

19



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



11 Publication number:

**0 226 579 B1**

12

### EUROPEAN PATENT SPECIFICATION

45 Date of publication of patent specification: **27.12.91** 51 Int. Cl.<sup>5</sup>: **B41J 1/20, B41J 2/22**

21 Application number: **85903515.6**

22 Date of filing: **20.06.85**

86 International application number:  
**PCT/US85/01164**

87 International publication number:  
**WO 86/07569 (31.12.86 86/28)**

54 **PRINT ELEMENT BAND FOR IMPACT PRINTER.**

43 Date of publication of application:  
**01.07.87 Bulletin 87/27**

45 Publication of the grant of the patent:  
**27.12.91 Bulletin 91/52**

84 Designated Contracting States:  
**BE CH DE FR GB IT LI NL SE**

56 References cited:  
**DE-A- 3 215 984**  
**US-A- 3 667 384**  
**US-A- 3 760 719**  
**US-A- 4 428 284**  
**US-A- 4 428 285**

**IBM TECHNICAL DISCLOSURE BULLETIN**, vol. 27, no. 3, August 1984, pages 1677-1678, Armonk, New York, US; E.F. HELINSKI et al.: "Ballistic band-dot printer accepting print bands with different buttons serving as ballistic print elements"

73 Proprietor: **INTERNATIONAL BUSINESS MACHINES CORPORATION**  
**18A/680-7 Patent Operations 1001 W.T. Harris Boulevard**  
**Charlotte, NC 28257(US)**

72 Inventor: **McELROY, Robert, Marion, Jr.**  
**3730 Winding Creek Lane**  
**Charlotte, NC 28226(US)**

Inventor: **McGUIRE, Thomas, Alfred, Jr.**  
**201 West Blume Street**  
**Landis, NC 28088(US)**

Inventor: **COLE, Norman, Frederick**  
**3901 Singletree Road**  
**Charlotte, NC 28212(US)**

Inventor: **THORNE, William, Duncan**  
**7904 Bridgewater Court**  
**Raleigh, NC 27609(US)**

Inventor: **PATTERSON, William, Alexander**  
**5419 Doncaster Drive**  
**Charlotte, NC 28211(US)**

**EP 0 226 579 B1**

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

**IBM TECHNICAL DISCLOSURE BULLETIN, vol. 27, no. 10B, March 1985, pages 5940-5941, Armonk, New York, US; "Print band encoding method"**

**IBM Technical Disclosure Bulletin, issued March, 1982, Vol. 24, No. 10, p. 5070, Hanna**

**IBM Technical Disclosure Bulletin, issued March, 1982, Vol. 24, No. 10, p. 5185, Fischer**

**IBM Technical Disclosure Bulletin, issued July, 1984, Vol. 27, No. 2, p. 1135-1136, Hjorth.**

⑦ Representative: **Atchley, Martin John Waldegrave**

**IBM United Kingdom Limited Intellectual Property Department Hursley Park Winchester Hampshire SO21 2JN(GB)**

## Description

### TECHNICAL FIELD

The present invention relates to impact printers of the kind which have a flexible metal band on which print elements are mounted and to such bands.

### BACKGROUND ART

In one known type of printer, adapted to print on a print medium as it passes over a platen using a plurality of print elements operated selectively by hammers, the print elements are mounted on flexible fingers forming part of a metal band which is in the form of a continuous loop, one print element being mounted on each flexible finger. The print elements extend in a straight line along the band parallel to the longitudinal center line of the band. A bank of hammers extends along the platen and is spaced from the platen so as to define a print region between the hammer bank and the platen. The print medium, such as a continuous web of paper, extends through the print region over the platen so that the hammer bank extends across the width of the print medium. The metal band on which the print elements are mounted also extends through the print region along the platen and across the width of the print medium and is located between the hammer bank and the print medium. An ink ribbon also is located in the print region between the metal band and the print medium.

The metal band is driven continuously past the platen and the hammer bank and across the print medium by a suitable drive system. Operation of any one of the hammers of the bank causes that hammer to move towards the metal band and to strike one of the print elements so as to move that print element on its flexible finger towards the ink ribbon and the print medium. The print element abuts against the ink ribbon, moves the ink ribbon into contact with the print medium and presses the ink ribbon and the print medium against the platen causing the printing of a mark on the print medium in the shape of the print element.

According to one particular printer of the above kind and illustrated by way of example in United States Patent No. 4,428,284, each of the print elements is shaped like a dot and operation of each hammer causes the printing of a dot on the print medium. As the metal band moves continuously across the print medium, operation of selected hammers will result in the printing of a row of dots in positions on the print medium corresponding to the positions of the hammers which are operated. Each hammer is formed with a head which has a width in the direction of movement of the band

which is greater than the width of a single print element. It is therefore possible for each hammer to print a dot in any position on the print medium which is covered by the hammer by varying the timing of the operation of the hammer relative to the movement of the band. Therefore, the dots in the row printed can occupy many selected positions on the print medium. There is only a small gap between each pair of adjacent hammer heads and the hammers can therefore print dots at all required positions along the row being printed.

After one row of dots has been printed the print medium can be moved through a small increment transversely to the length of the platen and the operation can be repeated resulting in the printing of a second row of dots below the first row of dots. By repeating these operations rows of dots can be printed as required.

A character can be printed on the medium by printing dots in selected positions in a matrix, for example a matrix of five columns and seven rows. By printing dots in selected positions in rows as described above and selectively moving the print medium, characters can be printed in selected positions on the medium. In order for the characters to be printed correctly the positions of the dots must be defined accurately. For this to happen it is essential that each print element should move in a predetermined path when struck by a hammer. The path of movement of each print element is defined by the construction of the finger on which the element is mounted. As a print element is struck by a hammer its associated finger will deflect out of the plane of the band and will cause the print element to move into the printing position in which it abuts against the ink ribbon, moves the ink ribbon into contact with the print medium and presses the ink ribbon and the print medium against the platen.

Stresses will be set up in the finger due to the initial impact by the hammer and due to the subsequent movement of the finger. In particular stresses will be set up in the finger in the region of the point of attachment of the print element to the finger and in the region of the point of attachment of the finger to the band. Stresses will also be set up in the band in the region of the point of attachment of each finger to the band.

