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Price et al.

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[54] **STATIC ELIMINATOR**

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[52] **U.S. Cl.** ..... **29/592**, 317/2 F

[51] **Int. Cl.** **H05f 3/00**

[58] **Field of Search** ..... 317/2 A, 2 F; 29/25.42, 592, 414, 576 S, 527.4; 113/119

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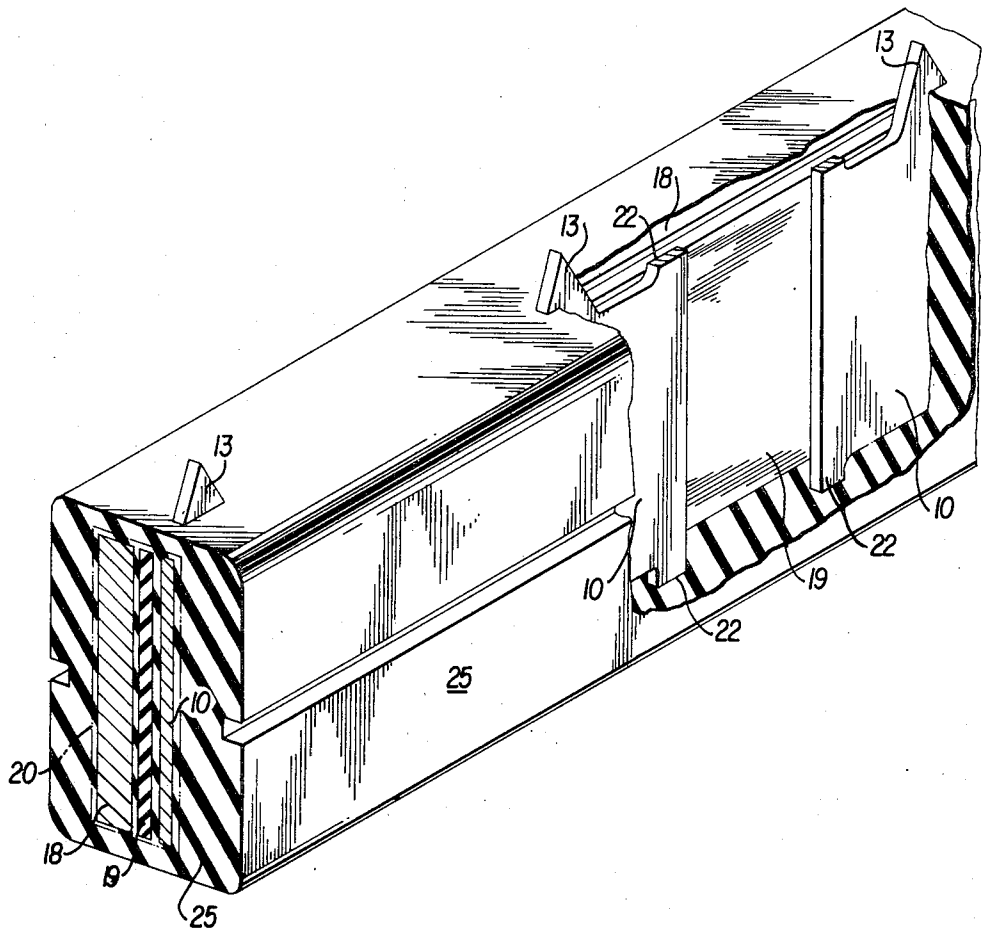
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[57] **ABSTRACT**

A static eliminator is fabricated by stamping a chain of linked equally spaced electrically conductive elements from sheet metal stock, each element including a projecting point; placing the chain of linked elements in longitudinally coextensive, dielectrically spaced relationship with a ribbon cable capable of carrying high voltage levels; constraining the chain and the cable to that placement while severing the links between elements so that each element is separated from the adjacent elements but retains the same spacing relative thereto and also retains the same spacing relative to the cable; and encapsulating the cable and the elements in that constrained configuration in a rigid mass of electrically insulative material from which the points of the elements project in equally spaced array.

