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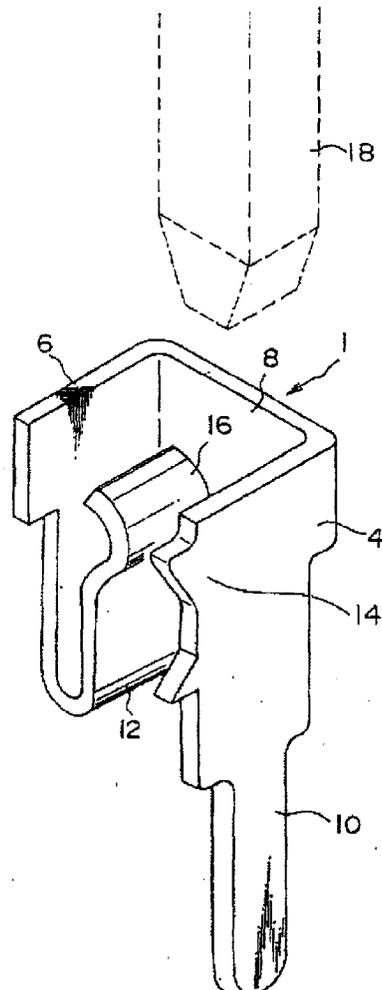
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**Receptor contact and receptor connector for receptor contacts.**

A receptor contact is formed as a one-piece unit from a phosphor bronze sheet. The contact has confronting side sections (4, 6) which define a passage (8) for receiving a contact pin (18). A beam (10) extends downwardly from one of the side sheet section (4) and another contact beam (16) is bent back from the lower end of the other sheet section (6) in a manner to extend upwardly along the inner wall surface of the opposite side sheet section (4). The contact beam (16) and the side section (4) are deformed at substantially central regions to provide projections within the passage (8) to grip the pin (18) elastically.



**Fig. 1**

The present invention relates to receptor contacts for receiving pin contacts and connectors employing such contacts.

Conventionally, pin contacts are electrically connected to a printed circuit board with the use of a receptor connector having receptor contacts. The receptor connector has the receptor contacts incorporated into a plastics housing. Each receptor contact has a pair of oppositely facing elastic contact beams and the associated pin contact is inserted between the contact beams in a contacting relationship. The receptor connector is mounted on the printed circuit board by inserting one end of each receptor contact into a corresponding through hole in the printed circuit board and soldering it there. In this type of receptor connector, where a housing is used between the pin contact and the printed circuit board, the whole thickness of an area of the connection of the pin contact to the printed circuit board is determined by the thickness of the bottom wall of the housing.

Recently, some reduction of the wall thickness has been attempted to produce a receptor connector of a low profile.

If the length of the contact beams is reduced in accordance with the reduction of the height of the housing then to achieve good electrical connection with the pin contacts, this has to be done so that adequate predetermined contact force is still obtained between each pin contact and the associated receptor contact.

If the length of the contact beams of the receptor contact is reduced, the range of a displacement for obtaining a predetermined elastic force becomes narrowed and, hence, high accuracy upon manufacture is demanded in view of a stricter manufacturing tolerance involved. Further, a permanent deformation is liable to be produced, ensuring no adequate force of contact between the receptor contact and the pin contact.

It is accordingly an object of the present invention to provide a readily manufacturable receptor contact as a low-profile unit in spite of an adequate length of its contact beam.

Another object of the present invention is to provide a receptor connector which can reduce the thickness of an associated housing so that the receptor connector can be obtained as a low-profile unit.

In one aspect, the present invention provides a receptor contact formed by bending an elastic, conductive metal sheet into a predetermined configuration, the receptor contact being operably associated with a pin contact insertable therein and extractable therefrom; said receptor contact comprising:

first and second side sheet sections with inner wall surface facing one another;

a first contact beam extending from one end of the first side sheet section;

a second contact beam bent back along the in-

ner wall surface of the second side sheet section;

a passage defined between the second contact beam and the inner wall surface of the first side section for receiving the pin contact;

a first elastic section formed at an area of the first side section so as to extend toward the inner wall surface of the second side sheet section; and

a second elastic section formed at an area of the second beam so as to extend towards the first elastic section whereby the first and second elastic sections elastically contact the pin contact when the pin contact is inserted into the passage.

