



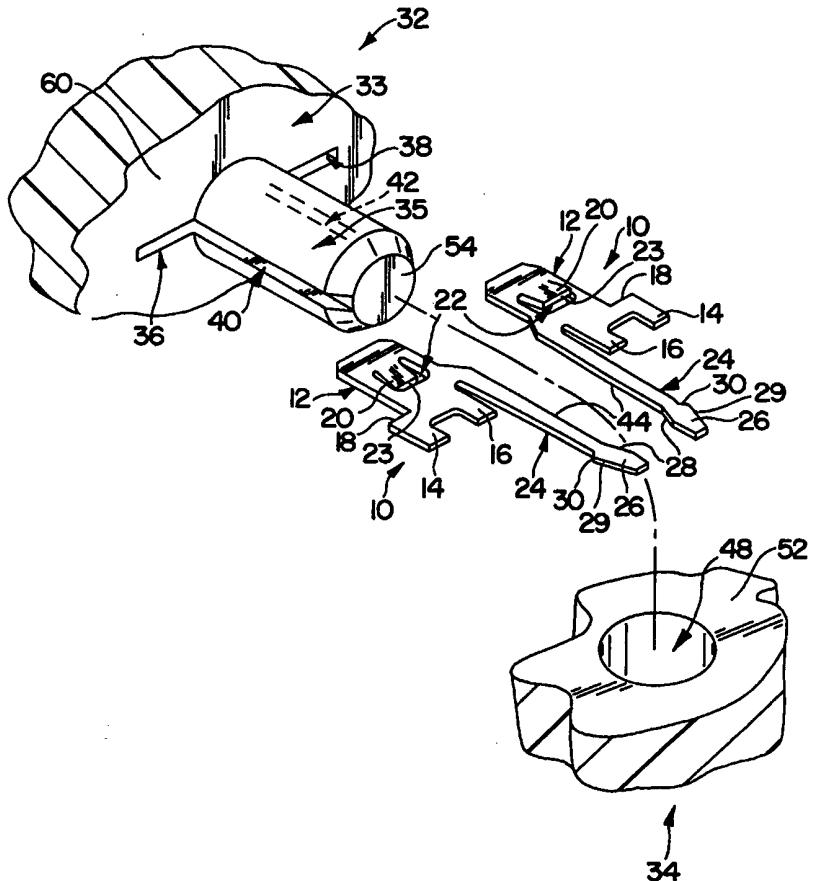
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US98/21405 (22) International Filing Date: 9 October 1998 (09.10.98) (30) Priority Data: 60/062,955 10 October 1997 (10.10.97) US (71) Applicant (for all designated States except US): ROBINSON NUGENT, INC. [US/US]; 800 East Eighth Street, New Albany, IN 47150 (US). (72) Inventor; and (75) Inventor/Applicant (for US only): RAMEY, Samuel, C. [US/US]; 1906 Lauderdale Road, Louisville, KY 40205 (US). (74) Agent: NIEDNAGEL, Timothy, E.; Barnes &amp; Thornburg, 11 South Meridian Street, Indianapolis, IN 46204 (US).</p>	<p>(81) Designated States: CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> With international search report.</p>	

(54) Title: RETENTION CLIP FOR AN ELECTRICAL CONNECTOR

(57) Abstract

A retention clip (10) is provided for securing an electrical connector (32) to a printed circuit board (34). The electrical connector (32) has a housing (33) and a post (40) extending away from a bottom surface (60) of the housing (33). The housing (33) also is formed to include a slot (36, 38) adjacent the post (40), and the printed circuit board (34) is formed to include a hole (48) configured to receive the post (40). The retention clip (10) includes a body portion (12) configured to be inserted into the slot (36, 38), and a spring arm (24) extending away from the body portion (12). The spring arm (24) includes an outer surface (44) configured to extend along the post (40) and a head portion (26). The head portion (26) has a ramp surface (28) extending over an end (54) of the post (40). The ramp surface (28) is configured to engage the post (40) upon insertion of the post (40) through the hole (48) to force the spring arm (24) radially outwardly against a side wall defining the hole (48) to secure the connector (32) to the printed circuit board (34).



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RETENTION CLIP FOR AN ELECTRICAL CONNECTORBackground and Summary of the Invention

The present invention relates to an improved retention mechanism for  
5 holding an electrical connector on a printed circuit board.

