

[54] **APPARATUS FOR PRODUCING RASTER DOT IMAGES**

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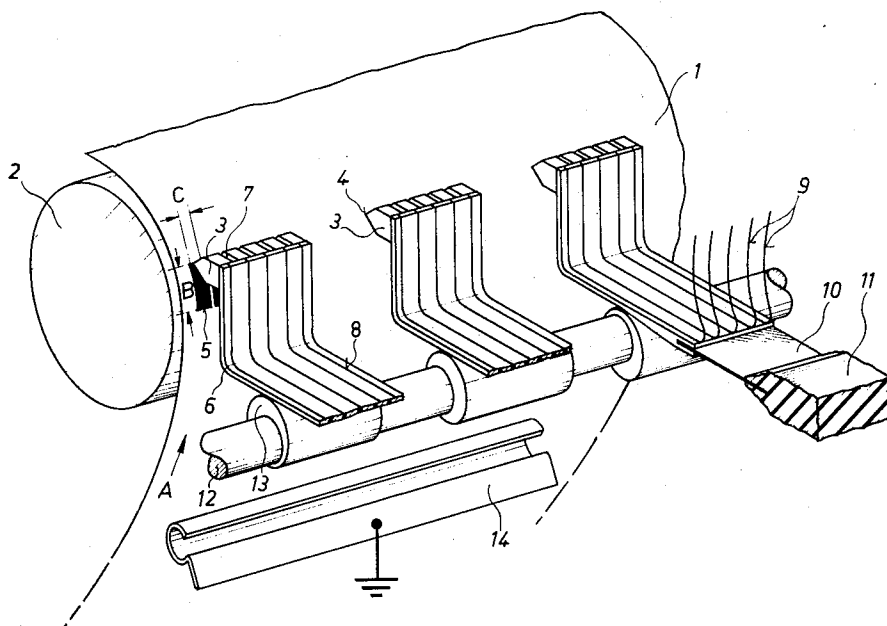