In another aspect of the present invention, a receptor connector comprises a housing mounted on a circuit board and a plurality of receptor contacts as aforesaid which are incorporated in a predetermined array in the housing. The first contact beam of each receptor contact then extends out of the housing so as to be connected to the circuit board. Holes are provided at upper and lower surfaces of the housing so as to permit access to the passages of the receptor contacts.

In another aspect of the present invention there is provided a unitary receptor contact formed by bending an elastic conductive metal sheet to a predetermined configuration and associated with a pin contact insertable therein and extractable therefrom, said receptor contact comprising first and second side sheet sections with inner wall surfaces facing one another;

a leg section provided between the first and second side sections and extending outwardly for mounting in a printed circuit board;

a first contact beam extending from one end of the first side sheet section and bent back along the inner wall surface of the first side sheet section;

a second contact beam extending from one end of the second side sheet section and bent back along the inner wall surface of the second side sheet section,

a passage defined between the first and second contact beams for receiving the pin contact;

a first elastic section formed at an area of the first contact beam as to extend toward the second contact beam; and

a second elastic section formed at an area of the second contact beam as to extend toward the first elastic section, whereby the first and second elastic sections elastically contact the pin contact when the pin contact is inserted into the passage.

According to another aspect of the present invention, there is provided a unitary contact formed by bending an elastic conductive metal sheet so as to provide a passage substantially rectangular in cross-section which can receive a pin contact insertable therein and extractable therefrom, the rectangular passage being defined by four side sheet sections, two of which face one another and provide U-shaped

contact beams with one of the remaining two side sheet sections being extended as a leg section for mounting in a printed circuit board.

According to another aspect of the present invention, a receptor connector comprises a housing mounted on a printed circuit board and a plurality of receptor contacts in accordance with the invention which are incorporated in a predetermined array in the housing, with the leg sections of the contacts extending out of the housing to allow it to be mounted in the circuit board. Holes are again provided at upper and lower surfaces of the housing so as to permit access to the passages of the receptor contacts.

According to the receptor contact of the present invention, one or more of the contact sections can be made as a folded-back type or a U-shaped type to secure a greater length and, at the same time, the contact beams can be made lower in their height to secure a low-profile receptor contact.

Further, the receptor connector of the present invention enables the associated housing to be reduced in height with the use of the aforementioned low-profile receptor contact.

According to the present receptor contact, the length of the contact beam can be made greater in spite of the fact that the contact beam is relatively low in height. This alleviates the manufacturing tolerance and ensures a ready manufacture of the receptor contact. Further, the present receptor contact can maintain a predetermined force of contact for an extended period of time and hold the pin contact in a steady and positive contact state. There is, therefore, almost no possibility that a contact failure or defect will occur due to the weakening of a contact force involved. The pin contact can be inserted either in an up direction or in a down direction, providing an added degree of freedom in the attachment of the pin contact to the circuit board.

The present receptor connector can reduce the height of the housing with the use of the aforementioned advantageous receptor contacts, leading to the obtainment of a low-profile receptor connector.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

The accompanying drawings, which are incorporated in, and constitute a part of the specification, illustrate presently preferred embodiments of the invention, and together with the general description given above and the detailed description of the preferred embodiments given below, serve to explain the principles of the invention.

Figure 1 is a perspective view showing a receptor

contact according to a first embodiment of the present invention;

Figure 2 is a cross-sectional view showing a receptor connector according to a second embodiment of the present invention;

Figure 3 is a perspective view showing a receptor contact according to a third embodiment of the present invention and

Figure 4 is a perspective view showing a receptor contact according to a fourth embodiment of the present invention.

The embodiments of the present invention will be explained below with reference to the accompanying drawings.

Referring to Figure 1, a receptor contact 1 is formed of a single conductive metal sheet, such as phosphor bronze, in which case it is formed by a bending method or a cutting/bending method.

A pair of side sheet sections 4, 6 of the receptor contact 1 are so provided that their inner walls surface face each other.

A contact beam 10 integrally extends downwardly from the lower end of the side sheet section 4. A contact beam 12 integrally extends upwardly from the lower end of the side sheet section 6. The contact beam 12 is bent at the lower end of the side sheet section 6 such that it extends upwardly along the inner wall surface of the side sheet section. An insertion passage 8 is defined at an area between the pin contact beam 12 and the inner wall surface of the side sheet section 4. A pin contact 18 is inserted into, and extracted out of, the passage 8.

