United States Patent [19]

Linder

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[54] **ARMATURE STRUCTURE FOR MOSAIC TYPE PRINTER**

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Related U.S. Application Data

[63] Continuation of Ser. No. 291,186, Sept. 22, 1972, abandoned.

[30] **Foreign Application Priority Data**

Sept. 24, 1971 Sweden 12092/71

[52] **U.S. Cl.** ..... **197/1 R;** 346/140; 101/93.05

[51] **Int. Cl.** **B41j 1/34**

[58] **Field of Search** ..... 197/1 R; 346/140, 139 R, 346/139 C; 335/279

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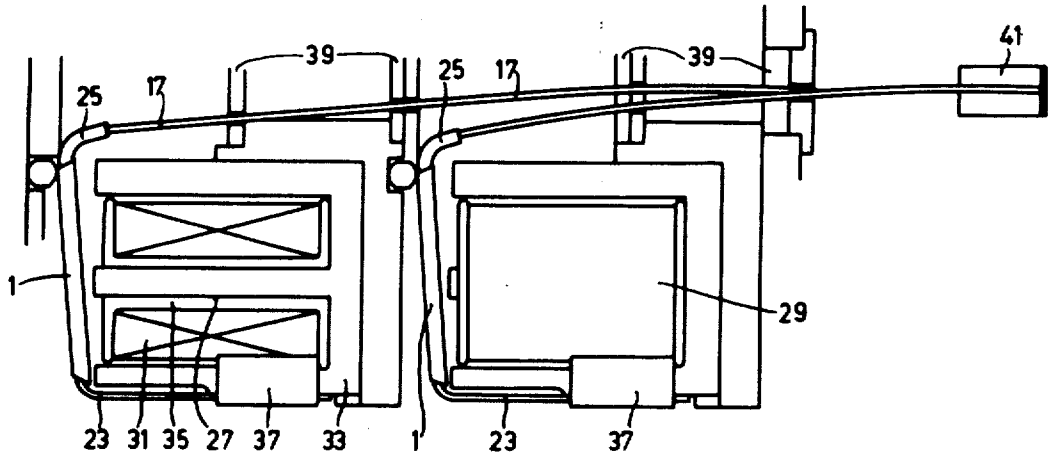
[57] **ABSTRACT**

A printing device for printing characters which consist of a mosaic pattern, comprising a number of recording pins which are actuated by a number of electromagnets which are regularly arranged with respect to each other. The electromagnets comprise strip-like armatures having a tunnel profile formed therein in which the recording pins are clamped.

