

[54] DURABLE REGISTRATION TEMPLATE
FOR ELECTROSTATIC PRINTERS
[75] Inventor: Hans Dieter Hinz, Tornesch,
Germany
[73] Assignee: U.S. Philips Corporation, New
York, N.Y.

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[21] Appl. No.: 315,643

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[63] Continuation of Ser. No. 177,255, Sept. 2, 1971.
[52] U.S. Cl. 101/1, 101/DIG. 13, 101/150,
101/368
[51] Int. Cl. G01d 15/18
[58] Field of Search. 101/1, DIG. 13, 150, 368, 170

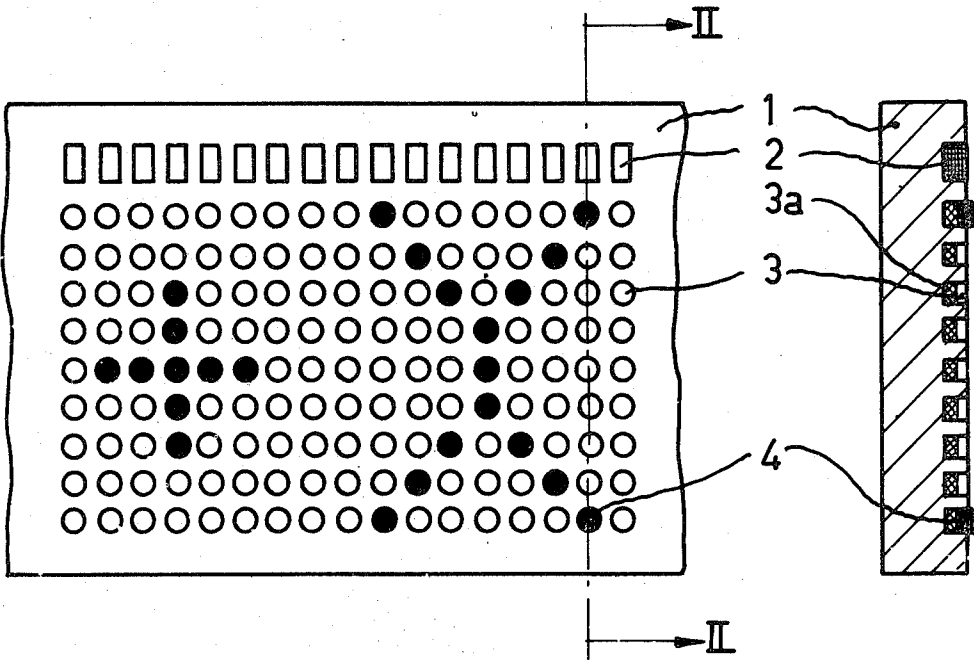
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Primary Examiner—Edgar S. Burr
Attorney, Agent, or Firm—Frank R. Trifari

[57] ABSTRACT
A electrostatic template for use in a printing operation.
The template comprises a synthetic resin raster having discrete raster positions surrounded by metal to form the template. A synchronization track is provided on the template adjacent the raster positions and coincident with the movement of the template carrier.

