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(71) Applicant:
CONNECTOR SYSTEMS TECHNOLOGY N.V.
Willemstad, Curaçao (AN)

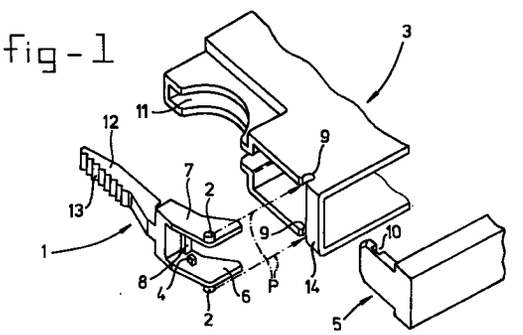
(72) Inventor: **Libregts,Hubertus Bernardus**
5252 CJ Vlijmen (NL)

(74) Representative: **de Bruijn, Leendert C.**
Nederlandsch Octrooibureau
P.O. Box 29720
2502 LS Den Haag (NL)

(54) Assembly of mating first and second connectors and an ejector latch for latching the mating connectors

(57) Assembly of mating first and second connectors (3, 5) and an ejector latch (1) for latching the mating connectors (3, 5), comprising first coupling means (2, 9) for coupling the ejector latch (1) to the first connector (3) and second coupling means (4, 10) for coupling the ejector latch (1) to the second connector (5), in latched position of which assembly the ejector latch (1) is coupled to both the first and the second connector (3, 5) whereas in unlatched position the ejector latch may be coupled to one of the connectors, whereby said second coupling means (4, 10) are constructed such as to provide a detachable coupling between said second connector (5) and said ejector latch (1) and whereby said first connector (3) and/or said ejector latch (1) are constructed such as to provide sufficient space to enable the unlatching of the connectors by moving the ejector latch (1) towards the first connector (3), thereby separating both the ejector latch (1) and the first connector (3) from the second connector (5).

fig-1



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Description

The present invention relates to an assembly of mating first and second connectors and an ejector latch for latching the mating connectors comprising first coupling means for coupling the ejector latch to the first connector and second coupling means for coupling the ejector latch to the second connector, in latched position of which assembly the ejector latch is coupled to both the first and the second connector whereas in unlatched position the ejector latch may be coupled to one of the connectors.

Such an assembly is known from the prior art and commonly comprises a "seahorse type" ejector latch, which can be used to latch various types of male and female connectors. In order to unlatch the connectors, said ejector latch has to be pushed outwards with respect to the first connector. The first connector and the ejector latch are thereby separated and the first connector is ejected from the second connector. Reversely the mating connectors can be latched by pushing the ejector latch towards the first connector.

The known ejector latch however enlarges the space required by the assembly of which it forms a part during latching and unlatching operations. In the scope of the miniaturization trend, as a result of which the impact of space requirements on design characteristics of all kinds of hardware components has increased, this is an important disadvantage.

The assembly according to the invention eliminates this disadvantage in that said second coupling means are constructed such as to provide a detachable coupling between said second connector and said ejector latch and in that said first connector and/or said ejector latch are constructed such as to provide sufficient space to enable the unlatching of the connectors by moving the ejector latch towards the first connector, thereby separating both the ejector latch and the first connector from the second connector.

In a preferred embodiment said ejector latch comprises first pushing means and second pushing means on which first pushing means a force can be exerted in order to move the ejector latch towards the first connector during which movement, by means of leverage of the ejector latch, the second pushing means can push the ejector latch away from the second connector thereby ejecting the first connector. This embodiment has the advantage that the connectors can be both unlatched and separated with one single movement.

In a further embodiment the first pushing means comprise at least one projecting member and the second pushing means comprise at least one projecting member, each projecting at in essence opposite ends of the ejector latch. The assembly according to this embodiment provides a simple and effective lever construction for the ejector latch which can be produced at low costs.

