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(54) **APPARATUS FOR FORMING A CONNECTION THROUGH A BOARD**

VORRICHTUNG ZUR HERSTELLUNG EINER VERBINDUNG DURCH EINE PLATTE

APPAREIL PERMETTANT DE FORMER UNE CONNEXION A TRAVERS UNE CARTE

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Description

[0001] The invention relates to an apparatus for contacting through a board, in particular a printed circuit board, having electric contacts which extend from one side of the board to the other, and having a receptacle housing, arranged on one side of the board, for receiving an electric plug with a shield, and having contacts for making contact with the shield, which likewise extend through the board.

[0002] EP 578 487-A1 has disclosed an arrangement for contacting across a board which has receptacles for receiving electric plugs on both sides of the board. The arrangement has electric pin contacts, each of which has in-between two pin regions, which come to lie on the two sides of the board a press-fit region which is fixed in corresponding plated through-hole in the board.

[0003] Such an arrangement for contacting through a board is also known from DE 40 40 551, in Figure 12. The arrangement in this case comprises a plurality of rows each having seven contact pins. The two outer contact pins serve to screen the signal contacts against electromagnetic interference and radio-frequency interference. They make contact with the shield of a mating plug. How such a means of contact can occur is also known, for example, in EP 560 550-A2. This relates not to an arrangement for contacting through a board, but only to an arrangement for making contact with a circuit board. However, the means for making contact with the shield is clearly seen. Located on the shield of the plug are elastic regions which respectively come into contact with the pins of the two outer pins. This ensures that contact is made with the shield. A similar arrangement is also shown in WO94/06179-A1.

[0004] It is frequently not possible for the shield of an electric plug to be equipped with elastic members, as disclosed, to permit the contact to be made. If a plug has no elastic regions on the shield, a different configuration is required for making contact with the shield. DE 35 29 218-A1 discloses a connecting device, according to the preamble of claim 1, for circuit boards, by means of which through contacting the signal contacts contact through a board. The contact for engaging the shield is constructed resiliently as a receptacle for engaging the electric plug, and has a press-in zone for pressing into a metallized bore of the circuit board. However, no provision is made with this contact for contacting through the board. The contact is constructed in such a way that it can make contact with a shield of a plug to be inserted, which shield is not constructed resiliently.

[0005] It is the object of the invention to specify an arrangement for contacting through a board which in addition to contacting through to signal contacts also is constructed for making contact with the shield of a mating plug where contacts extend through the board and are suitable for making contact with the shield, which is not of resilient construction.

[0006] The object is achieved by means of an appa-

ratus having the features of Patent Claim 1. Advantageous developments may be gathered from each of the subclaims.

[0007] The apparatus for contacting through a board is provided, in particular, for contacting through a printed circuit board. Such arrangements are used, for example, in order to realize a connection between a base plate and an associated daughter circuit board and a cable plug. In this case, the arrangement for contacting through the board is in the base plate. In this arrangement, a receptacle incorporated for the electric plug is provided on each side of the base plate.

[0008] Furthermore, electric contacts are provided that project from each side of the base plate in the form of contact pins. These contact pins project into the receptacle so that the electric plugs make contact with them. In order to make contact with and fasten to the base plate, press-fit zones which are inserted into corresponding bores in the base plate are provided in the electric contacts. If the bores in the base plate are metallized, electric contact is also made with corresponding conductors on the base plate or circuit board. The electric plugs which can be introduced into the receptacles could be a cable plug which has an outer shield in order to obtain shielding of the signal contacts against electromagnetic interference and radio-frequency interference.

[0009] To improve shielding it is sensible to connect the shield of the cable plug to the shield or ground potential of the base plate and also to the screen of a device which is connected on the other side of the base plate. This is enabled by having electric contacts for making contact with the shield which extend through the board. The previously known design of these shield contacts cannot be used when the shield of the electric plug or device has no flexible regions. It is then necessary to construct the corresponding shielding contact in a partially resilient fashion. In order to simplify the assembly of such a contact, construction of the contact can be in two parts, one part having a press-fit zone, a contact pin adjacent to the press-fit zone on one side, and an extended region adjacent to the press-fit zone on the opposite side. The second part of the contact would be located in an outer wall of the receptacle and includes a first resilient region for making contact with the extended region of the first part, and a second resilient region for making contact with the shield of the mating device.

[0010] Since there is little benefit to providing a contact for engaging the shield at each row of electric contacts, it is sensible to construct the second part of the contact in the shape of a fork, with a second resilient region including in each case two first resilient regions. As a result, the insertion force is reduced because of the reduced number of resilient regions making contact with the shield.

[0011] An exemplary embodiment of the invention will now be explained with the aid of the figures, in which:

Figure 1 shows a partially sectioned diagrammatic representation of an arrangement according to the invention for contacting through a board, having a cable plug and having another plug connected to a daughterboard;

Figure 2 shows the corresponding arrangement in accordance with the prior art;

Figure 3 shows a perspective view of a receptacle with contacts according to the present invention for making contact with the shield, in a partial section view;

Figure 4 shows a top view of the receptacle according to the invention and of a base plate, the receptacle being partially sectioned;

Figure 5 shows a section along the line of section BB through Figure 4;

Figure 6 shows a section along the line of section AA through Figure 4, with an enlarged detail and the inserted contacts;

Figure 7 shows a cable plug and a partially cut away receptacle and a base plate in a partially plugged-in state;

Figure 8 shows a partially sectioned receptacle with inserted contacts, in a first perspective view;

Figure 9 shows a second perspective view of the receptacle according to Figure 8;

Figure 10 shows the second part of a contact for making contact with the screen, in a top view; and Figure 11 shows the corresponding contact in a side view.

