

(19)



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11)

**EP 1 054 476 B1**

(12)

## EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention  
of the grant of the patent:  
**28.01.2004 Bulletin 2004/05**

(51) Int Cl.7: **H01R 13/426**

(21) Application number: **00110038.7**

(22) Date of filing: **12.05.2000**

### (54) **Primary terminal retention feature for connectors**

Elektrischer Verbinder mit Kontaktrückhaltemitteln

Connecteur électrique avec dispositif de rétention des contacts

(84) Designated Contracting States:  
**DE FR GB**

(30) Priority: **12.05.1999 EP 99109544**

(43) Date of publication of application:  
**22.11.2000 Bulletin 2000/47**

(73) Proprietor: **THE WHITAKER CORPORATION**  
**Wilmington, Delaware 19808 (US)**

(72) Inventors:  
• **Jetter, Rolf**  
**64291 Darmstadt (DE)**

• **Lehner, Antonio**  
**65207 Wiesbaden (DE)**  
• **Boemmel, Christian**  
**63225 Langen (DE)**

(74) Representative: **Heinz-Schäfer, Marion**  
**Tyco Electronics Logistics AG**  
**Ampèrestrasse 3**  
**9323 Steinach (CH)**

(56) References cited:  
**EP-A- 0 961 357** **WO-A-98/31076**  
**US-A- 5 538 445**

**EP 1 054 476 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).

## Description

**[0001]** This invention relates to terminal retention in connectors and particularly primary terminal retention.

**[0002]** In connectors, it is common to have a primary terminal retention feature that retains the individual terminals in their respective terminal passageways. Connectors typically hold a plurality of terminals, this primary retention feature enables each terminal to be held in place once loaded into the connector while the other terminals are being loaded in their respective passageways. In high vibration environments or in applications where it is likely that there may be additional forces exerted on the terminal that tend to dislodge the terminal from the terminal receiving passageway, it is also common to incorporate a secondary locking member as part of the connector assembly. A common form of a secondary locking member involves a structure having a shoulder that is moveable into the passageway in order to provide an obstruction therealong would interfere with a complementary shoulder on the contact and thereby prevent withdraw.

**[0003]** An example of an electrical connector of this type is illustrated in EP 0 510 583 where a generally rectangular terminal block has a number of electrical terminal receiving cavities with primary connection means disposed along the longer sides of the terminal block and corresponding to each of the respective cavities in order to retain the electrical terminals therein. The primary connecting means are integrally moulded resilient arms having a latching tab thereupon to engage the contact when it is inserted. Additionally, a secondary locking structure is provided by a flexible hinged flap having a plurality of comb-like teeth thereupon which extend through holes in the terminal block and into the passageway to obstruct the passageways, thereby preventing the terminal from being removed from the terminal block.

**[0004]** Another electrical connector with primary retention means, which is considered as the closest prior art, is known from WO 98/31076 A2. There a connector for receiving terminals therein is described, that includes a terminal block having outer side walls and opposing end walls, wherein terminal receiving passageways extend between the opposing end walls for receiving a terminal, and a primary retention member is disposed along at least one of the terminal receiving passageways that includes a resilient retention arm that extends into the passageway to retain the terminal therein. The primary retention member is made of metal sheet by stamping and bending and is fixed in the housing by press-fitting into attachment slots.

**[0005]** In general, there is trend toward reducing the size of connectors. For various reasons, it may not be possible to reduce the spacing between the terminals positioned within the connector. Therefore, it is desirable to minimise the outside profile of the terminal block. This presents a number of problems to connectors such

as that disclosed in the aforementioned reference. First of all, as the outer profile becomes smaller, the wall in which the primary retention means is disposed becomes thinner. This makes it difficult to form the integrally moulded latch arm. Additionally, when a primary retention arm and an opening for secondary locking is provided the structural integrity of the terminal block is reduced.

