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[54] **STATIC ELECTRICITY PINNING METHOD**
3 Claims, 4 Drawing Figs.

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[51] Int. Cl. **B32b 31/28**
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273, 274, 275; 310/5, 6; 101/232; 317/262 (E)

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ABSTRACT: Static electricity apparatus is provided including a device in the form of a wand coupled to a source of unidirectional potential for temporarily mounting a layer being worked onto a vertical or horizontal layer of high dielectric material. The layer being worked on is between a grounded substrate and the dielectric material. When the wand is moved over the layers, the layers are pinned together by static electricity. The substrate is of ground potential and provides a reference or basis for the electrical charge taken by the dielectric material.

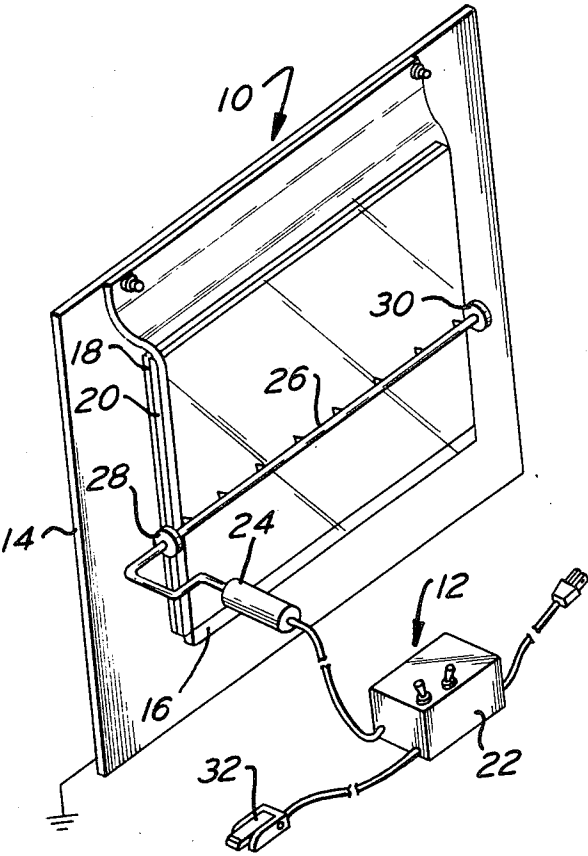


FIG. 1

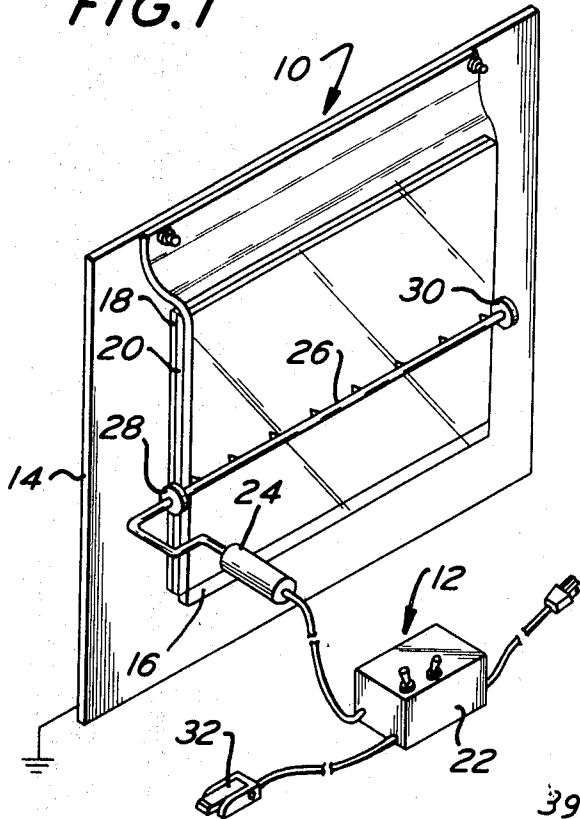


FIG. 2

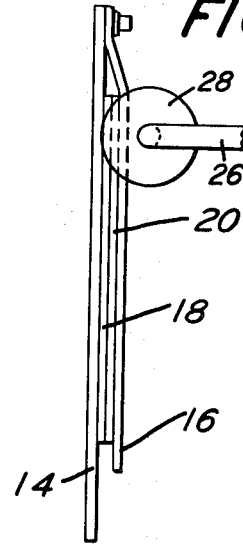
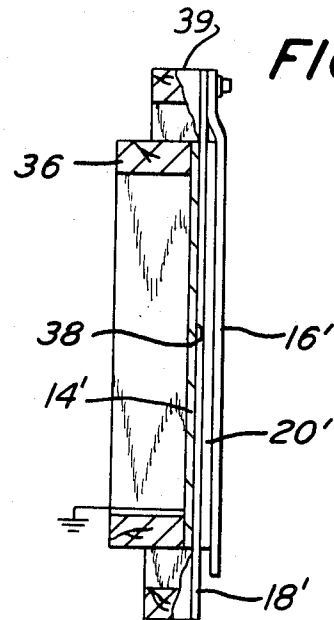
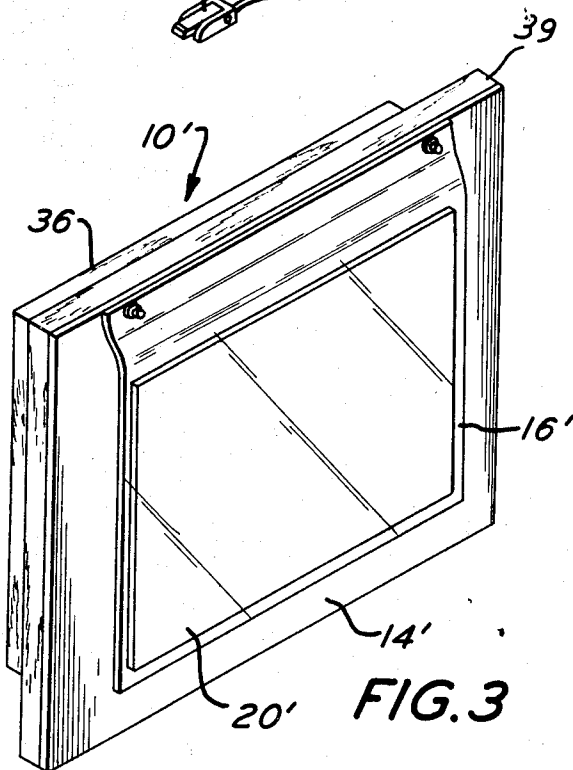


FIG. 4



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STATIC ELECTRICITY PINNING METHOD

This invention relates to a static electricity apparatus useful in pinning a layer of material to a layer of high dielectric material while being between a substrate and the dielectric material. The layers are pinned together by static electricity. Such apparatus is useful in silk screening techniques wherein the layer of material to be worked on has heretofore been held in place by use of a vacuum frame, adhesives, or tape. It is also useful in place of wet stripping of film in the publishing field and tape used in the printing field.

The apparatus is preferably portable, and is completely dependable. The size of the layer of material being worked on can vary to any desired size. The apparatus may be vertical or horizontal. When vertical, the apparatus materially reduces the floor space and does not require any special tables or supports.

The apparatus of the present invention utilizes a substrate. The substrate may be in the form of an ordinary aluminum household mesh screen painted black. Instead of a screen, the substrate could be a plate or a special transparent working surface, i.e., a fogged glass plate clamped to a grounded wire screen mounted on a plexiglass base. The size of the substrate determines the maximum size of the work that can be processed. The screen is preferably aluminum and it must be grounded. The substrate may have a size which bears no relationship to the size of the material worked on except that the substrate must be at least as large as the material being worked on.

