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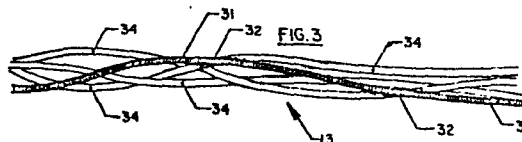
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54 Supported antistatic yarn, products incorporating same, and method for its production.

57 Disclosed is an antistatic yarn (13) comprising at least one conductive strand (2) composed of synthetic plastics material, said conductive strand (2) having finely divided electrically conductive material suffused therein and at least one support strand (6) composed of synthetic plastics material, characterised in that said conductive strand (2) is intermittently solvent bonded (32) along its length to said at least one support strand (6). Also disclosed is a method of making an antistatic yarn (13) which comprises suffusing a finely divided electrically conductive strand (2) with at least one support strand (6) composed of synthetic plastics material to form a coherent yarn (13), characterised by bringing the at least one support strand (6) into generally side-by-side relationship with said conductive strand (2) and intermittently solvent bonding (32) said conductive strand (2) along its length to said at least one support strand (6).



DESCRIPTIONSUPPORTED ANTISTATIC YARN, PRODUCTS INCORPORATING
SAME, AND METHOD FOR IT'S PRODUCTION.

5 The present invention relates to supported,
antistatic yarns, a process for making them and to
products incorporating such yarns.

10 Antistatic yarns have been in use for some time
and are incorporated in fabrics and carpets to reduce
the build up of electrostatic charges thereon. Such
antistatic yarns comprise one or more conductive
strands together with one or more support strands.
The support strands have been utilized to improve the
performance with respect to beaming, knitting and
weaving of such conductive strands. Conductive
15 strands which are particularly useful in forming
antistatic yarns are described in U.S. Patents
4,225,487 and 3,823,035 which disclose a method of
making a conductive material by a process of suffusing
conductive carbon black particles into a polymeric
substrate.

20 Such antistatic yarns have previously been formed
by twisting conductive strands with strengthening
support strands to form a yarn. Such twisted
antistatic ropes and yarns are described in U.S.
Patents 3,206,923 and 3,291,897.

25 Whilst such twisted antistatic yarns provide
improved performance over conductive strands in such
operations as warping, weaving and knitting, it is
frequently desirable to use twistless yarns in the
production of antistatic products. It is one object
30 of the present invention to provide twistless or
substantially twistless antistatic yarns which
nevertheless provide the desired improved performance
in such process operations.

The production of supported conductive strands in the form of antistatic yarn involves an additional process step which adds to the cost of producing the final products produced by such downstream process operations. It is a further object of the present invention to provide an improved method in which the formation of a supported conductive strand in the form of an antistatic yarn is concurrently effected with the production of the conductive strand itself.

The antistatic yarns of the present invention are produced using a solvent bonding technique. A number of solvent bonding techniques have been proposed in the production of coherent products from staple fibre materials.

Thus, a process of solvent bonding has been proposed to bond staple fibres together to form a non-woven fabric. U.S. Patent No.3,657,591 discloses such a process of making a non-woven fabric from a blend of staple fibres. In this patent a non-woven fabric containing a blend of staple fibres is contacted by an acid which softens only a specific type of fibre in the blend after which the blend is compressed to bond the fibres together.

The production of a twistless staple fibre yarn from a staple fibre material and a continuous filament yarn by a solvent bonding technique is described in U.S. Patent No.3,945,186. This patent proposed a solution to the problem arising in addition of a continuous filament yarn to staple fibre which rendered it impossible to draft the mixed fibre ribbon thus produced. The selection proposed was to use a continuous filament yarn which could be brought into a plastic state by the action of an applied solvent prior to drafting so that the drafting of the mixed fibre yarn amounted to drafting of the staple fibre

component of the mixed fibre yarn, the filamentary element also providing the means of bonding the staple fibre component.

5 U.S. 4,107,914 discloses a process of solvent bonding a sliver or roving of staple fibre into a twistless or substantially twistless yarn. The process requires a roving of staple fibres to be wetted with a mixture of a latent solvent and a more volatile liquid. The roving is then drafted, fibre
10 twisted and brought into contact with a heated surface which first evaporates the volatile liquid and then activates the latent solvent which dissolves only a surface layer of staple fibres forming a substantial proportion of the sliver or roving and so bonds the
15 staple fibres together, and thereafter evaporates the latent solvent from the yarn.