4 Claims, 6 Drawing Figures



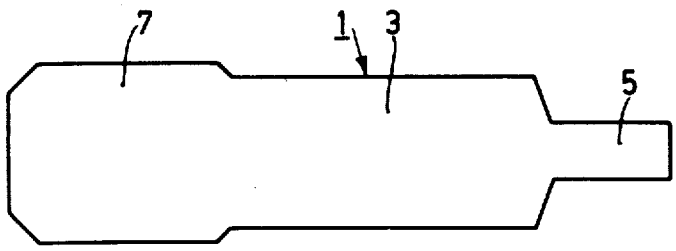


Fig.1

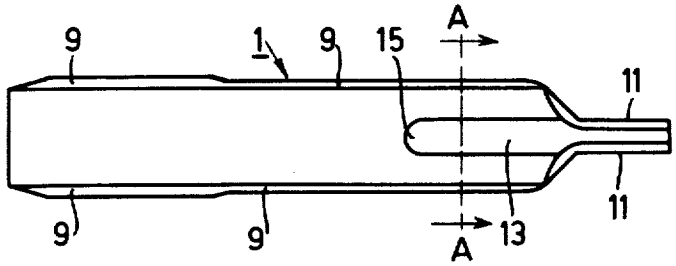


Fig.2

Fig.3

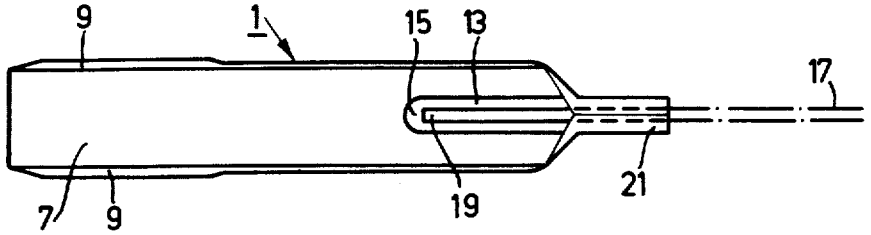


Fig.4

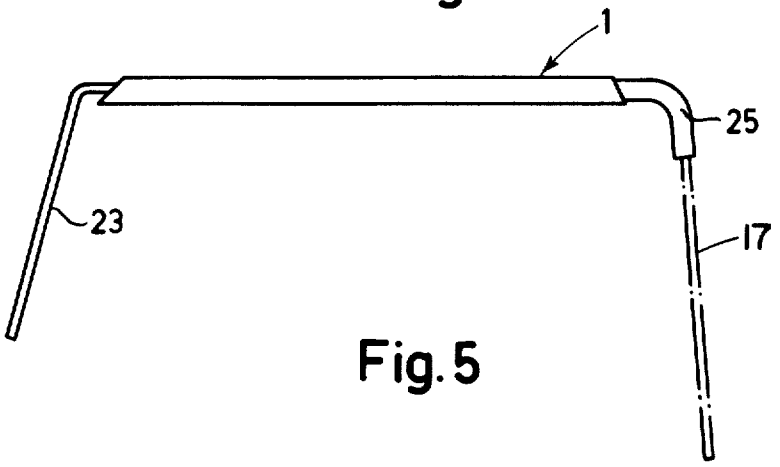


Fig.5

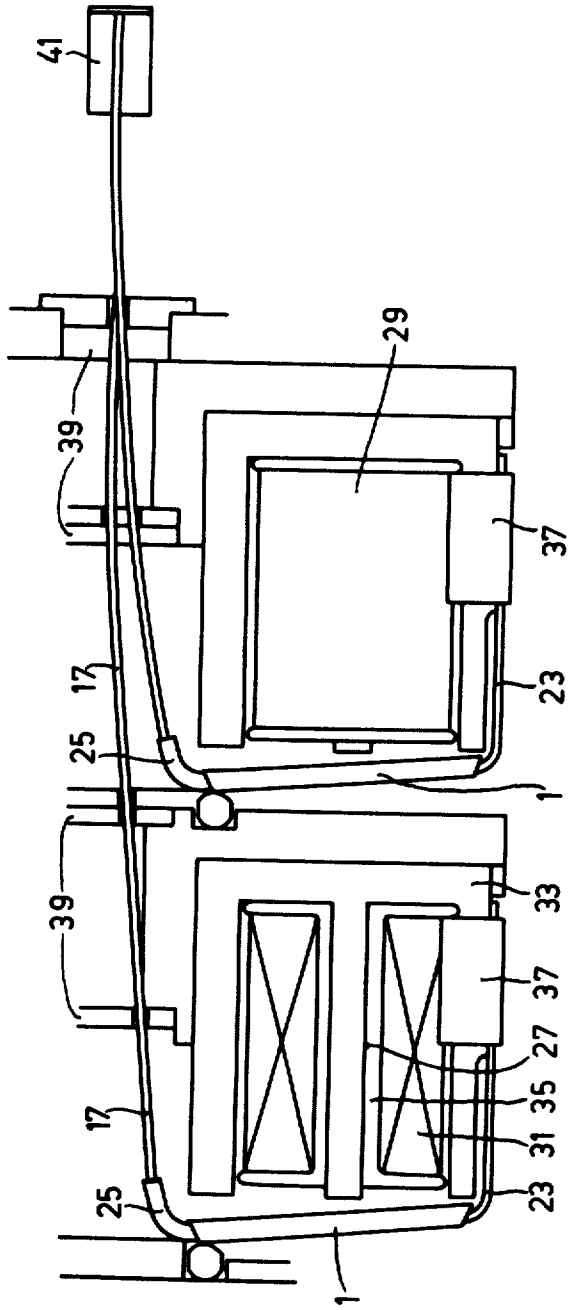


Fig.6

ARMATURE STRUCTURE FOR MOSAIC TYPE PRINTER

This is a continuation, of application Ser. No. 291,186, now abandoned, filed Sept. 22, 1972.