The band may be moved by means of a drive wheel located at one end of the platen and around which the band extends. As the wheel is rotated the portion of the band around the wheel will be bent to conform to the shape of the circumference of the wheel. The fingers on the band will not bend with the rest of the band and therefore, the fingers will project out of the plane of the band. As a result further stresses will be set up in each finger and in the band in the region of the point of attachment of

each finger to the band during normal movement of the band around the drive wheel.

As the fingers are moved during printing operations and as the band passes around the drive wheel the fingers will project out of the plane of the band and may make contact with fixed parts of the printer. It is therefore desirable that each finger should be shaped so that its movement will not be interrupted by making contact with fixed parts of the printer and so that it will not be damaged or deformed by such contact.

Various shapes for fingers of print element bands have been proposed and each finger can be formed by cutting slots in the band to define the edges of the finger. For example, in United States Patent No. 4,428,284 each finger is generally rectangular in shape, attached at one end to the band and with the print element attached to the other free end. Each finger extends either longitudinally along the band or transversely across the band. In United States Patent No. 3,667,384 each of the fingers is chevron shaped or V-shaped with the ends of the two arms of the chevron attached to the band and the print element attached to the apex of the chevron. The sides of each arm of each of the chevron shaped fingers extend substantially parallel to one another.

IBM Technical Disclosure Bulletin, Volume 27, No. 2, July 1984 at pages 1135/36 describes a chevron shaped finger for a print element band in which the sides of each arm of the chevron shaped fingers extend substantially parallel to each other. The points of attachment of the arms of the chevron are specially shaped so as to reduce stresses in the regions of these points of attachment. IBM Technical Disclosure Bulletin, Volume 24, No. 10, March 1982 at pages 5070/71 describes a chevron shaped finger for a print element band in which the sides of each arm of the chevron shaped finger extend substantially parallel to each other and in which the chevrons extend across the width of the band instead of along the length of the band.

In all the above kinds of finger for a print element band the shape of each finger and of the slots in the band which form the finger result in stresses occurring in the band and the fingers during the use of the fingers in a printing operation.

IBM Technical Disclosure Bulletin Vol 27, No 3, August 1984, pages 1677/1678 2nd IBM Technical Disclosure Bulletin Vol 27, No 10B, March 1985, pages 5940/5941 describe print element bands which include a metal band in the form of a continuous loop, a plurality of slots positioned symmetrically about a base line extending parallel to the longitudinal centre line of the band so as to define a plurality of flexible curved fingers also positioned symmetrically about the base line, and a print element attached to the apex of each finger.

The object of the present invention is to provide an improved print element band for a printer.

The present invention relates to a print element band for a printer comprising a metal band in the form of a continuous loop, a plurality of substantially V-shaped slots positioned symmetrically about a base line extending parallel to the longitudinal centre line of the band so as to define a plurality of flexible chevron shaped fingers also positioned symmetrically about the base line, and a print element attached to the apex of each chevron shaped finger.

According to the invention the band is characterised in that the shape of each V-shaped slot is such that the width of each chevron shaped finger is less in the regions of the points of attachment of the finger to the rest of the band than in the region of the apex of the finger.

It is found that, with chevron shaped fingers of the above design, when a print element on one of the fingers is struck by a hammer, the finger will deflect in such a way that the print element will move accurately perpendicular to the plane of the platen so that the printing operation is performed correctly.

#### BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects, features and advantages of the invention will be more fully understood by those working in the art by reading and understanding the following description of a preferred embodiment of the invention, wherein reference is made to the accompanying drawings of which:

Figure 1 is a diagrammatic plan view of a printer incorporating a metal print element band, including fingers on which are mounted print elements, which embodies the invention,

Figure 2 is a side view on a larger scale of the metal band used in the printer illustrated in Figure 1,

Figure 3 is a side view of part of the metal band illustrated in Figure 2 on a still larger scale,

Figure 4 is an end view of part of the metal band sectioned at the point of attachment of one of the print elements to one of the fingers on the metal band,

Figure 5 is a side view of one of the hammers of the hammer bank used in the printer illustrated in Figure 1,

Figures 6 and 7 are respectively a plan view and an end view in section of the metal band illustrating how one of the fingers on the metal band moves after the print element on the finger has been struck by the hammer of Figure 5, and

Figure 8 illustrates how the fingers on the metal band project out from the band as it passes around the drive wheel.

## BEST MODE OF CARRYING OUT THE INVENTION

Referring to Figure 1, the printer includes a platen 1 and a bank of hammers 2 mounted on the frame of the printer (represented diagrammatically at 3) and defining a print region 4 which extends between the platen and the hammer bank. A flexible metal band 5 in the form of a continuous loop and on which are mounted print elements is driven through the print region 4. The metal band 5 is made of a martensitic stainless steel. The band 5 has a thickness of about 4/1000 inch (0.1 millimeters) and a width of about 1½ inches (38.1 millimeters). The metal band 5 passes around the periphery of a drive wheel 6 located at one end of the print region and around the periphery of an idler wheel 7 located at the other end of the print region.

A print medium 8 and an ink ribbon 9 extend between the platen 1 and the metal band 5. The print medium 8, which is a continuous paper web, is driven intermittently over the surface of the platen 1 transversely relative to the platen by a print medium drive means illustrated diagrammatically at 11, 12 in order to bring selected parts of the print medium into the print region. The ink ribbon 9 is driven continuously along the length of the platen 1 through the print region 4 between the band 5 and the medium 8 by a ribbon drive means illustrated diagrammatically at 13, 14. The print medium drive means 11, 12 and the ribbon drive means 13, 14 are not described in detail because they do not form part of the invention.

The drive wheel 6 is mounted on a shaft 15 which is rotated at a constant speed by a suitable motor 16 so that the drive wheel 6 rotates in an anti-clockwise direction as seen in Figure 1 as indicated by the arrow A. The idler wheel 7 is mounted on a shaft 17 which is spaced from the shaft 15 by such a distance that the band 5 is in tension. The band 5 is guided through the print region 4 by a fixed guide member 18 extending along the length of the bank of hammers 2. Since the band 5 is in tension it fits closely to the guide member 18 and is kept flat as it passes through the print region 4.