The solvent bonding methods in the prior art, as exemplified by the above mentioned U.S. Patents have been principally concerned with effecting bonding of
20 staple fibres to form a strand which is then used as a component of a yarn, and in doing so have taken advantage of the well established wet drafting methods of producing such strands from slivers or rovings of staple fibres. The conductive strands which concern
25 the present invention are already continuous and coherent as also are the support strands used in conjunction with such conductive strands to form antistatic yarns. The conventional methods of twisting and plaiting were therefor obvious expedients
30 to use in the production of antistatic yarns and ropes from such already cohesive structures, especially as such conductive and support strands are composed of continuous filaments. The application of solvent bonding techniques previously known for staple fibre
35 to the production of antistatic yarns was not an

obvious expedient since such method would be expected on the one hand to provide yarns, especially when composed of continuous filaments having too little flexibility or if flexibility were sufficient to be
5 insufficiently cohesive to withstand the further processes such as warping, weaving and knitting.

It has now been surprisingly found that when conductive strands are intermittently solvent bonded along their length to support strands, especially
10 continuous filament support strands, the resulting antistatic yarn exhibits all the advantageous properties of the hitherto known twisted yarns in subsequent processing steps such as warping, weaving and knitting and can even possess superior properties
15 to such twisted yarns.

According to the present invention there is provided an antistatic yarn comprising at least one conductive strand composed of synthetic plastics material, said conductive strand having finely divided
20 electrically conductive material suffused thereinto, and at least one support strand composed of synthetic plastics material, characterised in that said conductive strand is intermittently solvent bonded along its length to said at least one support strand.

25 Preferably, the yarn comprises a plurality of support strands, said conductive strand being intermittently bonded along its length to more than one of said support strands.

The synthetic plastics material is preferably a
30 polyamide, most preferably a polycaprolactane. The preferred finely divided electrically conductive material is carbon black, although any other equivalent material could be used. Preferably both the conductive strands and support strands are
35 continuous filaments, the support strand most preferably being an interlaced yarn.

The antistatic yarn of the present invention finds use in the production of composite yarns composed of the antistatic yarn of the present invention interlaced into a carpet yarn. The present invention
5 also encompasses carpets comprising the antistatic yarn of the invention.

The present invention also provides a method of producing an antistatic yarn which comprises suffusing a finely divided electrically conductive material into
10 a strand composed of a synthetic plastics material to form a conductive strand and combining said conductive strand with at least one support strand composed of synthetic plastics material to form a coherent yarn, characterised by bringing the at least one support
15 strand into generally side by side relationship with said conductive strand and intermittently solvent bonding said conductive strand along its length to said at least one support strand.

The Applicants have found that by bringing a
20 moving support strand or strands into generally side-by-side relationship with a conductive or potentially conductive strand moving at the same speed, said conductive strand or said support strand or strands having provided on the surface thereof a
25 solvent for the synthetic plastics material of both the conductive and support strands, surprisingly the conductive or potentially conductive strand will intermittently touch the support strand or strands at points along their length and form intermittent
30 solvent bonded points or small areas and that subsequent evaporation of the solvent results in a coherent yarn without utilizing means to press the strands together. The strands must, of course, be brought into generally side-by-side relationship before
35 any substantial amount of the provided solvent has

evaporated so that the solvent action on the surfaces at the points of contact can cause solvent bonding to be effected.

5 At the point where the conductive or potentially conductive strand and the support strands first come into side-by-side relationship they should be no more than 3mm apart and most preferably should touch at this point.

10 In a preferred embodiment, the invention provides a method of forming an antistatic yarn which comprises suffusing a finely divided electrically conductive material into a strand composed of synthetic plastics material to form a conductive or potentially
15 conductive strand and combining said conductive or potentially conductive strand with at least one support strand composed of synthetic plastics material to form a coherent yarn, characterised by providing a solvent for the synthetic plastics material of both
20 the conductive or potentially conductive strand and the at least one support strand on the surface of the conductive or potentially conductive strand, bringing the conductive strand and the at least one support strand into generally side-by-side relationship and travelling at the same speed and in the same direction
25 before a substantial amount of the provided solvent has evaporated, allowing said strands to touch each other at intermittent points along their length, whereby to effect intermittent solvent bonding of the at least one support strand with the conductive strand
30 along the length thereof and effecting evaporation of the provided solvent to form a coherent antistatic yarn.

The suffusing of the finely divided electrically conductive material into the strand of synthetic
35 plastics material may be effected in known manner by

applying to the travelling strand a dispersion of the finely divided material in a liquid which is a solvent for the synthetic plastics material to form a potentially conductive strand and evaporating the solvent to form a conductive strand. In the most preferred method of the present invention, the said liquid is also a solvent for the synthetic plastics material of the support strands and the support strands are brought into generally side-by-side relationship with the potentially conductive strand before a substantial amount of the liquid has evaporated from the potentially conductive strand.

