



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US86/01237 (22) International Filing Date: 6 June 1986 (06.06.86) (31) Priority Application Number: 749,357 (32) Priority Date: 27 June 1985 (27.06.85) (33) Priority Country: US</p> <p>(71) Applicant: NCR CORPORATION [US/US]; World Headquarters, Dayton, OH 45479 (US). (72) Inventors: BANGS, Richard, G. ; 210 South Hill Terrace, Ithaca, NY 14850 (US). GREY, Michael, O. ; 240 Enfield Center Road, Ithaca, NY 14850 (US). (74) Agents: SESSLER, Albert, L., Jr. et al.; Group Intellectual Property Counsel, Law Department, NCR Corporation, World Headquarters, Dayton, OH 45479 (US).</p>		<p>(81) Designated States: DE (European patent), FR (European patent), GB (European patent), JP.</p> <p>Published <i>With international search report.</i></p>
<p>(54) Title: THERMAL PRINTER</p>		
<p>(57) Abstract</p> <p>A thermal printer (10) includes a print head (12) mounted in a housing (14) and having a plurality of electrically energizable thermal print elements (28) formed on a substrate. A ribbon-type cable (24) supplies electrical current to the thermal print elements (28) via conductors (26) formed on the substrate. The end of the cable (24) which is connected to the print head (12) has exposed individual leads (42) the free ends of which are positioned in first recess means (44) formed in the housing (14). The housing (14) includes second recess means (30) for slidably receiving the print head (12). Positioning means hold the cable (24) with the exposed leads (42) respectively in juxtaposition with associated conductors (26) on the substrate, the leads (42) being urged into contact with the associated conductors by an elongated member (52) of resilient material. When the print head (12) is to be replaced, it may be readily removed from the housing (14) by simply sliding it out of said second recess means (30).</p> <div data-bbox="861 1243 1460 2016" data-label="Image"> </div>		

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THERMAL PRINTERTechnical Field

This invention relates to thermal printers. The invention is concerned in particular with thermal printers of the kind including a print head mounted in a housing and having a plurality of electrically energizable thermal print elements formed on a substrate, and a cable for supplying electrical current to said thermal print elements via electrical conductors formed on said substrate.

Background Art

In the area of thermal printers, it is well-known that the use of such printers is increasing for certain operations that require a reduction in noise levels and at a reasonable cost. While development work is continually progressing to increase speed of operation with minimum maintenance or care of the equipment, it is desirable that improvements should be made to enable operator involvement in the maintaining of such equipment.

In the case of typewriters or like apparatus, it is common practice for the operator to replace the typewriter ribbon at periodic intervals or on an as-required basis. It is also within the capability of the operator of a printer or like recording equipment to replace the ribbon cassette periodically or as required.

In the case of thermal printers of the kind specified, it will be appreciated that the thermal print head needs to be replaced when the print head fails to operate or ceases to provide sharp and precise printing, by reason of failure or wear of one or more of the conductors and print elements on the substrate or for other reasons. A flexible flat

ribbon-like cable may be used to connect with pads or contact surfaces of the conductors on the print head, and the individual leads or wires of the cable may include end connectors or terminals for contact with the print head conductors. Since the leads or the end connectors or terminals of the individual leads may be exposed and not protected when the print head is removed, it is necessary to ensure that the terminals or the ends of the leads are not damaged when a print head is reinstalled in the printer.

From U.S. Patent No. 4390884 there is known a print head assembly having a replaceable stylus insert including a set of spaced elements arranged to receive electrical printing signals, said elements being adapted to influence a medium such as a ribbon to cause marking. The assembly includes a housing having first and second clamping sections between which are housed the stylus insert and a termination section of a cable, the stylus and termination section being urged together by means of a compressible backing sheet. The housing includes alignment pins for ensuring that contact pads on the stylus are in registration with associated contact pads on the termination section of the cable. A disadvantage of this known print head assembly is that the stylus insert is not readily replaceable by an operator, since it is necessary to dismantle the cable before the stylus insert can be replaced.

Disclosure of the Invention

It is an object of the invention to provide a thermal printer of the kind specified wherein the print head assembly is of simple construction, and wherein the print head may be readily replaced by an operator without any dismantling of the print head housing being necessary.