**[0006]** Therefore, it is desirable to improve upon the existing connectors by providing effective primary terminal retention in terminal blocks having thin walls. It is a problem with connectors such as that disclosed above to provide primary terminal retention in generally rectangular connectors where the longitudinally extending walls are close to the terminal passageways so that it is not easily to form primary connecting means therein. It is a problem with connectors as disclosed in the aforementioned reference that as the wall becomes thinner, the amount of material available for the forming of the resilient arm with the latch thereupon is reduced, these primary retention members become susceptible to over-stress damage and it is desirable to prevent such failure.

**[0007]** It is important to note however that while the aforementioned reference is directed to an electrical connector and that is the most common application of connectors, the problems set out above also apply to fibre optic connectors and the present invention is applicable to connectors in general. The terminals described herein are meant to be generic and could be either for the termination of optical or electrical cables.

**[0008]** At least the first problem set out above is solved by providing a connector for receiving terminals therein, the connector comprising a terminal block having outer walls and opposing ends walls, a terminal receiving passageway extending between the opposing end walls for receiving a terminal therein, and a primary retention member disposed along the passageway having a resilient retention arm extending into the passageway to retain their terminal therein, the connector being characterised in that the primary retention member is formed from a generally flat plate and includes a body set in the terminal block and the retention arm extends from the body into the passageway.

**[0009]** At least the second problem set out above is solved by providing a connector for receiving terminal therein, the connector comprising a terminal block having outer side walls that intersect to define corners and opposing end walls, a terminal receiving passageway extending between the opposing end walls for receiving a terminal therein, and a primary retention member disposed along at least one of the terminal receiving passageways and having resilient retention arm extending into the passageway to retain the terminal therein, where the at least one passageway is located in the vicinity of one of the corners, the connector is characterised in that primary retention member is disposed between the one of the corners and the one passageway in the vicinity of the corner.

**[0010]** At least the third problem set out above is solved by providing a connector for receiving terminals therein, the connector comprising a terminal block having outer side walls and opposing end walls with terminal receiving passageways extending therethrough, primary retention members are disposed along respective passageways and include a moulded resilient latch arm formed integrally with terminal block that extends into the passageway to prevent withdraw of the inserted terminal, the connector characterised in that the terminal block includes a post located behind the resilient latch arm to prevent overstress.

**[0011]** It is an advantage of the present invention that an effective primary retention of terminals in a terminal block may be achieved even when the walls adjacent the terminal receiving passageways are relatively close thereto. It is yet another advantage of the invention that the primary retention member may be stamped and formed from a thin sheet of metal. It is another advantage of the invention that by providing a primary retention member in the vicinity of the corner, additional material of the terminal block is available in order to establish the primary retention. It is another advantage of the invention that by providing a post behind a resilient latch arm of the primary retention member to prevent overstress, smaller latch arms may be used.

**[0012]** The invention will now be described by way of example with reference to the following drawings wherein:

Figure 1 is an upper perspective view of an electrical connector incorporating the present invention;  
Figure 2 is a partially cutaway side perspective view of the electrical connector of figure 1;  
Figure 3 is a sectional view of the electrical connector of figure 1 taken along line 3-3;  
Figure 4 is a sectional view of the connector of figure 1 taken along line 4-4; and  
Figure 5 is side perspective view of an alternative embodiment of an electrical connector according to the present invention.

**[0013]** With reference now to figure 1, a connector incorporating the present invention is shown generally at 2. The connector 2 includes a terminal block 4 having outer walls 6, 7, 8, 9, 10 and opposing end walls 12, 14. A pair of terminal receiving passageways 16 extend through the terminal block 4 between the opposing end walls 12, 14. Disposed in these terminal receiving passageways 16 are terminals 18. As mentioned above, these terminals 18 are meant to be generic in nature and could represent either fibre optic or electrical terminals. Respective primary retention members 20, 22 are disposed along the passageways for retaining the terminals 18 therein. Additionally, a secondary locking member 24 is received within a slot 26 that extends transversely across the terminal block 4 relative to the passageways 16. Additionally, it can be seen that side

walls 6 and 10 define a corner 28 and side walls 8 and 9 define a corner 30.