[0012] Figures 1 and 2 will firstly be described together as far as their features correspond. Sectionally represented are a base plate 1 and a daughterboard 2, which are to be electrically interconnected. The daughterboard 2 is arranged essentially perpendicular to the base plate 1. Located on the base plate 1 is an apparatus 3 for connecting through the base plate 1 which essentially comprises on each side of the base plate 1 a receptacle 4, 5 for corresponding plugs. Five contact pins 6, 7 are to be seen in each of the receptacles 4, 5 for making contact with corresponding contacts of the plugs 4, 5, which are inserted into the respective receptacle 4, 5 for signal transmission across and/or into the base plate 1. The daughterboard 2 is connected to the apparatus 3 by a plug-in connector 8, which can be inserted into the receptacle 5. The plug-in connector 8 has electric contacts for making contact with the contact pins 7. The receptacle 5 has a base 9 and two outer walls 10 and 11, in each case. Contact pins 12 and 13 are likewise located near the outer walls and are provided in each case for making contact with a EMI/RFI shield on an outer surface of the plug 8. A cable plug 14 can also be inserted into the receptacle 4 of the apparatus from the side of the base plate 1 opposite the daughterboard. The cable plug 14 terminates a cable 15. In addition to five socket contacts for making contact with the pin contacts 6 of the receptacle 4, the cable plug 14 also has

an outer EMI/RFI shield 16. In the prior art shown in Figure 2, the shield 16 has a resilient region 17 and is thus easily connected to pins 18 located near the outer walls 19 and 20 of the receptacle 4. The shield 16, represented in Figure 1, of the cable plug 14 does not include resilient regions as in the prior art making, it is necessary to include the resilient aspect of the contact interface of the screen in the receptacle 4 of the apparatus 3. As may be gathered from Figure 1, the contacts 21, 22 for engaging the shield have resilient regions.

[0013] A further difference between Figure 1 and Figure 2 is that the base plate 1 of Figure 1 is substantially thinner than the base plate 1 of Figure 2. In order to be able to use the same contacts independently of the thickness of the base plate 1, the receptacle 4 has spacers for effecting compensation. The way in which contacts are constructed for signal transmission, for example, may now be seen either from Figure 1 or Figure 2. The contacts have pin contacts at both ends and a press-fit zone in the middle, which is pressed into corresponding holes in the base plate 1. The press-fit zone can be constructed as an eye-of-a-needle, for example. These contacts may be fixed in the receptacle 5 and pressed, with this receptacle, into the base plate 1. Thereafter, the receptacle 4 is pushed onto the pin contacts 6 from the other side of the base plate 1. If the contacts for engaging the shields of the mating devices are also constructed as the pin contacts, then they too can be inserted into the base plate 1 as just specified. However, this is not possible if these contacts are to have on at least one side a resilient region over which the receptacle 4 is to be mounted.

[0014] Figure 3 reveals how making contact with the shield is accomplished in accordance with the invention. The contact for making the shield is constructed in two parts. One part comprises a pin contact 12, 13 (see Figure 1) and a press-fit zone is included therewith. Following the press-fit zone is an extended region 23 which projects beyond the base plate 1 into the receptacle 4 in the region of the outer wall 20. The receptacle 4 has through bores 24 for holding the contact pins 7. Furthermore, in outer walls 20, the receptacle 4 has grooves 25 for holding a second part 26 of the contact for engaging the shield.

[0015] The second part 26 is shown in more detail in Figures 10 and 11. It is constructed in the shape of a fork, where an upper resilient region 27 that serves to make contact with the shield of a mating device and two lower regions 28 serve in each case to make contact with the extended region 23 of the first part of the shielding contact. The second part 26 of the contact is produced from a metal sheet for stamping and bending.

[0016] The second part 26 of the contact is held in the receptacle 4 by being press-fit along regions 29 in slits 30 (see Figure 5) that are formed in the receptacle 4.

[0017] Represented again in Figures 4 to 6 is the base plate 1 with the receptacle 4 and the second part 26 of the shielding contact. In this apparatus, the position of

the contact in the receptacle is visible.

[0018] Figure 7 shows a side view of a cable plug 14 with an appropriate shield 16 and how the contact is produced between the shield 16 and the extended region 23 of the contact pin 12, 13.

[0019] Figures 8 and 9 show different perspective views of a receptacle 4 on a base plate 1. The views are represented in a partially sectioned fashion, and are fitted with contacts for signal transmission using contact pins 6. The grooves 25 for holding the second parts 26 of the contacts for making contact with the screen may be seen in the side wall 20 of the receptacle 4. The extended regions 23 of the first parts of the contacts for making contact with the screen project from the base plate 1.

Claims

1. An apparatus for connecting across a board (1), in particular a circuit board, the apparatus comprising electric contacts (6,7) for extending from one side of the board (1) to the other for transmitting signals, a receptacle (4) for arranging on one side of the board, for receiving a mating device (14) with a shield (16), and contacts for making contact with the shield and for extending through the board (1), **characterized in that** the contacts for making contact with the shield are constructed as a first part and a second part, separate from each other, the first part includes a contact pin, a press-fit zone for pressing into a bore in the board (1) and an extended region (23) adjacent to the press-fit zone when the apparatus is mounted to the board, and the second part (26) is held in an outer wall (19,20) of the receptacle (4) and includes a first resilient region (28) making contact with the extended region (23) of the first part when the apparatus is mounted on the board (1) and a second resilient region (27) for making contact with the shield (16) of the mating device (14) when mated with the receptacle (4).
2. The apparatus according to Claim 1, **characterized in that** the second part (26) of the contact for making contact with the shield is constructed like a fork, where one second resilient region (27) is connected to at least two first resilient regions (28).
3. The apparatus according to one of Claims 1 or 2, **characterized in that** electric contacts for signal transmission are pin contacts with a press-in region.
4. The apparatus according to one of Claims 1 or 3, **characterized in that** an inner side (19, 20) of the receptacle (4, 5) has grooves (25) for holding the second parts (26) of the contacts for making contact with the shield in position.