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According to the invention there is provided a thermal printer including a print head mounted in a housing and having a plurality of electrically energizable thermal print elements formed on a substrate, and a cable for supplying electrical current to said thermal print elements via electrical conductors formed on said substrate, characterized in that said cable is in the form of a ribbon-type cable having at one end exposed individual leads the free ends of which are positioned in first recess means formed in said housing, and in that said housing includes second recess means for slidably receiving said print head, and positioning means for holding said cable so that said exposed leads are respectively in juxtaposition with associated ones of the electrical conductors on said substrate, said housing having mounted therein resilient means for urging said exposed leads into contact with the associated electrical conductors on said substrate, whereby said print head may be slidably removed from said housing and replaced by a similar print head slidably insertable into said second recess means in said housing, said free ends of said exposed leads being held by said first recess means out of the path of said print head.

Brief Description of the Drawings

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a portion of a thermal printer incorporating the subject matter of the present invention in a preferred arrangement thereof;

Fig. 2 is a view taken on the line 2-2 of Fig. 1;

Fig. 3 is an enlarged sectional, side elevational view of the print head housing;

Fig. 4 is a sectional, side elevational view showing the ribbon cable installed and retained in position relative to the print head;

Fig. 5 is a sectional, side elevational view showing a modification of the print head assembly; and

Fig. 6 is a side elevational view showing a modification of a cable clamp portion of the print head housing.

Best Mode for Carrying Out the Invention

Referring now to Fig. 1, there is shown a perspective view of a portion of a printer 10 which includes a thermal print head 12 supported from and carried by a print head housing 14. In this particular printer, printing is accomplished in the direction as indicated by the arrow 15. It is well-known that a thermal print head, as 12, provides for relatively fast and silent operation by reason of the non-impact thermal element construction and arrangement. Thermal paper 16 (Fig. 5) is caused to be directed and driven in a path from a supply (not shown) around a platen 18 and then past the print head 12.

The print head housing 14 comprises a first portion 20 thereof (see also Fig. 3) for use in carrying the print head 12 and another or a second portion 22 for clamping a flat ribbon-like cable 24 for supplying current to the print head 12 for printing on the thermal paper 16. The housing 14 is of unitary construction and the two portions 20 and 22 thereof provide for supporting and carrying the print head 12 and for clamping the cable 24 in an arrangement enabling integral construction of the two portions. Printing is effected as the print head assembly is moved in the direction of arrow 15.

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The print head 12 includes an alumina substrate and a plurality of connector pads or runs 26 in the form of current conductors preferably made of palladium, silver, or gold and which pads or runs are screened onto the substrate. The substrate also has formed thereon thermal print elements, as at 28, connected with the upper ends of the respective runs 26 engageable with the individual leads or wires of the cable 24. The carriage portion 20 includes slots, as at 30, at the sides thereof for receiving the print head 12 in vertical sliding manner when it is necessary to replace the print head.

As seen in Figs. 3 and 4, the clamp portion 22 of the print head housing 14 is formed in irregular shape and provides a cavity 40 for receiving the cable 24 into a position adjacent and in contact with the print head 12. As is well-known, the flat cables which are widely used in printers include a plurality of individual leads or conductors in side-by-side manner (Fig. 1) and which are insulated from each other. The flat cable, of course, is widely used and is extremely suitable for use in those printers wherein the print head travels in reciprocating motion, and printing may be performed in either or both directions of travel of the print head.

The end of the cable 24 is not insulated in order to expose the individual leads or wires 42 so as to make good and proper contact thereof with the print head contact areas associated with the connector pads or runs 26. Fig. 1 shows the individual leads or wires 42 of the cable 24 with the cable insulation removed to expose the wires, whereas Fig. 4 includes connectors or terminals 43 crimped to the respective wires 45 as an extension of the leads of the cable 24 in a slightly modified arrangement. The clamp portion 22 includes an elongated notch 44 substantially along

the length thereof for receiving the ends of the individual leads 42, as seen in Fig. 1, and for training such ends away from the upper portion of the print head 12, as seen in Fig. 4. A plurality of separation pins 46, Figs. 2 to 4, are provided along the base or inward side of the notch 44 to space and to maintain separation of the individual leads from each other.