**[0014]** With reference now to figure 2, the primary retention members 20, 22 will be described in greater detail. With reference first to primary retention member 20, the primary retention member 20 is a stamped and formed piece of flat metal having a body portion 32. A locking lance 34 is sheared out of the body 32 in order to retain the retention member 20 within terminal block 4. Additionally, a resilient retention arm 36 is also sheared from the body 32 and folded so that a free end 38 extends into passageway 16. The resilient retention arm 36 is constructed such that as the terminal 18 is inserted into the housing, the retention arm 36 will deflect and a shoulder 40 of the terminal 18 passes by and then resile therebehind to prevent removal of the terminal 18.

**[0015]** The primary retention member 20 is disposed within a channel 43 that is moulded into the terminal block 4. The primary retention member 20 is disposed between the passageway 16 and the corner 30 defined by side walls 9 and 8. As can be seen, the primary retention member 20 is relatively thin and takes up a minimum amount of space, thereby making a particularly useful in connectors having relatively thin side portions between the terminal passageways 16 and an adjacent side 9. It is also envisioned that the body 32 and the associated retention arm 36 could be curved to more closely comply with the shape of the passageway 16 when cylindrical terminal 18 are used. Note, non-cylindrical passageways may be formed and the primary retention member may be disposed along the sidewall.

**[0016]** With further reference to figure 2, a further primary retention member 22 will be described in detail. The primary retention member 22 is a conventionally configured and integrally moulded member with the terminal block 4. Primary retention member 22 includes a resilient arm 42 suspended in cantilevered fashion and extending generally from opposing end wall 12 towards a free end 44. A latch 46 is formed at the free end 44 and extends into the passageway 16. The latch 46 is configured to allow a shoulder 40 of the terminal 18 to pass during insertion and then when the latch arm 42 resiles back to prevent withdraw of the terminal. This is best seen in figure 4. Furthermore, at the free end 44 is a notch 48 opposite the latch 46. Also, behind the free end 44 is a post 50 that prevents overstress of the primary retention member 22.

**[0017]** The retention member 22 is formed between the terminal receiving passageway 16 and the corner 28 defined by outer side walls 6 and 10. As can be seen, in the vicinity of the resilient arm 42, a portion of the terminal block 4 at the corner 28 has been removed. This enables the post 50 to be easily formed behind the resilient arm 42. However, a primary retention member 22 such as described above and the overstressed post 50 may be incorporated anywhere along the housing where it is desired to prevent damage to the primary re-

tention member 22 by way of overstressing. This is especially applicable where the side walls are relatively close to the terminal receiving passageway 16.

[0018] With reference now to figures 3 and 4, sectional views are shown that illustrate how the primary retention members 20, 22 interact with the terminals 18 when they are received within passageways 16. As can be seen in figure 3, retention arm 36 of the body 32 extends into the passageway 16 to fit behind the shoulder 40. Locking lance 34 is further received within a cavity 52 to prevent removal of the retention member 20. With reference now to figure 4, resilient arm 44 is shown cantilevered downward from the end wall 12 to a free end 44 which fits behind the shoulder of the terminal 18. Over-stress post 50 is shown behind the free end 44 such that excessive outward deflection of the resilient arm 42 will be prevented by way of the post 50 which is located behind the free end 44.

[0019] With reference to figures 1-4, it can advantageously be seen by locating the primary retention members 20, 22 in the corners 28, 30 that are in the vicinity of the passageways 16, more material of the terminal block 12 is available. Furthermore, the secondary locking member 24 that is inserted into the slot 26 includes a pair of arms 54 defining a U-shaped structure such that the arms 54 fit on either side of the terminal behind a second shoulder 56 thereof.