Contact of the solvent bearing strand and of the intermittently solvent bonded conductive or potentially conductive strand and the support strands with any other object or surface should be avoided before the solvent or in the case of the most preferred method, the liquid of the dispersion has evaporated. If such contact does occur it will result in accumulation of excessive solvent or liquid dispersion on such object or surface. The accumulation of excess solvent on such a surface could cause breaks to occur in the strands and in the most preferred method, if such accumulation (e.g. of liquid dispersion) is dislodged onto the strands, will cause a serious yarn and/or package defect. In the most preferred method therefore, it is especially desirable to avoid such contact and the potentially conductive strand should only be allowed to contact the support strand or strands and the atmosphere before the liquid has evaporated.

The support strands and the conductive or potentially conductive strands are preferably brought into generally side-by-side relationship by passing the non-solvent bearing strand or strands over a guide

such as a guide bar disposed adjacent but not touching, the moving solvent or liquid dispersion carrying strand so that the non-solvent-bearing strand or strands change direction to run generally parallel with the solvent or liquid dispersion bearing strand. Alternatively, but less preferably the conductive or potentially conductive and the support strands can be brought into generally side-by-side relationship by passing the solvent or liquid dispersion carrying strand through a hollow supply means (such as a pipe) for the non-solvent-bearing strand or strands and then passing both types of strand through a balloon guide, the solvent or liquid dispersion bearing strand passing through the centre of the balloon guide, but the non-solvent-bearing strands being in constant contact with the inside surface of the balloon guide, which arrangement has the effect of cabling the non-solvent-bearing strand or strands around the solvent bearing strand.

In the most preferred embodiment, the present invention provides a method in which the finely divided electrically conductive material is suffused into a strand of synthetic plastics material to produce a potentially conductive strand by applying to the travelling strand a dispersion of said finely divided material in a liquid which is a solvent for synthetic plastics material of both the strand which is to become the conductive strand and the support strands, but does not dissolve or react with said finely divided material, characterised in that the support strand or strands are brought into generally side-by-side relationship with the potentially conductive strand before a substantial amount of the liquid carried by the potentially conductive strand has evaporated therefrom and allowing said conductive

strand to contact said potentially support strand or strands at intermittent points along the length thereof, the potentially conductive strand being allowed to contact only the support strand or strands and the atmosphere until the liquid has substantially evaporated from the potentially conductive strand whereby to effect intermittent solvent bonding of the conductive strand to the support strand or strands along the length thereof.

10 Preferably the evaporation of solvent, e.g. liquid of the liquid dispersion is effected by passing the potentially conductive strand and the support strand or strands in generally side-by-side relationship and in contact at intermittent points along their length through an evaporation zone maintained at an elevated temperature.

15 Most preferably, air at an elevated temperature is passed through the evaporation zone in countercurrent to the direction of travel of the potentially conductive and the support strands.

20 The solvent is selected according to the nature of the synthetic plastics materials. Thus, in the case of a polyamide, especially a caprolactam, the solvent is preferably formic acid.

25 The invention will now be further described by way of examples, with reference to the accompanying drawings, in which:-

 Figure 1 is a schematic representation of the most preferred embodiment of the present invention;

30 Figure 2 is a schematic representation of an alternative process of carrying out the present invention;

 Figure 3 is a partial enlarged longitudinal view of the product of the present invention;

35 Figure 4 is an enlarged view of a small portion of Figure 3; and

Figure 5 is a cross sectional view of the product of the present invention, Figure 5 being taken through line C-C of Figure 4.

Figure 1 is a schematic representation of the most preferred process for carrying out the present invention. A first pirn 1 having a first strand 2 wound thereon supplies a strand 2 to a conductive mix applicator 3. The strand 2 is most preferably a nylon-6 monofilamentary strand. The conductive mix applicator 3, shown schematically, is comprised of a reservoir (which contains a conductive mix), the reservoir having an inlet orifice and an outlet orifice through which the strand enters and exits the reservoir. Both orifices are sized slightly larger than the strand diameter. The strand exits the reservoir with a controlled amount of mix thereon. The mix is most preferably formic acid having nylon 6 polymer dissolved therein and conductive carbon black particles dispersed therein. The strand is pulled off of the first pirn 1 by a pair of rollers 4, the surface speed of each roller 4 being set at approximately 700 metres per minute. Once the first strand 2 emerges from the applicator 3, the first strand 2 travels into an evaporation tube 5. As the first strand, having mix thereon, approaches the entrance to the evaporation tube 5, a second strand 6 is brought into generally side-by-side relationship with the first strand 2, the second strand 6 most preferably being a nylon-6 multifilament strand, the second strand 6 being supplied from a second pirn 7. It should be noted that the second strand 6 is most preferably directed through a balloon guide 9 in order to confine the downstream motion of the second strand 6. The second strand 6 is brought into generally side-by-side relationship with the first strand 2 by