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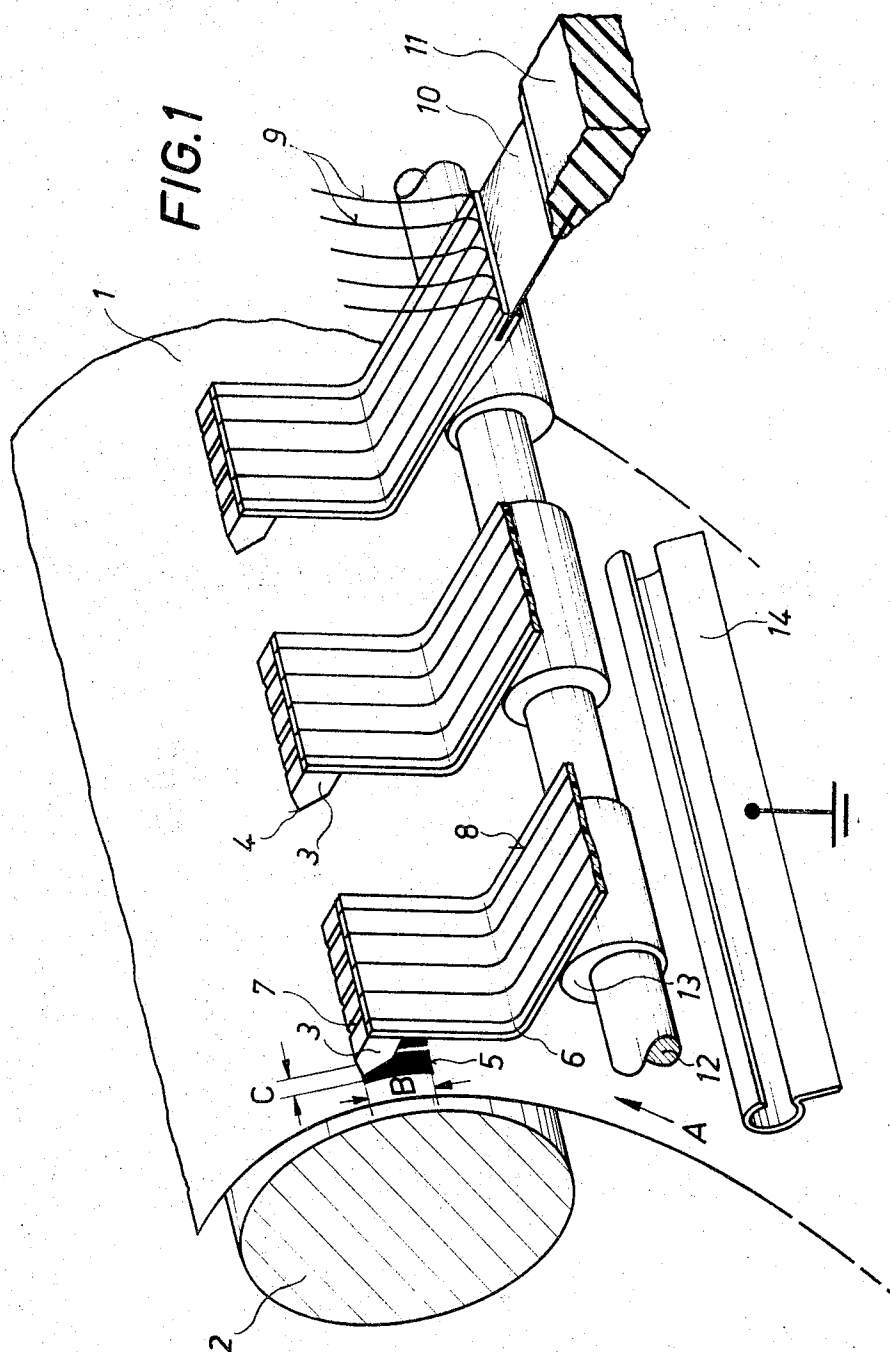
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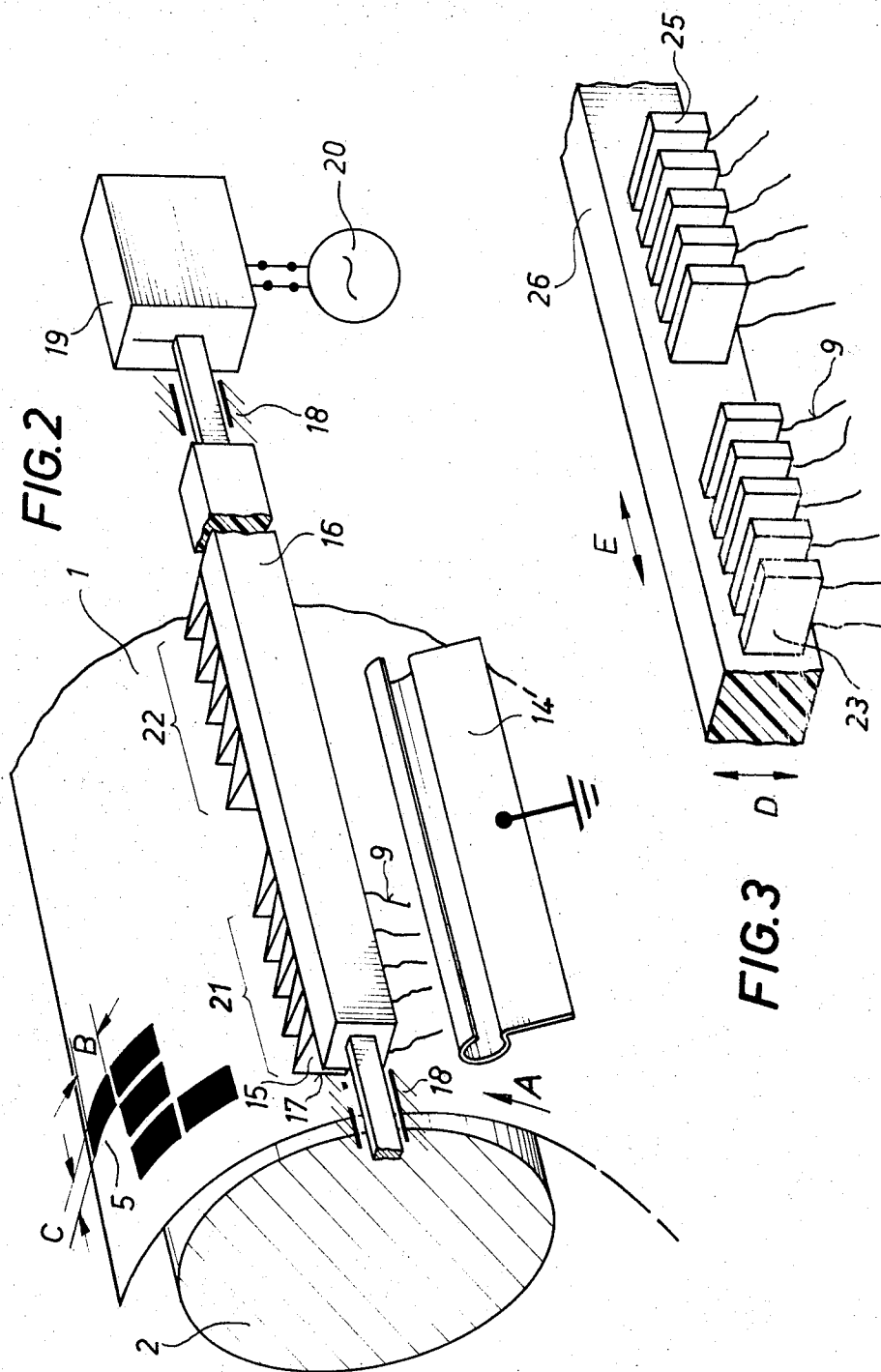
ABSTRACT