3 Claims, 2 Drawing Figures



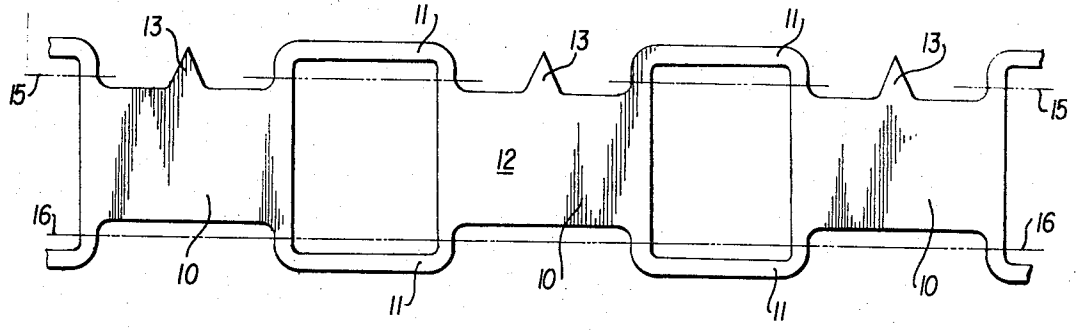


FIG. 1

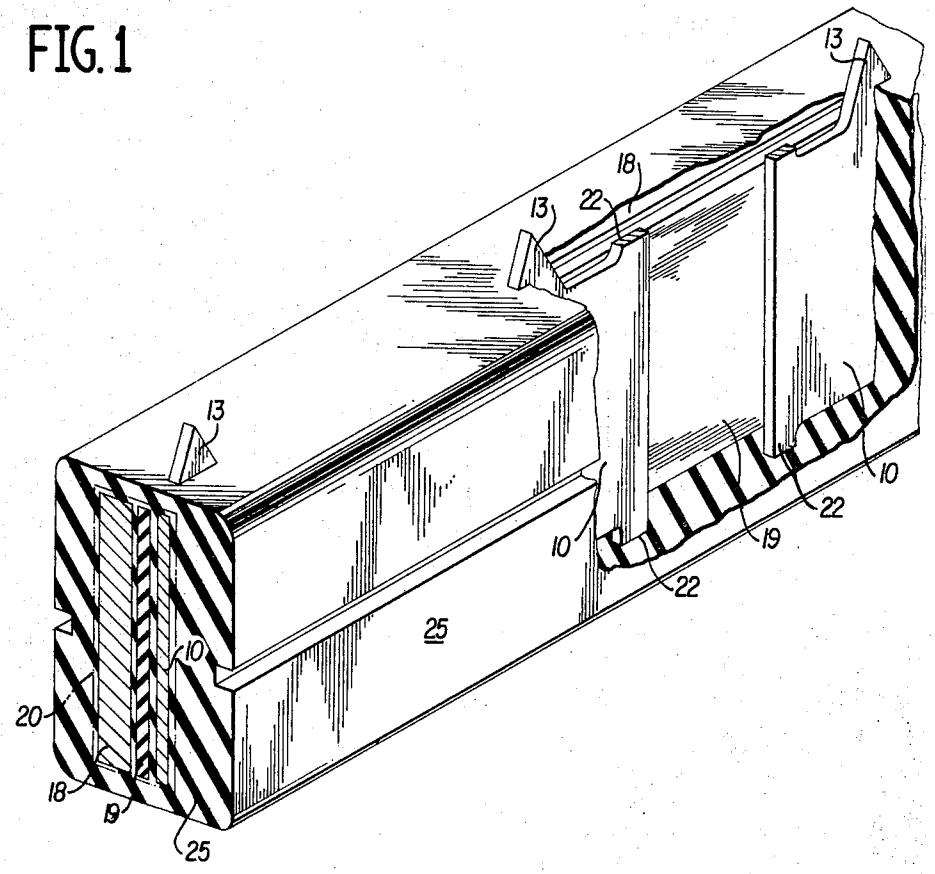


FIG. 2

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STATIC ELIMINATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to static eliminators of the type used in web or sheet feeding machines wherein the webs or sheets are subject to static charge accumulation, such as xerographic or electrophotographic printing machines. More particularly, the invention is concerned with inexpensive methods of production of static eliminators.

2. Prior Art

Representative related art prior to the present invention is described in a myriad of U.S. Pats., including No. 940,431 issued Nov. 16, 1909 to Chapman; Nos. 3,120,629, 3,137,806 and 3,443,155 issued Feb. 4, 1964, June 16, 1964 and May 6, 1969 to Schweringer; No. 3,133,193 issued May 12, 1964 to Guillotte et al.; No. 3,470,416 issued Sept. 30, 1969 to Radington-Meech et al.; No. 3,531,688 issued Sept. 29, 1970 to Jackson; and No. 3,551,743 issued Dec. 29, 1970 to Koepke et al.; to name only a few.

