Nov. 5, 1968 D. I. WALSH ETAL 3,408,986

ELECTROSTATIC GRID

Filed March 2, 1967

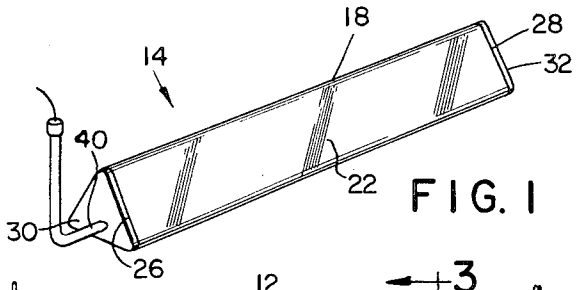


FIG. 1

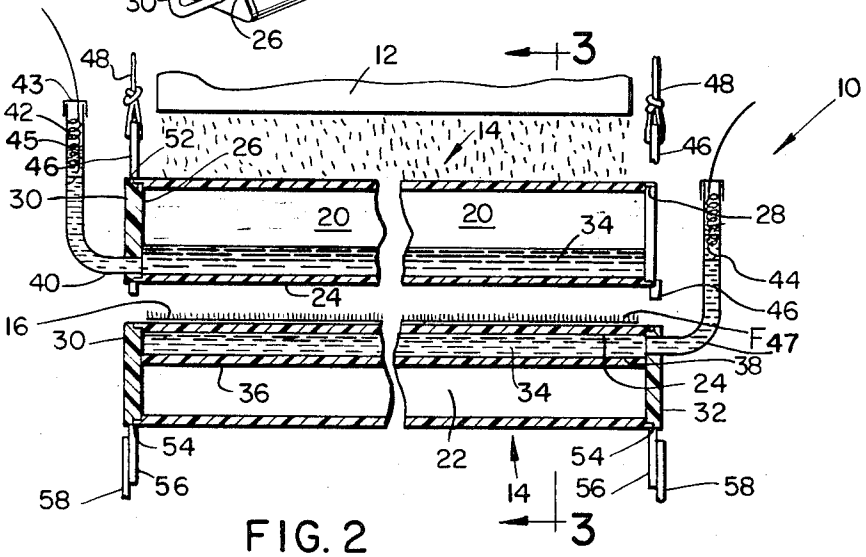


FIG. 2

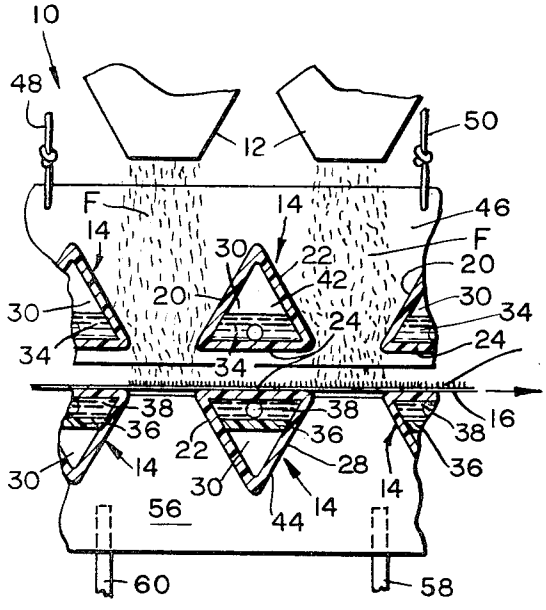


FIG. 3

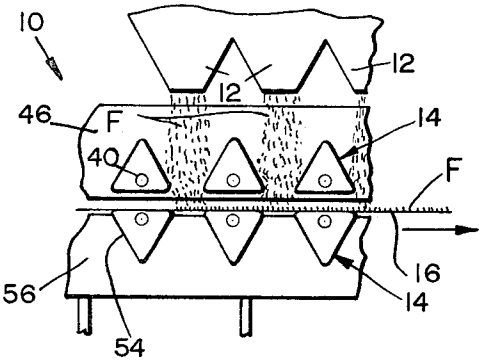


FIG. 4

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ELECTROSTATIC GRID

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ABSTRACT OF THE DISCLOSURE

A flocking apparatus for applying fibrous pile to an adhesively coated article moving along a plane through the apparatus, in which a conductor system is positioned on each side of the article; one conductor system is grounded and the other is connected to a source of alternating current. Each conductor system comprises a series of triangular elongated tubular members of a selected electrically non-conductive material having a body of electrically conductive fluid therein adjacent a planar wall section of the tubular member that is positioned parallel to the plane of movement of the article. The body of electrically conductive fluid in each tubular member communicates with a body of electrically conductive fluid in a connecting tube, a wire end, which is connected to an electric circuit, being immersed in the fluid of the connecting tube.

The present invention relates to improvements in flocking machines and more particularly to an improved high voltage grid for use in flocking machines.

An object of the present invention relates to improvements in flocking machines in which high voltage grids are employed to produce an electrostatic field and wherein the grids are adapted to A.C. power usage.

Another object of the present invention is to provide an improved flocking machine in which grids are employed to produce an electrostatic field and wherein the grids are of novel design practically obviating the use of metal.

A further object of the present invention is to provide an improved flocking machine in which grids are employed to produce an electrostatic field and wherein the grid is so constructed as to provide inclined faces adapted to shed flock and thereby prevent flock collection on the grid.

A still further object of the present invention is to provide an improved grid for use in flocking machines wherein the grid employs a conductive fluid rather than a metal plate for improved production of the electrostatic field.

Still another object of the present invention is to provide an improved grid for use in flocking machines wherein the grid casing is constructed of lightweight insulating material having a cross-sectional design which provides inclined faces for shedding flock and also gives such rigidity to the grid that long unsupported grid lengths can be utilized.

Various other objects and advantages will become apparent from the detailed description to follow.