An apparatus for producing images with raster dots on a recording carrier. The recording carrier has a coating which can be modified by writing electrodes to which an electrical voltage can be applied. A transporting member is used to move the recording carrier relative to the writing electrodes. An oscillator imparts an oscillating movement to the writing electrodes, each writing electrode sweeping over a respective area corresponding in size to a raster dot.

7 Claims, 3 Drawing Figures







APPARATUS FOR PRODUCING RASTER DOT IMAGES

BACKGROUND OF THE INVENTION

This invention relates to an apparatus for producing images, such as characters or portions of pictures, with raster dots on a recording carrier. The present invention relates, more particularly, to an apparatus for producing script characters or parts of pictures with raster dots on a recording carrier having a coating which can be modified by a voltage applied selectively to writing electrodes, a relative movement taking place between the recording carrier and the writing electrodes. The coating on the recording carrier is preferably of such a nature that it may be burnt out upon application of voltage to the writing electrodes.

In ever increasing degree so-called nonmechanical writing techniques and methods are used in data processing apparatuses to realize substantially higher writing speeds, noiseless operation and, not the least, a compact and inexpensive structure. Methods in which a specially prepared recording carrier is varied in certain areas on its surface by an electric voltage applied to writing electrodes constitute a major portion of such methods. One particular known method is, for example, the metal burning method. Here, the metal coating of a recording carrier is removed, at selected locations, by the action of the writing electrodes.

These methods have been in use for a long time in registering devices where a register strip is moved under the writing electrodes. Attempts have also been made to develop writing apparatuses based on this technique.

In such a case, however, the recording carrier must not be moved at all or only at a relatively slow speed with respect to the writing electrodes compared to the writing speed, if the writing electrodes are arranged, for example, over the whole width of a line. This is again necessary in order not to make high writing speed impossible or difficult.

In order to attain sharp outlines without any relative movement between recording carrier and the writing electrodes, electrical voltages are required at an intensity which can not readily be used in office machines because of the dangers and necessary circuitry.

SUMMARY OF THE INVENTION

It is the principal object of the present invention to overcome the above-described drawbacks in an apparatus for producing images with raster dots on a recording carrier.

The above-mentioned object, as well as others which will become apparent from the text which follows, is accomplished in an apparatus for producing images with raster dots on a recording carrier by providing an oscillation producing instrumentality coupled to writing electrodes. The oscillation producing instrumentality causes the writing electrodes to perform an oscillating movement and sweep over a respective area corresponding in size to a raster dot. The recording carrier has a coating which can be modified by the writing electrodes to which an electrical voltage can be applied. A transporting device or the like is provided for effecting a relative movement between the recording carrier and the writing electrodes.

An advantage of the apparatus of the present invention is particularly that the oscillating movement pro-

duces script characters and picture portions having well defined, sharp outlines on the recording carrier. Writing voltages are required only of such an intensity as is necessary to modify the surface of the recording carrier. The magnitudes of the writing voltages required are within a safe range. Moreover the voltages can be supplied to the writing electrodes through simple, low-output electronic components whose insulation breakdown resistance need not meet high demands.

