

Description

[0001] The present invention concerns a connection device for a flexible printed circuit comprising a contact and an associated connector. Flexible printed circuits generally consist of a first sheet of flexible insulation material on which are arranged conducting tracks made, for example, of copper, the said tracks themselves being covered either with a second sheet of insulation material or with an insulating varnish. These circuits are used on a large scale in the electrical industry and several methods of connection exist for connecting them to electrical contacts or to electronic components

[0002] In this context, USP 3 713 072 concerns a connection device of tabs arranged perpendicularly to the flexible printed circuit, formed by two staples which pierce the printed circuit, these staples comprising in their centre a hole to receive the tab, these staples being subsequently crimped on the flexible printed circuit.

[0003] USP 4 749 368 concerns a connection device of a component to one or more tracks of a flexible printed circuit by means of staples equipped with a ring of piercing teeth embedded in the flexible printed circuit and subsequently crimped on the said circuit.

[0004] USP 4 082 402 concerns the embodiment of a connector for a flexible printed circuit, the electrical contacts of which comprise on the one hand piercing wings and on the other a supplementary contact termination. These contacts which are connected to the flexible printed circuit are received into an insulating housing which is destined to receive a supplementary housing comprising the supplementary contacts.

[0005] The connection of flexible printed circuits to connectors imposes constraints on the connection with contacts and, in the case of flexible printed circuits with multiple tracks connected by devices which pierce the insulation, necessitates a simultaneous connection of the tracks and the contacts and the retention of a good alignment of the said contacts, both in an axis parallel to the contacts, as well as in an axis perpendicular to the flexible printed circuit.

[0006] Still with the same objective, the present invention proposes a device for connecting the flexible printed circuit, simplifying the process of connection whilst ensuring an improved retention of the flexible printed circuit.

[0007] For this purpose, the invention principally proposes a connection contact for a flexible printed circuit equipped with a termination for connection to a supplementary contact, an elongated central part which forms the floor and an insulation-piercing connection part destined for coming into contact with a flexible printed circuit track, the contact being destined to be placed in a cavity of a housing and for which purpose the elongated central part is equipped with an elastic leg, this leg comprising a lug curved under the elongated central part.

gated central part.

[0008] Advantageously, the insulation-piercing connection part may be elevated with respect to the elongated central part which forms the floor.

[0009] In a particular embodiment of the contact according to the invention, the insulation-piercing part may include at least one toothed ring destined to pierce the flexible insulation and to be crimped on the flexible printed circuit.

[0010] More particularly, the contact may comprise two aligned crimping rings.

[0011] The contact may moreover comprise in its elongated central portion, lateral reinforcement flanks.

[0012] Still according to the invention, the lateral flanks of the contact may comprise a tab zone forming a stiffener which is substantially arranged opposite the lug.

[0013] The invention also concerns a connector for a flexible printed circuit comprising a contact according to the invention and a housing equipped with at least one cavity for the reception of the said contact for which purpose, in the pre-insertion position, the contact lug bears against the rim of a lower wall of the housing and may bend and flatten under the action of a thrust in the direction of the insertion of contacts.

[0014] The housing and the contact may advantageously comprise supplementary means of attachment and retention of the contact in the direction of its insertion.

[0015] In one particular embodiment of the connector according to the invention, the latter may comprise a shrouding cover component which can be manoeuvred in a direction perpendicular to the cavities between a pre-insertion position of the contacts and a position of complete insertion and of the locking of the contacts, the shrouding cover component comprising at least one tab per contact, the said tab in its locked position bearing against the part of the contact connecting it with the flexible printed circuit.

[0016] In a case where the contacts comprise two aligned toothed crimping rings, the said tabs may support themselves between the said toothed rings.

[0017] The present invention will be better understood by reading the description of a particular non-limiting embodiment in conjunction with the drawings which respectively show the following aspects :

- Fig 1 : shows a perspective view of a connection device according to the invention ;
- Fig 2 : shows a perspective view of a contact according to the invention ;
- Fig 3 : shows a detail of the connection device from Fig 1 ;
- Fig 4 : shows a perspective view from below of the shrouding cover from Fig 1 ;

- Figs 5A, 5B and 5C : show section views representing the kinematics of insertion and locking of the device from Fig 1 ;
- Fig 5D : shows a detail of a variant of Fig 5 ;
- Fig 6 : shows a part-section of the device from Fig 1 in a locked position;
- Fig 7 : shows a connector according to the invention, completely locked.