In the drawings:

FIGURE 1 is a perspective view of a grid, per se, according to the present invention;

FIGURE 2 is a longitudinal sectional view through a flocking system with upper and lower grids;

FIGURE 3 is a transverse sectional view taken substantially on the plane of line 3—3 in FIGURE 2;

FIGURE 4 is a schematic view showing part of a flocking machine with the grids employed therein.

Referring more particularly to the drawings wherein

like numerals apply to like parts throughout, it will be seen that we have provided an improved flocking machine **10** which comprises supply hoppers **12** for the flock F, and grids **14** which produce an electrostatic field through the object **16** to which the flock is applied.

Flock F can be of any desired characteristics; the length, diameter, color and other features are varied according to the desired end product, as is well known in the art.

Patent No. 2,992,126 for Flocking Machine and Method, Kenneth Roberts and Silas Carlyle Peterson, illustrates and describes a machine of the type here involved for applying flock to an object. The description contained in that patent is incorporated herein by reference. The present invention relates principally to improved grids for use in such machines.

The flock F is carried in the supply hoppers **12** which continuously dispense the flock over the article **16** during operation of the machine. The article **16** is moved through the machine along a path between the series of upper and series of lower grids **14**. The article has an adhesive coating in any area where it is desired to bond the flock, as is understood.

The grids are charged to function to produce a field of force between the upper and lower grids whereby the flock is oriented relative to the article preparatory to bonding thereto, as will now be described.

The grids **14** are substantially of identical design so a description of one is deemed to suffice for all.

Each grid **14** is comprised of an elongated tubular housing **18** which is of equilateral triangular cross-section, as seen in FIGURES 1 and 3, with longitudinal planar faces or surfaces at **20, 22, 24**. The material from which the grid housing is made is a polyester reinforced fiberglass, vinyl or polyethylene or other suitable non-conductive material which provides strength and stability. The housing can be quite long, extending the width of the flocking machine, yet it has ample rigidity due to the cross-section employed.

The housing is hollow and has open ends at **26** and **28**. A closure is provided at each end, as **30, 32**. The latter are permanently sealingly bonded to close off the ends **26, 28**. The closure **30** has an opening sealingly receiving the elbow tube **40** which communicates with the conductive fluid, as shown.