The printer also includes two bearing members 19, 21 for the band 5. These bearing members are located respectively at the two ends of the print region 4 and serve to support the lower edge of the band 5.

The band 5 is illustrated more clearly in Figure 2 which is a side view of the band 5 from the hammer bank 2. The arrow B indicates the direction of movement of the band. The band 5 is formed with a series of slots 31, 32. The portions of material between the alternate slots 31, 32 form a set of flexible fingers 33 and spacers 34. The slots

31, 32 are generally V-shaped and are positioned symmetrically about a base line 22 which extends parallel to the longitudinal center line of the band 5 so that the fingers 33 are chevron shaped. At the apex of each of the fingers 33 is attached a print element 35 which will be described in greater detail below.

It will be seen that the sides of each arm of each slot 31 are straight but do not extend parallel to each other so that the outer ends 36 of each slot 31 are wider than the region 37 of each slot 31 near its apex. On the other hand the sides of each arm of each slot 32 are also straight but do extend parallel to each other. Therefore the sides 38, 39 of each arm of each finger 33 are straight but do not extend parallel to each other. As a result the width of the region 41 of each finger 33 where it is joined to the rest of the band 5 is smaller than the width of the region 42 of each arm of each finger 33 located adjacent to the apex and the point of attachment of the print element 35.

The band 5 is also formed with two sets of timing slots 51, 52, adapted to cooperate with an emitter device 23 on the printer. The device 23 is illustrated diagrammatically in Figure 1 as including a light source 24 and a light detector 25. Light from the source 24 is projected onto the region of the band in which the slots 51, 52 are formed and, on passing through any one of the slots 51, 52, is received by the light detector 25 which produces a corresponding signal. The slots 51 extend in a row along the length of the band, there being one slot 51 for each finger 33. The slots 52 also extend in a row along the length of the band 5, there being a plurality of slots 52 for each finger 33. The operation of the emitter device 23 in cooperation with the slots 51, 52 is not described in detail since it does not form part of the invention.

Figure 3 is a view of part of the band 5 illustrating one of the chevron shaped fingers 33 on a larger scale. By way of example, the dimensions of the finger 33 and of the slots 31, 32 forming the finger 33 are as follows.

Radii of parts of slots 31, 32 at the apex of each slot:

r1 = 1.51 mm

r2 = 1.2 mm

r3 = 1.06 mm

r4 = 0.42 mm

Radii of parts of slots 31, 32 at ends of arms:

r5 = 1.00 mm

r6 = 0.32 mm

Radius of print element 35:

r7 = 0.61 mm

Minimum width of slot 31 near apex:

d1 = 0.31 mm

Width of slot 32:

d2 = 0.64 mm

Distance from center of print element to apex of finger 33:

d3 = 1.2 mm

Length of arm of slot 31:

d4 = 16.8 mm

Length of arm of slot 32:

d5 = 13.6 mm

Width of finger 33 adjacent to attachment points to band 5:

d6 = 0.85 mm

Width of finger 33 adjacent to apex:

d7 = 1.95 mm

Angle between arms of finger 33 =  $84.36^\circ$

The above dimensions are given by way of example only and are only approximate.

Figure 4 illustrates one of the print elements 35 and the method of attaching it to one of the fingers 33 of the band 5. The element 35 consists of a cylindrical body portion 61 formed with a flange 62, a neck portion 63 having a diameter slightly less than the outer diameter of the body portion 61, a conical end portion 64 and a flat end face 65. The end face 66 of the conical end portion 64 is spherical. Alternatively the end face 66 can be flat. The element 35 is made of a relatively hard material, for example a martensitic stainless steel.

In order to attach the element 35 to the finger 33, a hole 67 of diameter just greater than the outer diameter of the body portion 61 of the element 35 is formed in the apex of the finger 33 and the body portion 61 of the element is inserted into the hole 67 so that the flange 62 abuts against the surface of the finger. A swaging ring 68 of relatively soft material, for example a free machining low carbon steel, is placed around the neck portion 63 of the element. By using a suitable swaging tool the ring 68 is deformed so that it is forced into the neck portion 63 and pulls the body portion 61 downwardly as viewed in Figure 4. As a result, the flange 62 is forced against the upper surface of the finger 33 and the element 35 is secured in position.

In order to perform a printing operation, the end face 65 of the print element 35 is struck by a hammer in the hammer bank 2 so that the element 35 moves into the printing position and the end face 66 performs the printing operation.

Figure 5 illustrates one of the hammers of the hammer bank 2 and shows how this hammer cooperates with the print elements 35 on the band 5 in order to perform printing operations.

The hammer bank 2 consists of a plurality of hammers 70 which can be of the type described in general terms in United States Patent No. 4,428,284. Each hammer 70 consists of a resilient flexible arm 71 attached at one end 72 to a hammer frame member 73 and formed at its other end with a hammer head 74. On the frame member 73

are mounted two permanent magnets 75, 76 and a pole piece 77 and all these components cooperate to produce a magnetic flux. This flux attracts the free end of the flexible arm 71 into a cocked position in which the arm rests against the pole piece 77 and is resiliently biased away from this cocked position by its natural resilience. A coil 78 surrounds the pole piece 77. When the coil 78 is energised it produces another magnetic flux which overcomes the magnetic flux produced by the frame member 73, the permanent magnets 75, 76 and the pole piece 77 and releases the flexible arm 71 from its cocked position. The arm 71 moves away from the frame 73 and the hammer head 74 on the free end of the arm 71 projects through a gap 79 in the guide member 18 attached to the hammer bank 2 and strikes the flat end face 65 of a print element 35 which is in position adjacent to the hammer. The hammer head 74 is made of a suitable material, such as a carburised low carbon steel with a hard chromium outer layer so as to be able to withstand the repeated impacts that occur during operation of the printer.

The hammers 70 are mounted on a common frame 81 which extends along the platen 1 and all the hammer heads 74 are aligned along a line extending along the platen. The frame 81 supports the guide member 18 and also supports connections (not illustrated) to drive circuits for the coils 78 of the hammers which are located elsewhere in the printer. The operation of the hammers is described in detail in United States Patent No. 4,428,284 and does not form part of the invention.