As seen in Fig. 3, a curved recess 50 is provided in the clamp portion 22 of the housing 14 for receiving a short length of silicone rubber rod 52 (Figs. 1 and 4) extending transversely to the leads 42. The silicone rubber element 52 provides constant pressure as a function of time since the material does not cold flow and therefore urges the leads 42 into, and maintains them in contact with, the connector elements 26 at or near the bottom edge of the print head 12. A barb 54 along the lower edge of the recess 50, Fig. 3, serves to retain the individual leads 42 (or the extension leads 45) of the cable 24 in position during operation of the printer and prevents movement of the cable either in longitudinal or lateral direction. The barb 54 and pins 46 together serve to hold the leads 42 or 45 respectively in juxtaposition with associated ones of the connector elements 26.

Fig. 5 shows a modification of the print head assembly wherein the print head 12 is again carried by the carriage portion 20 of the housing 14, and the clamp portion 22 thereof retains the cable 24 in precise position. One difference in Fig. 5 from the preferred structure of Figs. 1-4 is that the rod 52 is replaced by a length of silicone rubber tubing 64 and that the recess 60 for the silicone rubber tubing 64 is of square construction, which may allow the tubing to be squeezed into the corners during insertion of the cable 24. Another area of modification is that

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the print head carriage portion 20 and the clamp portion 22 of the housing 14 include two barbed edges 62 in opposed relationship for retaining the cable 24 in position.

Fig. 6 shows the clamp portion 22 having a different form of construction for the notch or slot 44 for the ends of the leads, and also including the curved recess 50 for the tubing 64. It is seen that while the structure of Fig. 6 does not include the separation pins 46, such pins may be incorporated therein to prevent shorting of the individual leads.

When the print head 12 needs to be replaced, it is seen that the print head 12 may be easily removed by the operator of the printer 10 without any dismantling of the housing 14 being necessary. The print head 12 is caused to be slidably lifted from the bottoming support and out of the guides, as at 30 (Fig. 1), and upwardly away from the bare individual leads 42 or lead extensions 45 of the cable 24. While the silicone rod 52 or tubing 64 provides resilient urging of the individual leads 42 or 45 against the connector pads or elements 26 of the print head 12, the print head can be conveniently removed from the carriage portion 20 of the housing 14. A replacement print head 12 can then be conveniently installed in the printer 10, it being seen that the bare ends of the individual leads or wires 42 or 45 of the cable 24 are removed from the path of the print head as it is being inserted into the guide slots 30 of the housing 14 and that such leads or wires are protected and not subject to being bent by the action of installing the print head. When the print head 12 is installed and bottomed in the carriage, the rod 52 or tubing 64 again exerts pressure on the leads or wires 42 or 45 to maintain contact thereof with the connection elements 26 on the print head.

It is thus seen that herein shown and described is a print head assembly that includes a unitary member both for containing or carrying the print head and for clamping the cable for precise positioning thereof relative to the print head.

Claims

1. A thermal printer including a print head (12) mounted in a housing (14) and having a plurality of electrically energizable thermal print elements (28) formed on a substrate, and a cable (24) for supplying electrical current to said thermal print elements via electrical conductors (26) formed on said substrate, characterized in that said cable (24) is in the form of a ribbon-type cable having at one end exposed individual leads (42) the free ends of which are positioned in first recess means (44) formed in said housing (14), and in that said housing (14) includes second recess means (30) for slidably receiving said print head (12), and positioning means (54, 46) for holding said cable (24) so that said exposed leads are respectively in juxtaposition with associated ones of the electrical conductors (26) on said substrate, said housing (14) having mounted therein resilient means (52) for urging said exposed leads (42) into contact with the associated electrical conductors on said substrate, whereby said print head (12) may be slidably removed from said housing (14) and replaced by a similar print head slidably insertable into said second recess means (30) in said housing, said free ends of said exposed leads being held by said first recess means (44) out of the path of said print head.

2. A thermal printer according to claim 1, characterized in that said housing (14) is of unitary construction and includes a first portion (20) in which said second recess means (30) are formed, and a second portion (22) in which said first recess means (42) are formed.

3. A thermal printer according to claim 2, characterized in that said resilient means (52) is in the form of an elongated member of resilient material positioned between said exposed leads (42) and said second portion (22) and extending transversely to said exposed leads (50), said elongated member (52) being partially accommodated in a recess (50) formed in said second position (22).

4. A thermal printer according to any one of the preceding claims, characterized in that said positioning means (54, 46) includes barb means (54) integral with said housing (14) and arranged to engage with said cable (24).

5. A thermal printer according to any one of the preceding claims, characterized in that said positioning means (54, 46) includes a plurality of projections (46) formed on said housing (14) and associated with said first recess means (44), said projections being arranged to maintain separation of said exposed leads (42) from one another.