Fasteners, or hold-downs are typically used to secure an electrical  
connector in a predetermined position on a printed circuit board. Fasteners reduce  
stresses on solder joints of surface mount components. Fasteners also align the  
connectors during placement of the connectors on the printed circuit board. In  
10 addition, the fasteners hold the connectors in place for soldering or other operations  
and can provide a ground path, if necessary.

According to one aspect of the present invention, a retention clip is  
provided for securing an electrical connector to a printed circuit board. The electrical  
connector has a housing and a post extending away from a bottom surface of the  
15 housing. The housing also is formed to include a slot adjacent the post, and the  
printed circuit board is formed to include a hole configured to receive the post. The  
retention clip includes a body portion configured to be inserted into the slot, and a  
spring arm extending away from the body portion. The spring arm includes an outer  
surface configured to extend along the post and a head portion. The head portion has  
20 a ramp surface over an end of the post. The ramp surface is configured to engage the  
post upon insertion of the post through the hole to force the spring arm radially  
outwardly against a side wall defining the hole to secure the connector to the printed  
circuit board.

In the illustrated embodiment, the post is formed to include an  
25 elongated slot. The outer surface of the spring arm is positioned to lie in the elongated  
slot formed in the post. The illustrated elongated slot extends along a length of the  
post adjacent the slot formed in the housing.

The illustrated retention clip also includes first and second spaced apart  
legs extending away from the body portion in spaced apart relation to the spring arm.  
30 The first and second legs are configured to engage a top surface of the printed circuit  
board to hold the retention clip in a predetermined position relative to the printed  
circuit board. The illustrated embodiment also includes a shoulder extending away

from the body portion. The shoulder is configured to engage the bottom surface of the housing to hold the bottom surface of the housing a predetermined distance above the top surface of the printed circuit board.

In the illustrated retention clip, the body portion is formed to include a  
5 tab extending outwardly from the body portion to increase a retention force of the retention clip in the slot formed in the connector. The housing includes a ledge formed in the slot, and the tab is configured to engage the ledge to retain the retention clip within the housing.

The illustrated retention clip further includes a barb extending radially  
10 outwardly from the head relative to the post. The barb is configured to engage the side wall of the hole to increase a retention force of the retention clip in the hole. The illustrated retention clip still further includes a second ramp surface formed on the head to facilitate insertion of the post and spring arm into the hole.

#### 15 Brief Description of the Drawings

The detailed description particularly refers to the accompanying figures in which:

Fig. 1 is a perspective view of first and second retention clips according to the present invention being configured to connect an electrical connector having a  
20 housing and a post extending away from the housing to a printed circuit board being formed to include a hole;

Fig. 2 is a sectional view illustrating one of the retention clips of Fig. 1 being positioned within a slot formed in the housing of the connector and extending through the hole in the printed circuit board to secure the electrical connector to the  
25 printed circuit board;

Fig. 3 is a side elevational view of one of the retention clips of Fig. 1;

Fig. 4 is a sectional view illustrating the first and second retention clips as shown in Fig. 1 installed on opposite sides of the post of the electrical connector for securing the electrical connector to the printed circuit board; and

30 Fig. 5 is a sectional view similar to Fig. 2 in which the connector has been moved downwardly and a spring arm of each retention clip is moved into

engagement with the printed circuit board by the post to secure the electrical connector to the printed circuit board.

#### Detailed Description of the Drawings

5 Referring now to the drawings, Fig. 1 illustrates two retention clips 10 of the present invention being used to secure an electrical connector 32 to a printed circuit board 34. Each retention clip 10 includes a body portion 12, a pair of spaced apart legs 14, 16, a shoulder 18, and a spring arm 24. A central portion of the body portion 12 is formed to include tab 20 surrounded by an opening 22. Tab 20 is bent  
10 outwardly relative to the body portion 12 of clip 10 to provide a retention mechanism or barb 23 configured to hold the clip 10 within the connector 32, as shown in Fig. 2 and discussed in detail below. Spring arm 24 includes an outer surface 44 and a head 26. Head 26 has a first ramp surface 28, a second ramp surface 29, and a barb 30. Each clip 10 is preferably stamp-formed from a flat sheet of metal material.