4 Claims, 7 Drawing Figures



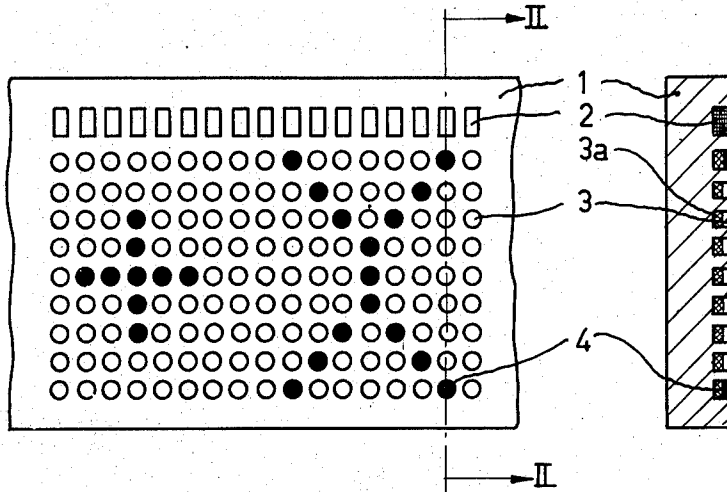


Fig.1

Fig.2

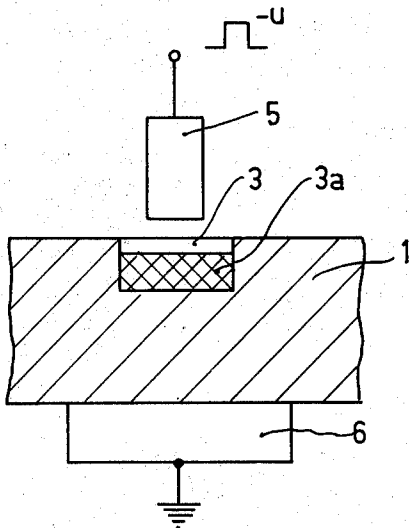


Fig. 3

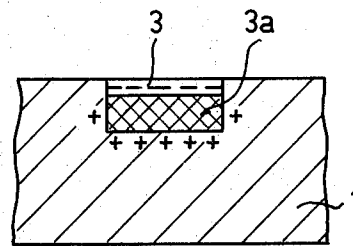


Fig.4

INVENTOR.

HANS DIETER HINZ

BY

Frank R. [Signature]

AGENT

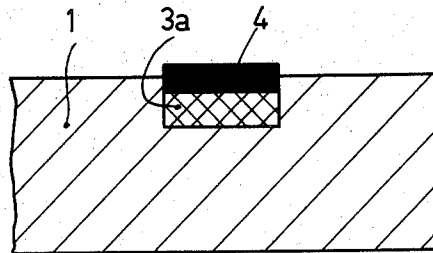


Fig. 5

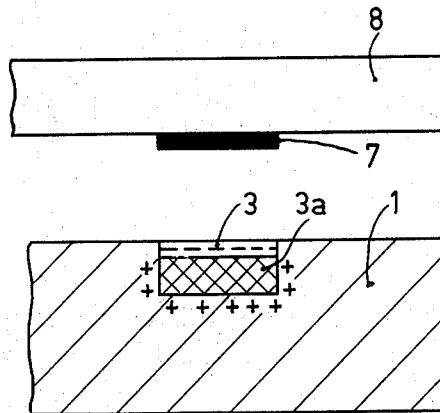


Fig. 6

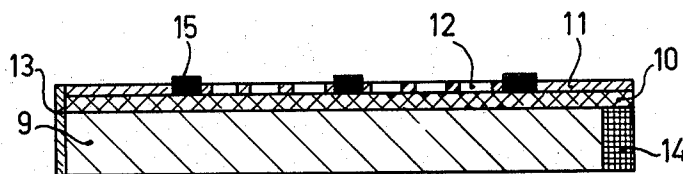


Fig. 7

INVENTOR.

HANS DIETER HINZ

BY

Frank R. Diefen

AGENT

DURABLE REGISTRATION TEMPLATE FOR ELECTROSTATIC PRINTERS

This is a continuation, of application Ser. No. 177,255, filed Sept. 2, 1971.

The present invention relates to a durable registration template for a printer operating according to electrostatic electrography and having a raster-like divided, chargeable synthetic-resin and metal surface.

These printers, called electrostatic printers for short, may be designed for matrix printing in which the printing characters, in accordance with the prescription for the chosen matrix writing, are formed from a number of, for example $7 \times 9 = 63$ possible printing points contained in a rectangular field.

Known electrostatic matrix printers produce the charge image on a special registration carrier, for example, paper which is rendered conducting and which is unilaterally coated with a layer of highly insulating synthetic resin. The charging device consists, typically, of a row of juxtaposed, generally round registration electrodes representing a limited registration dimension. The registration carrier is drawn between the row of electrodes, which is situated perpendicular to the synthetic resin layer registering the charge image, and a counter-electrode entirely covering this row of electrodes. Intimate contact exists between the paper substrate and the counter electrode, whilst the registration electrodes are some microns remote from the synthetic resin layer. This transport of the registration carrier, at an angle of 90° with respect to the row of electrodes results in the second registration dimension of variable length. A synchronizing device coupled to the registration carrier supplies a trigger pulse at each new row of printing points, said trigger pulse producing a high-voltage pulse at the relevant registration electrodes during a brief period in accordance with the information to be printed.