5. The apparatus according to one of Claims 1 to 4, **characterized in that** the second parts (26) of the contacts are press-fit in the receptacle (4, 5).

6. The apparatus according to one of Claims 1 to 5, **characterized in that** a second receptacle (5) for a plug is provided on the side of the board (1) opposite the side with the first receptacle (4).

7. The apparatus according to Claim 6, **characterized in that** one of the receptacles (4, 5) is configured for holding a plug connected to a daughterboard (2).

8. The apparatus according to one of Claims 1 to 7, **characterized in that** the electric contacts for signal transmission, and the first parts of the contacts for making contact with the screen are fixed in a receptacle (4, 5).

9. The apparatus according to Claim 8, **characterized in that** the electric contacts for signal transmission, and the first parts of the contacts for making contact with the screen are fixed in the second receptacle (4, 5).

Patentansprüche

1. Vorrichtung zur Herstellung einer Verbindung durch eine Platte (1), insbesondere eine Leiterplatte, wobei die Vorrichtung aufweist: elektrische Kontakte (6, 7), die sich von einer Seite der Platte (1) zur anderen für das Übertragen von Signalen erstrecken; eine Steckbuchse (4), die auf einer Seite der Platte angeordnet ist, um eine Eingriffsvorrichtung (14) mit einer Abschirmung (16) aufzunehmen; und Kontakte für eine Kontaktgabe mit der Abschirmung und so, daß sie sich durch die Platte (1) erstrecken, **dadurch gekennzeichnet, daß** die Kontakte für eine Kontaktgabe mit der Abschirmung als ein erstes Teil und ein zweites Teil konstruiert sind, die voneinander getrennt sind, wobei das erste Teil umfaßt: einen Kontaktstift; eine Preßpassungszone für das Pressen in eine Bohrung in der Platte (1); und einen erweiterten Bereich (23) angrenzend an die Preßpassungszone, wenn die Vorrichtung auf der Platte montiert wird; und wobei das zweite Teil (26) in einer Außenwand (19, 20) der Steckbuchse (4) gehalten wird und umfaßt: einen ersten elastischen Bereich (28) für die Kontaktgabe mit dem erweiterten Bereich (23) des ersten Teils, wenn die Vorrichtung auf der Platte (1) montiert wird; und einen zweiten elastischen Bereich (27) für eine Kontaktgabe mit der Abschirmung (16) der Eingriffsvorrichtung (14), wenn sie mit der Steckbuchse (4) in Eingriff ist.
2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, daß** der zweite Teil (26) des Kontaktes

für die Kontaktgabe mit der Abschirmung wie eine Gabel konstruiert ist, wo ein zweiter elastischer Bereich (27) mit mindestens zwei ersten elastischen Bereichen (28) verbunden ist.

3. Vorrichtung nach einem der Ansprüche 1 oder 2, **dadurch gekennzeichnet, daß** die elektrischen Kontakte für die Signalübertragung Stiftkontakte mit einem Einpreßbereich sind.
4. Vorrichtung nach einem der Ansprüche 1 oder 3, **dadurch gekennzeichnet, daß** eine Innenseite (19, 20) der Steckbuchse (4, 5) Nuten (25) für das Halten der zweiten Teile (26) der Kontakte für die Kontaktgabe mit der Abschirmung in der richtigen Lage aufweist.
5. Vorrichtung nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, daß** die zweiten Teile (26) der Kontakte in der Steckbuchse (4, 5) mit Preßpassung angeordnet sind.
6. Vorrichtung nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, daß** eine zweite Steckbuchse (5) für einen Stecker auf der Seite der Platte (1) vorhanden ist, die der Seite mit der ersten Steckbuchse (4) gegenüberliegt.
7. Vorrichtung nach Anspruch 6, **dadurch gekennzeichnet, daß** eine der Steckbuchsen (4, 5) für ein Halten eines Steckers konfiguriert ist, der mit einer Tochterleiterplatte (2) verbunden ist.
8. Vorrichtung nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, daß** die elektrischen Kontakte für eine Signalübertragung und die ersten Teile der Kontakte für eine Kontaktgabe mit der Abschirmung in einer Steckbuchse (4, 5) fest sind.
9. Vorrichtung nach Anspruch 8, **dadurch gekennzeichnet, daß** die elektrischen Kontakte für eine Signalübertragung und die ersten Teile der Kontakte für eine Kontaktgabe mit der Abschirmung in der zweiten Steckbuchse (4, 5) fest sind.

Revendications

1. Appareil servant à établir la connexion à travers une plaquette (1), en particulier une plaquette à circuits imprimés, l'appareil comprenant des contacts électriques (6, 7) destinés à s'étendre d'un côté de la plaquette (1) vers l'autre côté en vue de la transmission de signaux, une prise (4), agencée sur un côté de la plaquette, destinée à recevoir un dispositif d'accouplement (14) avec un élément de blindage (16), et des contacts destinés à établir un contact avec l'élément de blindage et à s'étendre à travers

la plaquette (1), **caractérisé en ce que** les contacts destinés à établir le contact avec l'élément de blindage comportent une première partie et une deuxième partie, séparées l'une de l'autre, la première partie englobant une broche de contact, une zone à ajustement serré destinée à être pressée dans un alésage dans la plaquette (1), et une région étendue (23) adjacente à la zone à ajustement serré lorsque l'appareil est monté sur la plaquette, la deuxième partie (26) étant retenue dans une paroi externe (19, 20) de la prise (4) et englobant une première région élastique (28) établissant le contact avec la région étendue (23) de la première partie lorsque l'appareil est monté sur la plaquette (1), et une deuxième région élastique (27) pour établir un contact avec l'élément de blindage (16) du dispositif d'accouplement (14) lors de l'accouplement avec la prise (4).