6. A thermal printer according to claim 3, characterized in that said elongated member (52) is of silicone rubber.

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FIG. 1

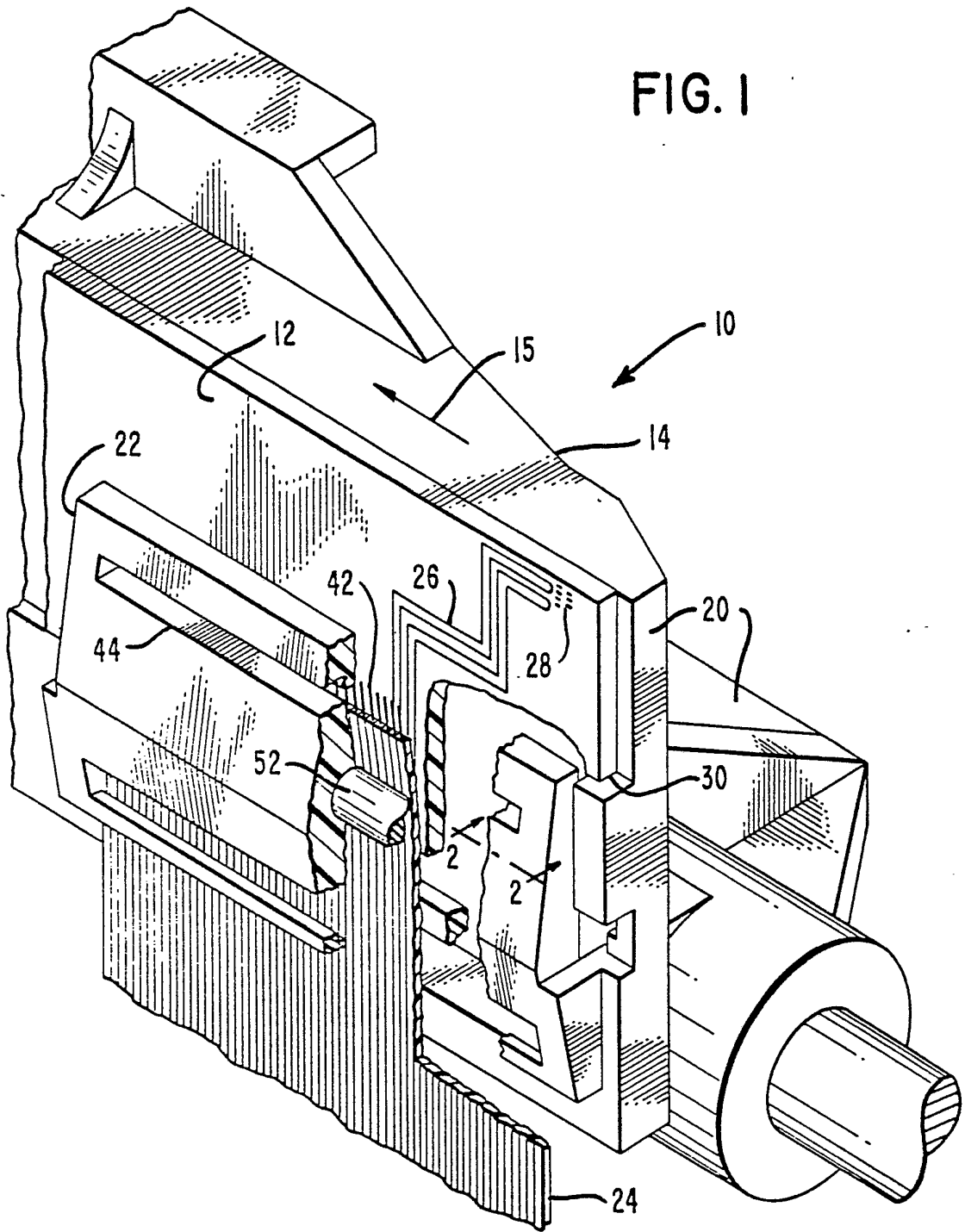


FIG. 2

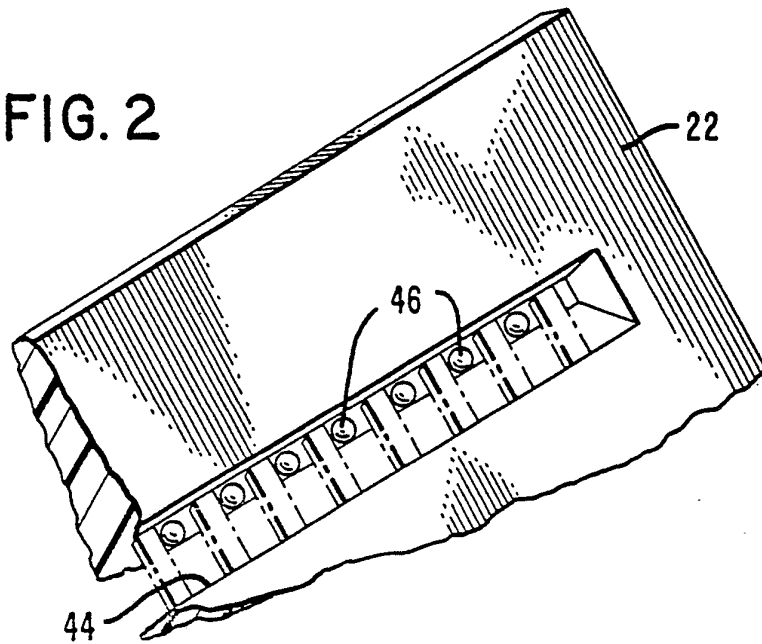


FIG. 4

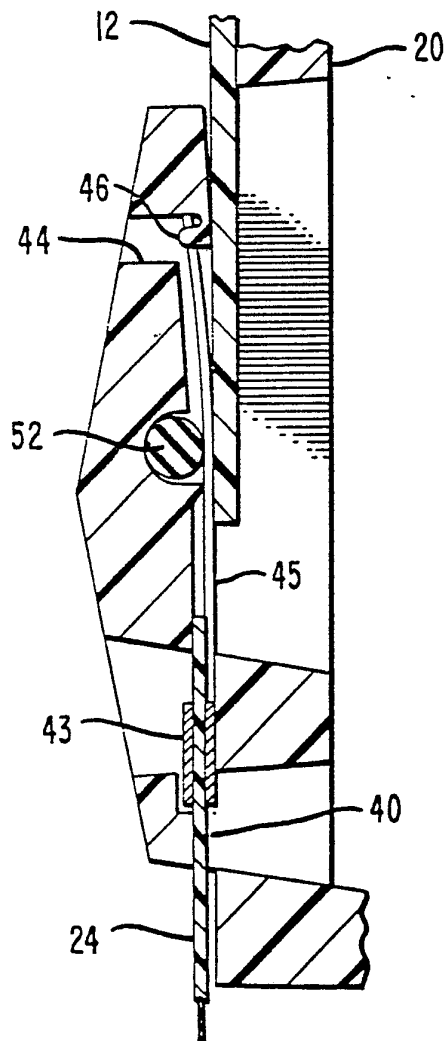


FIG. 3

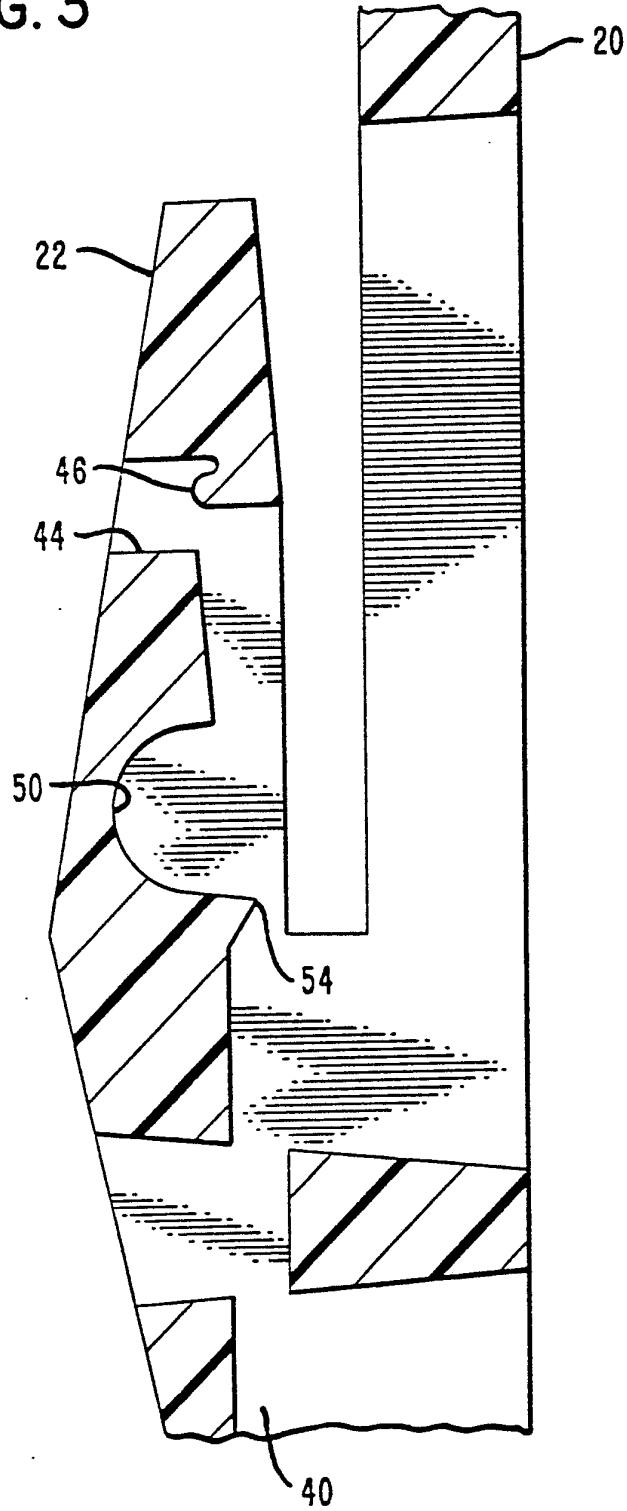


FIG. 5

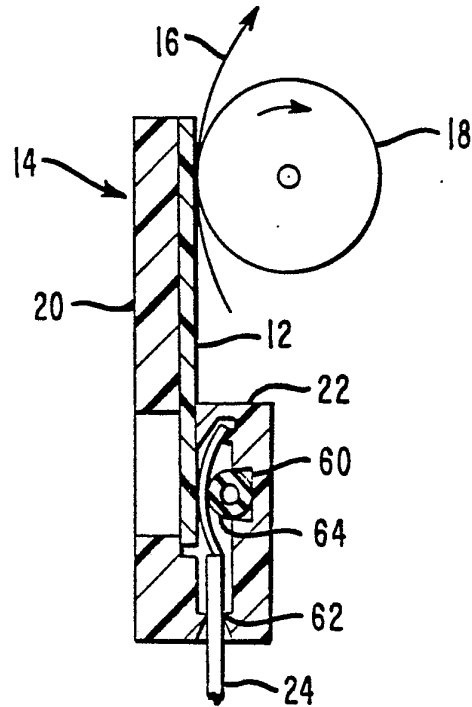
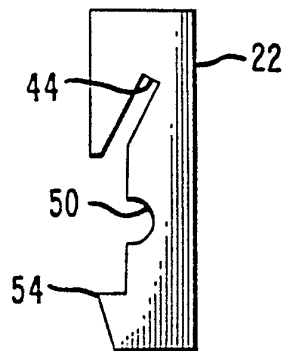


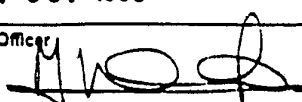
FIG. 6



INTERNATIONAL SEARCH REPORT

International Application No PCT/US 86/01237

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ⁴ : H 01 R 23/66		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC ⁴	H 01 R 9/00; H 01 R 23/00; B 41 J 3/00	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category ⁹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y	Patents Abstracts of Japan, volume 9, no. 34, (M-357)(1757) 14 February 1985 & JP, A, 59176065 (KIYOUSERA K.K.) 5 October 1984, see abstract	1
Y	-- DE, A, 2424419 (HARTMANN) 4 December 1975, see pages 3,4; claims 1,2; figures	1
A	--	3,6
A	EP, A, 0083419 (IBM) 13 July 1983, see page 5, lines 10-24; figure 1 (cited in the application)	1,4

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24th September 1986	24 OCT 1986	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	M. VAN MOL 	

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/US 86/01237 (SA 13598)

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A- 2424419	04/12/75	None	
EP-A- 0083419	13/07/83	US-A- 4390884	28/06/83
		JP-A- 58118263	14/07/83
		CA-A- 1175288	02/10/84

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