In the specific type of static eliminator to which the present invention relates, a plurality of spaced apart elements constituting conductive projections or points, insulated from one another, are substantially equally separated from a high voltage cable to produce an ionized field about the points when the high voltage is applied to the cable. The effect when the eliminator is placed in the vicinity of the web or sheet is to neutralize the static charge which accumulates on the web or sheet (generally paper) as it is being fed through the machine.

In general, methods of fabricating such static eliminators have been relatively expensive because of the need for special handling of a large number of elements which must be reasonably accurately spaced from one another, while creating desirable rigidity in the final structure.

SUMMARY OF THE INVENTION

It is a principal object of the present invention to overcome the disadvantages of production of prior art static eliminators of the type described immediately above.

Briefly, according to the invention the conductive elements containing the projections are preferably stamped from a single piece of suitable sheet metal as a continuous chain or series wherein the individual elements are linked together by narrow strips or veins of the sheet metal. This linking allows the elements to be handled and processed as a unit during production of the static eliminator, while maintaining the desired accurate spacing between elements. The chain of elements is positioned in a plane parallel to the plane of a coextensive ribbon conductor forming the high voltage cable and is insulatively separated therefrom throughout by a suitable spacer bar or layer of insulating material.

Thereafter, permanent retention of these components in position is achieved by molding or encapsulting them in any suitable rigid insulative material. This molding of the components in place is such that the linking strips (hereinafter sometimes referred to simply as "links") are at least partly exposed to permit them to be readily severed and thereby to electrically separate the individual elements from one another. Preferably, the links are severed along a continuous trim line to allow complete severance of all elements in a single operation while removing at least a substantial portion of each link. The latter insures against any re-establishment of electrical contact between elements by accidental loding of metal cuttings or other conductive bits on the molded surface or via a mere surface layer of moisture. After the severing or trimming operation, it is desirable to provide a final integrally molded body about all of the components including the preliminary molding, so that only the conductive projection of each element is exposed. Additionally, the final molded body may be provided to conform to any desired shape according to the environment and the particular machine in which the static eliminator is to be used.

BRIEF DESCRIPTION OF THE DRAWING

The features and particular advantages of the present invention will become apparent from a consideration of the following detailed description of a preferred method of fabrication of the static eliminator, especially when taken in conjunction with the accompanying drawing in which:

FIG. 1 is a fragmentary side view of the unitary chain of conductive elements for an embodiment made in accordance with the present invention; and

FIG. 2 is a fragmentary perspective view, partly in section, of the embodiment of the invention in which the unitary chain of FIG. 1 is utilized.

DETAILED DESCRIPTION OF PREFERRED METHOD AND EMBODIMENT:

Referring now to FIG. 1, a series of conductive elements **10** to be employed in the static eliminator are coupled together by links **11** in the form of a chain **12** which has been stamped from a sheet of suitable electrically conductive material, such as steel, aluminum, or copper. In addition to providing all of the conductive elements **10** required for the static eliminator in a single operation, the stamping method insures the maintenance of reasonably accurate equal spacing between the elements despite subsequent handling and further processing during the fabrication of the overall static eliminator. This factor alone represents a considerable advantage in convenience and simplicity of production over methods employed in conjunction with fabrication of prior art static eliminators.

Each conductive element **10** includes a projecting portion or point **13** extending about midway along one edge of the element in a direction common to that of the points **13** of the other elements. Since the elements **10** are equally spaced, and the points **13** are located in corresponding positions on every element, the points are themselves equally spaced along chain **12** and are maintained so by virtue of the rigid unitary construction of the chain. Each of links **11** preferably projects laterally of the conductive elements it connects, so that the links may be severed along longitudinal trim lines **15** and **16** in a subsequent step of the fabrication process.

After the chain **12** has been stamped or otherwise cut from sheet metal stock, it is juxtaposed with a coextensive ribbon conductor **18** (FIG. 2) capable of carrying a sufficiently high voltage for operation of the static eliminator. However, elements **10** and ribbon conductor **18** are separated throughout their lengths by a spacer bar **19** consisting of a layer of electrically insula-

tive material, such as polyvinyl chloride. This configuration, in which the spacer bar **19** is sandwiched between chain **12** and ribbon conductor **18**, is conveniently maintained such that these three components retain their juxtaposed relationship by encapsulating them lightly in a mold or cast of rigid insulative material (whose sectional outline is indicated by phantom line **20**. An example of a high strength insulative material suitable for this purpose is glass reinforced phenolic. This initial mold of the three components within a plastic body must be such as to sufficiently expose links **11** so that they may thereafter be severed along trim lines **15** and **16**, prior to the final molding operation.