2. Appareil selon la revendication 1, **caractérisé en ce que** la deuxième partie (26) du contact destiné à établir un contact avec l'élément de blindage est construite sous forme d'une fourche, une deuxième région élastique (27) étant connectée à au moins deux premières régions élastiques (28).
3. Appareil selon l'une des revendications 1 ou 2, **caractérisé en ce que** les contacts électriques chargés de la transmission des signaux sont des contacts à broche comportant une région à ajustement serré.
4. Appareil selon l'une des revendications 1 ou 3, **caractérisé en ce qu'un** côté interne (19, 20) de la prise (4, 5) comporte des rainures (25) pour retenir les deuxièmes parties (26) des contacts, pour contacter l'élément de blindage agencé dans sa position.
5. Appareil selon l'une des revendications 1 à 4, **caractérisé en ce que** les deuxièmes parties (26) des contacts sont agencées par ajustement serré dans la prise (4, 5).
6. Appareil selon l'une des revendications 1 à 5, **caractérisé en ce qu'une** deuxième prise (5) pour une fiche est agencée sur le côté de la plaquette (1) opposé au côté comportant la première prise (4).
7. Appareil selon la revendication 6, **caractérisé en ce qu'une** des prises (4, 5) est configurée à retenir une fiche connectée à une carte-fille (2).
8. Appareil selon l'une des revendications 1 à 7, **caractérisé en ce que** les contacts électriques chargés de la transmission des signaux ainsi que les premières parties des contacts destinés à établir un contact avec l'élément de blindage sont fixés dans

une prise (4, 5).

9. Appareil selon la revendication 8, **caractérisé en ce que** les contacts électriques chargés de la transmission des signaux ainsi que les premières parties des contacts destinés à établir le contact avec l'élément de blindage sont fixés dans la deuxième prise (4, 5).