Each grid **14** is supported in the machine so that one of the faces **24** is positioned parallel to the path of the article **16**.

The grid conductive element **34** comprises a body of conductive fluid, such as water, in the housing adjacent the wall **24** thereof.

In the upper grids the fluid by gravity lies against wall **24**.

In the lower grids, the housing has an inner wall **36** spaced from wall **24** so as to provide a sealed chamber **38** which is filled with the conductive fluid such as water.

The conductive element **34** has an electrical connection including the high voltage wire **42**, which is sealingly passed through cap **43** and terminated in a coil **45** submerged in the conductive fluid in the elbow tube **40**. The high voltage wire **42** is adapted for connection with an outside source of an A.C. high voltage or to ground.

As viewed in FIGURE 4, certain of the grids **14** are disposed beneath the upper grids in inverted relation thereto. The conductive element **34** in the lower grids, water or the like, has a similar electrical connection as at **44** in the elbow tube **47** connected to end plate **32**. Of course, elbow tube **47** communicates with the fluid **34** in the bottom grid. The upper grids may all be connected to an A.C. high voltage source and the lower grids grounded or the connections above and below the

article can be alternately connected to such source and ground.

In any case, the grids produce an electrostatic field which acts in a highly efficient manner to orient the fibers of flock in relation to the article.

The support of the grids can be of any desired design. For the upper grids a rigid fiberglass sheet **46** is suspended by cords **48, 50** anchored at any suitable location in the flocking machine. Each sheet **46** has triangular cut-outs **52** of a size to receive the upper grid therethrough for support thereby. The lower grids are supported in V-shaped notches **54** cut in the lower fiberglass plates **56**. The latter are rigid and supported on posts **58, 60** whereby the grids are in predetermined spaced relation above and below the path of the object being flocked.

It will be understood that the grids do not employ any metal components except for the wire connections in the elbow tubes so that the high voltage charge does not concentrate in any specific location or cause arcs or shorting.

The triangular grid cross-section presents two sloped surfaces which shed falling flock.

In view of the foregoing, it is believed that I have provided an improved grid and flocking machine which fulfill the objects hereinbefore enumerated.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, since the scope of the invention is defined by the appended claims rather than by the description preceding them, and all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents, are therefore intended to be embraced by these claims.

We claim:

1. In a flocking apparatus wherein fibrous pile is applied to an adhesive surface of a selected article from supply means holding a supply of flock over said adhesive surface as said article is moved along a plane through the apparatus, said apparatus including two electrical conductor systems, one above the plane of movement of said article and the other below the plane of movement of said article, one of said conductor systems being grounded and the other of said conductor systems being connected to a source of alternating current so as to produce an electrostatic field between the conductor systems,

the improvement of at least one said conductor system comprising a series of elongated tubular members of a selected electrically non-conductive material, each said member having an axially extending planar wall section positioned parallel to the plane of movement of the article, a body of electrically conductive fluid in each said member adjacent said planar wall section, and terminal means for connecting each said body of electrically conductive fluid to an electric circuit.

2. The apparatus of claim **1** wherein the conductor system positioned above said plane of movement of said article includes a series of said elongated tubular members and each said tubular member in said upper conductor system has a pair of flock-shedding inclined wall portions.

3. The apparatus of claim **1** wherein each said tubular member has closures at its ends and is fluid tight.

4. The apparatus of claim **1** wherein the conductor system positioned beneath said plane of movement of said article includes a series of said elongated tubular members, and each said tubular member in said lower conductor system includes a flat chamber for holding said body of electrically coductive fluid, said flat chamber extending substantially the length and width of said planar wall section.

5. The apparatus of claim **1** wherein said terminal means includes a connecting tube, each connecting tube having a body of electrically conductive fluid therein in communication with the body of electrically conductive fluid in the elongated tubular member, and a wire end immersed in each said connecting tube and connected to an electric circuit.

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