In another embodiment of the assembly the second coupling means comprise at least one ridge provided on the ejector latch that can be moved into at least one matching slot provided on the second connector. This embodiment provides simple and solid coupling means which can be produced at low costs.

In another embodiment of the assembly the first connector comprises reception means for receiving the ejector latch. Said embodiment has the advantage that the first connector can incorporate the ejector latch so that all latching and unlatching operations can be carried out within the space occupied by the first and second connector, the ejector latch not enlarging the required space.

In a further embodiment said first connector comprises first blocking means which prevent a lateral shift of the first connector with respect to the second connector in latched position of the assembly. In an advantageous manner these first blocking means prevent any undesired change of position of the ejector latch as a result of the shifting apart of said connectors.

In a still further embodiment the ejector latch comprises second blocking means which prevent the ejector latch from moving outwardly away from the first connector once the connectors are latched. These blocking means ensure, in a simple and inexpensive manner, that the ejector latch does not enlarge the space required by the first and second connectors when latched.

In another embodiment of the assembly the first coupling means are arranged such that the ejector latch can be coupled pivotably to the first connector. This embodiment facilitates the movement required for latching and unlatching operations.

In yet another embodiment of the ejector latch the first coupling means are arranged such that the ejector latch can be coupled detachably to the first connector. This has the advantage that the ejector latch can be produced separately from the first connector. Another advantage of this embodiment is that once the first connector and the second connector are unlatched, e.g. to replace the first connector by another one, the same ejector latch can be used to latch the replacement connector and the second connector.

The present invention also relates to an ejector latch for use in the assembly, in which the second pushing means comprise two spaced members, each having an inner and an outer side, projecting at one end of the ejector latch, the first coupling means being arranged at the outer sides of the projecting members and the second coupling means being arranged at the inner sides of the projecting members. By means of said projecting members this ejector latch fills the existing space between the first and the second connector thereby clamping said connectors in an advantageous manner.

The assembly according to the invention will be described in more detail with reference to the accompanying drawings in which:

Figure 1 shows a schematic view of an assembly according to the present invention comprising an

ejector latch and a first and second connector, of which the connectors are only partly shown;

Figure 2 shows a sectional view of the assembly shown in figure 1, the ejector latch now latching the mating first and second connectors;

Figure 3 shows the sectional view according to figure 2 during the unlatching operation, the ejector being pushed towards the first connector;

Figure 4 shows the sectional view shown in figures 2 and 3 after the unlatching has been completed;

Figures 5a and 5b show an assembly according to the prior art comprising a "seahorse type" ejector latch and an assembly according to the present invention, both in latching position, respectively;

Figures 6a and 6b show the assemblies shown in figures 5a and 5b, respectively, during the unlatching operation.

Figure 1 shows a schematic view of an assembly according to the present invention comprising an ejector latch 1 and a first and second connector, 3, 5 respectively, which are only partly shown. The ejector latch 1 comprises two spaced, parallel projecting, flat members 6, 7 on whose outer sides first coupling means 2 are provided for coupling the ejector latch 1 to the first connector 3. In the embodiment shown the first coupling means 2 comprise two ridges which fit into two matching slots 9 provided on the first connector 3, which enables a detachable coupling, preferrably by means of a snap-in construction. Furthermore, the ridges 2 are round as to provide a pivotably coupling of the ejector latch 1 and the first connector 3. On the inner sides of said projecting members 6, 7 second coupling means 4 are provided for detachably coupling the ejector latch 1 to the second connector 5. The second coupling means 4 comprise two ridges which are able to fit into two matching slots 10 provided on the second connector 5. A further projecting member 12, which is mainly projecting in a direction opposite to the direction of the members 6, 7, is provided for exerting a force thereon in order to unlatch the two mating connectors 3 and 5. In order to facilitate said exertion of force member 12 preferrably comprises ribs 13. First blocking means 14 are provided on the first connector 3 to prevent a lateral shift of said first connector 3 with respect to the second connector 5 in latched position of the assembly. Second blocking means 8 are provided on the ejector latch 1 to prevent said ejector latch 1 from moving outwardly away from the first connector 3 when the first and second connector are latched.