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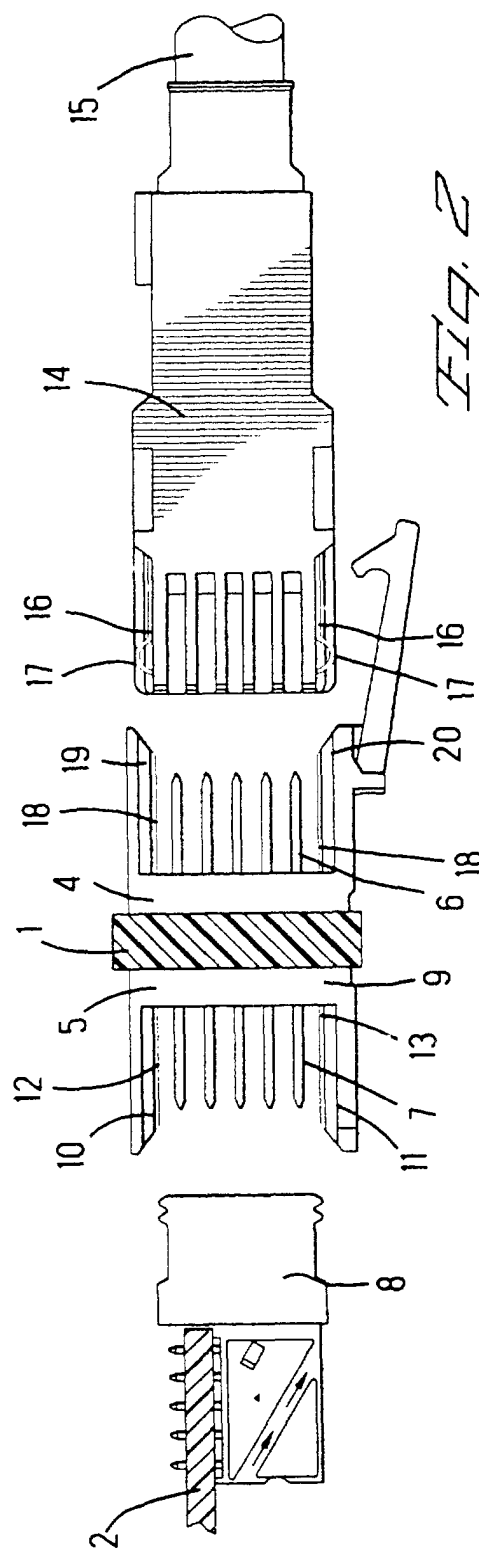
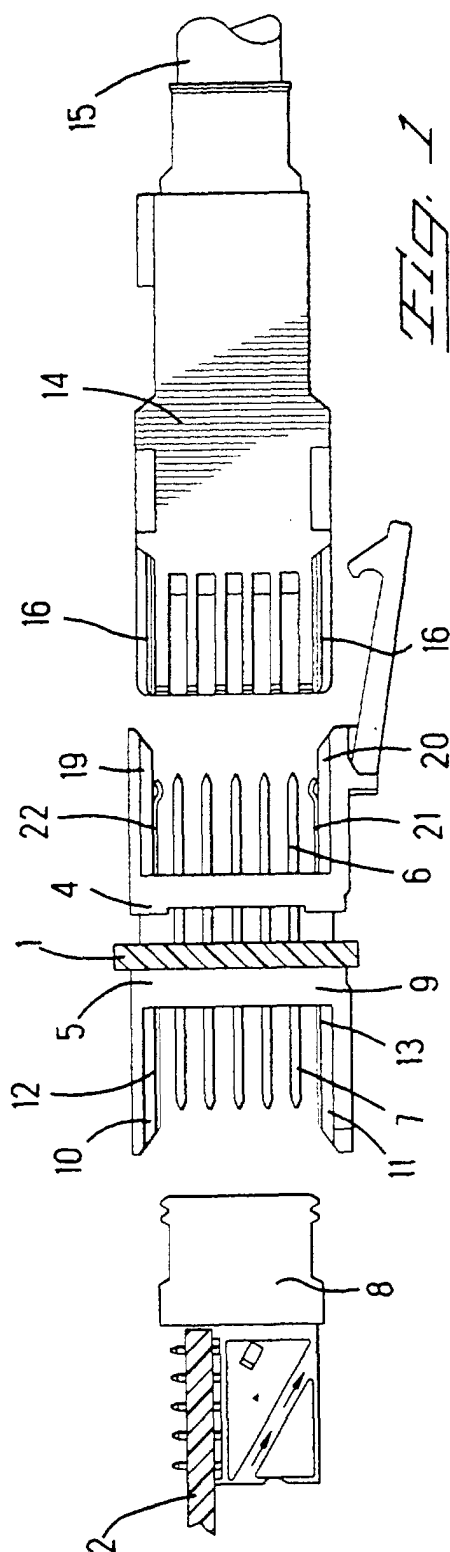
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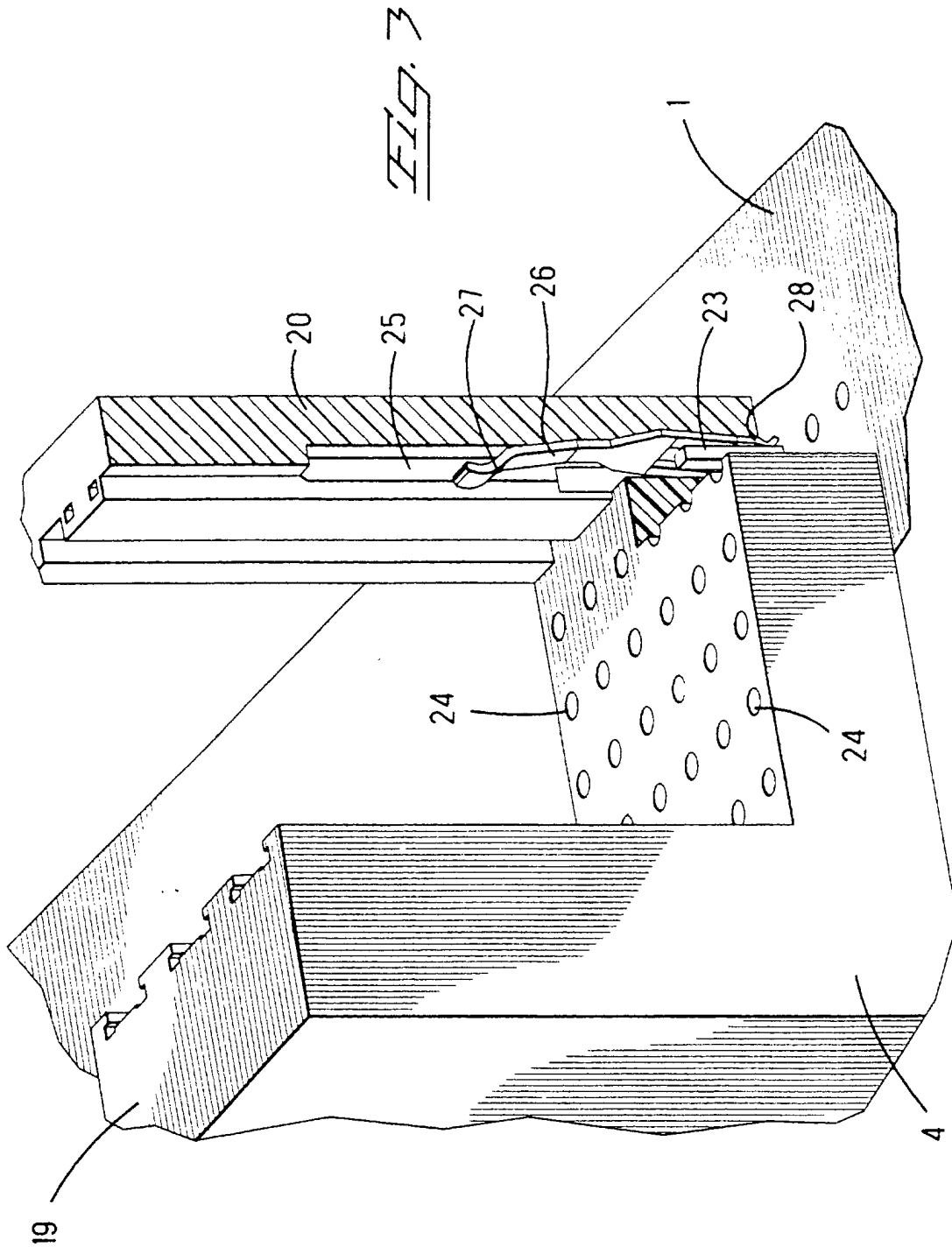
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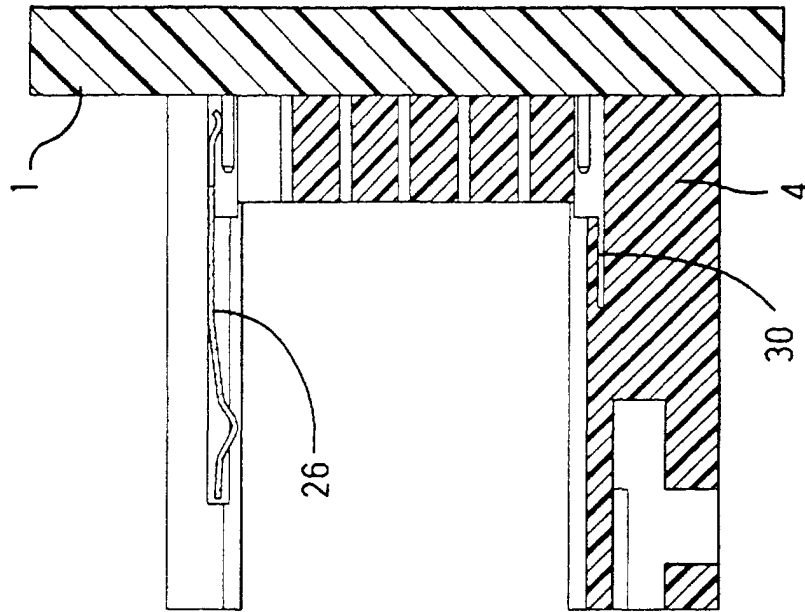