15 The connector 32 includes a socket housing 33, a post 35 extending outwardly away from housing 33, and electrical contacts 43, as shown in Figs. 1, 4, and 5. The housing 33 includes a top surface 58 and a bottom surface 60. Housing 33 is also formed to include a pair of slots 36, 38 extending between the top and bottom surfaces 58, 60 on opposite sides of the post 35. Slots 36, 38 are configured to  
20 receive the body portion 12 of the retention clips 10. As shown in Fig. 2, the housing 33 is also formed to include a ledge 37 positioned to lie within each elongated slot 36, 38 which allows tab 20 to better retain clip 10 to connector 32. As shown in Figs. 4 and 5, the housing 33 of connector 32 is also formed to include a cavity 39 for receiving an electrical module or card 41.

25 Electrical contacts 43 are positioned within electrical connector 32 to extend into cavity 39 near top surface 58 of housing 33. Tails of the contacts 43 extend outwardly away from housing 33 near bottom surface 60. The electrical contacts 43 engage conductive traces (not shown) on the electrical card 41 to electrically couple the electrical card 41 to surface mount pads 64 coupled to a top  
30 surface 52 of the printed circuit board 34 as shown in Figs. 4 and 5. Illustratively, connector 32 is a DIMM connector. Although connector 32 is shown to be a surface

mount connector as shown in Figs. 4 and 5, it is understood that the retention clips 10 of the present invention may be used with any type of electrical connector.

The post 35 of connector 32, as shown in Fig. 1, is formed to include a pair of opposing elongated slots 40, 42 extending lengthwise along the post 35 from the housing 33 of connector 32 to a bottom surface 54 of the post 35. The slots 40, 42 are aligned with slots 36, 38 so that surfaces 44 of the retention clips 10 can be positioned within the slots 40, 42, as shown diagrammatically in Fig. 1. As shown in Fig. 1, one of the retention clips 10 is positioned in slots 36, 40 and the other retention clip 10 is positioned to lie within slots 38, 42 on the opposite side of post 35. Thus, the same type of clip 10 can be used on either side slots 36 or 38. Furthermore, only one style clip 10 needs to be manufactured and stocked in accordance with the present invention.

As shown in Fig. 2, when one clip 10 is coupled to the connector 32 and the post 35 of connector 32 is inserted into a hole 48 of the printed circuit board 34, the barb 23 of tab 20 engages the ledge 37 of the electrical connector 32 to hold the clip 10 to the electrical connector 32. A separate tool must be inserted into slots 36, 38 to remove the clip 10. In addition, the spring arm 24 is forced outwardly relative to post 35 causing the barb section 32 of head 26 to grip a portion of the printed circuit board 32 around the hole 48 to secure the connector 32 to the printed circuit board 34.

Illustratively, two clips 10 are used to connect electrical connector 32 to printed circuit board 34. Using two clips 10 provides balance and stability to the connection. In addition, a bridge (not shown) may be used to couple the heads 26 of the connectors together so that both clips 10 may be installed simultaneously. Only one clip 10 may be used to connect connector 32 to printed circuit board 34, if desired.

The initial loading of clips 10 into connector body 32 is shown in Fig. 4. Clips 10 are inserted into connector 32 so that the body portions 12 are positioned within slots 36, 38 and the surfaces 44 of spring arms 24 are positioned within the slots 40, 42. The post 35 and spring arms 24 are then positioned to extend through the hole 48 in the printed circuit board 34. Thus, the spring arms 24 are inserted along with the post 35 through the hole 48. Ramp surfaces 29 facilitate installation. In the initial loading position, each shoulder 18 is spaced apart from the bottom surface 60 of

housing 33. Legs 14, 16 of clips 10 are configured to engage a top surface 52 of the printed circuit board 34 during insertion. Therefore, the clips 10 are installed into the electrical connector 32 in an unactivated position as illustrated in Fig. 4.

After the connector 32 is positioned as shown in Fig. 4, a force is  
5 applied to the electrical connector 32 downwardly toward printed circuit board 34 in the direction of arrow 50 of Fig. 5. The downward force in the direction of arrow 50 causes the connector 32 to move downwardly in the direction of arrow 50. Since the legs 14, 16 of clips 10 are already engaged with the top surface 52 of the printed  
10 circuit board 34 the clips 10 do not move downwardly. Downward movement of the connector 32 relative to the clips 10 causes the bottom surface 54 of post 35 to engage ramp surfaces 28 of heads 26 of clips 10. This forces the spring arms 24 outwardly in the direction of arrows 56 of Fig. 5. Biasing the spring arms 24 outwardly causes the barb sections 30 of heads 26 to grip a portion of the printed circuit board 32 around the hole 48 to secure the connector 32 to the printed circuit board 34.