[0020] With reference now to figure 5, a second embodiment of the connector shown in figures 1-4 generally at 200. The second embodiment 200 also includes a terminal block 204 and primary terminal retaining members 220, 222. Basically, the second embodiment is generally identical to the first embodiment with the exception of a different secondary locking member 224. In the second embodiment, the secondary locking member 224 is a key-like member integrally moulded to the terminal block 204 by way of a frangible portion 260. The secondary locking member 224 is to be received within a cavity 226 that is located between terminal receiving passageways 16 such that shoulders 262 will co-operate with the shoulders 56 (not shown in figure 5). As a result of rotating the secondary locking member 224 in the direction of arrow A, the secondary locking member 224 is inserted into the cavity 226 free end 268 first. The act of rotation in the direction of arrow A brakes the frangible portion 260 and enables the secondary locking member 224 to be properly seated within the terminal block 204.

[0021] Therefore, advantageously, primary retention has been provided for a connector having relatively thin sections between terminal receiving passageways and outer side walls of a terminal block. This is accomplished by either locating the primary terminal retention members at the corners defined by the side walls that are in the vicinity of the terminal receiving passageways, or by providing a primary retention member that is stamped and formed from thin sheets of material and received within the terminal block or by enhancing the structural

integrity of a primary locking member by providing over-stress protection thereto.

## 5 Claims

1. A connector (2) for receiving terminals (18) therein, the connector comprising: a terminal block (4) having outer side walls (6-10) that intersect to define corners (28, 30) and opposing end walls (12, 14), at least one terminal receiving passageway (16) extending between the opposing end walls for receiving a terminal therein, and a primary retention member (20, 22) disposed along one terminal receiving passageway and having a resilient retention arm (36, 42) extending into the passageway to retain the terminal therein, where the one passageway is located in the vicinity of one of the corners, the connector being **characterised in that** the primary retention member is disposed between one of the corners and the passageway in the vicinity of the corner.
2. The connector of claim 1, wherein the primary retention member (20) is a stamped and formed metal member.
3. The connector of claim 1, wherein the primary retention member (22) is integrally moulded with the terminal block.
4. The connector of claim 3, wherein the resilient retention arm (42) extends to a free end (44) and the terminal block includes a post (50) behind the free end to prevent overstressing of the arm.
5. The connector of claim 4, wherein the resilient retention arm (42) includes a notch (48) corresponding to the post.
6. The connector of claim 2, **characterised in that** the primary retention member (20) is formed from a generally flat plate and includes a body (32) set in the terminal block and the retention arm extends from the body into the passageway.
7. The connector of claim 6, **characterized in that** the primary retention member is received in a channel (43) of the terminal block located along the passageway.