[0018] Fig 2 : shows a connection contact (general marking 6) for a flexible printed circuit equipped with an insulation-piercing termination (20) for connection to a supplementary contact, an elongated central portion (21) which forms the floor and an insulation-piercing connection part (22). The connection termination may, in particular, be, as shown, of the female type and consist of a cage equipped with one or more elastic contact blades (50). The connection termination according to the invention is extended on one of its faces by an elongated central part (21) which is itself extended by a flat zone (22) which forms part of the insulation-piercing connection. The elongated central part is equipped with an elastic leg (26), this leg comprising a lug (27) curved under the elongated central part. This leg is destined to work in conjunction with the rim (32) of the lower wall (35) of a housing (1) for receiving the contact (6), as will be explained below.

[0019] Still according to Fig 2, the insulation-piercing connection part (22) is elevated with reference to the elongated central part (21) which forms the floor. As can be seen in Figs 5B and 5C, this arrangement makes it possible to remove the insulation-piercing part from the lower wall (35) of the housing which receives the contact.

[0020] The elongated central part of the contact may possess lateral flanks (24, 25). These flanks which extend the lower face of the contact termination serve as a reinforcement of the contact and as a lateral guidance of the contact into its reception cavity (2) in the housing (1). These flanks may comprise a pinch zone (28) around the zone of the elastic leg (26) comprising the lug (27) in such a way as to reinforce, by constriction of the metal, this part which was weakened by the cutting needed to form the leg (26). This pinch zone moreover makes it possible to create a continuous change of level so that the insulation-piercing connection part (22) may become elevated with reference to the elongated central part.

[0021] In a known manner, the termination (20) for connection to a supplementary contact may comprise a cage formed by successive bending in a direction parallel to the contact and comprise a folded shutter (30) at the transition to the elongated central part.

[0022] The insulation-piercing part is in the embodiment shown in the Fig., of the type comprising at least

one toothed ring (23) destined to pierce the flexible printed circuit and to be crimped into the flexible printed circuit in order to create contact with a track 100 of the flexible printed circuit (10). Other configurations such as piercing blades are possible without departing from the scope of the invention, such configurations being well known in the field of flexible printed circuits.

[0023] As a step of simplification, a single track 100 is shown in Fig 1, it being understood that there are several tracks on the flexible printed circuit.

[0024] Two aligned crimping rings (23, 23') are advantageously formed in order to improve the connection. It should be noted that although, for reason of clarity, Fig 3 does not show the flexible printed circuit, the piercing rings are shown in their condition after crimping. The rings in their condition before crimping are shown in Fig 3

[0025] Fig 1 shows a general view of a connector for a flexible printed circuit according to the invention which comprises a contact (6) as previously described, a housing (1) equipped with at least one cavity (2) for receiving the said contact (6) for which the contact lug (27) leans, in the pre-insertion position, against the rim (32) of the lower wall (35) of the housing. This pre-insertion position makes it possible to supply connectors equipped with their contacts and, in a suitable tool, to position the flexible printed circuit and to crimp in a single operation, all the piercing and crimping components (23,23') on the tracks 100.

[0026] Once the crimping has been completed, a thrust on the flexible printed circuit in the direction of insertion of the contacts causes the lugs (27) to bend and flatten and makes it possible for the contacts to penetrate fully into the insulator (1). The kinematics of insertion of contacts is shown diagrammatically in Figs 5A, 5B and 5C, where it is possible to see in section the respective pre-insertion phases of the contact, the contact crimped on the flexible printed circuit and the locked connector.

[0027] The housing (1) and the contact (6) may comprise supplementary means of fastening and retention of the contact in the direction of insertion of the contact. These means may consist of a forked leg (51) on the contact, of a first retention stop (52) of the forked leg to prevent the coming out of the contact when it is in the pre-insertion position and a second retention stop (53) of the forked leg in order to retain the contact in a position of complete insertion.

[0028] In the event of the connector comprising a supplementary locking shrouding cover, the lowered cover may perform, aside from a possible contact locking function by the leaning of a ratchet (4) against a shutter (30) arranged at the rear of the contact connection part, the function of holding the flexible printed circuit and the contacts in position by means of the tabs (31) supporting the crimping zone (22).