placing a guide 8 above the entrance to the evaporation tube 5. The guide 8 serves as a contact point for the second strand 6, this contact point allowing the second strand 6 to change directions so that immediately downstream of the guide 8, the direction of travel of the second strand 6 and the first strand 2 is generally parallel. The speed of both strands 2 and 6 is controlled by the rollers 4. Both strands 2 and 6 travel at the same speed. The second strand 6 is threaded over the guide 8 so that the second strand 6 is between the guide 8 and the first strand 2, the guide being positioned so that there is a distance ranging from 0 mm to 3 mm between the first strand 2 and the second strand 6 at the point at which the second strand 6 contacts the guide 2. Most preferably the first strand contacts the second strand at the guide (i.e. the most preferred distance is 0 mm). However, it is also preferred that the path of travel of the first strand is substantially undeflected (unchanged) by the guide and the support strand. The first strand 2 and the second strand 6 travel into the evaporation tube in close proximity to one another, and it has been observed that the two strands 2 and 6 tend to "jump together" slightly downstream of the guide 8 when a distance no greater than 3mm is maintained between the strands 2 and 6 at the guide 8. Most preferably the second strand 6 is an interlaced yarn.

Once the strands 6 and 2 enter the evaporation tube, the strands are subjected to a countercurrent (about 600 metres per minute) of hot air (most preferably 150°C), the hot air entering the evaporation tube at an inlet port 15 and exiting the evaporation tube at an exhaust port 10. The "break" 11 indicated in the figure is included in order to

reveal the fact that the evaporation tube must be relatively long compared to the remainder of the process. Most preferably the distance from the first pirn 1 to the evaporation tube entrance is about 1
5 metre, while the length of the evaporation tube 5 is about 10 metres, and the distance from the evaporation tube exit to a yarn take-up pirn 12 is about 2 metres.

After the strands 2 and 6 are brought into generally side-by-side relationship at the guide 8,
10 the mix applied to the first strand 2 contacts and spreads into the second strand 6 at points at which the first strand 2 contacts the second strand 6. As the strands 2 and 6, now together, travel through the evaporation tube, the mix suffuses into both yarns 2
15 and 6 and causes intermittent solvent bonding to occur at the contact points. Thus, upon emerging from the downstream end of the evaporation tube 5, a supported antistatic yarn 13 has been formed by the solvent-bonding occurring between the two strands 2 and 6
20 entering the evaporation tube 5. After emerging from the downstream end of the evaporation tube 5, the yarn 13 is directed around the rollers 4 which control the speed of the yarn, following which the yarn 13 is directed through a pigtail guide 14, following which
25 the yarn is wound up onto the take-up pirn 12, the yarn 13 together with the take up pirn 12 forming a package of supported antistatic yarn.

Figure 2 is a schematic of an alternative process of the invention. The process illustrated in Figure 1
30 is used to make what may be termed a "simple side-by-side" supported antistatic yarn. However, in Figure 2 the second pirn 7 has the first strand 2 running longitudinally therethrough, the pirn 7 being hollow. The first strand 2 is directed through the mix
35 applicator 3 before it enters the second pirn 7, and

the first strand is directed through the centre of a balloon guide 8A after emerging from the second pirn 7. The second strand 6 is taken off the second pirn 7 and is also directed through the balloon guide 8A.

5 The first strand 2 is aligned so that it travels through the centre of the guide 8A, while the second strand constantly remains on the inside surface of the balloon guide. Thus, in bringing the strand 2 and the strand 6 into generally side-by-side relationship, the
10 process illustrated in figure 2 "cables" the support strand 6 around the antistatic strand 2. The process illustrated in figure 2 results in a "cabled supported antistatic yarn". The balloon guide 8A most preferably has a 4mm wide inside diameter. This guide
15 8A is designated as being different from the guide 8 in Figure 1. The alternative process illustrated in Figure 2 requires a balloon guide, whereas the preferred process illustrated in Figure 1 may use, in addition to a balloon guide, any other guide which
20 will hold the second strand 6 at the desired point alongside the path of the first strand 2. Aside from the description above, the alternative process illustrated in Figure 2 is no different from the preferred process illustrated in Figure 1. The
25 process of Figure 1 is preferred for several reasons, including easier stringup and the convenience of using transfer tails on the second strand 6, this convenience enabling a "non-stop" process not possible with the embodiment shown in Figure 2.