Fig. 5

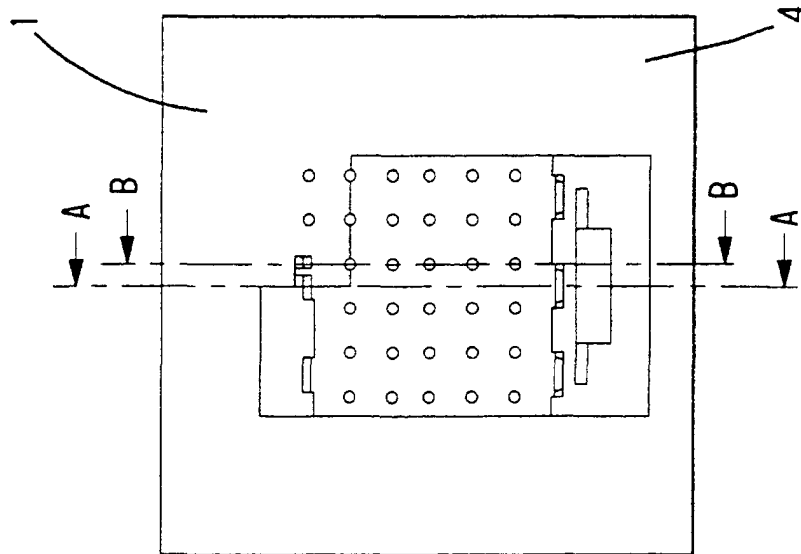


Fig. 4

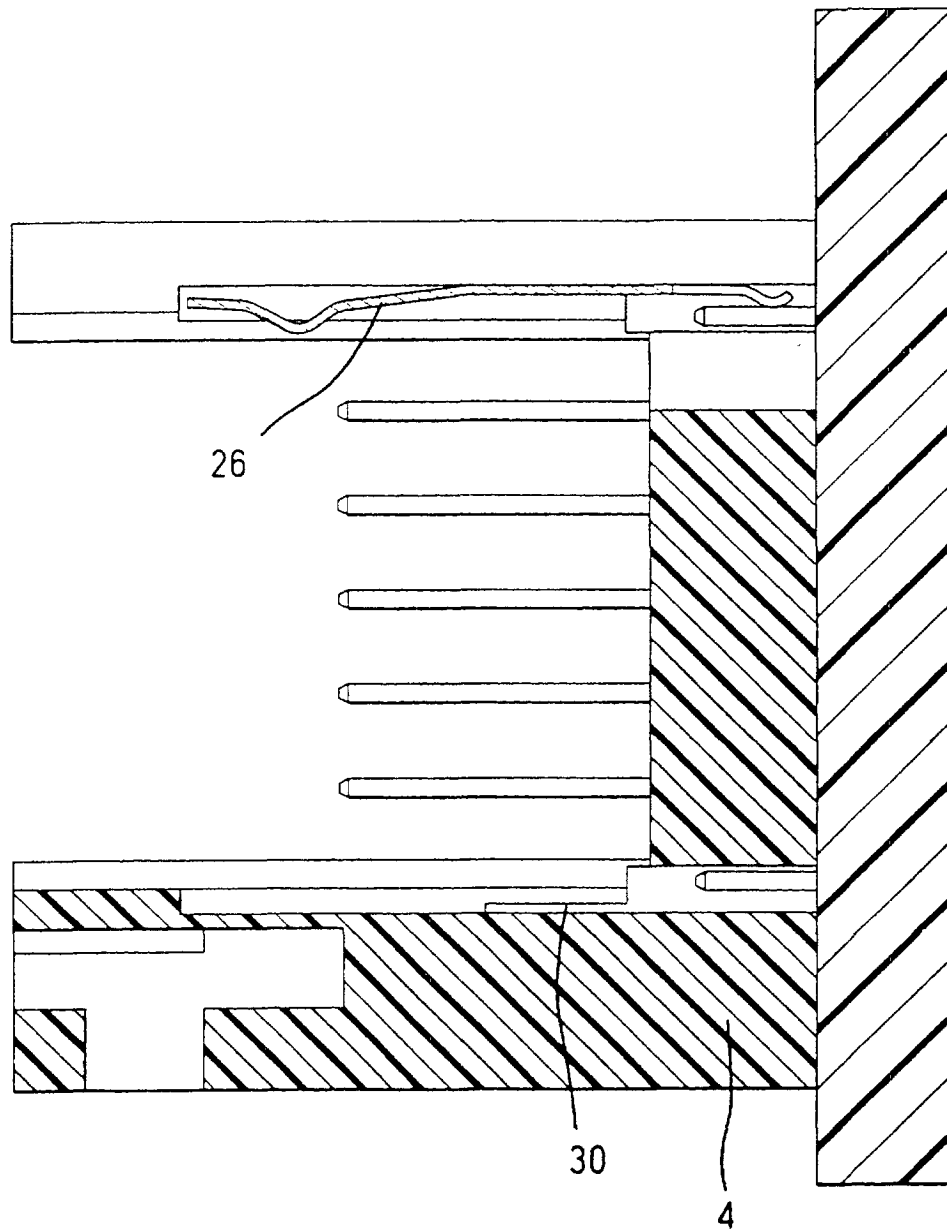