A layer of material having a high dielectric constant is juxtaposed to the substrate. Such material may be in form of a layer of plastic material such as acetate or Mylar having one side attached to the substrate or adjacent thereof. The material being worked on is disposed between the dielectric layer and the substrate. By passing the wand over the layers, the dielectric layer and the material being worked on are electrostatically pinned together.

The wand is preferably provided with a handle so that it may be portable and is coupled to a source of unidirectional potential. A switch which may be hand or foot operated is provided. The wand is moved over the juxtaposed layers. In doing so, the material being worked on is pinned to the dielectric layer. Until the layers are physically separated, they will remain in that position for a period of several hours.

It is an object of the present invention to provide a novel static electricity apparatus for electrostatically pinning material to be worked on to a layer of other material which may be vertical or horizontal.

It is another object of the present invention to provide an electrostatic pinning device so that layers being worked on may be maintained in a predetermined position without the use of adhesives, vacuum, tape, etc.

It is another object of the present invention to provide a novel method for supporting and maintaining layers of material being worked on in the predetermined position by use of electrostatics.

Other objects will appear hereinafter.

For the purpose of illustrating the invention, there are shown in the drawings forms which are presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. 1 is a perspective view of the apparatus of the present invention and illustrating the electrostatic pinning device.

FIG. 2 is a side elevation view of the apparatus shown in FIG. 1 with parts broken away.

FIG. 3 is a perspective view of the apparatus in accordance with another embodiment of the present invention.

FIG. 4 is a side elevation view of the apparatus shown in FIG. 3.

Referring to the drawing in detail, wherein like numerals indicate like elements, there is shown in FIG. 1 an apparatus in accordance with one embodiment of the present invention designated generally as 10 and having associated therewith an electrostatic pinning device designated generally as 12.