The side sheet section 4 is so bent as to provide a projection 14 extending toward the side sheet section 6 at a substantially middle area of the inner wall of the side sheet section 4. Similarly, the contact beam 12 is so bent as to provide a projection 16 facing the projection 14.

When the pin contact 18 is inserted into the passage 8 either from above or from below, the projections 14 and 16 elastically contact with the pin contact 18.

Figure 2 shows a receptor connector according to a second embodiment of the present invention. The receptor connector 20 is of such a type that a plurality of receptor contacts are incorporated in a predetermined array into a plastics housing 22. In Figure 2, only one receptor contact 1 is shown for brevity's sake.

The housing 22 for the receptor connector 20 is mounted on a printed circuit board 24 and, in this state, a contact beam 10 is inserted into the printed circuit board 24. Holes 22b and 22c are provided in an upper plate 22a and lower surface of the housing 22 such that these holes communicate with an insertion passage 8 of the receptor contact 1.

When the receptor connector 20 is to be mounted on the printed circuit board 24, the passage 8 is

aligned with a through hole 24a provided in the printed circuit board 24 and, in that aligned state, the pin contact 18 can be inserted into the insertion passage 8 in an up or down direction.

According to the first and second embodiments, the contact beam 12 is folded back upwardly and, by so doing, the full length of the contact beam 12 acting as an elastic section can be made greater in spite of its small height thus attained. Hence the receptor connector 20 can be achieved as a low-profile unit.

By an elastic spring force of the projection 14 of the side section 4 and projection 16 of the contact beam 12, the pin contact 18 inserted into the passage 8 is positively electrically connected to the receptor contact 1 with an adequate contact pressure. The manufacturing tolerance of the contact beam 12 requiring to obtain a predetermined contact force can be alleviated, making it easier to manufacture a receptor connector.

Since the length of the contact section can be increased at the receptor contact 1, a greater, elastic deformation area can be secured, maintaining a firm elastic force for an extended period of time without a risk of a contact defect resulting from an otherwise weakened spring force. That is, the contact section of the receptor contact 1 can readily be prevented from being excessively or permanently deformed and ensures a steady force of contact with the pin contact.

Figure 3 shows a receptor contact according to a third embodiment of the present invention. In Figure 3, a pair of side sheet sections 26, 28 are so provided at a receptor contact 2 that their inner wall surface face each other.

In Figure 3, a pair of contact beams 30, 32 similar to the contact beam 12 in the first embodiment extend from the lower ends of corresponding side sheet sections 26, 28. Stated in another way, the contact beam 30 (32) is folded back upwardly from the lower end of the side sheet section 26 (28), that is extends upwardly along the inner wall surface of the side sheet section 26. Further, a projection 36 (34) is provided at the contact beam 32 in a manner similar to the projection 16 in the first embodiment of the present invention.

A passage 38 is defined at an area between the contact beams 30 and 32 so that a pin contact 18 may be inserted into, or extracted out of, the passage 38. The projections 34, 36 of the contact beams 30, 32 are brought into elastic contact with the pin contact 18 which is inserted into the passage 38 in an up or down direction.

In the third embodiment, each of the contact beams 30, 32 is folded back upon itself and has a leg section 40 as a section for connection to a printed circuit board. The leg section 40 extends from the lower end of a back section 38 by which the side sheet sections 26 and 28 merges with each other. The leg section 40 is inserted into, and fixed to, a mount hole (not

shown) provided in the printed circuit board 8.

Figure 4 shows a receptor contact according to a fourth embodiment of the present invention. The receptor contact 3 is substantially rectangular in cross-section. A pair of side sheet sections or contact beams 42, 44 of the receptor contact 3 are so provided that their inner wall surfaces face each other. The side sheet sections 42, 44 extend, at their base ends, from both the end portions of a back sheet section 46 of the receptor contact 3. The free end portions of the side sheet sections, 42, 44 are so bent as to provide flat sheet-like front portions 48a, 48b facing the back sheet section 46. A passage 50 substantially rectangular in cross-section is defined by those inner walls of the side sheet sections 42, 44, front sections 48a, 48b and back sheet section 46. A pin contact 18 is inserted into, and extracted out of, the passage 50.

A leg section 52 extends from the lower end of the back sheet section 46 as in the third embodiment of the present invention.