[0029] The shrouding cover (5) which can be seen in Fig 4 is movable in a direction perpendicular to the

cavities between a pre-insertion position of the contacts and a position of complete insertion and locking of the contacts. It comprises, for example, a window (60) which receives a lug (61) of the housing (1).

[0030] When the contacts are completely inserted, the shrouding cover may be pushed vertically into a locked position. The locking of the shrouding cover is performed by the latching of the window (60) on a second lug (62). In the locked position the tabs (31) lean on the connection part (22) of the contact with the flexible printed circuit. This leaning places under constraint and bends the crimping part which in its natural position is elevated with respect to the lower wall of the housing.

[0031] On referring to Fig 3 it can be seen that the lower wall (35) of the housing (1) comprises ribs (40) which separate the cavities (2). Also, the flexing of the crimping part (22) brings the flexible printed circuit into contact with the ribs framing the contacts and advantageously causes the flexible printed circuit to corrugate under the effect of opposing offset supports. These constraints make the zone of connection of the flexible printed circuit (10) more rigid and more suitable for supporting the vibrations which are encountered, in particular, in automotive applications.

[0032] In the event of the crimping zone containing two aligned crimping rings (23, 23'), the tabs (31) will support themselves between these two rings, reinforcing the connecting zones even further.

[0033] To achieve a function of secondary locking of the contact in the cavity, the contact may comprise a stop (30), consisting, for example, of a folded shutter of the termination (20) or of the cage of the termination itself, the shrouding cover comprising a supplementary retention ratchet (4) of the contact acting in conjunction with the stop (30) in order to bring about the locking of the contact (6) into the cavity, the shrouding cover being in a closed position. This configuration moreover makes it possible to prevent the closure and locking of the shrouding cover when the contacts are not completely inserted, the ratchets (4) in this case abutting against the termination (20).

[0034] In applications where the shrouding cover is not required, for example to reduce the cost of the connector, it is possible, as shown in the detail of Fig 5D at the level of Fig 5C, to make a hole (36) opening or otherwise from the reception of the lug (27) when the contact is in a completely inserted position. In this case, the leg locks the contact.

[0035] Naturally, the invention does not restrict itself to the example described in the Figures and is, in particular, able to be adapted to any type of termination for connection to a supplementary contact such as, for example, a male termination.

Claims

1. A contact (6) for connection to flexible printed circuits provided with a termination (20) for connection

to a supplementary contact, an elongated central part (21) which forms the floor and a insulation-piercing connection part (22) destined to come into contact with a track (100) of a flexible printed circuit (10), the contact (6) being destined to be positioned in an cavity (2) of a housing (1) characterised by the fact that the elongated central part is equipped with an elastic leg (26), this leg comprising a lug (27) bent under the central elongated part.

2. A contact according to Claim 1 characterised by the fact that the insulation-piercing connection part (22) is elevated with respect to the elongated central part (21) which forms the floor.
3. A contact according to one of the Claims 1 or 2, characterised by the fact that it comprises in its elongated central part, reinforcing lateral flanks (24,25).
4. A contact according to one of the preceding Claims, characterised by the fact that the insulation-piercing part comprises at least one toothed ring (23) destined to pierce the flexible printed circuit and to be crimped on the flexible printed circuit.
5. A contact according to Claim 4, characterised by the fact that it comprises two aligned crimping rings (23, 23')
6. A contact according to one of the preceding Claims, characterised by the fact that the lateral flanks comprise a pinch zone (28) forming a stiffener, substantially arranged opposite the lug (27)
7. A connector for a flexible printed circuit comprising a contact according to one of the Claims 1 to 6, characterised by the fact that it comprises a housing (1) equipped with at least one cavity (2) to receive the said contact (6) for which the lug (27) of the contact leans, in its pre-insertion position, against the rim (32) of a lower wall (35) of the housing and is able to bend and flatten under the action of a thrust in the direction of insertion of the contacts.
8. A connector according to Claim 7 characterised by the fact that the housing (1) and the contact (6) comprise supplementary means (51,52,53) of fastening and retention of contact in the direction of its insertion.
9. A connector according to one of the Claims 7 or 8, characterised by the fact that it comprises a shrouding cover (5) movable between a position of pre-insertion of the contacts and a position of their complete insertion and locking, the shrouding cover comprising at least one tab (31) per contact, this

tab (31) in the locked position leaning against the connection part (22) of the contact with the flexible printed circuit.

10. A connector according to Claim 9, characterised by 5
the fact that since the contacts comprise two
aligned crimping rings (23, 23'), the tabs (31) will
support themselves between the rings.