In order to latch the connectors 3 and 5 the ejector latch 1 is first coupled to the first connector 3. Therefore it is moved in the direction of the arrows P, the ridges 2 mating with the slots 9. Reception means 11 are provided on the first connector 3 for receiving the ejector latch 1. The first connector 3, which now incorporates ejector latch 1, can then be slided over the second connector 5, the ridges 4 mating with the slots 10 thereof. It will be evident to any person skilled in the art that the ejector latch 1 may also comprise only one projecting member 6 or 7, the first and second coupling means, 2, 4 respectively, being arranged at opposite sides thereof. The necessary adaptations to the connectors following from that alternative embodiment will also be clear to any person skilled in the art.

Figure 2 shows a sectional view of the assembly shown in figure 1, the ejector latch 1 now latching the mating first and second connectors 3, 5 respectively. In this position the ejector latch 1 is almost completely incorporated in the first connector 3, thus using no more space than is required for the two connectors alone. From figure 2 it can clearly be seen that in latched position of the assembly the first blocking means 14 and the second blocking means 8 cooperate to retain the ejector latch 1 in position.

Figure 3 shows the sectional view according to figure 2 during the unlatching operation. In order to move the ejector latch 1 towards the first connector 3 a force is exerted on the projecting member 12, as indicated by a horizontal arrow Q. By leverage of the ejector latch 1 the projecting members 6 and 7 (of which only 6 is shown) subsequently exert a force on the second connector 5, as indicated by a vertical arrow R, thereby freeing the ridges 4 from the slots 10, as a result of which the ejector latch 1 pushes itself away from the second connector 5. As the ejector latch 1 and the first connector 3 are still coupled by means of the first coupling means 2, at the same time said first connector 3 is ejected from said second connector 5. The preferred embodiment of the ejector latch 1 thus advantageously enables the unlatching as well as the ejection of the first connector from the second connector in one movement. It must be noted that whereas on one hand the material of the ejector latch 1 should be chosen sufficiently flexible as to enable the ridges 4 to be freed of the slots 10 during the above described inward movement of the ejector latch 1, on the other hand said material should be chosen sufficiently rigid as to enable the above described ejection of the first connector 3.

In the reverse latching operation, wherein the first connector 3 incorporating the ejector latch 1 is slided over the second connector 5, the projecting members 6, 7 first get clamped between the first connector 3 and the second connector 5. Next, at a certain point during said sliding, the projecting members 6, 7 will contact the second connector 5. By means of leverage of the ejector latch 1 the projecting member 12 of the ejector latch 1 will subsequently be pushed outward with respect to the first connector 3, which can be facilitated by means of the specific shape of the projecting members 6 and 7. The latching of the connectors is further facilitated by means of recess 15 provided on the ejector latch 1, which recess can be adapted to the shape of ejector latch 1. The combination of forces as discussed above results in the coupling of ridges 4 and slots 10.

Figure 4 shows the sectional view of figures 2 and 3 after the unlatching has been completed. From figure 4 it is clear that ejector latch 1 can be completely incorpo-

rated by first connector 3 according to its preferred embodiment.

Figure 5a shows an assembly according to the prior art comprising a "seahorse type" ejector latch 20 that latches mating first and second connectors 21, 22 respectively. Figure 5b shows an alternative embodiment of an assembly according to the present invention comprising ejector latch 1' which latches mating first and second connectors 21', 22' respectively. It must be noted that all components equal to components described above are indicated with equal reference numerals provided with a quotation mark. First connector 21' of the alternative embodiment deviates from first connector 3 as shown in figures 1 through 4 in that it has no reception means for reception of the ejector latch. Ejector latch 1' resembles ejector latch 1 as shown in figures 1 through 4 in many aspects (e.g. blocking means 8', ridges 4' mating with slots 10'), but is adapted to the specific shape of first connector 21'. However, both the ejector latch 1' and the first connector 21' are constructed such as to provide sufficient space to enable the unlatching of the first and second connectors, 21' and 22' respectively, by moving the ejector latch 1' towards the first connector 21', just as in the assembly shown in figures 1 through 4.