When the flat end face 65 of a print element 35 is struck by a hammer, the chevron shaped finger 33 on which the print element is mounted will deflect out of the plane of the band 5 so that the end face 66 impacts the ribbon 9 moving it into contact with the print medium 8. The ribbon 9 and the print medium 8 are pressed against the platen 1 and a printing operation is performed. A dot of the same shape as the end face 66 of the element 33 is printed.

It is essential that the axis of the print element 35, as it impacts the ribbon 9 and presses the ink ribbon 9 and the print medium 8 against the platen 1, is accurately at right angles to the plane of the platen 1 so that a dot will be printed in the required position. Two factors may prevent this from happening, one that the hammer does not strike the print element directly in the center of the end face 65 and the other that the construction of the finger 33 does not allow movement of the print element in a path at right angles to the plane of the platen 1.

Figures 6 and 7 illustrate diagrammatically the various ways in which the finger 33 can deflect upon impact by a hammer. Figure 6 is a diagrammatic plan view of one of the fingers 33 to which is

attached a print element 35. The print element 35 is in a position to be struck by a hammer head 74. If the hammer head 74 strikes accurately in the center of the end face 65 of the print element 35 and the finger 33 is correctly shaped, the finger 33 will deflect into an S-shape as illustrated in Figure 6a. The axis of the print element 35 will remain accurately at right angles to the plane of the platen 1 and accurate printing will result. If the hammer head 74 strikes the end face 65 at a point spaced to the right of its center, the finger 33 will deflect into a C-shape as illustrated in Figure 6b. In this situation the axis of the print element 35 will not remain accurately at right angles to the plane of the platen 1 as illustrated and inaccurate printing will result. If the hammer head 74 strikes the end face 65 at a point spaced to the left of its center, the finger 33 will deflect into an S-shape as illustrated in Figure 6c. In this situation also the axis of the print element 35 will not remain accurately at right angles to the plane of the platen 1 as illustrated and inaccurate printing will result.

Figure 7 is a diagrammatic end view of one of the fingers 33, as viewed along the length of the band 5, to which is attached a print element 35. The element is in a position to be struck by the head 74 of a hammer 71. If the hammer head 74 strikes accurately in the center of the end face 65 of the print element 35 and the finger 33 is correctly shaped, the finger will deflect symmetrically as illustrated in Figure 7a and accurate printing will result. If the hammer head 74 strikes the end face 65 at a point spaced to the right or to the left of its center, the finger 33 will deflect asymmetrically as illustrated in Figures 7b and 7c. In these situations the axis of the print element 35 will not remain accurately at right angles to the plane of the platen 1 and inaccurate printing will result.

When each print element 35 is struck by the hammer head 74 and the associated finger 33 is deflected, the finger 33 will bend and stresses will occur in the finger at the point S1 adjacent to the apex of the finger 33 at the point of attachment of the element 35, and at the points S2 adjacent to the points of attachment of the finger 33 to the rest of the band 5, as illustrated in Figures 6 and 7. It is desirable that these stresses be reduced to a minimum in order to increase the life of the print element band 5.

Figure 8, which is a diagrammatic plan view of the drive wheel 6 and part of the band 5, illustrates how each finger 33 deflects away from the rest of the band 5 as the band passes around the periphery of the drive wheel 6. As the band 5 moves onto the periphery of the drive wheel it bends to conform to the shape of the periphery. However, each of the fingers 33 will not bend and, as a result, each finger 33 will project above the periphery of

the wheel 6 as illustrated. Stresses are therefore set up in the band 5 at S3 in the regions of the points of attachment of each finger 33 to the band 5. Further, when the fingers 33 are in the positions illustrated in Figure 8 in which they project out of the rest of the band 5, there is a possibility that any one of the fingers 33 will come into contact with a fixed part of the printer.

The overall shape of and the dimensions of the slots 31, 32 provided in the band 5 so as to form the fingers 33 are selected so as to reduce:

- (a) the chances of each of the print elements 35 not moving accurately at right angles to the platen 1 when struck by a hammer head 74,
- (b) the values of the stresses set up at S1 and S2 in each of the fingers 33 and at S3 in the regions of the band 5 adjacent to the points of attachment of the fingers 33 to the band,
- (c) the chances of a finger 33 being damaged or deformed by making contact with any fixed part of the printer.

As will be apparent from Figures 3 and 4 the main characteristic of each of the fingers 33 is that it is chevron shaped, with the arms of the chevron positioned symmetrically about a base line 22 extending parallel to the longitudinal center line of the band 5 and the apex of the chevron located at the rear of the finger with respect to the direction of movement of the band 5. A further characteristic is that the width of each arm of each chevron in the regions 41 near the points of attachment of the arm to the band 5 is less than the width of each arm in the region 42 near the apex of the chevron. Yet another characteristic is that the sides 38, 39 of each arm are straight. These characteristics tend to ensure that each finger 33 will take up the S-shape illustrated in Figure 6a when the print element 35 is struck by a hammer head 74 even if the hammer head makes contact at a point spaced from the center of the end face 65 of the print element 35 as illustrated in Figures 6b and 6c. This shape also tends to reduce the values of the stresses set up in the fingers in the regions S1, S2 as illustrated in Figure 6.

Making each finger 33 in the shape of a chevron with two equal sized arms positioned symmetrically about the base line 22 extending parallel to the longitudinal center line of the band 5 tends to ensure that the finger 33 will take up the symmetrical shape illustrated in Figure 7a when the print element 35 is struck by a hammer head 74, even if the hammer head makes contact at a point spaced from the center of the end face 65 of the print element as illustrated in Figures 7b and 7c.

If the fingers 33 are in the positions illustrated in Figure 8 and one of the fingers comes into contact with a fixed part of the printer, the finger will move back towards the rest of the band 5. The

likelihood of damage being done to the finger or the finger being deformed is low since the apex of each finger is located at the rear of the finger 33 with respect to the direction of movement and the finger will tend to slide over the fixed part of the printer with which it comes into contact.

A further characteristic of each of the slots 31 is that the radius of each end 36 of the slot is appreciably greater than the radius of the ends of each of the slots 32. This tends to ensure that the values of the stresses set up at S3 in the regions of the band 5 adjacent to the points of attachment of the arms of the fingers 33 are reduced.