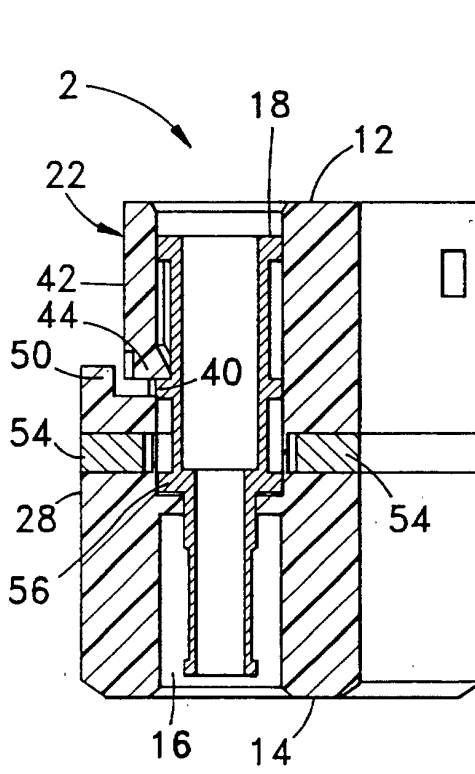
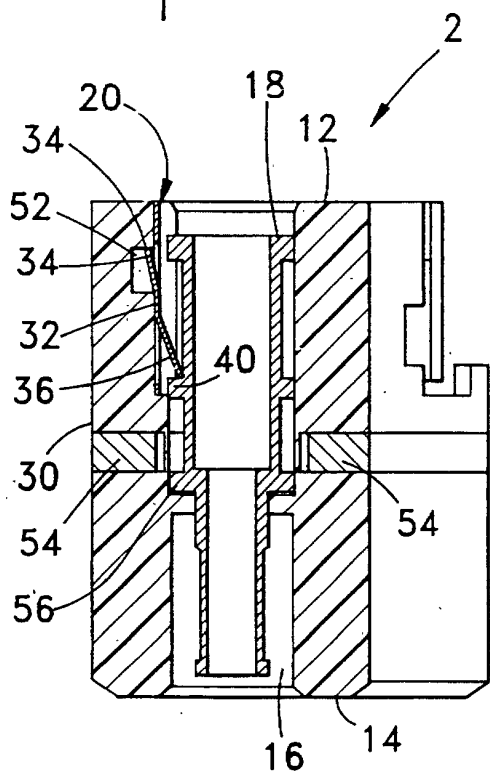
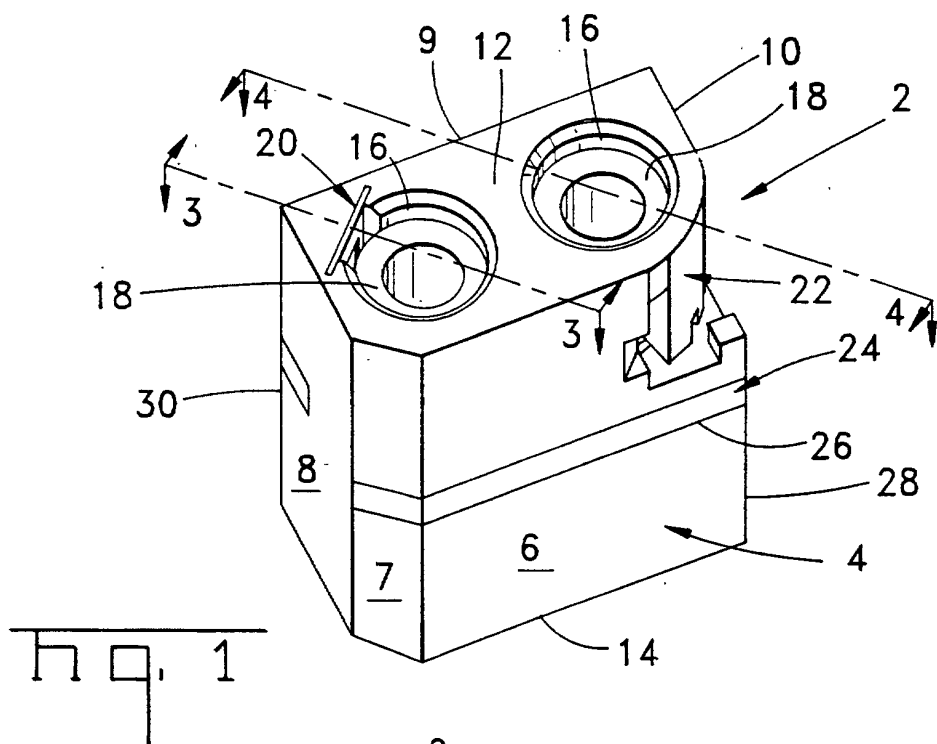
## Patentansprüche