As can be seen from figures 5a and 5b the first connectors 21, 21' are in essence equal, apart from a few necessary adaptations to the type of ejector latch used (this also applies for second connectors 22, 22'). In their latching position both assemblies occupy an equal amount of space, as is indicated by the two dotted lines.

Figures 6a and 6b show the ejector latches shown in figures 5a and 5b, respectively, during the unlatching operation. In order to perform the unlatching of the two mating connectors in the known assembly the ejector latch 20 must be moved outward with respect to the first connector 21, the assembly thereby occupying the amount of space indicated by the left dotted line in figure 5a. Contrary to this the ejector latch 1' being part of the assembly according to the present invention must be moved inwardly with respect to the first connector 21' in order to unlatch the connectors, as described above. In this case the unlatching operation can be carried out within the space already occupied by the assembly, as becomes apparent from figure 6b. The assembly according to the present invention therefore minimizes space requirements in comparison with the assembly known in the prior art.

The invention is, of course, not limited to the embodiments shown, but can be modified in various ways and extended without deviating from the inventive idea as formulated in the accompanying claims.

Claims

1. Assembly of mating first and second connectors (3, 5) and an ejector latch (1) for latching the mating connectors (3, 5), comprising first coupling means (2, 9) for coupling the ejector latch (1) to the first connector (3) and second coupling means (4, 10) for coupling the ejector latch (1) to the second connector (5), in latched position of which assembly the ejector latch (1) is coupled to both the first and the second connector (3, 5) whereas in unlatched position the ejector latch may be coupled to one of the connectors, characterised in that, said second coupling means (4, 10) are constructed such as to provide a detachable coupling between said second connector (5) and said ejector latch (1) and in that said first connector (3) and/or said ejector latch (1) are constructed such as to provide sufficient space to enable the unlatching of the connectors by moving the ejector latch (1) towards the first connector (3), thereby separating both the ejector latch (1) and the first connector (3) from the second connector (5).

2. Assembly according to claim 1, characterised in that, said ejector latch (1) comprises first pushing means (12) and second pushing means (6) on which first pushing means (12) a force can be exerted in order to move the ejector latch (1) towards the first connector (3) during which movement, by means of leverage of the ejector latch (1), the second pushing means (6) can push the ejector latch (1) away from the second connector (5) thereby ejecting the first connector (3).

3. Assembly according to claim 2, characterised in that, the first pushing means comprise at least one projecting member (12) and the second pushing means comprise at least one projecting member (6), each projecting at in essence opposite ends of the ejector latch (1).

4. Assembly according to one of the preceding claims 3, characterised in that, the first (2) and second coupling means (4) are arranged at opposite sides of the at least one projecting member of the second pushing means.

5. Assembly according to one of the preceding claims, characterised in that, the second coupling means (4,10) comprise at least one ridge (4) provided on the ejector latch (1) that can be moved into at least one matching slot (10) provided on the second connector (5).

6. Assembly according to one of the preceding claims, characterised in that, said first connector (3) comprises reception means (11) for receiving the ejector latch (1).

7. Assembly according to one of the preceding claims, characterised in that, said first connector (3) comprises first blocking means (14) which prevent a lateral shift of the first connector (3) with respect to the second connector (5) in latched position of the

assembly.

8. Assembly according to one of the preceding claims, characterised in that, the ejector latch (1) comprises second blocking means (8) which prevent the ejector latch (1) from moving outwardly away from the first connector (3) once the connectors are latched.

9. Assembly according to one of the preceding claims, characterised in that, the first coupling means (2, 9) are arranged such that the ejector latch (1) can be coupled pivotably to the first connector (3).