The gas discharge thus produced in the air gap between the driven registration electrodes and the registration carrier, causes the area of the registration carrier which is situated below the registration electrode, to be charged. The accompanying impact ionization providing the charge to the carrier is transported in the air space and is not only limited to the cylindrical spaces considered to be an extension to the registration electrodes and having the same diameter, which spaces are located between the said electrodes and the synthetic resin surface registering the charge image. It rather expands in the direction of the layer, such that the charged areas are larger than the front faces of the electrodes. The size of the charged area, its shape and the position of its centre with respect to the axis of the registration electrode is also influenced by various other influences and effects which are essentially determined by the configuration of the charging device, the nature of the durable registration carrier, the air humidity and the value of the high voltage. This obviously has an adverse effect on the quality of the printed characters, which therefore deviate from the prescribed matrix writing as regards shape, size and distance of the printing points.

The durable registration template according to the invention eliminates these drawbacks, i.e., it guarantees an exactly defined matrix print for a sufficient number of printing runs. To this end the synthetic resin raster, surrounded by metal, is provided in the dimension of the direction of the template movement, with a

synchronization track by means of which voltage pulses can be applied to charging electrodes which are arranged in at least one row opposite from the synthetic, resin raster positions.

The invention is not restricted to a band-shaped, generally endless construction, i.e., a loop, having dimensions conforming to the printer and the width of the printing text.

The construction of the durable registration template with its advantageous properties, can also be readily used on other constructions, for example, rollers. The novel durable registration template is particularly suitable for electrostatic printers having a constant and a variable output of information in an adequate number of copies.

In processes building a latent electrostatic image on the surface of a photoconducting element, it is known to subdivide an intermediate element in a raster-like manner. This is to improve the reproduction of the half-tones of the actual registration carrier upon photographic development. An intermediate element of this kind, however, is not suitable for the matrix printer operating without a photoconducting element.

In order that the invention may be readily carried into effect, some embodiments thereof will now be described in detail, by way of example, with reference to the accompanying diagrammatic drawings, in which:

FIG. 1 is a plan view of a portion of a band-like template,

FIG. 2 is a cross-sectional view of the portion shown in FIG. 1,

FIGS. 3 to 6 are cross-sectional views of a single raster point in various operating conditions during a printing cycle,

FIG. 7 is a cross-sectional view of another embodiment of the registration template.

In the embodiment shown in FIGS. 1 to 6 the durable registration template comprises a carrier band 1, a conducting homogeneous substrate of high mechanical strength, for example, metal, having a smooth surface. In this band, a field of appropriate width of, for example, round raster points 3, is recessed uniformly at a depth of approximately 10 microns. The diameter and distance of the raster points corresponds to that of the printing points of the chosen matrix writing. These recesses are filled with a highly insulating, homogeneous material having a smooth surface, for example, synthetic resin or lacquer, having a thickness of approximately 10 microns. The dielectric fillings 3a registering the charge image, do not necessarily need to be flush with the surface. The charge image shown in FIG. 4, provided by means of an appropriate charging device, has exclusively the shape of the surface of the dielectric filling 3a of a raster point, as only the latter is capable of storing a charge. All charge carriers contacting the conducting substrate 1 outside the dielectric fillings 3a due to the described mechanism of the gas discharge causing the charging, are depleted to a counter electrode 6.

FIG. 7 is a cross-sectional view through the band. On the carrier band 9 according to the same specification as in the described embodiment, there is provided an homogeneous, highly insulating synthetic resin or lacquer layer 10 having a uniform thickness of approximately 10 microns and a smooth surface, and on this layer there is provided a conducting, homogeneous coating 11 of uniform thickness, for example, a metal

of some microns thickness and having a smooth surface. In this coating the raster points, for example, 12, are recessed the full depth of the layer 11. The carrier band 9 and the coating 11 are connected in a conducting manner via a metallic connection 13, for example, at the edge. Also in this embodiment, the charge image can be registered only by the surface of the dielectric layer 10 which is dependent upon the shape of the raster points 12.