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FIG 1

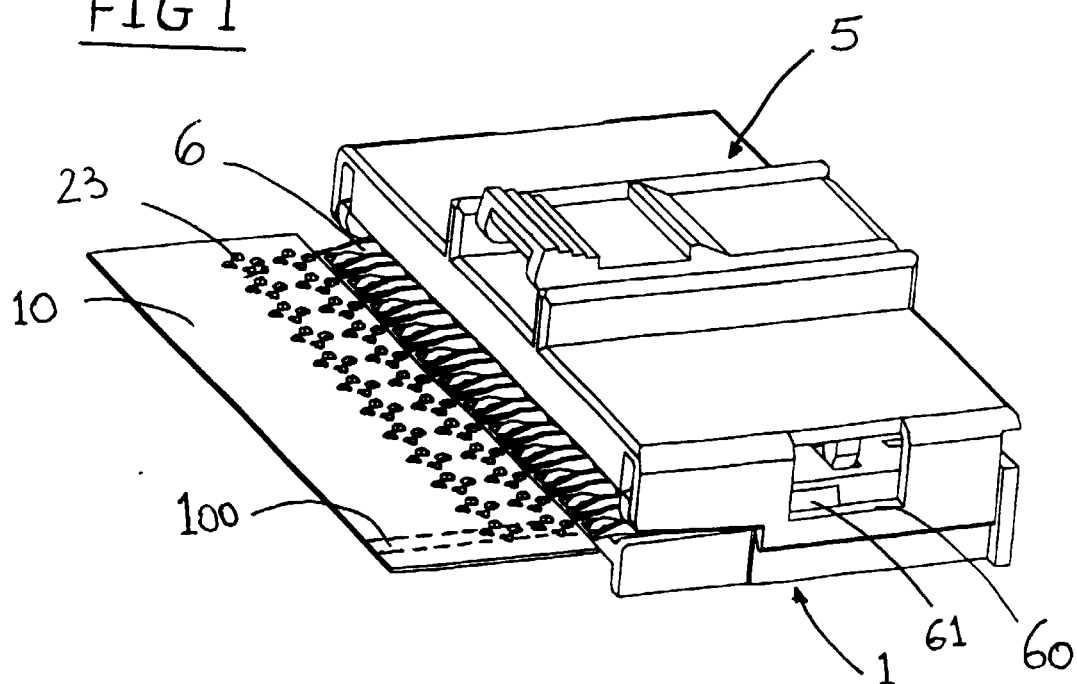