30 Figure 3 is a partial enlarged view of the product of the present invention. The supported antistatic yarn 13 is shown in part, i.e. several nonconductive support strands are not shown for the sake of simplicity. A conductive monofilament strand 31 is
35 shown in combination with three nonconductive support

strands 34. At two separate solvent-bonded points 32, the conductive strand has been solvent bonded to a nonconductive support strand 34.

5 Figure 4 shows an enlarged close-up view of one of the solvent bonds 32 shown in Figure 3. As can easily be seen in Figure 4, at the solvent-bonded point 32 the mix on the conductive strand 31 has spread onto the nonconductive support strand 34 to which the conductive strand 31 has solvent-bonded.

10 Figure 5 is a cross sectional view of the strands shown in Figure 4, the cross sectional view being taken through section C-C shown in Figure 4. Figure 5 shows the conductive strand 31 having an outer "coated" region 36 and an inner "suffused" region 35.
15 The conductive strand 31 is solvent bonded to the support (nonconductive) strand 34, with the supporting strand 34 having an outer "coated" region 38 partially around and an inner "suffused" region 37 also partially around. An interface region 39 is believed
20 to exist between the conductive strand 31 and the nonconductive support strand 34. The interface region 39 is furthermore believed to resemble the outer "coated" regions 38 and 36.

25 In the most preferred embodiment of process of the present invention, the support strand is brought into general side-by-side relationship and intermittent contact with a conductive strand, e.g. a filamentary substrate both after the conductive strand has been
30 coated with a conductive solvent-containing mix, and before the solvent has substantially evaporated from the mix. Thus the support strand is brought into general side-by-side relationship (i.e. $\leq 3\text{mm}$) from the web conductive support at the guide 8 so that the two strands will "jump together" in time for an
35 adequate frequency of solvent-bonded "weld points"

to occur. In any event in order to avoid the risk of packing defects it is imperative that the conductive strand, once wet with the mix, contacts only the support strand and the atmosphere, or the mix will
5 accumulate on any contact point and eventually will be picked up and carried by the conductive strand or the support strand. Any sizeable accumulation (i.e. a lump) of mix will probably contain so much solvent
10 that it will fail to dry in the evaporation tube and will fuse windings of yarn together on the package, ruining the remainder of the package for downstream processing operations.

EXAMPLE

A conductive mix applicator was constructed from a
15 first pipe having a length of 55 mm and an i.d. of 10 mm. The first pipe was vertically oriented and securely mounted. From the side, a second pipe was connected to the midpoint of the first pipe. The second pipe had a shutoff valve thereon a short way
20 back from the intersection of the second pipe with the first pipe. The shutoff valve was closed. The second pipe was connected to a pressurized source of conductive mix. Two jewelled bearings (synthetic sapphire watch bearings) were obtained from A.M.
25 Gatti, Inc., 524 Tindall Avenue, Trenton, N.J. Each jewelled bearing had an outside diameter of 1.5 mm. and a centrally located orifice having a diameter of 75 microns, and each bearing had a thickness of 0.5 millimetres. The bearings were swaged into stainless
30 steel discs which had a diameter of 13 mm and a thickness of 1 millimetre. Each disc had a through hole which was centered and was 1.3 mm in diameter, the through hole having a counterbore 1.6 mm in diameter and 0.5 mm deep. The bearings were swaged
35 into the counterbores. After both of the bearings

were swaged into the counterbores, the discs were clamped onto the ends of the first pipe (i.e. each disc/bearing combination formed a "cap" on the ends of the first pipe). The bearings were about 55 mm
5 apart. The clamping was performed so that watertight seals were formed between the pipe and the caps. The combination of the bearings, the discs, and the first pipe constitutes the conductive mix applicator.