The invention relates to a printing device for printing characters which consist of a mosaic of point-like or line-like elements on an information carrier, comprising a plurality of recording pins which are regularly arranged with respect to each other and which are operated by strip-like armatures of electromagnets, the said recording pins being mainly arranged in a plane which is transverse to the plane of the armature.

In a known printing device of the kind set forth, each armature is connected to the relevant recording pin by welding or hard soldering. A drawback of the connection by welding or hard soldering is that both the armature and the recording pin are exposed to local heating. This may give rise to inhomogeneities in the material of the armature and the recording pin. Such inhomogeneities often lead to fractures at the area of the connection of the heavily loaded armatures and recording pins. The connection of the armature to the recording pin by welding or hard soldering is further hampered by the fact that different materials are chosen for the armatures and the recording pins. Whilst the material of the armature should have favourable magnetic properties (such as, for example, soft iron), the recording pin should be made of a wear-resistant material (for example, tungsten).

The invention has for its object to eliminate the said drawbacks.

To this end, the invention is characterized in that each of the armatures consists of a metal strip comprising a tunnel which is formed by a bent edge portion in which a bent end of the relevant recording pin is clamped.

The invention will be described in detail with reference to the drawing.

FIG. 1 shows an armature blank which is used in a printing device according to the invention.

FIG. 2 shows an armature as shown in FIG. 1 which has been subjected to a number of bending operations.

FIG. 3 is a cross-sectional view of the armature shown in FIG. 2 according to the line A-A.

FIG. 4 shows an armature as shown in FIG. 2 to which a recording pin has been connected by a further bending operation.

FIG. 5 shows an armature as shown in FIG. 4 which has been subjected to a final bending operation and to which a reset spring is connected by bending.

FIG. 6 is a diagrammatic view of a printing device according to the invention.

The metal strip 1 which is shown in FIG. 1 and which serves as an armature for a printing device is made of, for example, soft iron and comprises a centre portion 3 which is adjoined by a narrower end portion 5 and a wider end portion 7. Using the metal strip 1 shown in FIG. 1 as a basis, a recording pin and a reset spring are connected to the armature by a number of known bending and pressing operations, as is shown in FIG. 5. To this end, the strip 1 shown in FIG. 1 is provided on both sides with a flange 9 along the edges of the wide portion 7 and the centre portion 3 by means of a bending operation, the narrow portion 5 being provided with a flange 11, the direction of which opposes that of the edge 9. The narrow portion 11 and a part of the centre portion 3 are also subjected to a pressing operation so as to form a U-shaped groove 13 having an end 15 which serves as an abutment for a recording pin.

FIG. 3 is a cross-sectional view along the line A—A in FIG. 2 of the trough-like profile of the metal strip 1 which is obtained by bending and pressing. In the trough-like profile of the metal strip 1 according to FIGS. 2 and 3 a recording pin 17 is inserted which is made of, for example, tungsten, until one end 19 thereof rests against the abutment 15 of the groove 13. Subsequently, the flanges 11 are pressed towards each other about the recording pin 17. The tunnel 21 thus obtained firmly encloses the recording pin 17. Simultaneously with this operation, or thereafter, the flanges of the wider portion 7 are bent over a leaf spring 23 which is made of, for example, spring steel and which serves as a reset spring. During a final operation both the narrow portion 5, containing the recording pin 17, and the leaf spring 23 are bent in their correct position by bending in a plane transverse to the metal strip 1. The bend 25 thus obtained in the narrow portion 5 provides additional clamping of the recording pin 17 in the tunnel 21. A number of combinations of armature, recording pin and leaf spring as shown in FIG. 5 are assembled in the printing device which will be described with reference to FIG. 6.