The side sheet sections 42, 44, each provide a U-shaped side sheet section upwardly opened as shown in Figure 4. The U-shaped side sheet sections 44 and 42 are elastically deformed in their width direction depending upon a stress applied from each side of the U-shaped areas of the side sheet sections. Stated in another way, when the pin contact 18 is inserted into the passage 50, the back sheet section 46 and front surface sections 48, 48b are deformed and, at that time, the side sheet sections 42 and 44 are elastically deformed depending upon a stress applied. By so doing, the pin contact 3 is positively held in firm contact with the receptor contact 3.

It is of course possible to use various known structures in order to achieve a positive, electrical connection, to increase the elasticity of the back sheet section 46 and front surface sections 48a, 48b, or to fix the receptor contact 3 to a housing.

Even in the third and fourth embodiments, each of the receptor contact 2, 3 can be formed by cutting a conductive flat sheet and bending it to a proper configuration. Further, a receptor connector of a low profile can be manufactured by incorporating the receptor contacts into plastics housing 22 (see Figure 2).

Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, and representative devices shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.

## Claims

1. A unitary receptor contact (1) formed by bending an elastic, conductive metal sheet into a prede-

terminated configuration, the receptor contact being operably associated with a pin contact (18) insertable therein and extractable therefrom; said receptor contact (1) comprising:

first and second side sheet sections (4, 6) with inner wall surfaces facing one another;

a first contact beam (10) extending from one end of the first side sheet section (4);

a second contact beam (12) bent back along the inner wall surface of the second side sheet section (6);

a passage (8) defined between the second contact beam (12) and the inner wall surface of the first side section (4) for receiving the pin contact (18);

a first elastic section (14) formed at an area of the first side section (4) so as to extend toward the inner wall surface of the second side sheet section (6); and

a second elastic section (16) formed at an area of the second contact beam (12) so as to intend towards the first elastic section (14) whereby the first and second elastic sections (14, 16) elastically contact the pin contact (18) when the pin contact is inserted into the passage (8).

2. A receptor connector (20) comprising a housing (22) mounted on a printed circuit board and a plurality of receptor contacts (1) as claimed in Claim 1 disposed as a predetermined array in the housing (22), the first contact beam (10) of each receptor contact (1) extending out of the housing (22) so as to be connected to the printed circuit board, and further comprising holes (22b, 22c) in the housing which align with the passages (8) of the receptor contacts (1).

3. A unitary receptor contact (2) formed, by bending an elastic, conductive metal sheet to a predetermined configuration, the receptor contact being operably associated with a pin contact insertable therein and extractable therefrom, said receptor contact comprising:

first and second side sheet sections (26, 28) with inner wall surfaces facing one another;

a leg section (40) provided between the first and second side sections (26, 28) and extending outwardly for mounting in a printed circuit board;

a first contact beam (30) extending from one end of the first side sheet section (28) and bent back along the inner wall surface of the first side sheet section (28);

a second contact beam (32) extending from one end the second side sheet section (26) and bent back along the inner wall surface of the second side sheet section (26);

a passage (38) defined between the first

and second contact beams (30, 32) for receiving the pin contact;

a first elastic section (34) formed at an area of the first contact beam (30) as to extend toward the second contact beam (32); and

a second elastic section (36) formed at an area of the second contact beam (32) as to extend toward the first elastic section (34), whereby the first and second elastic sections (34, 36) elastically contact the pin contact when the pin contact is inserted into the passage (38).

4. A unitary receptor contact (3) formed by bending an elastic, conductive metal sheet so as to provide a passage (50) substantially rectangular in cross-section which can receive a pin contact insertable therein and extractable therefrom, the rectangular passage (50) being defined by four side sheet sections (42, 44, 46, 48) wherein two of the side sheet sections face one another and provide U-shaped contact beams, and one (46) of the remaining two side sheet sections is extruded to form a leg section (52) for mounting in a printed circuit board.
5. A receptor connector comprising a housing mounted on a printed circuit board and a plurality of receptor contacts of a type as claimed in Claim 3 or 4 which are incorporated in a predetermined array in the housing, the leg sections of the contacts extending out of the housing to allow it to be mounted in the circuit board and further comprising holes in the housing aligned with the passages of the receptor contacts.