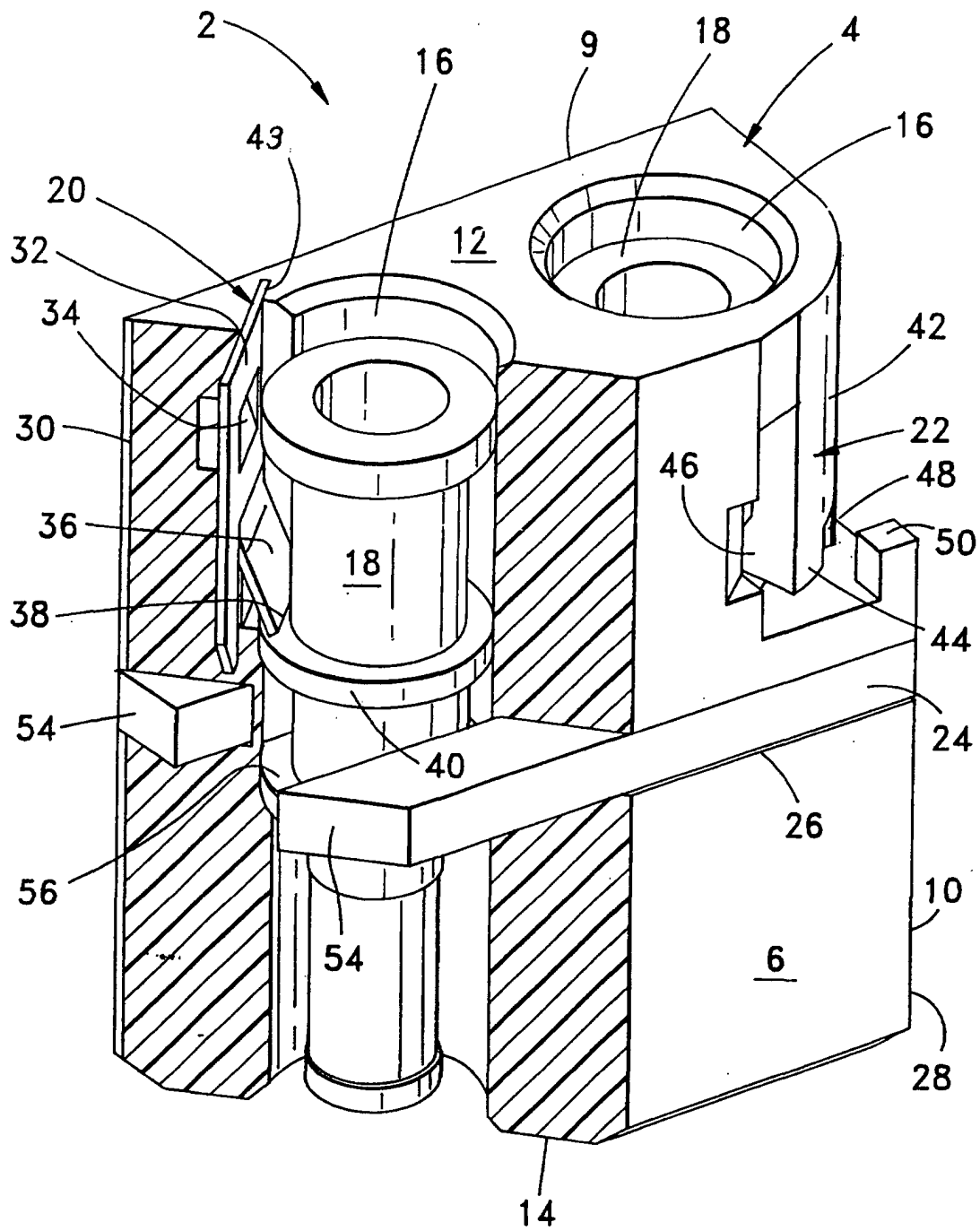
1. Verbinder (2) für das Aufnehmen von Anschlußklemmen (18) darin, wobei der Verbinder aufweist: einen Klemmenblock (4) mit äußeren Seitenwänden (6-10), die sich schneiden, um Ecken