The band 5 is constructed by taking a long continuous strip of metal etching out the geometrics herein described. As an alternative these slots and holes can be formed by punching or by burning out using a laser. Each of the print elements 35 is then inserted into its respective hole 67 and secured in position by swaging, using a ring 68 of deformable material as described above. The continuous strip is then cut into short individual strips each equal to the length of a band and the ends of each individual strip are welded together to form the individual bands 5 as continuous loops.

### Claims

1. A print element band for a printer comprising
  - a metal band (5) in the form of a continuous loop,
  - a plurality of substantially V-shaped slots (31, 32) positioned symmetrically about a base line (22) extending parallel to the longitudinal centre line of said band so as to define a plurality of flexible chevron shaped fingers (33) also positioned symmetrically about said base line, and
  - a print element (35) attached to the apex of each chevron shaped finger (33),
  - characterised in that
  - the shape of each V-shaped slot (31, 32) is such that the width of each chevron shaped finger is less in the regions (41) of the points of attachment of said finger to the rest of said band than in the region (42) of the apex of the finger.
2. A print element band as claimed in Claim 1 characterised in that the apex of each chevron shaped finger is located at the rear of the finger relative to the intended direction of movement of said band when it is in use in a

printer.

### Revendications

1. Bande d'éléments d'impression pour une imprimante, comprenant
    - une bande métallique (5) sous la forme d'une boucle continue,
    - une pluralité de fentes sensiblement en forme de V (31,32) disposées symétriquement par rapport à une ligne de base (22) parallèle à l'axe longitudinal de la dite bande, de façon à définir une pluralité de doigts flexibles en forme de chevron (33) également disposés symétriquement par rapport à ladite ligne de base, et
    - un élément d'impression (35) fixé au sommet de chaque doigt en forme de chevron (33),
    - caractérisée en ce que
    - la forme de chaque fente en V (31,32) est telle que la largeur de chaque doigt en forme de chevron est plus faible dans les régions-(41)des points d'attache dudit doigt au reste de ladite bande que dans la région (42) du sommet du doigt.
  2. Bande d'éléments d'impression suivant la revendication 1,
    - caractérisée en ce que
    - le sommet de chaque doigt en forme de chevron est situé à l'arrière du doigt par rapport à la direction de mouvement prévue de ladite bande lorsqu'elle est en service dans une imprimante.
- ### Patentansprüche
1. Typenband für einen Drucker
    - mit einem Metallband (5) in Form einer Endlosschleife,
    - mit einer Mehrzahl im wesentlichen V-förmiger Schlitze (31, 32), die bezüglich einer sich parallel zu der Längsmittellinie des Bandes erstreckenden Basislinie symmetrisch gelegen sind, um hiedurch eine Mehrzahl flexibler, Chevron-förmiger Finger (33) zu bilden, die gleichfalls bezüglich der Basislinie symmetrisch gelegen sind, und
    - mit einem an der Spitze jedes Chevron-förmigen Fingers (33) angebrachten Druckelement (35),
    - dadurch gekennzeichnet, daß jeder V-förmige Schlitz (31, 32) so geformt ist, daß die Breite

jedes Chevron-förmigen Fingers in Bereich (41) der Verbindungsstellen des Fingers mit dem übrigen Band geringer ist, als in dem Bereich (42) der Spitze des Fingers.

2. Typenband nach Anspruch 1, dadurch gekennzeichnet, daß die Spitze jedes Chevron-förmigen Fingers bezüglich der vorgesehenen Bewegungsrichtung des Bandes bei seiner Verwendung in einem Drucker an der Hinterseite des Fingers gelegen ist.