So as to minimize the risk of damage of the recording pin or reset spring during the pressing and bending operations (which can be performed both simultaneously and consecutively), the material of the armature should preferably be softer than the material of the recording pin or reset spring.

The preferred embodiment of a printing device according to the invention which is shown in FIG. 6 comprises a number of electromagnets which are regularly arranged with respect to each other, only the electromagnets 27 and 29 being shown for the sake of simplicity. Each of the electromagnets (see electromagnet 27) comprises an excitation coil 31 which is provided about the centre leg of an E-shaped yoke 33 by means of a coil former 35. Connected to the yoke 33 is a block 37 for connecting the reset spring 23 in the manner described with reference to FIG. 5. The reset spring 23 supports the strip-like armature 1 which is described with reference to the FIGS. 1 to 5. The recording pin 17 is connected to the armature 1. The recording pin 17 is situated in a plane which is substantially perpendicular to the plane of the strip-like armature 1 and is guided to be slidable between the information carrier (not shown) and armature 1 in bearings 39 and 41. Because the electromagnets 27 and 29 are arranged in different planes and because the ends of the recording pins 17 which face the information carrier as usual closely adjoin each other in the bearing 41, the recording pins 17 which are associated with the electromagnets 27 and 29 have a different bending line. The bends 25 of the armatures 1 which are associated with the electromagnets 27 and 29 have a different curvation so as to avoid undesired forces in the recording pin, the armature and the reset spring. Near their ends the bends extend as much as possible in the direction of the bending line of the relevant recording pin, i.e. the bending line which is imposed on the recording pins by the bearings, 39 and 41.

The invention described in the foregoing is not restricted to printing devices having an arrangement of the electromagnets as shown in FIG. 6. For example, all of the electromagnets can alternatively be arranged in

the same plane. The invention can in general be used in printing devices which comprise electromagnets with strip-like armatures in which the recording pins are mainly situated in a plane transverse to the plane of the armature and are mainly transverse to this plane. In the preferred embodiment according to the invention which is shown in FIG. **6** the reset springs **23** are clamped in the armatures. However, the reset springs can also be welded or riveted to the armature in known manner. It is alternatively possible to provide the strip-like reset spring itself with a U-shaped profile in which the armature is clamped. The U-shaped groove **13** which is provided in the armature and which has an abutment **15** for the recording pin can also be replaced by a projection on the armature. The portion of the metal strip from which the said tunnel **21** is formed need not necessarily be narrower. However, the full width of the strip will preferably not be used in order to avoid excessively large forces in forming the bend **25**.

What is claimed is:

1. A printing device for printing characters which are composed by a mosaic of elements on an information carrier, said device comprising a body portion which includes a plurality of electromagnets a plurality of armatures each respectively disposed opposite an electromagnet of said body portion, said armatures each being formed of a metal strip of magnetic material and having a tubular portion formed in one end thereof and flanged edge portions formed at the other end thereof, a plurality of printing pins each respectively having a first portion secured in said tubular portion of a respective armature and a second portion extending from said tubular portion and substantially arranged transversely of the armature, and a plurality of leaf spring members, each of said spring members having one end secured to an armature at the said flange portion thereof and having the other end thereof secured to said body portion.

2. A printing device as claimed in claim **1** wherein the tubular portion of each of said strips comprises a narrowed portion of the metal strip, each narrowed portion having a bend about the longitudinal axis thereof to form said tubular portion.

3. A printing device as claimed in claim **2**, wherein each of said armatures is provided with a longitudinally-extending groove at the portion of the armature adjacent said tubular portion and wherein the end of said pin is positioned within said groove.

4. A printing device as claimed in claim **1**, wherein each armature is composed of soft iron and said printing pin is composed of tungsten.

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