- (28, 30) zu definieren, und gegenüberliegenden Stirnseitenwänden (12, 14); mindestens einen Klemmenaufnahmedurchgang (16), der sich zwischen den gegenüberliegenden Stirnseitenwänden für das Aufnehmen einer Anschlußklemme darin erstreckt; und ein primäres Arretierelement (20, 22), angeordnet längs eines Klemmenaufnahmedurchganges und mit einem elastischen Arretierarm (36, 42), der sich in den Durchgang hinein erstreckt, um die Anschlußklemme darin zu halten, wobei ein Durchgang in der Nähe der einen der Ecken angeordnet ist, wobei der Verbinder **dadurch gekennzeichnet ist, daß** das primäre Arretierelement zwischen einer der Ecken und dem Durchgang in der Nähe der Ecke angeordnet ist.
2. Verbinder nach Anspruch 1, bei dem das primäre Arretierelement (20) ein gestanztes und geformtes Metallelement ist.
3. Verbinder nach Anspruch 1, bei dem das primäre Arretierelement (22) zusammenhängend mit dem Klemmenblock geformt ist.
4. Verbinder nach Anspruch 3, bei dem sich der elastische Arretierarm (42) zu einem freien Ende (44) erstreckt und der Klemmenblock eine Stütze (50) hinter dem freien Ende umfaßt, um eine Überbeanspruchung des Armes zu verhindern.
5. Verbinder nach Anspruch 4, bei dem der elastische Arretierarm (42) einen Einschnitt (48) umfaßt, der der Stütze entspricht.
6. Verbinder nach Anspruch 2, **dadurch gekennzeichnet, daß** das primäre Arretierelement (20) aus einer im allgemeinen flachen Platte gebildet wird und einen Körper (32) umfaßt, der in den Klemmenblock eingesetzt wird, und daß sich der Arretierarm vom Körper in den Durchgang erstreckt.
7. Verbinder nach Anspruch 6, **dadurch gekennzeichnet, daß** das primäre Arretierelement in einem Kanal (43) des Klemmenblockes aufgenommen wird, der längs des Durchganges angeordnet ist.
- posé le long d'un passage recevant une borne et ayant un bras de retenue élastique (36, 42) s'étendant dans le passage pour y retenir la borne, l'un des passages étant situé à proximité d'un des coins, le connecteur étant **caractérisé en ce que** l'élément de retenue primaire est situé entre l'un des coins et le passage au voisinage du coin.
2. Connecteur selon la revendication 1, dans lequel l'élément de retenue primaire (20) est un élément métallique estampé et formé.
3. Connecteur selon la revendication 1, dans lequel l'élément de retenue primaire (22) est moulé intégralement avec le bloc de bornes.
4. Connecteur selon la revendication 3, dans lequel le bras de retenue élastique (42) s'étend jusqu'à une extrémité libre (44) et le bloc de bornes comprend un plot (50) derrière l'extrémité libre pour empêcher une déformation excessive du bras.
5. Connecteur selon la revendication 4, dans lequel le bras de retenue élastique (42) inclut une encoche (48) correspondant au plot.
6. Connecteur selon la revendication 2, **caractérisé en ce que** l'élément de retenue primaire (20) est formé à partir d'une plaque sensiblement plate et inclut un corps (32) positionné dans le bloc de bornes et **en ce que** le bras de retenue s'étend du corps dans le passage.
7. Connecteur selon la revendication 6, **caractérisé en ce que** l'élément de retenue primaire se loge dans un canal (43) du bloc de bornes situé le long du passage.