5

10

15

20

25

30

35

40

45

50

55

9

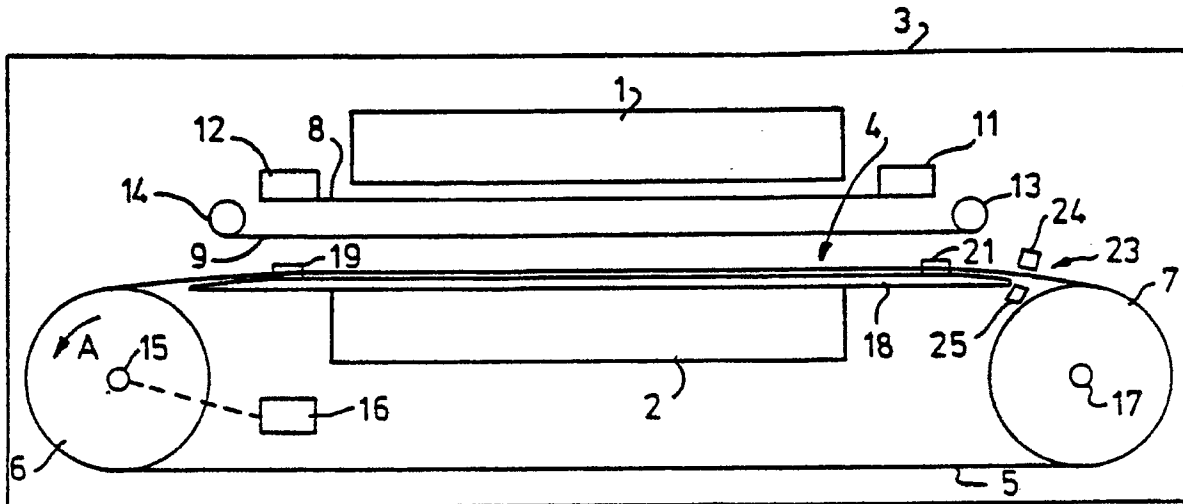


FIG. 1

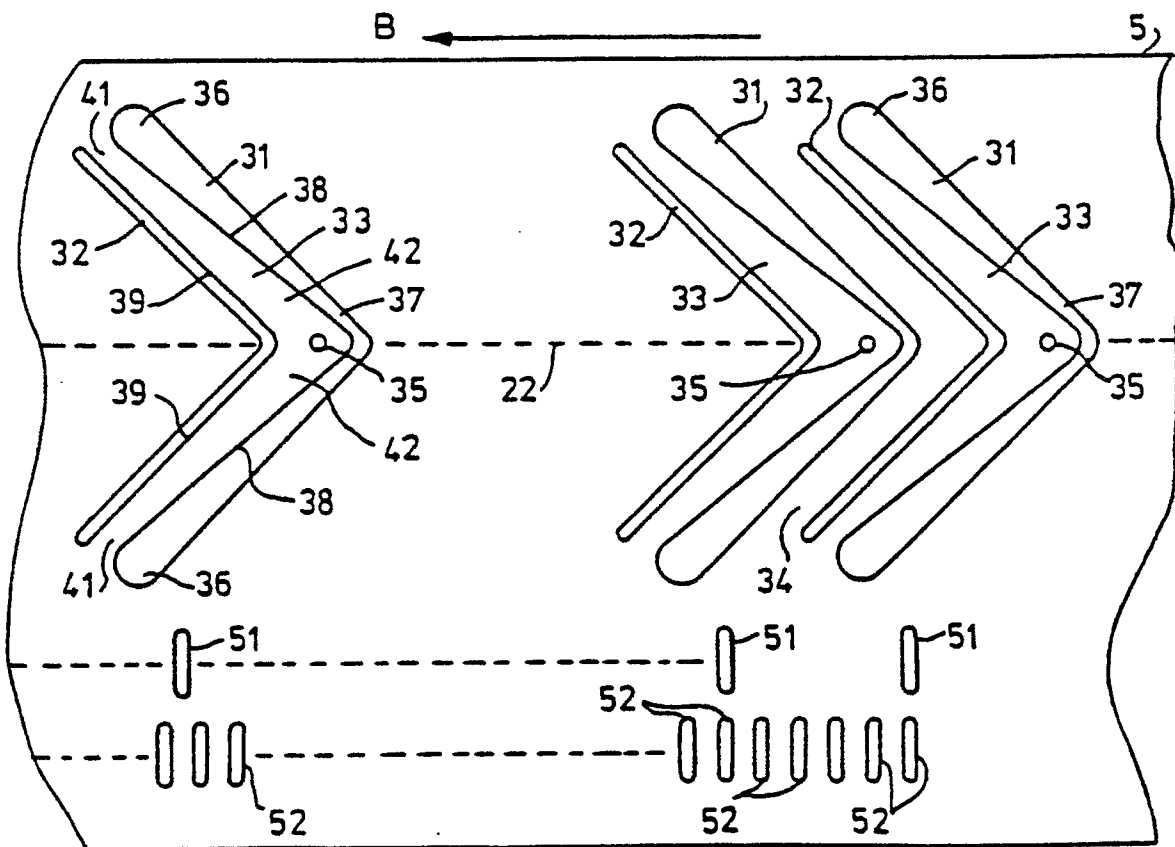
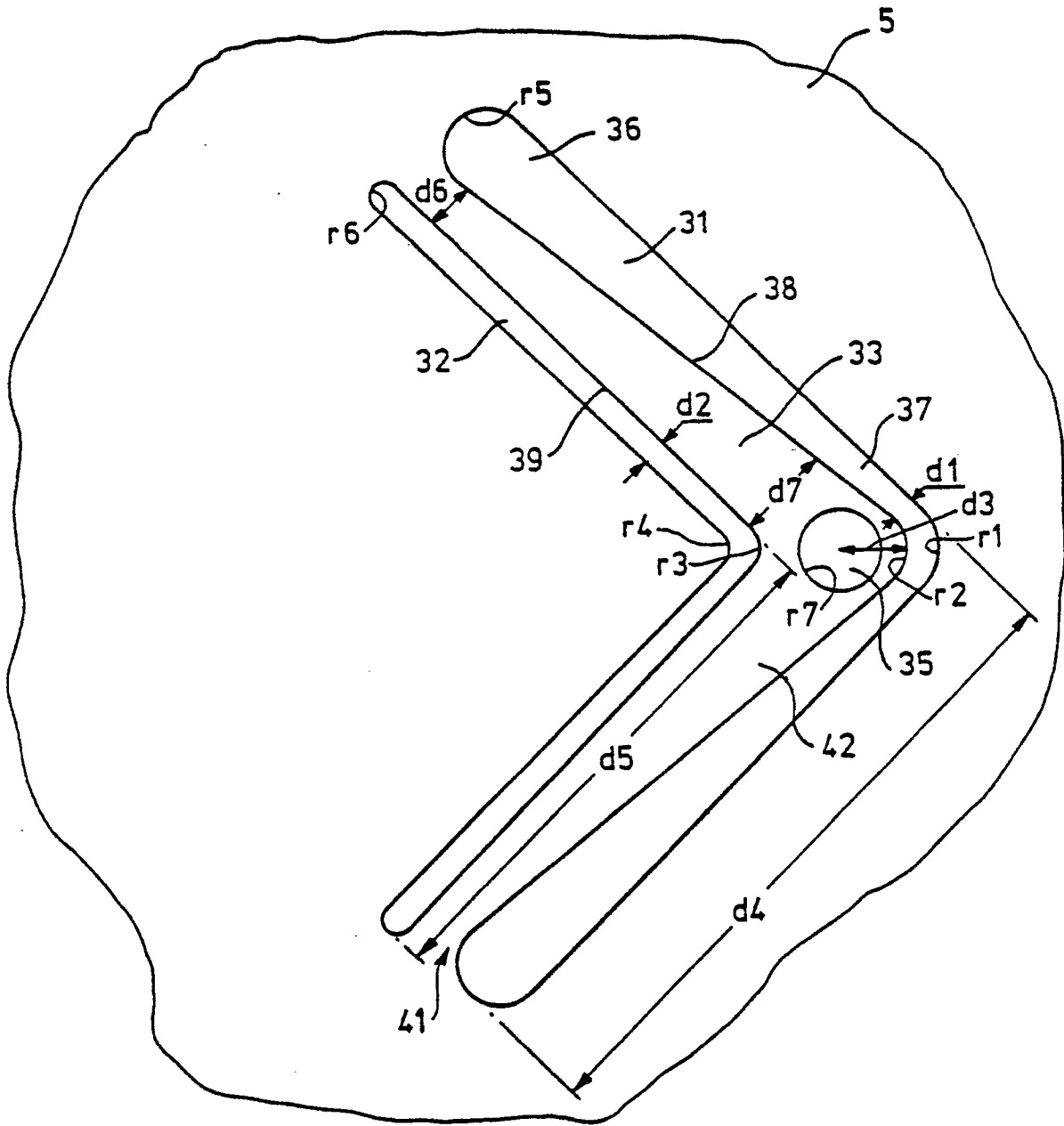