After links **11** have been severed, as in a punch press or similar machine with appropriate jigs, the conductive elements **10** are physically and electrically separated from one another but their spacing is maintained at the previously set intervals by the preliminary molding which has filled the holes between elements **10**, surrounded the elements, and adhered to exposed areas of spacer bar **19**. The separation of elements **10** upon severing links **11** along longitudinal trim lines **15** (a discontinuous trim line to avoid severing of points **13**) and **16** (a continuous trim line) is shown more clearly in the open section of the complete static eliminator of FIG. **2**. Prongs **22** projecting from the corners of elements **10** are those portions of the links **11** which remain after the severing operation. It will be appreciated that the preliminary molding serves not only to hold the components in place and to maintain accurate spacing of elements **10** (and their projections **13**) during and after the severing operation, but also to prevent any slivers of metal from lodging between the encapsulated components as the severing operation proceeds.

Finally, a body **25** of insulative material similar to or the same as that used for the preliminary molding may be molded about the entire configuration except at least the tips of equally spaced points **13** to allow generation of an ionized field thereat, and an end or other region of ribbon cable **18** to afford a point of connection to the high voltage supply.

Operation of the static eliminator constructed in accordance with the present invention is apparent to those skilled in the pertinent art from a knowledge of similar capacitively coupled static eliminators of the prior art.

While we have disclosed a preferred method of construction and embodiment of our invention, it will be apparent that variations of the details of construction which have been specifically illustrated and described may readily be devised from a consideration of the foregoing specification, without departing from the spirit and scope of the invention as defined in the following claims.

What is claimed is:

1. A method of producing a static eliminator, comprising stamping from sheet metal stock a unitary strip consisting of a plurality of electrically conductive elements joined together in a common plane along a common longitudinal axis by a plurality of links, said elements being of equal length in the direction parallel to said longitudinal axis and having a first side edge and a second side edge with each of the side edges being aligned along a respective line parallel to said longitudinal axis, each of said conductive elements including a respective coplanar projection point each extending transversely from said first side edge from a location intermediate the longitudinally spaced ends of said element,

the projecting points of said elements being equally spaced from each other, and the corners of each element being directly connected to the corners of an adjacent element by one of said links at each corner, said links being spaced transversely from said elements beyond said first side edge and longitudinally spaced from adjacent said projecting points,

juxtaposing said unitary strip and a substantially longitudinally coextensive ribbon conductor in dielectrically spaced parallel planes,

integrally molding said juxtaposed dielectrically spaced unitary strip and ribbon conductor together in an electrically insulative block with said links and so that said projecting points and said intermediate link portions on each side extend from said block, severing a major portion of each of said links on a first side along a line spaced outwardly from said first side edge and intermediate said first side edge and a line interconnecting the apexes of said projecting points, and severing a major portion of each of the links along a line spaced outwardly from said second side edge to open the conductive paths between said elements while leaving said projecting points exposed in a substantially equally spaced array and,

integrally encapsulating the electrically insulative block on the sides and edges with the links severed therefrom in a larger electrically insulative integrally molded block conforming in shape to the requirements of the environment in which said static eliminator is to be used and exposing the tips of said projecting points in said equally spaced array.

2. A process for fabricating static eliminators intended to discharge static electricity from a sheet or web on which the static electricity is accumulated as an electrical charge, said process including

forming a chain of electrically conductive elements each having a projecting point similarly located thereon and equally spaced from each other by two links directly joining each element to each adjacent element, each said link extending directly between corners of adjacent said elements and spaced from said projecting points,

constraining said chain in dielectrically spaced relationship with an elongate flat high voltage cable so that the chain and the cable lie in substantially parallel planes and are substantially longitudinally coextensive, and

severing said links to separate said elements while maintaining their constrained spaced relationship with said cable,

wherein said dielectrically spaced relationship of said chain and said cable is achieved by inserting an elongate electrically insulative spacer bar therebetween, and

wherein said constraining is achieved by encapsulating said cable, said spacer bar, and said chain except for said links and said projecting points, in a thin mass of integrally molded rigid electrically insulative material, and

further including the step subsequent to said step of severing said links of enclosing said cable, said spacer bar, and said conductive elements in their constrained relationship in a larger mass of inte-

grally molded rigid electrically insulative material with at least the tips of said projecting points remaining exposed.

3. The process of claim 2, wherein

said links are severed by trimming them off longitudinally relative to the length of said chain at the positions of exposure from said mass, so that each of said conductive elements is individually capacitively coupled to said cable.

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