Non-Carbon Fiber Electrical Heating Textile

Introduction:

This Heating Textile is a new generation electrical heating system which is specially designed for mobile heating, energy saving and safety orientated requirements with DC power. The Ultra Heating Fabric adopts an advanced smart textile technology. A patented Metal Conductive Yarn is introduced to the Fabric. The conductive yarn is very fine (the most fineness can go to 0.27 mm diameter in present commercial grade) and strong. The conductive yarn can be easily enhanced in conductivity, strength, and thermal resistance in our advanced design system to meet customer requirements. The metal conductive yarn is perfectly integrated with the Fabric by textile processes. Hence, the Heating Textile is superior soft, light, thin and strong. The most importance is the Textile can be connected with connector or cable by traditional electrical skills, and the connection has higher reliability and yield rate than carbon fiber or metal plating polymer yarn which is widely used as the heating element nowadays.
1. Conductive yarn capable of withstanding dyeing, finishing and washing

Issued patents:
TW M371733
CN 201485574U
Pending application: US 12/787, 378

2. Flexible heating element

Pending applications:
TW 099146482
CN 201120008487.x

THE REASONS WHY CHOOSE US

Our Competitive Advantage

1. USB Drive with 5V (Computer/ power bank can drive it quickly).
2. Raise to desired temperature in 5 seconds.
3. DC power, safe, no electromagnetic.
4. Resist to rubbing and squeezing.
5. No production loss.
6. Even and stable heating temperature
7. Easy to proceed /use
8. Lower cost
9. Reach & RoHS
10. Green material, low energy consumption.

Basing on the above advantages, the following information is given for easier comparison between DC power heating/ AC power heating and the efficiency of the products on the market.

<table>
<thead>
<tr>
<th>Heating Type</th>
<th>DC Power Heating</th>
<th>AC Power Heating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Flexible Printed Circuit Board( Film Heater)</td>
<td>2. Carbon Fiber/Carbon Fabric</td>
</tr>
<tr>
<td></td>
<td>3. Stainless Steel Fiber</td>
<td></td>
</tr>
<tr>
<td>Merchandise</td>
<td>1. Small and Medium Size Blanket</td>
<td>Large and Medium Size Blanket</td>
</tr>
<tr>
<td></td>
<td>2. Heating Pad</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Heating Jacket</td>
<td></td>
</tr>
<tr>
<td>Applied Voltage</td>
<td>7.5~12 Volt</td>
<td>110~240 Volt</td>
</tr>
<tr>
<td>Electromagnetic Radiation</td>
<td>Low Risk</td>
<td>In Doubt</td>
</tr>
<tr>
<td>Safety Design</td>
<td>No strict regulation needed</td>
<td>Need to meet strict regulation</td>
</tr>
<tr>
<td>Energy Consuming</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Weight</td>
<td>Light</td>
<td>Heavy</td>
</tr>
<tr>
<td>Retailer Price</td>
<td>About 80~150 USD in Taiwan</td>
<td>About 30~90 USD in Taiwan</td>
</tr>
</tbody>
</table>

From the above comparison, we get the conclusion that the ordinary DC power heating is higher priced but energy safe and real safer.
Why ordinary DC power heating is higher priced.

1. The heating element can not be welded directly to cable or PCB, and an extra welding solution such as terminal mounting are needed.
2. The material property of the heating element is fragile, hence an extra safety solution is required.
3. Most of manufacturers proceed the layout of the heating element by handwork or by expensive equipment.
4. The cost of raw material is higher than the traditional heating wire.

**Products already on market**

- The layout of carbon fiber (hand-made)
- The heating film

Both of the above are very expensive and broken/damaged easily.
• The following is the comparison among different DC power heating