FIG. 2



**FIG. 3**

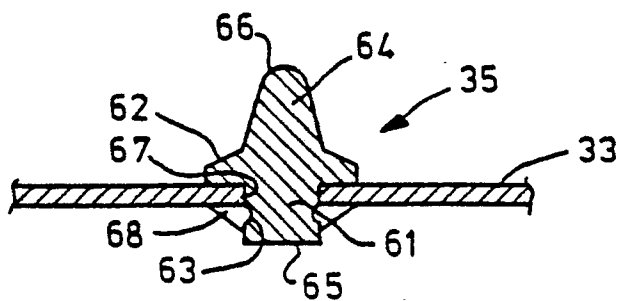


FIG. 4

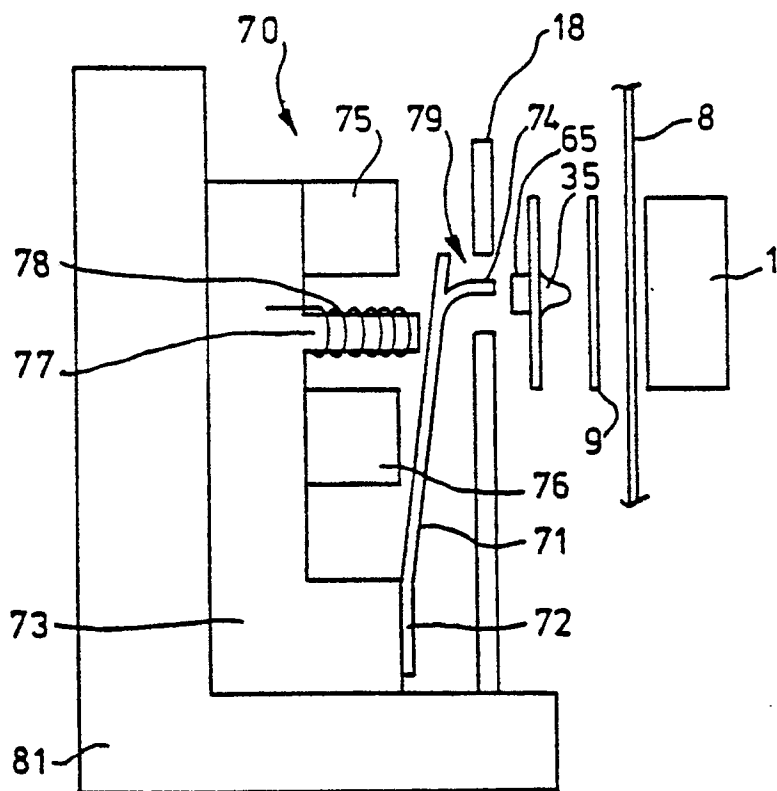


FIG. 5

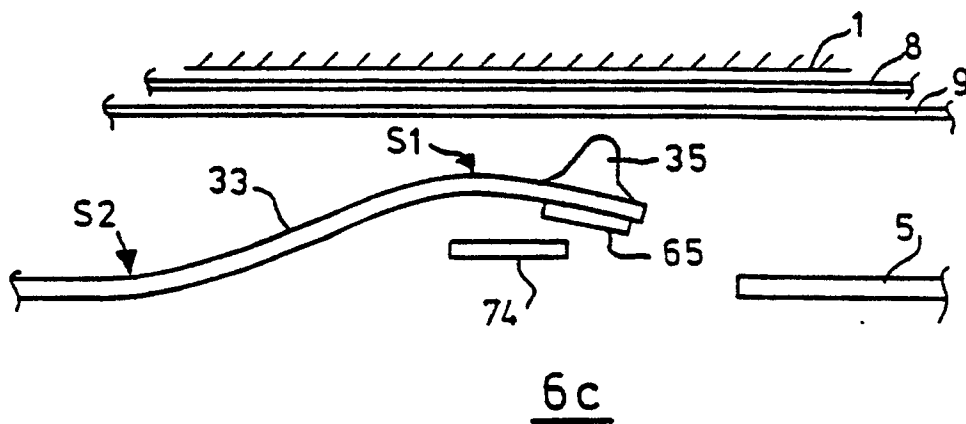
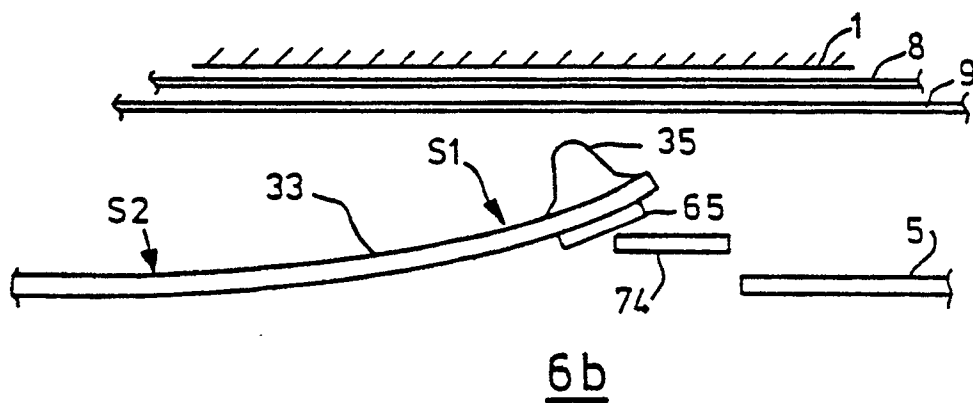
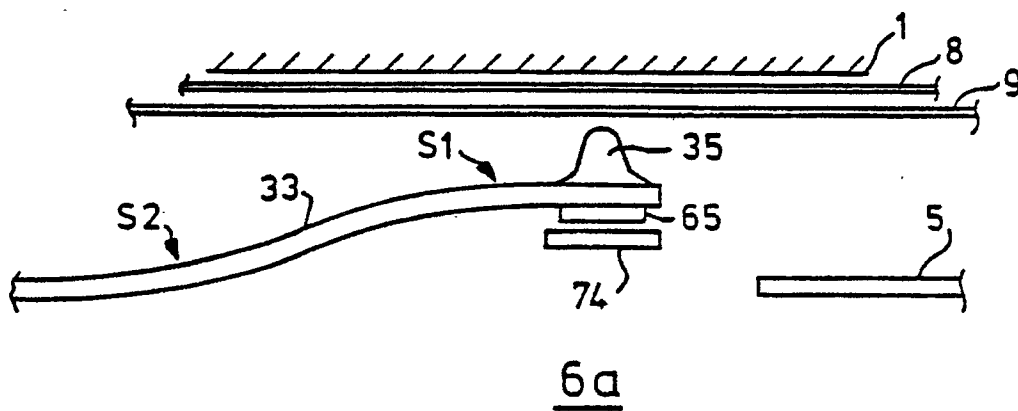