The apparatus 10 includes a substrate 14. The substrate 14 may be a grounded aluminum mesh screen, a grounded stainless steel screen, a grounded plate, or a special surface. A layer of high dielectric material 16 of any configuration overlies the substrate 14. High in this regard is excess of about 2.2 at 10^6 cycles per-second and at room temperature and/or a surface resistivity of 10^{10} megohms per square. The physical size of the dielectric material is unimportant. Layer 16 is preferably secured to the substrate 14 along one edge such as the top edge as illustrated. The apparatus is preferably used in a vertical position. If the apparatus is used horizontally, the side edge of the layer 16 may be secured to the substrate 14. Layer 16 may be a layer of polymeric material such as an acetate having a thickness of about three one-thousandths of an inch.

While apparatus 10 may be utilized for mounting various types of material such as drawings in an art department, for the purposes of this disclosure, it will be assumed that the apparatus 10 is being used in a silk screening process. Thus, a positive 20 overlies a stencil film 18. The positive 20, in accordance with conventional silk screening practice, is a sheet plastic material having thereon a photographically produced "positive" image. The stencil film 18 is a sheet of plastic, commonly Mylar or acetate, having a photosensitive emulsion thereon which is to be exposed to a light source to thereby receive the image of positive 20. Film 18 and positive 20 are positioned between substrate 14 and layer 16 with the positive being in contact with the layer 16. In order to electrostatically pin elements 14, 16, 18 and 20 together it is only necessary to move wand 26 of the electrostatic pinning device 12 over the various elements.

The electrostatic pinning device 12 includes a unidirectional power supply 22 having a voltage such as 15,000 volts. Power supply 22 may, for example, be a conventional direct current source of potential. The wand 26 may be removably connected to and supported by handle 24. Wand 26 has sharp stainless steel or monel points at three-fourths inch intervals on an aluminum tube so as to have overlapping ionization patterns. Wand 26 is coupled to the source of potential 22 by an electrical conductor extending through the wand to an electrical socket in the handle 24 wherein it is electrically coupled to the cord extending to source 22. The polarity of wand 26 is unidirectional to that of the grounded substrate 14.

The wand 26 and discharge points thereon are spaced from the layer 16 by means of bushings 28 and 30. Bushings 28 and 30 assure that the wand will be a uniform distance from the layer 16 at all times and facilitate the ease with which the wand will be moved relative to layer 16. Handle 24 is an electrically insulated handle and may be made from plexiglass. Bushings 28 and 30 likewise may be made from electrical insulation material. Coupling of current from source 22 to the wand 26 may be effected by a foot switch 32.

With the stencil film and positive being thusly pinned to the layer 16, the light source (not shown) may be turned on so that burning or exposure will commence. In the case of large screens or substrates, the light source may have to be moved and several burns made.

The layer 16, positive 20, stencil film 18 are all held tightly to the substrate 14 and to each other by static electricity so that no undercutting will take place when the light source moves from place to place for more than one burn as is in the case of large positives. Unless the elements are physically pulled apart, the electrostatic lamination will hold together for many hours. While the time period will vary with humidity conditions, the minimum holding time is usually over one hour.

The above description and the illustration in FIGS. 1 and 2 may be referred to as an indirect method of preparing a screen in screen process printing. A direct method is shown in FIGS. 3 and 4 wherein the apparatus is identical with that described above except as will be made clear hereinafter. Hence, corresponding elements are provided with corresponding primed

numerals. The identical electrostatic pin device will be used with the apparatus 10'.

The apparatus 10' includes a wooden frame 36 to which is secured a grounded surface 38 of a substrate such as a metal plate. The photosensitive screen 18' is directly against the surface 38 and may be mounted on a separate frame which is larger than frame 36. The screen 18' may be silk, nylon or dacron coated in conventional manner with a photosensitive layer. The positive 20' is disposed between the photosensitive screen 18' and the layer of dielectric material 16'.

It is preferable when preparing the photosensitive screen 18' for the direct method that the work be done in the vertical position. However, the screen 18', positive 20' and layer 16' of dielectric material may be pinned together while in the horizontal position and then secured to the surface 38 of grounded substrate 14' for processing with the elements in a vertical position.

The pinning device is preferably a portable unit for ease of handling and for ease of transportation. It will be appreciated that the wand 26 whether it is used in the direct or indirect method is of opposite polarity with respect to the screen 18 and surface 38.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes

thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

I claim:

1. A static electricity pinning method for closely adhering together a film having photosensitive emulsion thereon and an image bearing sheet for exposure to a light source without "undercutting" comprising:
superimposing a said film, a said sheet and a layer of high dielectric strength material onto a grounded conductive substrate,
with said film and said sheet between said layer and said substrate, and at least one of said substrate and layer being light transmitting,
and electrostatically pinning together said superimposed layers by moving a wand having ionizing points connected to a source of direct current over and in juxtaposition to said superimposed layers.
2. The method of claim 1, said layer of high dielectric strength material being transparent.
3. The method of claim 1, said sheet being adjacent said substrate.

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