The charging device may have, for example, the construction and the lay-out as in known electrostatic printers which print on synthetic resin-paper-registration carriers. By driving the registration electrodes 5 each time after transport over a distance of one raster point, annunciated by a synchronization signal, each raster point can be charged at random, i.e. each character of the matrix writing can be printed as a charge image, in any arbitrary position of the raster field, formed by, for example, 7×9 points.

The synchronization signal is provided by a corresponding source, scanning the synchronization track 2 (FIG. 1) or 14 (FIG. 7). In accordance with the requirements imposed by the applied source system, this track can be arranged on the edges, or on the upper and lower sides of the band.

FIGS. 3 to 6 illustrate by way of an exposed raster point of the band-shaped durable registration template, the process steps of a printing cycle passing the stations of an electrostatic printer, constructed and operating in known manner. The following also applies to the embodiment shown in FIG. 7. FIG. 3 shows the raster point 3 from the instant of charging triggered by the synchronization device (charging electrode in the centre of the raster point filling), a registration electrode 5, (a round pin electrode) and the counter electrode 6, (which is connected to earth) is provided. The surface of the dielectric filling 3a is charged by the ignited gas discharge with the aid of a brief high voltage pulse U on the registration electrode. The surface and the shape of the electrode are to be in agreement with those of the dielectric only as far as this is in conformity with the surface density in the entire range of the filling required for making the latent charge image visible.

In a known development chamber, the charge image (FIG. 4) of the raster point (filling 3a) is covered, in accordance with the surface-charge density, with an adequately thick, equivalent layer 4 of charged, pulverized dye, as is shown in FIGS. 1 and 5. This layer has the shape of the dielectric version 3a.

FIG. 6 shows the raster point 3 after the printing of the powder image 7 has been effected by means of a known transfer device, on a normal registration carrier 8, for example, paper, in the electrical field by the active electrostatic forces. The printing image 7 on the normal registration carrier again corresponds in shape only with the shape of the powder image 4, and hence with the shape of the filling 3 carrying the charge image. The charge image is not lost when transferred and can be used during its service life for an adequate number of printing processes. For printing new information, the charge images must in any case be erased.

What is claimed is:

1. A template for use in an electrostatic printing device, in which a number of printing runs may be obtained from one electrostatic image by repeatedly attracting dye to said template in accordance with the charge image of a printing character and transferring said dye to form matrix prints on a registration carrier, said template comprising a band containing a conducting metallic substrate, said band having edges thereon, and having an upper and a lower surface, one of said surfaces containing said substrate, said substrate having a plurality of raster points for printing a character, said raster points being formed by recesses disposed in said substrate, each of said recesses having a bottom portion with an insulating surface which may be charged to form part of said image, said dye being attracted only to the charged insulating surfaces to thereby from said image, and synchronization track means disposed upon the template adjacent to said raster positions.

2. The template of claim 1, wherein said insulating surface in said bottom portions of said recesses is formed by partially filling said recesses with an insulating material.

3. The template of claim 1, wherein said insulating surface in said bottom portions of said recesses is formed by a layer of insulating material abutting said recesses and adjacent said substrate.

4. The template of claim 1, wherein said band comprises two conducting layers with an insulating layer disposed therebetween, one of said conducting layers being said metallic substrate, and said insulating surface in said bottom portion of said recesses being formed by said insulating layer abutting the recesses in said substrate, said template further comprising a conducting member connected between said conducting layers.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3786745 Dated January 22, 1974

Inventor(s) HANS DIETER HINZ

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

IN THE TITLE PAGE

After "[21] Appl. No.: 315,643" insert as two new lines

--[30] Foreign Application Priority Data
Sept. 5, 1970 - German - P.2044180.9--

Signed and Sealed this

sixth Day of April 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

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Commissioner of Patents and Trademarks