In an advantageous embodiment of the present invention the oscillating movement is produced by oscillators which are excitable by the effect of an electrical or magnetic alternating field. The use of such oscillators requires only small, inexpensive mechanical and electrical components so that the compact structure of the apparatus can be maintained.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a pictorial view, partially broken away, of a first embodiment of an apparatus for producing images with raster dots on a recording carrier according to the present invention.

FIG. 2 is a pictorial view of a second embodiment of an apparatus for producing images with raster dots according to the present invention.

FIG. 3 shows another form of the writing electrodes which may be used in apparatus constructed according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1, a recording carrier 1 having a metal layer on the surface which can be seen in the drawing, is transported by a transporting roller 2 at slow speed in the direction of an arrow A. The transporting roller 2 contacts the rear surface of the recording carrier 1. Writing electrodes 3 are in contact with the metal layer on the visible surface of the recording carrier 1. Each of the writing electrodes 3 is provided with a cutting edge 4 extending in the same direction as the raster line to be cut.

With the assumption that a raster field is to be formed for a script character with 5×7 raster dots 5, five writing electrodes 3 with their cutting edges 4 are arranged side-by-side on a respective supporting arm 6, a plurality of three supporting arms being shown. These five writing electrodes 3 are separated from one another by a thin insulating layer 7.

The supporting arms 6 are made of electrically non-conductive material. Electrical leads 8 to the writing electrodes 3 are designed as printed or etched conductive paths on the three supporting arms 6 and lead via their terminals 9 to a control circuit (not shown). On the side of each of the supporting arms 6 opposite the writing electrodes 3, a leaf spring 10 is disposed, only one being shown in FIG. 1. Each of the leaf springs 10, with its associated supporting arm 6, is fastened in a mounting ledge 11.

The plurality of supporting arms 6, each carrying five writing electrodes 3, are arranged side-by-side in such a number as required by the characters which are to appear in a line. Below the supporting arms 6 a camshaft 12 rotates. The camshaft 12 is provided with a cam 13 for each of the supporting arms. The cams 13 cause each of the supporting arms 6 to be deflected once during each revolution of camshaft 12 against one of the

leaf springs 10, the degree of the deflection being so dimensioned that the cutting edges 4 of the writing electrodes 3 passes over a height corresponding to the height B of a raster dot on the recording carrier 1. Since the width of each of the writing electrodes 3 corresponds to the width C of a raster dot, a whole area corresponding in size to the size of a raster dot 5 is swept over by the cutting edge 4 of one of the writing electrodes 3 during one revolution of the camshaft, the other cutting edges 4 effectively sweeping arms corresponding in size to the areas of other raster dots. If now a voltage is applied between one or more of the writing electrodes 3 and a counterelectrode 14, which is held in contact with the metal layer on the recording carrier 1, the metal layer is burnt out adjacent those writing electrodes which are energized. The metal layer is burnt out in the desired shape of the raster dots with sharp outlines, as illustrated by the raster dot 5.

Advisably the cams 13 are arranged along the periphery of camshaft 12 in such an offset manner that the supporting arms 6 are deflected in succession. This produces the possibility of charging first the writing electrodes 3 of one of the supporting arms 6 with the control circuit (not shown) while such arm is being deflected by its associated cam 13, but to then, with the same control circuit, already charge the electrodes of the following supporting arm 6 before its deflection has been initiated. In this way the writing electrodes 3 of all of the supporting arms 6 are charged in succession by the same, rapidly working control circuit during one revolution of the camshaft 12 and a raster line of all characters across the width of the recording carrier 1 is produced.

Referring now to FIG. 2, an apparatus according to a second embodiment of the present invention includes a plurality of writing electrodes 15 also combined into groups of 5, but arranged on an electrically nonconductive carrier 16 which is common to all of the writing electrodes 15 across the width of the recording carrier 1. Moreover, cutting edges 17 of the writing electrodes 15 are perpendicularly aligned, their length corresponding to the height B of a raster dot. The carrier 16 is mounted to be displaceable in the direction of the raster line in a pair of guides shown diagrammatically at 18 and is caused to oscillate by an oscillator 19.