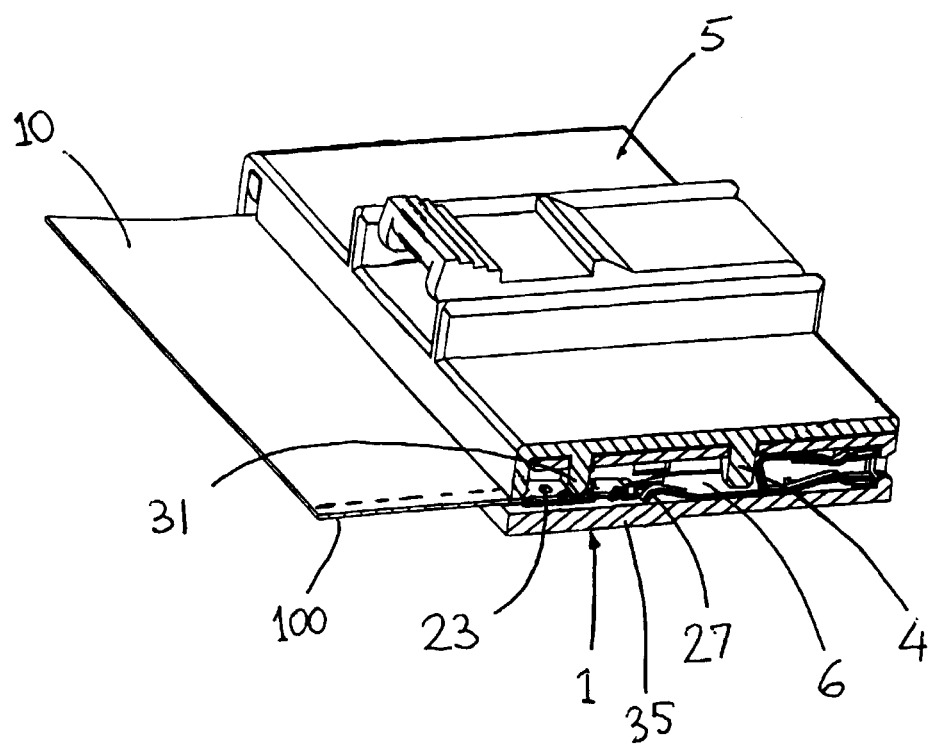
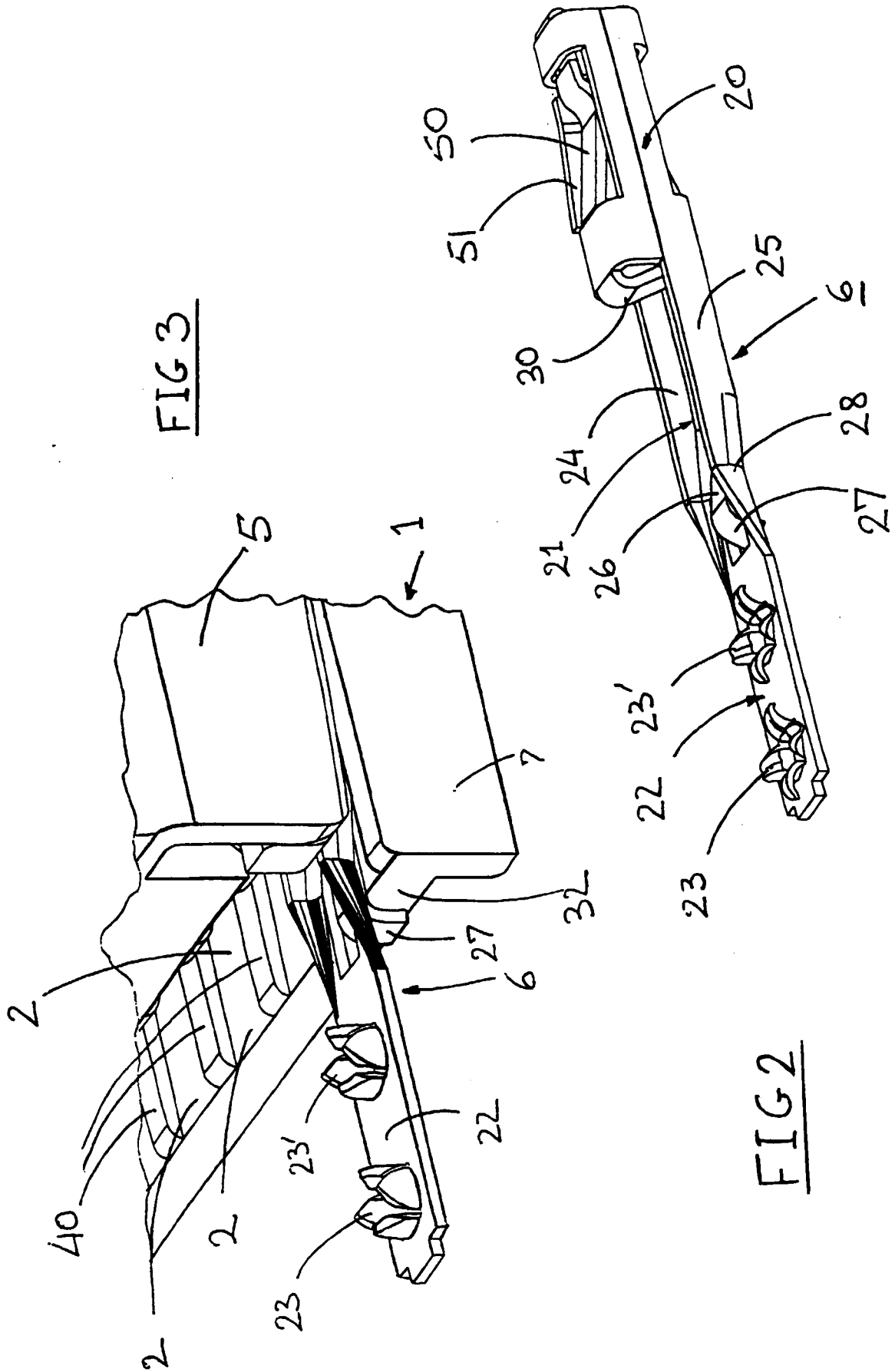