15 Although the invention has been described in detail with reference to certain illustrated embodiments, variations and modifications exist within the scope and spirit of the invention as described and defined in the following claims.

## CLAIMS:

1. A retention clip for securing an electrical connector to a printed circuit board, the electrical connector having a housing and a post extending away from a bottom surface of the housing, the housing also being formed to include a slot adjacent the post, and the printed circuit board being formed to include a hole configured to receive the post, the retention clip comprising:
  - a body portion configured to be inserted into the slot; and
  - a spring arm extending away from the body portion, the spring arm including an outer surface configured to extend along the post and a head portion, the head portion having a ramp surface extending over an end of the post, the ramp surface being configured to engage the post upon insertion of the post through the hole to force the spring arm radially outwardly against a side wall defining the hole to secure the connector to the printed circuit board.
2. The retention clip of claim 1, wherein the post is formed to include an elongated slot.
3. The retention clip of claim 2, wherein the outer surface of the spring arm is positioned to lie in the elongated slot formed in the post.
4. The retention clip of claim 1, further comprising a leg extending away from the body portion in spaced apart relation to the spring arm, the leg being configured to engage a top surface of the printed circuit board to hold the retention clip in a predetermined position relative to the printed circuit board.
5. The retention clip of claim 4, wherein the body portion further includes a shoulder extending away from the body portion configured to engage the bottom surface of the housing to hold the bottom surface of the housing a predetermined distance above the top surface of the printed circuit board.
6. The retention clip of claim 1, further comprising first and second spaced apart legs extending away from the body portion in spaced apart relation to the spring arm, the first and second legs being configured to engage a top surface of the printed circuit board to hold the retention clip in a predetermined position relative to the printed circuit board.
7. The retention clip of claim 1, wherein the post is formed to include an elongated slot extending along a length of the post adjacent the slot formed



in the housing, and the outer surface of the spring arm is positioned to lie in the elongated slot formed in the post.

8. The retention clip of claim 1, wherein the body portion is formed to include a tab extending outwardly from the body portion to increase a retention force of the retention clip in the slot formed in the connector.

9. The retention clip of claim 8, wherein the housing includes a ledge formed in the slot, the tab being configured to engage the ledge to retain the retention clip within the housing.

10. The retention clip of claim 1, wherein the retention clip is stamp-formed from a flat sheet of metal material.

11. The retention clip of claim 1, further comprising a barb extending radially outwardly from the head relative to the post, the barb being configured to engage the side wall of the hole to increase a retention force of the retention clip in the hole.

12. The retention clip of claim 1, further comprising a second ramp surface formed on the head to facilitate insertion of the post and spring arm into the hole.