10. Assembly according to one of the preceding claims, characterised in that, the first coupling means (2, 9) are arranged such that the ejector latch (1) can be coupled detachably to the first connector (3).

11. Assembly according to one of the preceding claims, characterised in that, the first coupling means (2, 9) comprise at least one ridge (2) provided on the ejector latch (1) that can be moved into at least one matching slot (9) provided on the first connector (3).

12. Ejector latch for use in the assembly according to claims 2 through 11, characterised in that, the second pushing means comprise two spaced members (6, 7), each having an inner and an outer side, projecting at one end of the ejector latch (1), the first coupling means (2) being arranged at the outer sides of the projecting members (6, 7) and the second coupling means (4) being arranged at the inner sides of the projecting members (6, 7).

Fig - 1

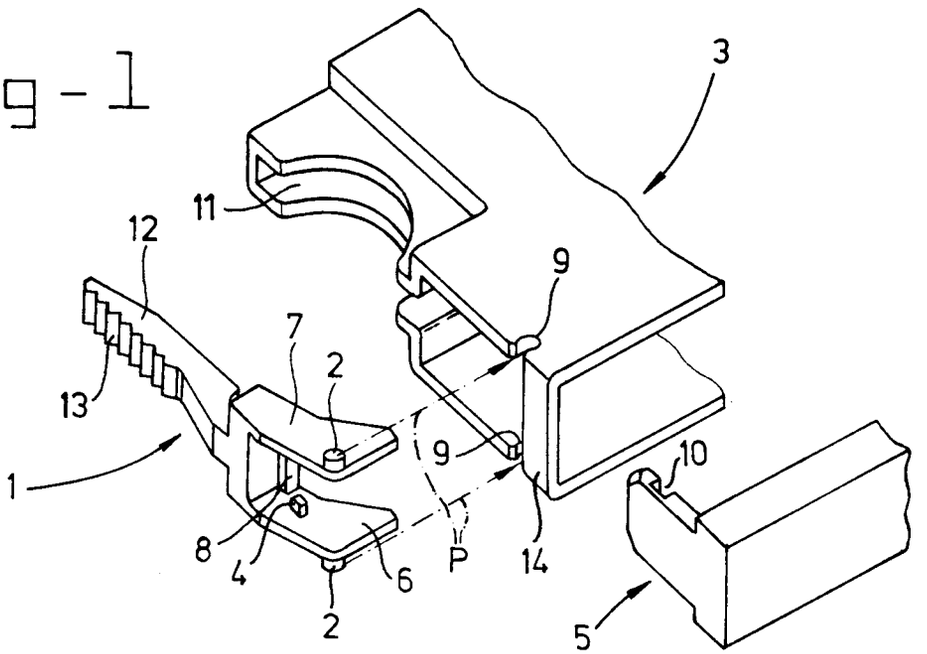


Fig - 2

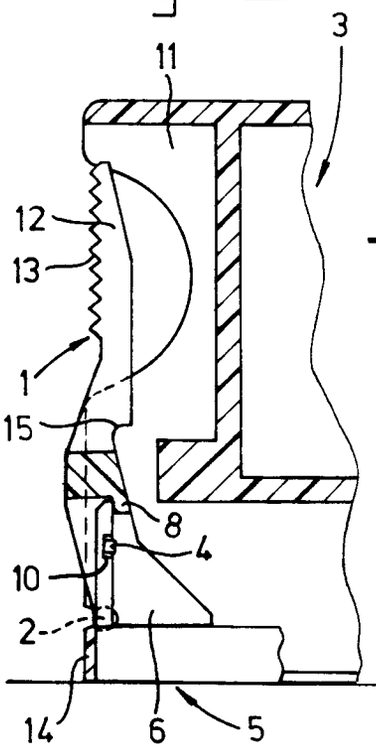


Fig - 3

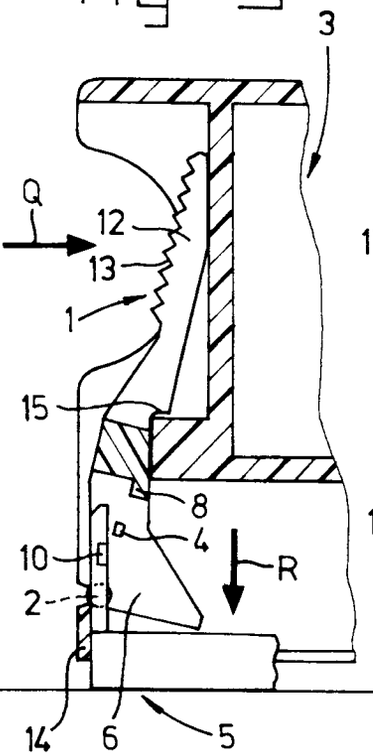


Fig - 4

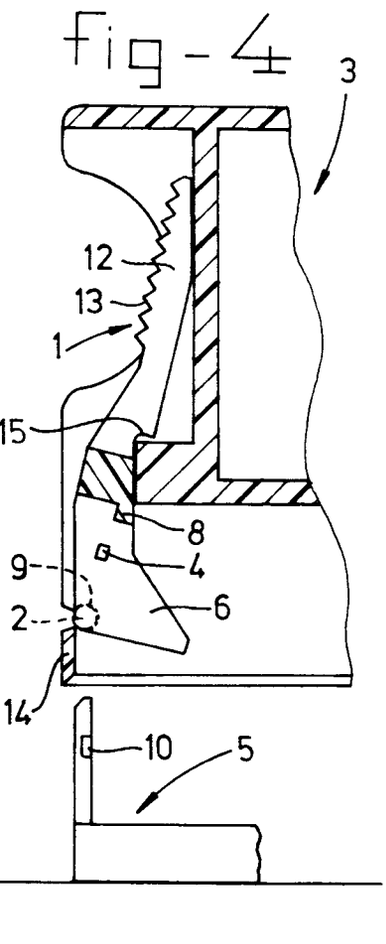


Fig-5a

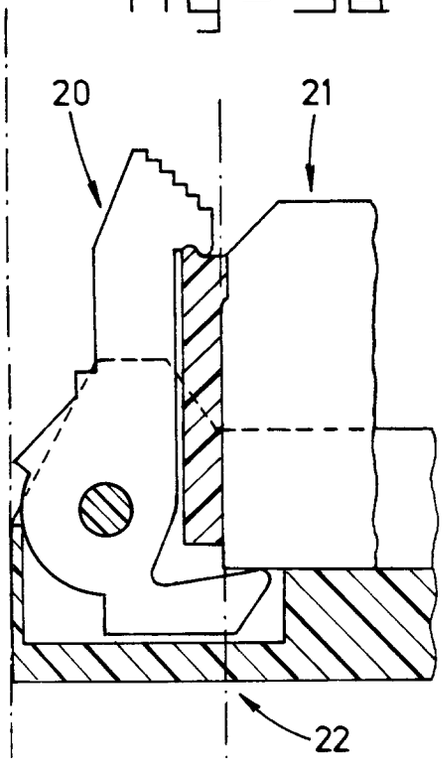


Fig-6a

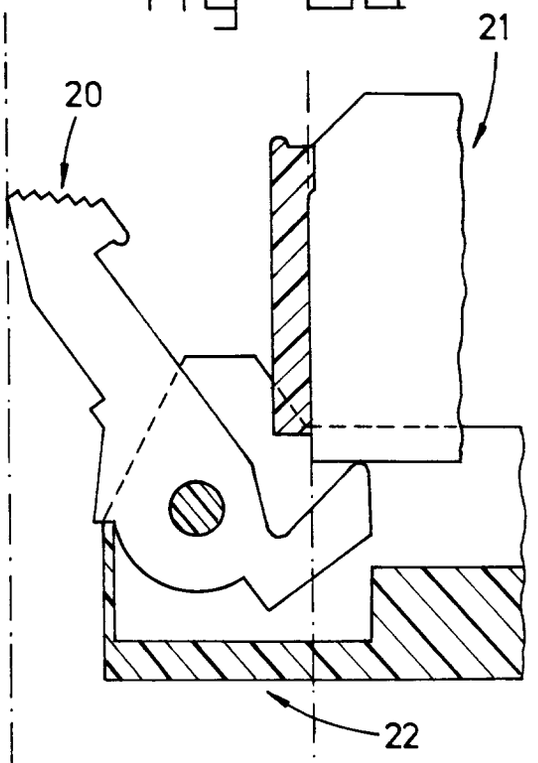


Fig-5b

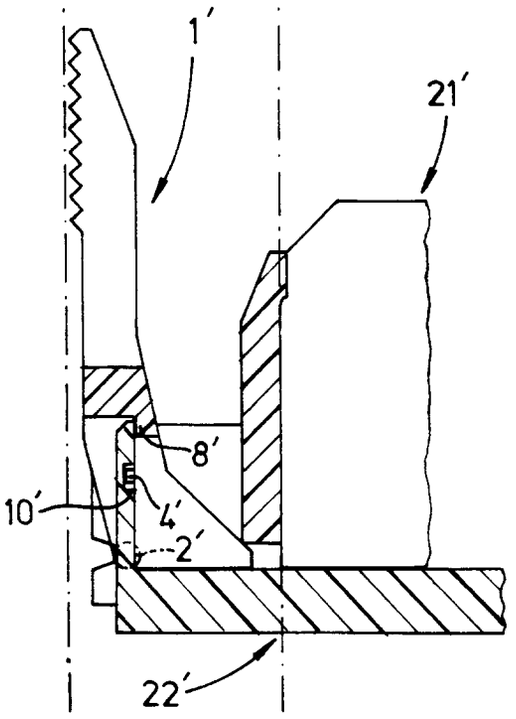
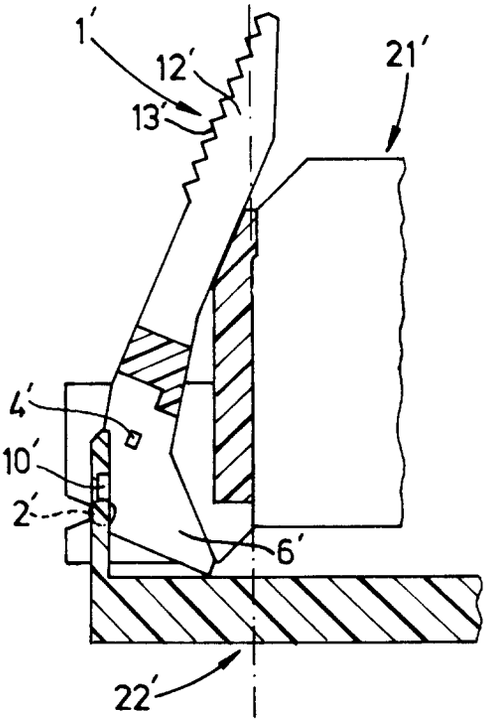


Fig-6b



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EUROPEAN SEARCH REPORT

Application Number
EP 94 20 3591

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US-A-5 232 374 (KOUICHI IIONO) * the whole document *	1-11	H01R13/633
A	US-A-5 302 133 (ROBERT J. TONDREAULT) * abstract; claims; figures *	1-11	
A	EP-A-0 431 888 (MOLEX) * abstract; claims; figures *	1-11	
A	DE-U-83 29 459 (ELCO) * claims; figures *	1	
A	EP-A-0 091 615 (LITTON SYSTEMS) * claims; figures *	1	
A	US-A-4 531 795 (WILLIAM Y. SINCLAIR) * abstract; claims; figures *	1-4	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31 May 1995	Durand, F

CATEGORY OF CITED DOCUMENTS

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