FIG 6





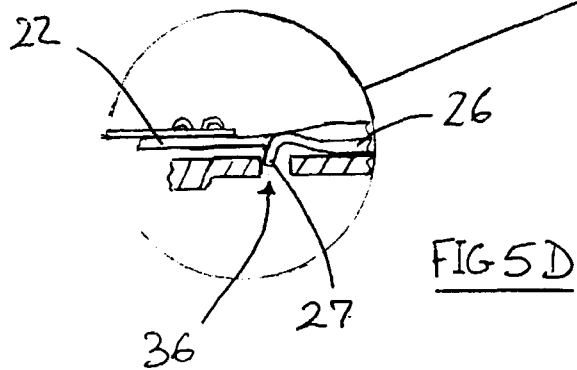
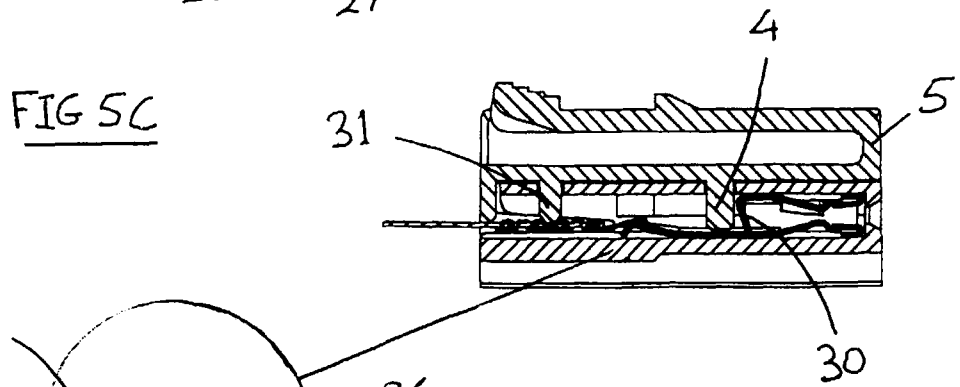
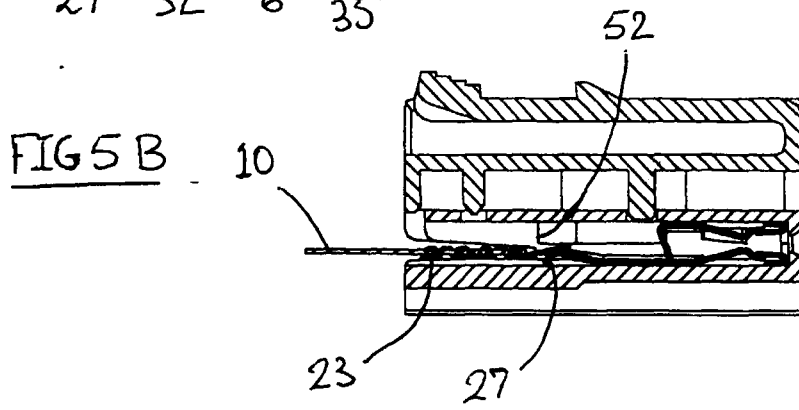
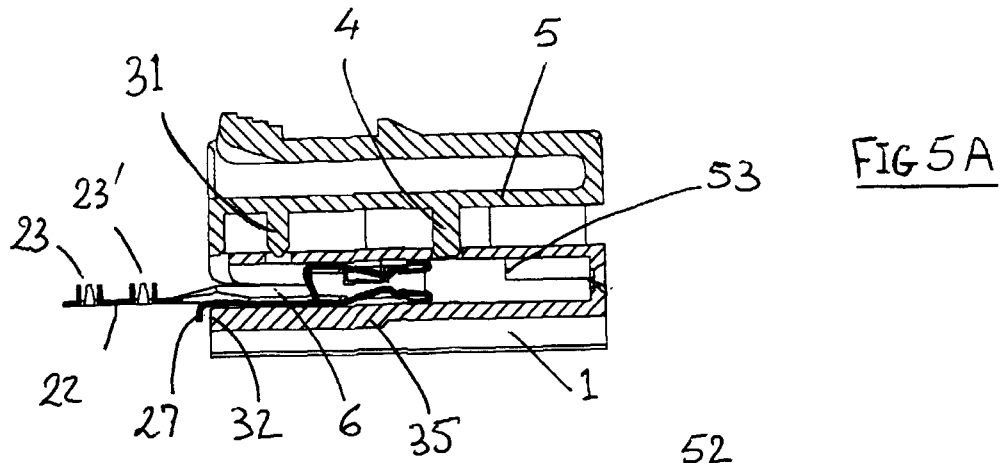