<table>
<thead>
<tr>
<th>Heating Element</th>
<th>Material behaviour</th>
<th>Welding</th>
<th>Material Cost</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Fiber Carbon Fabric</td>
<td>Brittle, it could be partially broke in layout process or in using. The broken could cause variation of conductivity and seriously effect heating performance. Hence, it needs extra protection.</td>
<td>It can not be welded with cable or PCB directly. Hence, an extra terminal is required. However, manufacturer must pay more attention on the terminal mounting quality. Bad quality could cause safety issue.</td>
<td>Raw material source is limited. Price depends on quality.</td>
<td>Most of manufacturers adopt manual layout. Hence, most of manufacturers are in emerging countries, specially in China.</td>
</tr>
<tr>
<td>Flexible Printed Circuit Board (Heating Film)</td>
<td>The circuit printing thickness is very thin. Hence, bending angle of the flexible board is limited.</td>
<td>It can be welded with cable and PCB.</td>
<td>Raw material is expensive.</td>
<td>Special equipments is required. The operation cost is very expensive.</td>
</tr>
<tr>
<td>Stainless Steel Fiber</td>
<td>Brittle, it could be partially broke in layout process or in using. The broken could cause variation of conductivity and seriously effect heating performance. Hence, it needs extra protection.</td>
<td>It can not be welded with cable or PCB directly. Hence, an extra terminal is required. However, manufacturer must pay more attention on the terminal mounting quality. Bad quality could cause safety issue.</td>
<td>It is very special raw material and expensive. The source is very limited.</td>
<td>Most of manufacturers adopt manual layout. Hence, most of manufacturers are in emerging countries, specially in China.</td>
</tr>
</tbody>
</table>
| Our Metal Conductive Yarn (MCY) | 1. The layout of the MCY is a heating fabric. Thus, the layout is very light and flexible, but though. It can resist complicated stresses.  
2. The composite structure design of the MCY can provide DC and AC power heating applications through different combinations of metal and polymer. For example, the MCY uses high performance polymer such as PBO as the core, then the MCY can be heated to 500°C. | The MCY can be welded directly with cable or PCB, and don't need any extra welding and safety solution. | X | The MCY and the heating fabric are invented and made in Taiwan. The quality is ensured. |
The diagram about the temperature and the length of textile

Design references:
Testing conditions:
(1) The width of the Heating Textile is 5 cm
(2) The diameter of metal conductive yarn is about 0.27 mm
(3) The pitch of the conductive yarn in the Fabric is about 4 mm
(4) The input voltage to the Textile is 5, 7.4, 9, 12 Voltage, respectively.

Table 1  (INPUT, VOLTAGE: 5V)

<table>
<thead>
<tr>
<th>Length of the Textile</th>
<th>4cm</th>
<th>4.8cm</th>
<th>5.2cm</th>
<th>6.0cm</th>
<th>6.8cm</th>
<th>7.6cm</th>
<th>8.4cm</th>
<th>9.2cm</th>
<th>10.4cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current, A</td>
<td>1.5</td>
<td>1.3</td>
<td>1.2</td>
<td>1.05</td>
<td>0.95</td>
<td>0.9</td>
<td>0.86</td>
<td>0.80</td>
<td>0.74</td>
</tr>
<tr>
<td>Temperature, °C</td>
<td>130</td>
<td>95</td>
<td>88</td>
<td>80</td>
<td>68</td>
<td>60</td>
<td>52</td>
<td>46</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 2  (INPUT, VOLTAGE: 7.4V)

<table>
<thead>
<tr>
<th>Length of the Textile</th>
<th>7.2cm</th>
<th>8cm</th>
<th>8.8cm</th>
<th>9.6cm</th>
<th>10.4cm</th>
<th>11.2cm</th>
<th>12cm</th>
<th>12.8cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current, A</td>
<td>1.3</td>
<td>1.12</td>
<td>1.07</td>
<td>1.05</td>
<td>1.0</td>
<td>0.95</td>
<td>0.9</td>
<td>0.85</td>
</tr>
<tr>
<td>Temperature, °C</td>
<td>115</td>
<td>95</td>
<td>90</td>
<td>84</td>
<td>75</td>
<td>71</td>
<td>65</td>
<td>63</td>
</tr>
</tbody>
</table>

Table 3  (INPUT, VOLTAGE: 9V)

<table>
<thead>
<tr>
<th>Length of the Textile</th>
<th>8cm</th>
<th>8.8cm</th>
<th>9.6cm</th>
<th>10.4cm</th>
<th>11.2cm</th>
<th>12cm</th>
<th>12.8cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current, A</td>
<td>1.3</td>
<td>1.25</td>
<td>1.18</td>
<td>1.1</td>
<td>1.06</td>
<td>1.02</td>
<td>1.0</td>
</tr>
<tr>
<td>Temperature, °C</td>
<td>110</td>
<td>108</td>
<td>100</td>
<td>91</td>
<td>86</td>
<td>82</td>
<td>73</td>
</tr>
</tbody>
</table>