## Revendications

1. Un connecteur (2) pour recevoir des bornes (18), le connecteur comprenant: un bloc de bornes (4) ayant des parois latérales externes (6-10) qui se coupent pour définir des coins (28, 30) et des parois d'extrémité opposées (12, 14), au moins un passage (16) recevant une borne s'étendant entre les parois d'extrémité opposées pour y recevoir une borne, et un élément de retenue primaire (20, 22) dis-





Hq. 2

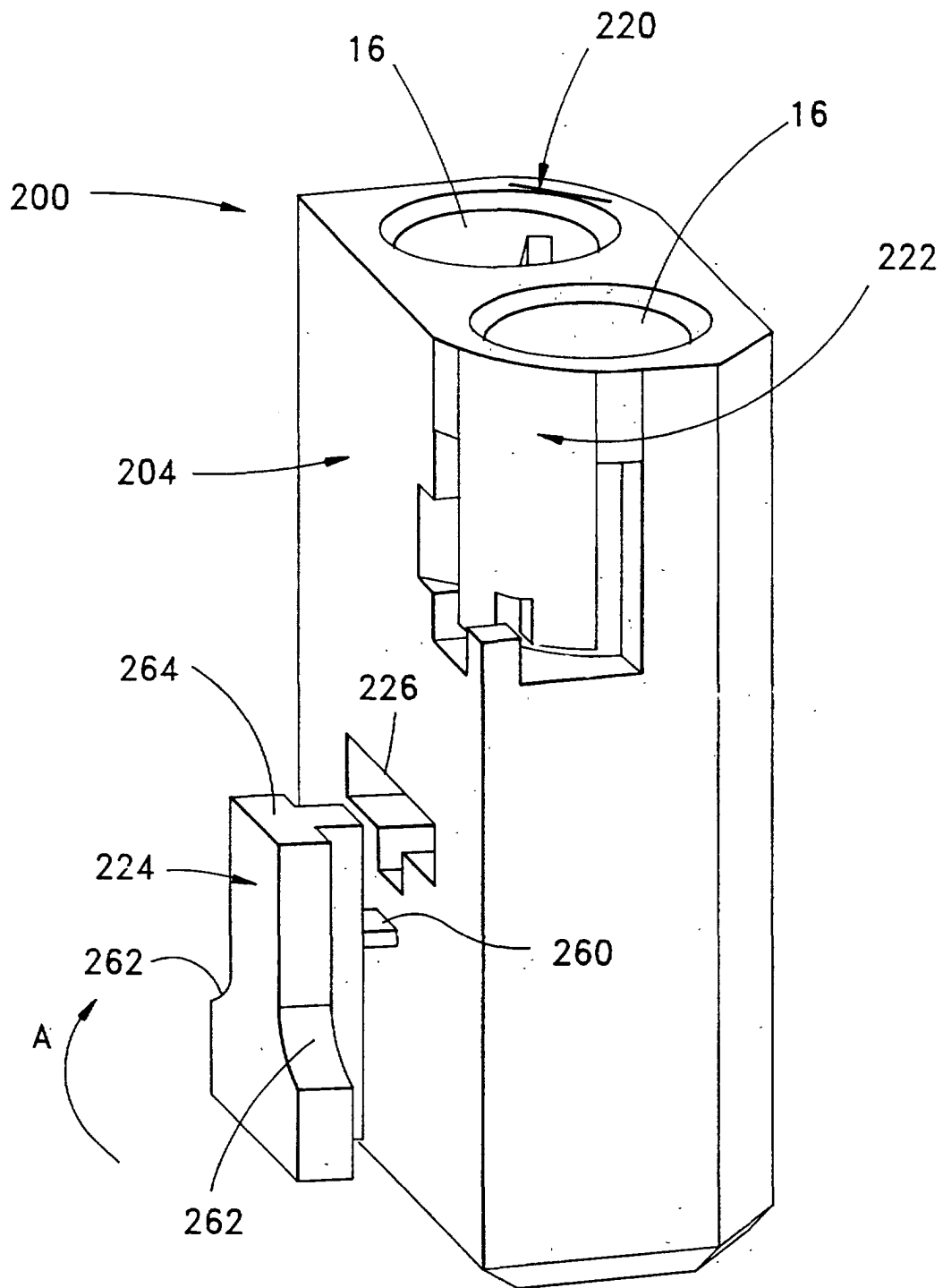


Fig. 5