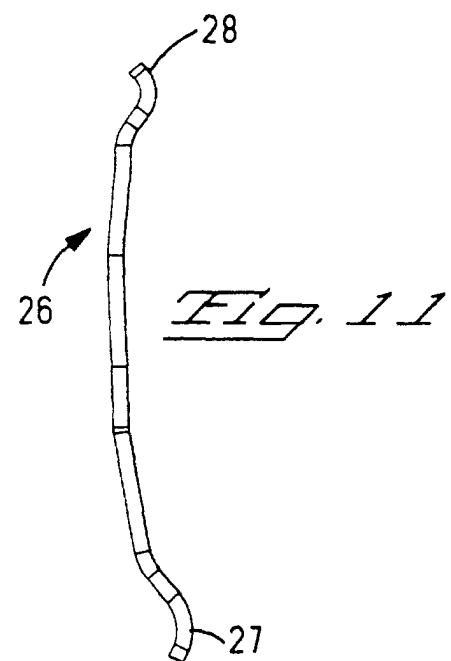
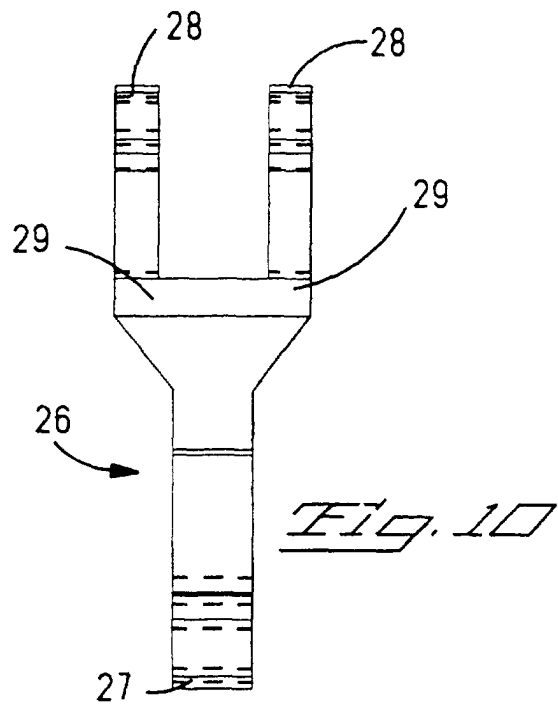
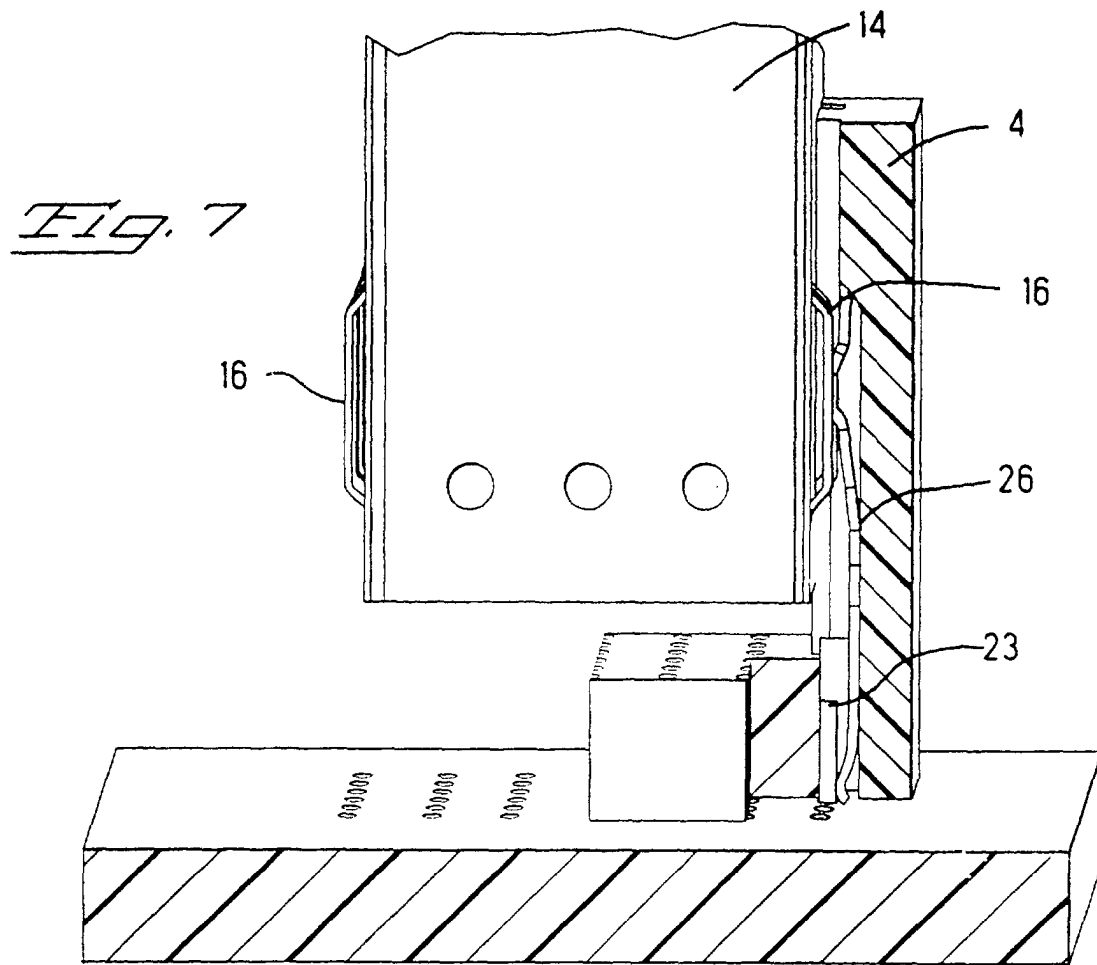