The oscillator 19 may be, for example, a generally known magnetostrictive, electrostrictive or piezoelectric transducer which is caused to oscillate by a magnetic or an electrical alternating field. Thus, for example, the oscillator 19 shown in FIG. 2 could be a quartz crystal oscillating at the alternating voltage frequency applied by an alternating voltage source 20 to the plates (not shown) of the transducer. Advisably, the frequency of the alternating voltage is so selected that it coincides with the natural frequency of the quartz crystal. In this way the highest possible oscillation amplitude is produced with the lowest possible energy consumption. The resulting oscillating movement is transmitted to the carrier 16 which moves the writing electrodes 15 with a stroke of such magnitude that a width corresponding to the width of a raster dot is swept by each of the writing electrodes 15.

In this way oscillation frequencies in the ultrasonic range are possible so that no interfering noises will be heard during the writing process. Here, too, the switching frequency of a control circuit (not shown) from one group of electrodes 21 to the following group of elec-

trodes 22 can be identical with the frequency of the quartz crystal oscillator 19 so that the formation of a raster line for a character is effected during one stroke of the carrier 16. The oscillating frequency of the quartz crystal oscillator 19 can also be selected to be substantially higher than the switching frequency of the control circuit.

FIG. 3 shows an electrode and carrier arrangement using a type of writing electrode whose writing surface 25, which at least in the writing range, corresponds to the shape of a raster dot.

With such a configuration for the writing surface 25 of each of a plurality of writing electrodes 23, the oscillating amplitude of an electrically nonconductive carrier 24 need be only very low, regardless of whether it is effected in a vertical direction D or a horizontal direction E. Each of the writing electrodes 23 is provided with a lead 9 suitable for connecting each writing electrode to a control circuit (not shown) which provides input voltage signals.

A further improvement of the raster image, i.e., uniform burning of the metal coating on the recording carrier (not shown in FIG. 3) with sharper outlines can be additionally attained in that the roughness of the electrode writing surface 25 is selected to be substantially equal to the average roughness value of the recording carrier metal coated surface. Thus a type of meshing is produced during the writing process between the writing surface 25 of each of the writing electrodes 23 and the recording carrier.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

We claim:

1. An apparatus for producing images with raster dots on a recording carrier having a coating which can be modified, writing electrodes to which an electrical voltage can be applied for modifying the coating, and means for providing a relative movement between the recording carrier and the writing electrodes, the improvement comprising:

- a. a plurality of oscillatable supporting arms in a juxtaposed arrangement, each supporting arm carrying a plurality of said writing electrodes;
- b. a camshaft disposed along said supporting arms;
- c. a plurality of cams affixed to said camshaft and disposed in an angularly offset manner with respect to one another; each cam being operatively coupled to a separate one of said supporting arms, said supporting arms being deflected in succession upon rotation of said camshaft for causing said writing electrodes to perform an oscillating movement and sweep over respective areas corresponding in size to areas of respective raster dots while electric voltage is applied to said writing electrodes, said writing electrodes being supplied with electrical voltage in sequence from a single source.

2. An arrangement as defined in claim 1 wherein said writing electrodes are provided with cutting edges extending in the direction of the raster lines, a respective one of said cutting edges being provided on that side of each of said writing electrodes which is to face the recording carrier.

3. An arrangement as defined in claim 1 wherein said writing electrodes each have a writing surface configu-

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ration on their respective sides which are to face the recording carrier, which corresponds substantially to the shape of a raster dot.

4. An arrangement as defined in claim 3 wherein said writing surfaces of each of said writing electrodes have a roughness which is substantially equal to that of the surface of the recording carrier having the coating thereon.

5. An arrangement as defined in claim 1 further comprising spring means, and wherein said writing electrodes have the width corresponding to the width of a raster dot; said supporting arms are mounted to be pivotal against the force of said spring means to cause an

oscillating motion of said writing electrodes in the direction of the height of the raster dots.

6. An arrangement as defined in claim 5 wherein each said supporting arm comprises a first end and a second end, individual ones of said writing electrodes being carried respectively on said first ends, said spring means being operatively connected to said second ends.

7. An arrangement as defined in claim 5 wherein said writing electrodes are adjacently disposed, and correspond in number to the raster dots in one width of a given raster field.

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