein said pile yarn filaments having been comprised of wires made of metal filaments previously surrounded by a sacrifical metal matrix that has been removed.

6. The velvet fabric of claim 1 including metal yarns in the base fabric.

7. The velvet fabric of claim 6 wherein said yarns comprising said base fabric and said pile comprise different metals.

8. The velvet fabric of claim 6 wherein the securing means provides an electrically conductive junction between the pile yarns to the base fabric.

9. The velvet fabric of claim 6 wherein said metal pile yarns are metallurgically bonded to said metal yarn of said base fabric.

10. The velvet fabric of claim 9 wherein said metallurgical bond is defined as a sinter bond.

11. The velvet fabric of claim 1 wherein base fabric yarns are metallurgically bonded together.

12. A velvet fabric with antistatic properties comprising:
   - a non-metallic base fabric comprising a knit fabric structure;
   - pile yarns interwoven with said base fabric forming a pile surface projecting from one surface of said base fabric, each of said yarns having a plurality of textile metal filaments therein; and
   - means for securing said pile yarns to said base, said means including the rough, unmachined, unburnished fracture-free outer surface of said metal filaments.

* * * * *