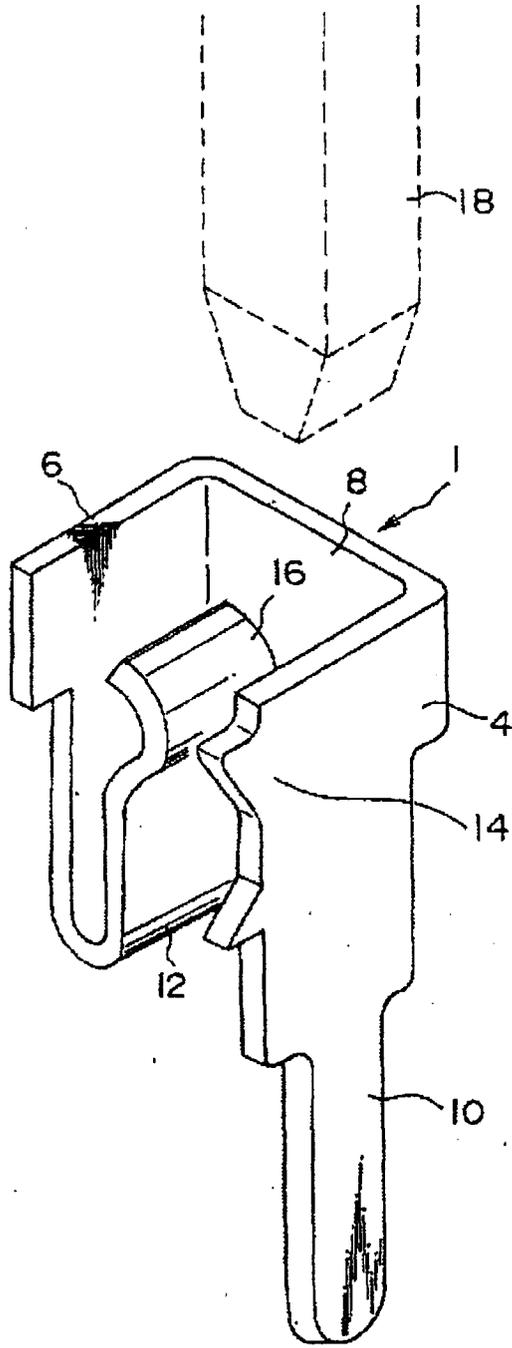


Fig. 1

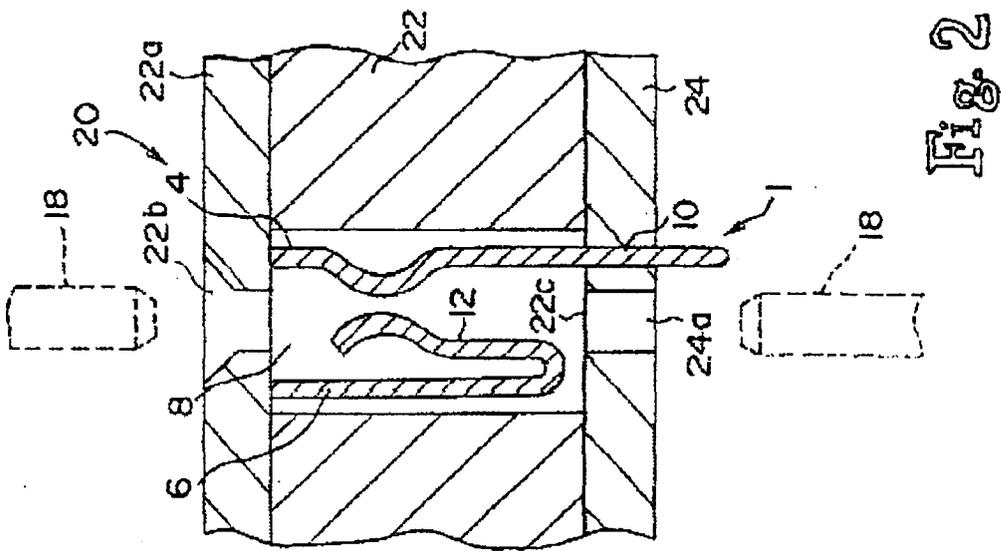


Fig. 2

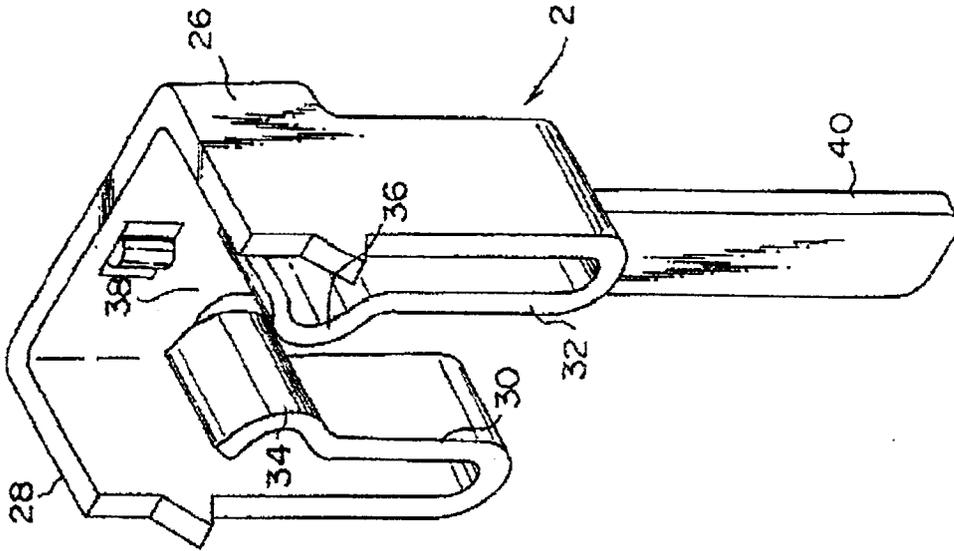


Fig. 3

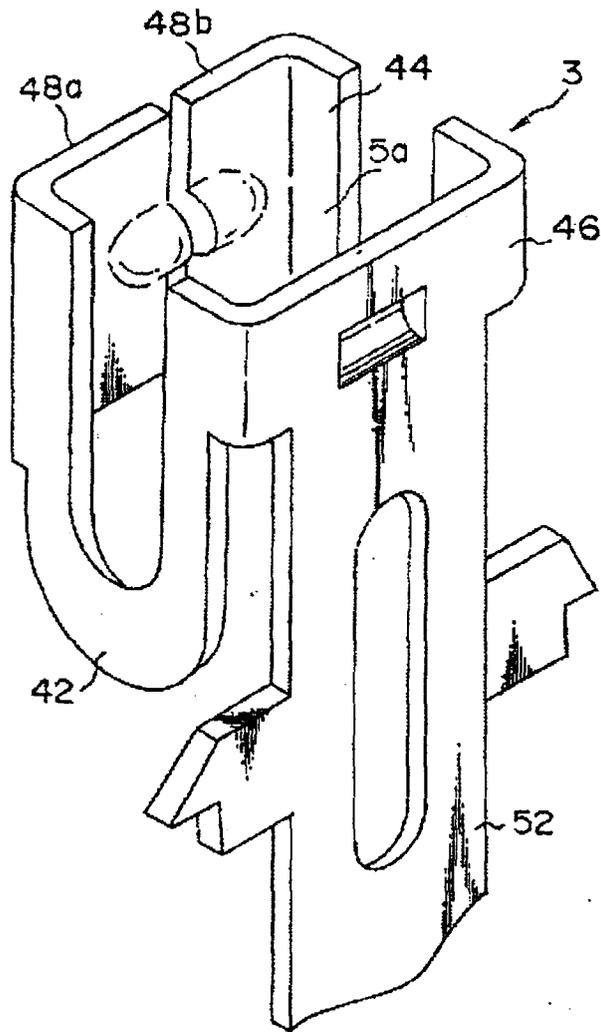


Fig. 4



European Patent  
Office

EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 92307974.3
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	SOVIET INVENTIONS ILLUSTRATED, E1 section, week 8728, August 26, 1987 DERWENT PUBLICATIONS LTD., London, SU-V, V04 * SU-A-1275 596 (OSTROUMOV) *	1, 2, 3, 5	H 01 R 13/11 H 01 R 9/09
A	DE - A - 3 815 405 (AMP) * Column 6, lines 8-30; fig. 1,9 *	1-3	
A	US - A - 4 907 990 (BERTHO) * Abstract; fig. 4 *	4, 5	
A	EP - A - 0 379 365 (E.I. DU PONT) * Fig. 2,4,5,7; abstract *	4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			H 01 R 13/00 H 01 R 9/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 19-11-1992	Examiner SCHMIDT
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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