A 20 denier polycaprolactam monofilamentary
10 strand, having a diameter of 50 microns, was supplied from a first pirn mounted above the mix applicator. The cap on the upper end of the first pipe was removed, and the monofilament strand was threaded through the 75 micron orifice by hand. Several inches
15 (about 10 inches) of monofilament strand were pulled through the orifice. The bottom cap was removed from the pipe and the upper cap was held close to the upper end of the first pipe while a slight vacuum was applied to the bottom of the first pipe. The airflow
20 created by the vacuum caused the 10 inches of monofilament strand to be directed through the first pipe. The upper cap was then reclamped, with the monofilament strand threaded through both the upper cap (i.e. bearing) and the first pipe. The
25 monofilament strand was then threaded through the lower bearing, after which the lower cap was reclamped in position. The monofilament strand was then pulled downward towards the upper end of the evaporation tube. A second polycaprolactam strand was located on
30 a pirn above and to the side of the upper end of the evaporation tube, as shown in Figure 1. The second strand was a 140 denier, 36 filament yarn. Both strands were obtained from Badische Corporation of Anderson, South Carolina. A strand guide bar was
35 positioned immediately above the upstream end of the

evaporation tube and was aligned very close to the path which the monofilament strand would ultimately take after completion of stringup. The second strand (the multifilament strand) was passed over the guide, the second strand changing direction of travel by contacting the guide bar. The second prin had an associated balloon guide which positioned the second strand on the guide bar at a point between the guide bar and the point at which the first strand came closest to the guide bar. The guide bar was aligned so close to the path of the first strand that the first strand barely touched the second strand, but the path of the first strand was not substantially deflected nor did the first strand ever touch the guide bar once stringup was complete. Both strands were then directed through a 10 metre long evaporation tube and wound twice around a pair of rollers, as shown in Figure 1. Both rollers had surface speed of 690 metres per minute, with the larger roller having a diameter of about 10 centimetres and the smaller roller having a diameter of about 2.5 centimetres. The winding of the coherent yarn on a single take-up pirn was then begun as shown in Figure 1.

A conductive mix was made by dispersing 6 parts (by weight) of conductive carbon black into 4 parts of polycaprolactam chip and 90 parts of 70% formic acid. The carbon black particles were obtained from Cabot Corporation of 200 Raritan Centre, Parkway, Edison, N.J. 08817. The carbon black was labelled Vulcan XC-72R. The polycaprolactam chip was obtained from Badische Corporation, Freeport, Texas, the chip being designated as Nylon 6 grade 206 chip.

After the winding of the strands was begun, the valve leading to the mix applicator was opened, filling the reservoir with mix. The stringup

procedure must be performed as described above because the monofilament strand will completely disintegrate within about 3 seconds if the acid remains substantially unevaporated thereon.

5 The product yarn of the above described process had intermittent solvent bonds averaging 5mm to 10mm apart. If the gap (between the first and second strands) at the guide was widened to as much as 3mm, the solvent bonds may average one every 200 mm, and
10 the product still shows improved beaming over other prior art supported yarns, such as twisted yarns. The product made from the process described above was a 161 denier 37 filament supported antistatic yarn which had a breaking strength of about 4.4 grams per
15 denier. The breaking strength of both original strands was approximately 4.4 grams per denier. The mix added approximately 1 denier to the sum of the original strand deniers. The product of this example is a "simple side-by-side" supported, solvent-bonded,
20 antistatic yarn, which is the most preferred product of the present invention.

 The yarn made by the process of this example was used in the manufacture of Polypropylene Carpet Primary Fabric. The fabric was manufactured by Amoco
25 Fabrics, South Hamilton Street, Dalton, Georgia 30720. The fabric was designated Polybac AS, style number 2605.

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CLAIMS

1. An antistatic yarn comprising at least one
conductive strand composed of synthetic plastics
material, said conductive strand having finely divided
electrically conductive material suffused thereinto
5 and at least one support strand composed of synthetic
plastics material characterised in that said
conductive strand is intermittently solvent bonded
along its length to said at least one support strand.

10 2. An antistatic yarn as claimed in claim 1,
characterised in that said yarn comprises a plurality
of support strands, said conductive strand being
intermittently bonded along its length to more than
one of said support strands.

15 3. An antistatic yarn as claimed in claim 1,
characterised in that said conductive and said support
strands are composed of polyamide.

4. An antistatic yarn as claimed in claim 3,
characterised in that the polyamide is a
polycaprolactam.

20 5. An antistatic yarn as claimed in any of claims
1 to 4, characterised in that said finely divided
electrically conductive material is carbon black.

25 6. An antistatic yarn as claimed in any of claims
1 to 5, in which the conductive strands and support
strands are continuous filaments.

7. A carpet comprising an antistatic yarn as
claimed in any of claims 1 to 6.

30 8. A carpet as claimed in claim 7, characterised
in that it is comprised of a composite yarn composed
of an antistatic yarn as claimed in any of claims 1 to
6 interlaced into a carpet yarn.