FIG. 6

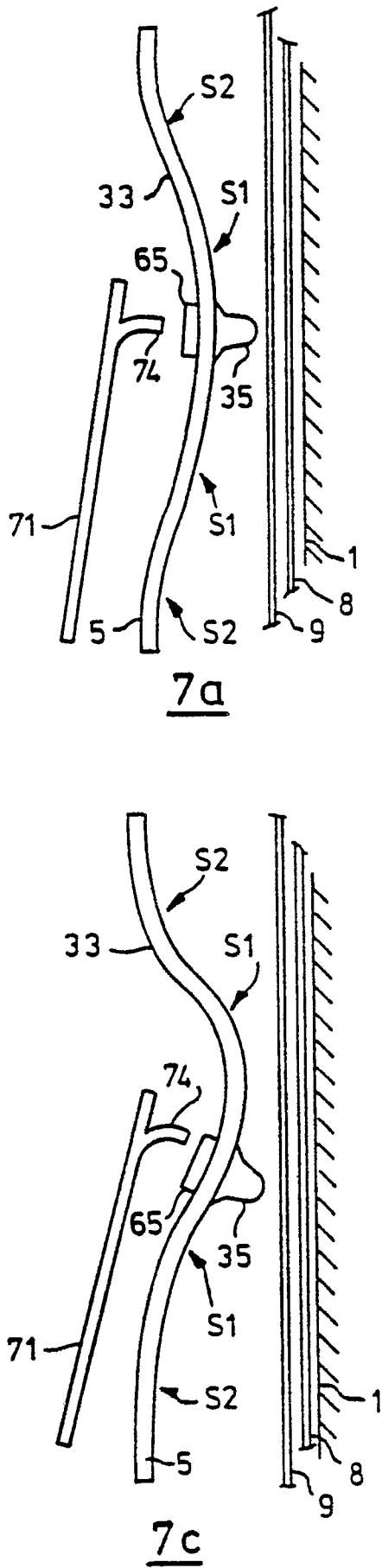


FIG. 7

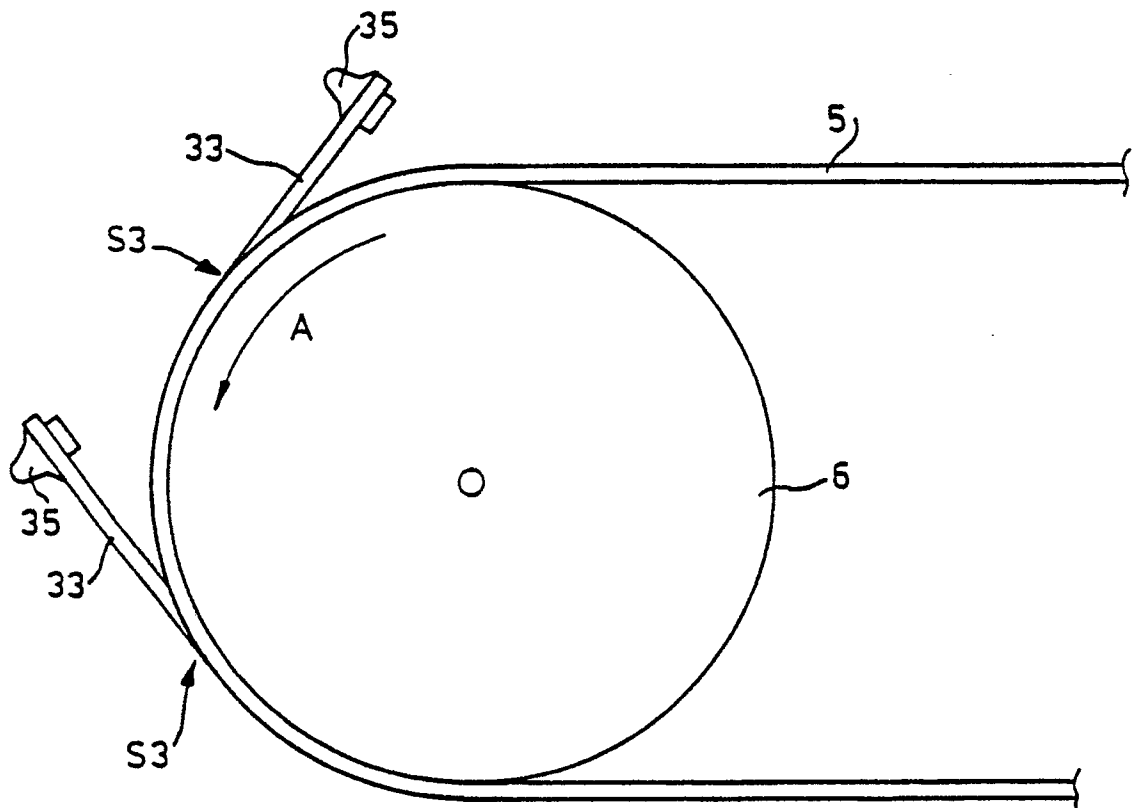


FIG. 8