Table 4  (INPUT, VOLTAGE: 12V)

<table>
<thead>
<tr>
<th>Length of the Textile</th>
<th>9.6cm</th>
<th>10.4cm</th>
<th>11.2cm</th>
<th>12cm</th>
<th>12.8cm</th>
<th>20cm</th>
<th>32cm</th>
<th>40cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current, A</td>
<td>1.4</td>
<td>1.33</td>
<td>1.27</td>
<td>1.25</td>
<td>1.22</td>
<td>0.9</td>
<td>0.66</td>
<td>0.52</td>
</tr>
<tr>
<td>Temperature, °C</td>
<td>123</td>
<td>110</td>
<td>106</td>
<td>104</td>
<td>102</td>
<td>80</td>
<td>55</td>
<td>4</td>
</tr>
</tbody>
</table>
Our standard spec.

- **Textile wide 5 cm :**

  1. **Spec. No.: 511-4**
     Wide: 5cm
     Warp: 11 ends
     Material: Polyester
     Material of Metal Conductive Yarn: Nomex & Copper alloy
     Metal Conductive Yarn pitch: 4 ± 0.1mm
     Temperature conditions: Polyester: 70 °C / 158 °F (Soft point)
     Metal Conductive Yarn: 200 °C / 392 °F
     Put up: 100M/ roll, 6 rolls/ bag, 2 bags/ carton (1,200M/ Carton)

  2. **Spec. No.: 521-4**
     Wide: 5cm
     Warp: 21 ends
     Material: Polyester
     Material of Metal Conductive Yarn: Nomex & Copper alloy
     Metal Conductive Yarn pitch: 4 ± 0.1mm
     Temperature conditions: Polyester: 70 °C / 158 °F (Soft point)
     Metal Conductive Yarn: 200 °C / 392 °F
     Put up: 100M/ roll, 6 rolls/ bag, 2 bags/ carton (1,200M/ Carton)

  3. **Spec. No.: N511-4**
     Wide: 5cm
     Warp: 11 ends
     Material: Nomex
     Material of Metal Conductive Yarn: Nomex & Copper alloy
     Metal Conductive Yarn pitch: 4 ± 0.1mm
     Temperature conditions: 200 °C / 392 °F
     Put up: 50M/ roll, 6 rolls/ bag, 1 bags/ carton (600M/ Carton)

- **Textile wide 12 cm :**

  1. **Spec. No.: 1249-4**
     Wide: 12 cm
     Warp: 49 ends
     Material: Polyester
     Material of Metal Conductive Yarn: Nomex & Copper alloy
     Metal Conductive Yarn pitch: 4 ± 0.1mm
     Temperature conditions: Polyester: 70 °C / 158 °F (Soft point)
     Metal Conductive Yarn: 200 °C / 392 °F
     Put up: 50M/ roll, 2 rolls/ bag, 4 bags/ carton (400M/ Carton)
2. **Spec. No.: 1249-10**  
Wide: 12 cm  
Warp: 49 ends  
Material: Polyester  
Material of Metal Conductive Yarn: Nomex & Copper alloy  
Metal Conductive Yarn pitch: $10 \pm 0.1$ mm  
Temperature conditions: Polyester: $70 \, ^\circ C / 158 \, ^\circ F$ (Soft point)  
Metal Conductive Yarn: $200 \, ^\circ C / 392 \, ^\circ F$  
Put up: 50M/ roll, 2 rolls/ bag, 4 bags/ carton (400M/ Carton)

- **Textile wide 30 cm:**
  1. **Spec. No.: 30121-5**  
Wide: 30 cm  
Warp: 121 ends  
Material: Polyester  
Material of Metal Conductive Yarn: Nomex & Copper alloy  
Metal Conductive Yarn pitch: $5 \pm 0.1$ mm  
Temperature conditions: Polyester: $70 \, ^\circ C / 158 \, ^\circ F$ (Soft point)  
Metal Conductive Yarn: $200 \, ^\circ C / 392 \, ^\circ F$  
Put up: 50M/ roll, 1 rolls/ bag, 4 bags/ carton (200M/ Carton)