9. A carpet as claimed in claim 8, characterised
in that the carpet yarn is a continuous filament yarn.

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10. A carpet as claimed in claim 8 or 9, characterised in that the carpet is composed of polyamide.

5 11. A method of producing an antistatic yarn which comprises suffusing a finely divided electrically conductive material into a strand composed of a synthetic plastics material to form a conductive strand and combining said conductive strand with at least one support strand composed of synthetic
10 plastics material to form a coherent yarn, characterised by bringing the at least one support strand into generally side by side relationship with said conductive strand and intermittently solvent bonding said conductive strand along its length to
15 said at least one support strand.

12. A method as claimed in claim 11, characterised in that the synthetic plastics material is polyamide.

20 13. A method as claimed in claim 12, characterised in that the polyamide is a polycaprolactam.

25 14. A method as claimed in any of claims 11 to 13, in which the finely divided electrically conductive material is suffused into the strand of synthetic plastics material to produce a potentially conductive strand by applying to the travelling strand a dispersion of said finely divided material in a liquid which is a solvent for synthetic plastics material of both the strand which is to become the
30 conductive strand and the support strands, but does not dissolve or react with the said finely divided material, characterised in that the support strand or strands are brought into generally side-by-side relationship with the potentially conductive strand
35 before a substantial amount of the solvent carried by

the potentially conductive strand has evaporated therefrom and allowing said potentially conductive strand to contact said support strand or strands at intermittent points along the length thereof, the
5 potentially conductive strand being allowed to contact only the support strand or strands and the atmosphere until the liquid has substantially evaporated from the potentially conductive strand whereby to effect
10 intermittent solvent bonding of the conductive strand to the support strand or strands along the length thereof.

15. A method as claimed in claim 14,
characterised in that the evaporation of liquid is effected by passing the potentially conductive strand
15 and the support strand or strands in generally side-by-side relationship and in contact at intermittent points along their length through an evaporation zone maintained at an elevated temperature.

20 16. A method as claimed in claim 15, characterised in that air at an elevated temperature is passed through the evaporation zone in countercurrent to the direction of travel of the potentially conductive and support strands.

25 17. A method as claimed in any of claims 11 to 16, in which the strands are continuous filaments.