FIG 4

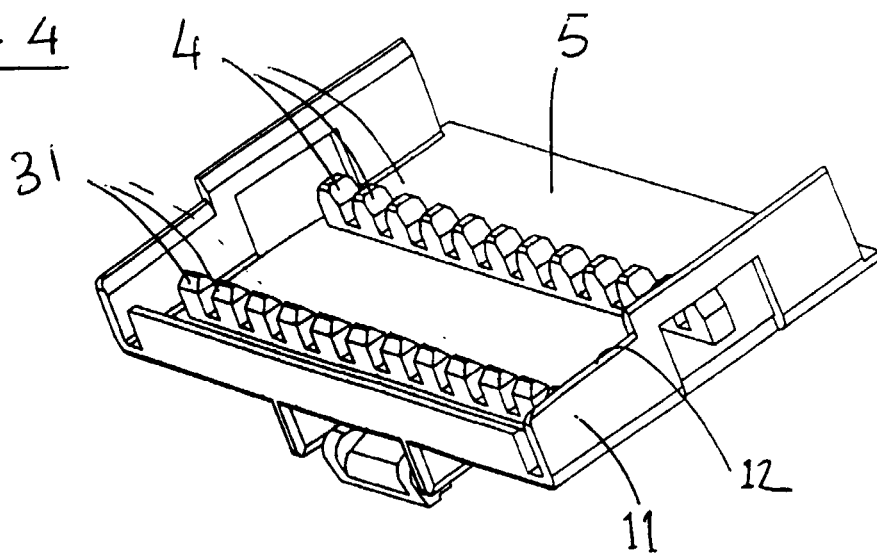
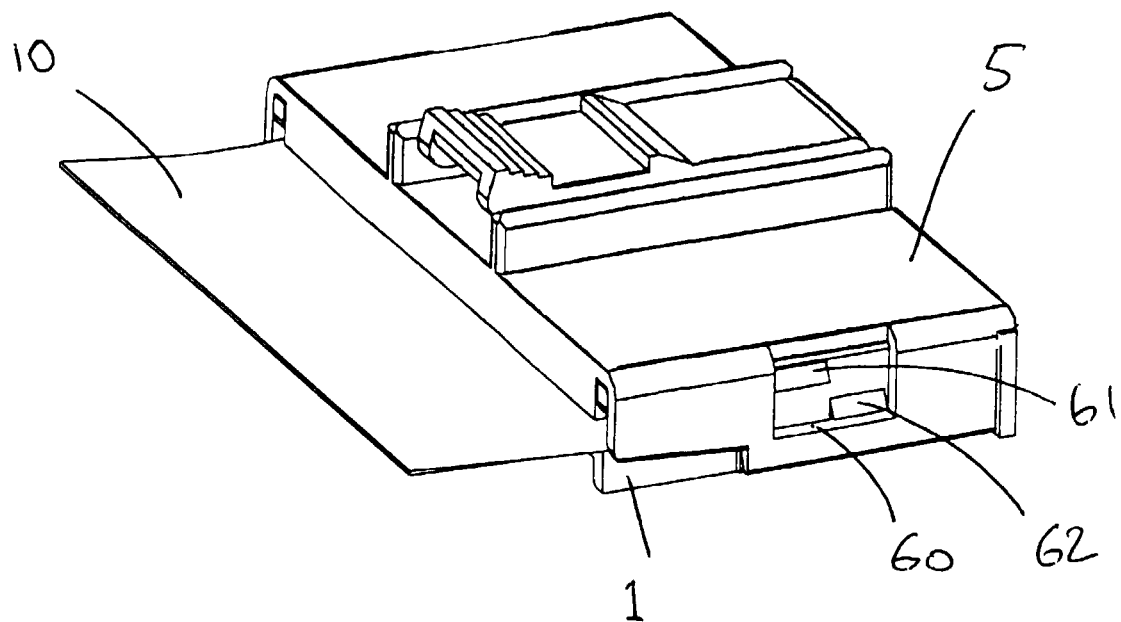


FIG 7





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 00 11 8292

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The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 8 December 2000	Examiner Alexatos, G
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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