Fig. 6



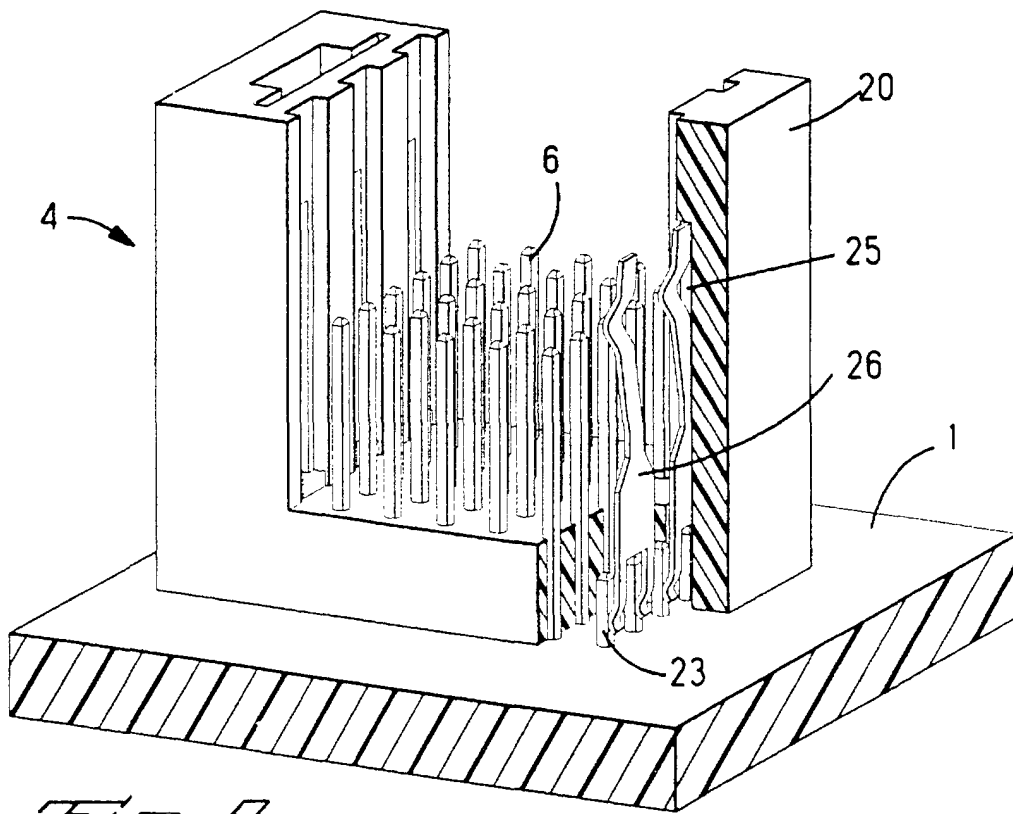


Fig. 8

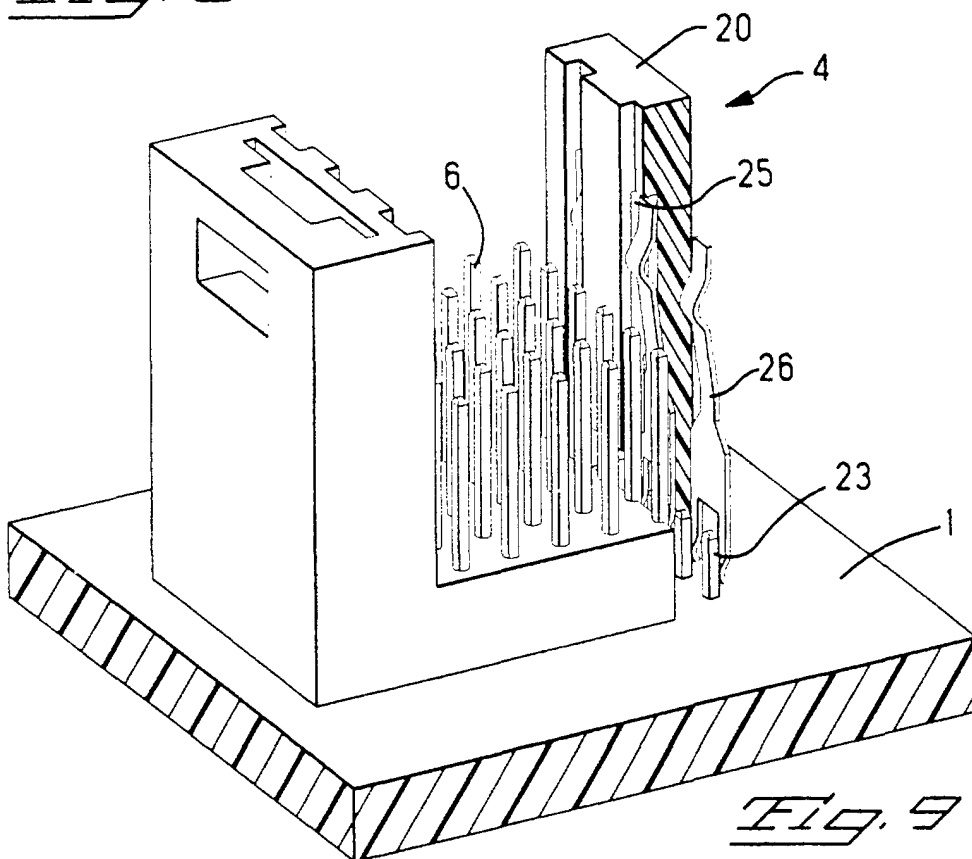


Fig. 9