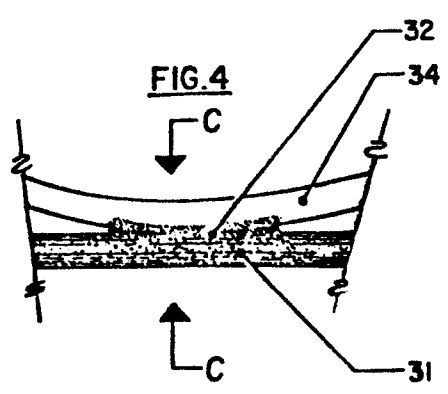
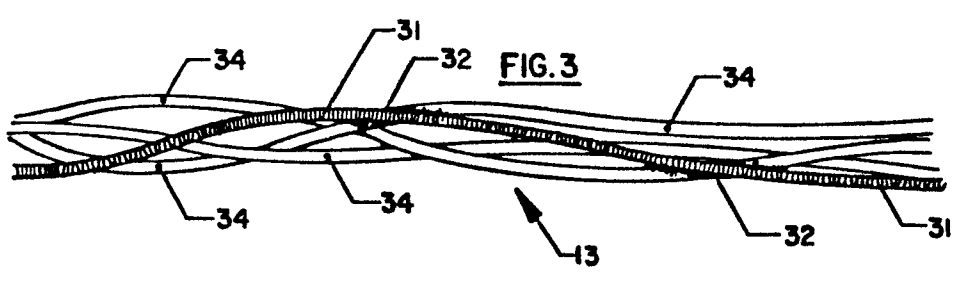
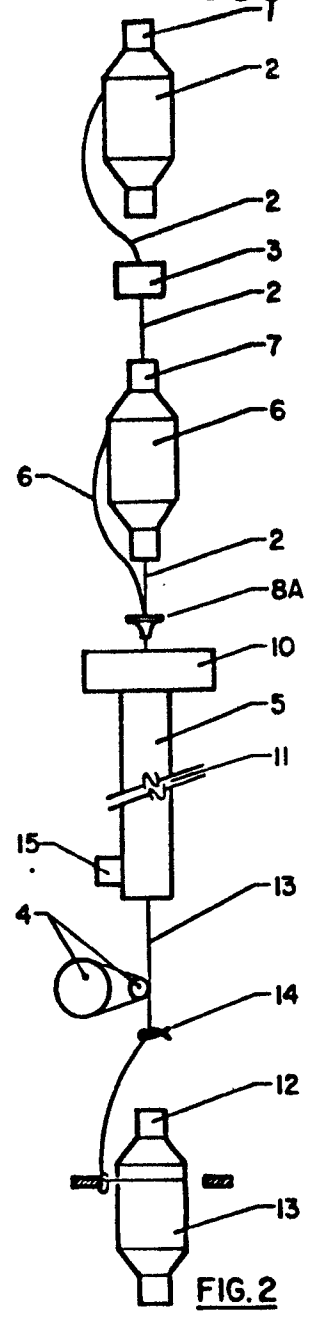
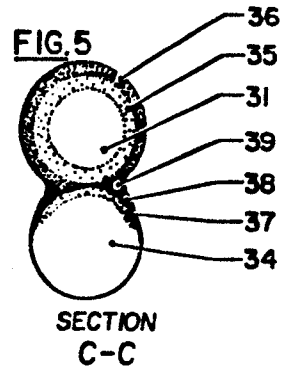
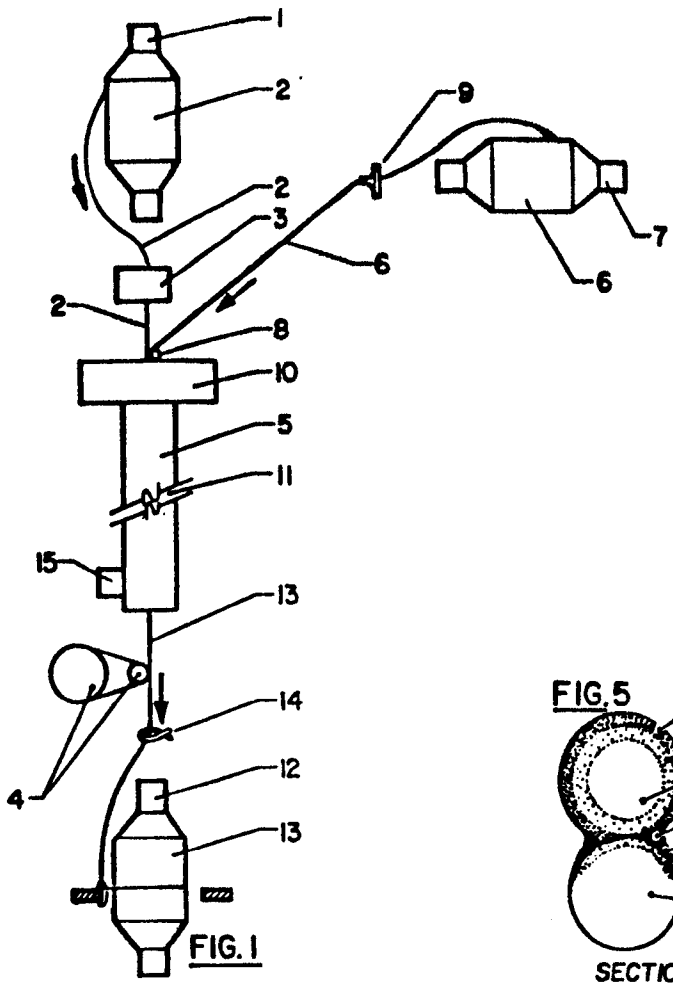
30 18. A method as claimed in any of claims 11 to 17, characterized in that when the potentially conductive strand and support strand or strands are brought into generally side-by-side relationship the distance between them is no greater than 3mm and the path of travel of the potentially conductive strand is substantially undeflected.

19. A method as claimed in any of claims 11 to 18, characterized by the solvent being formic acid.

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0185806





European Patent
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EUROPEAN SEARCH REPORT

0185806

Application number

EP 84 30 8470

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
Y	US-A-3 590 570 (TEIJIN LTD.) * Whole document *	1, 11	D 02 G 3/44 D 02 G 3/16
A		3, 5, 12	
Y	FR-A-2 060 679 (ALLIED CHEMICAL CORP.) * Whole document *	1, 11	
A	US-A-4 232 082 (NIPPON KEORI K.K.)		
A	US-A-3 969 559 (MONSANTO COMPANY)		
A	DE-A-2 106 784 (I.C.I.)		TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
A	DE-A-3 019 151 (KÜHN)		D 02 G
A	FR-A-2 193 888 (DU PONT DE NEMOURS) * page 24, lines 35-39; page 25 *	7, 8	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 02-07-1985	Examiner DEPRUN M.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			