electrostatic fields associated with these charges can cause surface contamination of the shaped parts by attracting dust particles, fibers, bugs, hair, processing debris, and the like. A large static charge residing on a shaped part can also present a safety hazard.

Existing methods for eliminating static charge on shaped parts have drawbacks. An apparatus and technique are needed to reliably reduce static electricity generated on polymeric shaped parts.

Summary

Embodiments of the present invention provide a looped pile static reduction blanket or cloth, an apparatus including the looped pile static reduction blanket, a technique to neutralize static and static patterns from a polymeric film surface during processing, to enable higher speeds and fewer defects during web transport and subsequent processing of wound web rolls, an apparatus including the looped pile static reduction cloth, and a technique to neutralize static from a polymeric shaped part during processing, to enable fewer defects. The looped pile static reduction blanket includes a static reduction engagement fabric that is resilient and can facilitate discharge of static from the web to ground before, during, and after contact with a charged web.

In one aspect, the present invention provides an apparatus for reducing static on a moving polymeric web including a static reduction blanket that includes a static reduction engagement fabric having an inner surface and a resilient looped pile engagement surface, the engagement surface intended for contact with the moving web. The resilient looped pile comprises fiber having a size ranging from about 35 denier to about 400 denier and loops having a height from about 0.25 to about 5 mm. The static reduction engagement fabric also includes electrically conductive fibers in the resilient engagement surface, wherein the electrically conductive fibers are disposed throughout the resilient engagement surface such that a portion of the electrically conductive fibers are proximate the outer surface. The apparatus also includes an electrically conductive member in electrical contact with the static reduction blanket and with an electrical ground. The apparatus is adapted to contact a first major surface of the moving web to the engagement surface of the static reduction blanket.

In yet another aspect, the present invention provides a method for reducing static on a web that includes providing the apparatus for removing static on a web as described; conveying the web material in

a downweb direction; and contacting the moving web material with the resilient engagement surface of the static reduction blanket, thereby removing static charge from the web material and discharging the static charge to the electrical ground.

There is also disclosed a static reduction cloth comprising:
a static reduction engagement fabric having an inner surface and a resilient looped pile engagement surface, the engagement surface intended for contact with a moving web,
the static reduction engagement fabric comprising electrically conductive fibers in the resilient engagement surface wherein the electrically conductive fibers are disposed throughout the resilient engagement surface such that a portion of the electrically conductive fibers are proximate the outer surface.

There is also disclosed an apparatus for reducing static on a shaped part that includes a static reduction cloth as described. The apparatus further includes an electrically conductive member in electrical contact with the static reduction cloth and in electrical contact with an electrical ground.

There is also disclosed a method for reducing static on a shaped part that includes providing the apparatus for removing static on a shaped part as described; rubbing the shaped part with the resilient engagement surface of the static reduction cloth, thereby removing static charge from the shaped part and discharging the static charge to the electrical ground.

The above summary is not intended to describe each disclosed embodiment or every implementation of the present invention. The figures and the detailed description below more particularly exemplify illustrative embodiments.

Brief Description of the Drawings

The invention is further explained with reference to the drawing wherein:

FIG. 1 shows an illustrative embodiment of a static reduction blanket installed on a winder;

FIG. 2 shows a schematic view of a static reduction cloth of the invention being used by an operator;

FIG. 3 shows an enlarged schematic view of the conductive portion of the static reduction blanket or cloth; and

FIGS. 4A-4C show plan views of the engagement surface of illustrative embodiments of static reduction blanket or cloths of the invention having different conductive patterns.

What is claimed is:

1. An apparatus for reducing static on a moving polymeric web comprising a static reduction blanket comprising:

(a) a static reduction engagement fabric having an inner surface and a resilient looped pile engagement surface, the engagement surface intended for contact with the moving web, wherein the resilient looped pile comprises fiber having a size ranging from about 35 denier to about 400 denier and loops having a height from about 0.25 to about 5 mm,

the static reduction engagement fabric comprising electrically conductive fibers in the resilient engagement surface wherein the electrically conductive fibers are disposed throughout the resilient engagement surface such that a portion of the electrically conductive fibers are proximate the outer surface; and

(b) an electrically conductive member in electrical contact with the static reduction blanket and with an electrical ground;

wherein the apparatus is adapted to contact a first major surface of the moving web to the engagement surface of the static reduction blanket.

2. The apparatus of claim 1 wherein the electrically conductive fibers are disposed in a first region of the resilient engagement surface and absent in a second adjacent region of the resilient engagement surface.

3. The apparatus of claim 2 wherein the first region and the second adjacent region form a continuous pattern across the resilient engagement surface made up of one or more first regions and one or more second regions.

4. The apparatus of claim 2 wherein the first region and the second adjacent region form a grid pattern across the resilient engagement surface.

5. The apparatus of claim 1 wherein the electrically conductive fibers comprise metal coated fibers, metal fibers, alloy fibers, carbon fibers, or a combination thereof.

6. The apparatus of claim 1 wherein the electrically conductive fibers have a length that includes kinks, bumps, ends or a combination thereof, that form pointed conductive regions.

7. The apparatus of claim 1 wherein the resilient engagement surface is a knit fabric comprising a base layer having first and second faces and a resilient looped pile protruding from the first face.

8. The apparatus of claim 7 wherein the base layer comprises a woven base layer, a knitted base layer, a non-woven base layer, or a combination thereof.

9. The apparatus of claim 7 wherein the electrically conductive fibers are disposed in the resilient looped pile.

10. The apparatus of claim 1 wherein the static reduction engagement fabric is rectangular in shape.

11. The apparatus of claim 7 wherein the resilient looped pile comprises a fibrous material selected from poly(tetrafluoroethylene), aramid, polyester, polypropylene, polyethylene, nylon, wool, bamboo, cotton, or a combination thereof.

12. The apparatus of claim 1 wherein the electrically conductive fibers comprise a fiber having a size ranging from about 3 microns to about 20 microns.

13. The apparatus of claim 1 wherein the electrically conductive fibers comprise a plurality of ends, and are intertwined in electrical contact throughout the resilient engagement surface.

14. The apparatus of claim 1 further comprising a corona discharge generator positioned adjacent the first major surface of the web material, upweb from the static reduction blanket.

15. The apparatus of claim 14 further comprising a second corona discharge generator positioned adjacent the second major surface of the web material, upweb from the static reduction blanket.

16. The apparatus of claim 1 wherein the first major surface of a web material contacts the outer surface of the static reduction blanket while within a winder or an unwind station.

17. A method for reducing static on a web comprising:
providing an apparatus of claim 1;
conveying the web material in a downweb direction; and
contacting the moving web material with the resilient engagement surface of the static reduction blanket, thereby removing static charge from the web material and discharging the static charge to the electrical ground.

18. The method of claim 17 further comprising:
charging the web material with a corona discharge prior to contacting the moving web material with the resilient engagement surface.