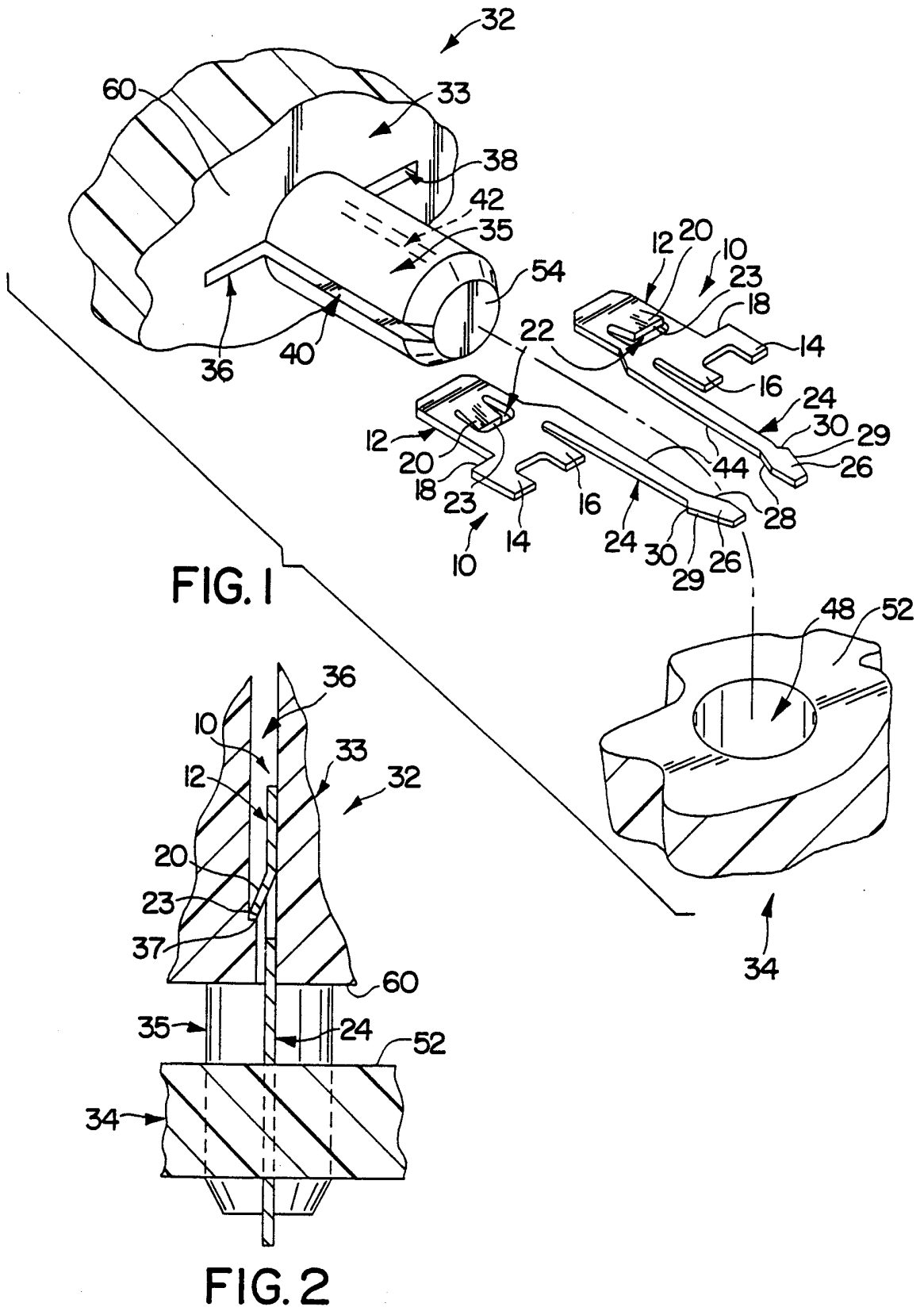


FIG. 1

FIG. 2

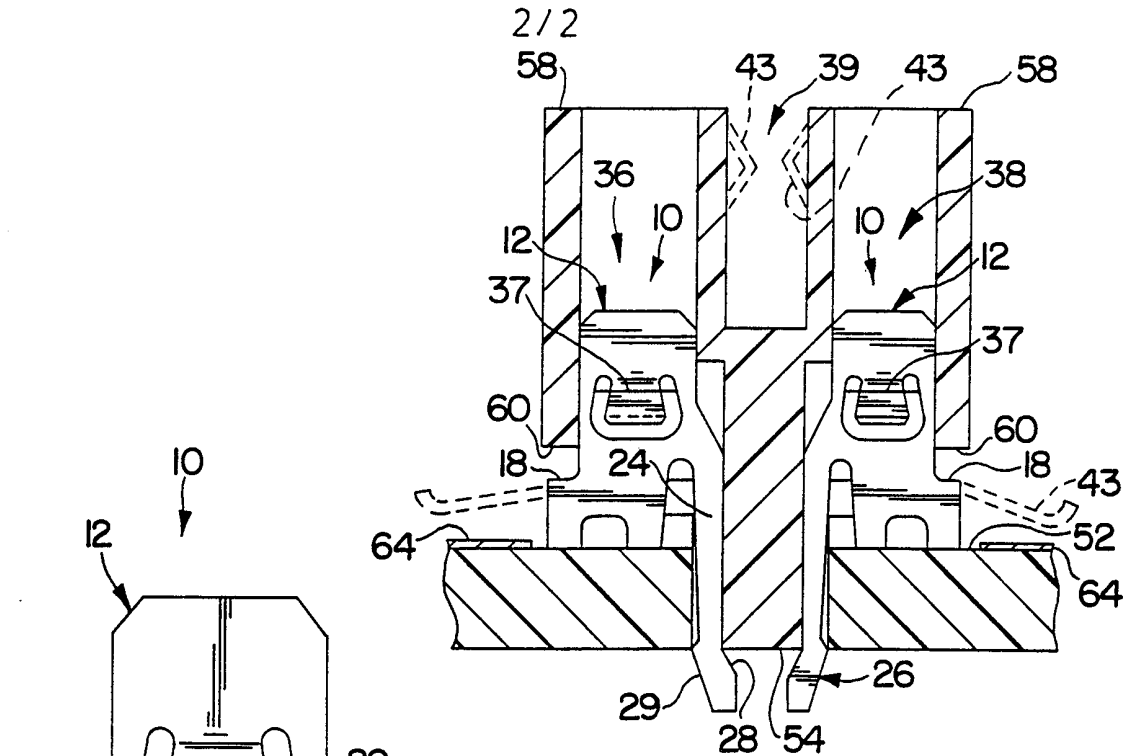


FIG. 4

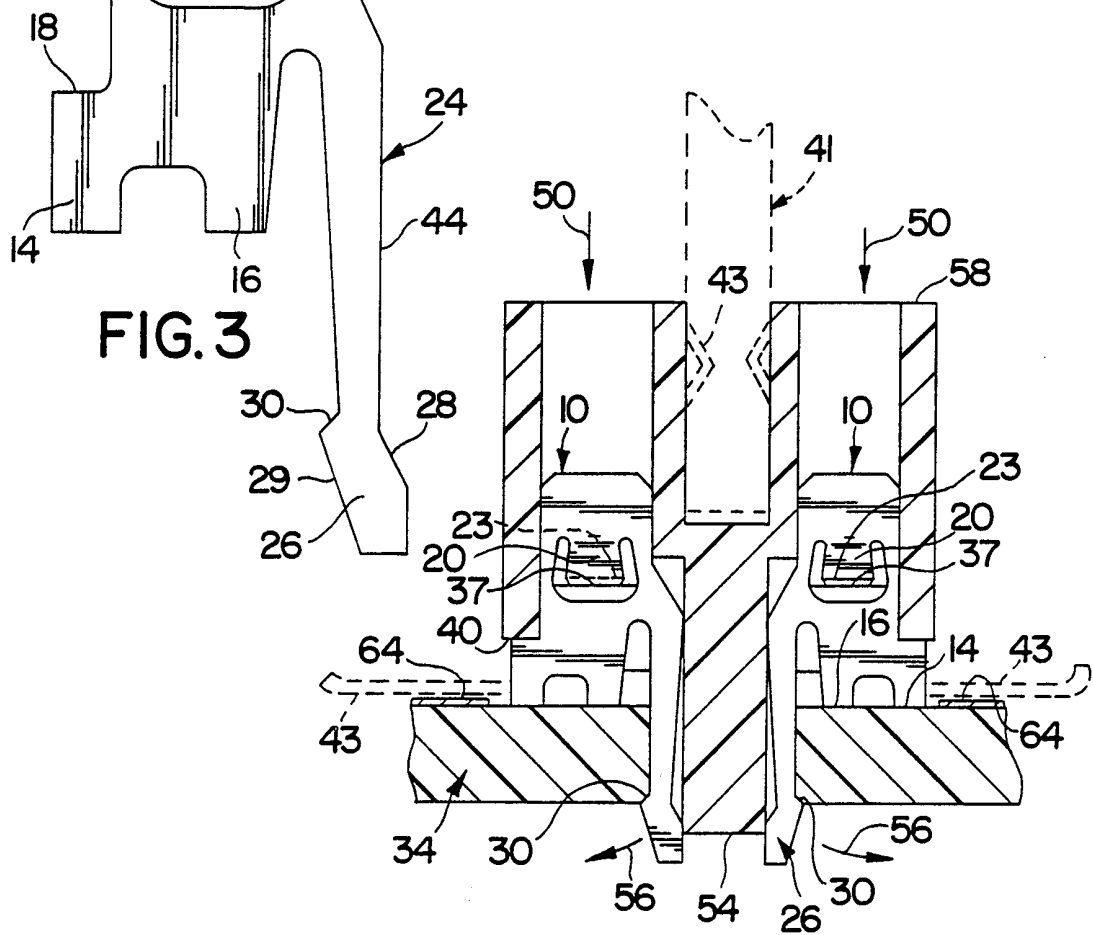


FIG. 5

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US98/21405

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :HO1R 13/60, 13/66, 13/73

US CL :439/567, 571, 572

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 439/567, 571, 572

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
noneElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
none

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,468,154 A (YIP et al) 21 November 1995, (21/11/95) Fig 2 & col. 3.	1-12
Y	US 5,145,407 A (OBATA et al.) 08 September 1992, (08/09/92) Fig. 2 & col. 2, lines 50-68.	8 & 9
Y	US 5,184,963 A (Ishikawa) 09 February 1993, (09/02/93) Fig. 1.	1-12



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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