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(54) **FLOATING CONNECTOR ASSEMBLY**

SCHWIMMENDE VERBINDERANORDNUNG

ENSEMBLE CONNECTEUR FLOTTANT

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Description

[0001] This invention relates to an electrical connector assembly comprising a first connector and a second connector matable therewith, the assembly floatably mounted with respect to a device such as a panel to enable adjustment of positional tolerances during coupling.

[0002] European Patent 371835, and German Patent DE 3903839, disclose connectors floatably mountable to a panel or support in order to adjust for tolerances in the relative position between connectors to be coupled. In DE 3903839, the connector compensates for angular misalignment in addition to translational misalignment. Adjustment for misalignment is typically required when the connectors are mounted on devices that are assembled together, whereby connector coupling occurs automatically. The devices may be relatively large with respect to the connectors, an example of a potential application being the assembly of automobile body or component parts, such as an automobile chassis to an automobile body. Assembly of such devices would require particularly large absorption of positional tolerances.

[0003] US 5620329 discloses a connector assembly comprising a first connector and a second connector matable therewith in a mating direction, the second connector being mountable on a support frame or structure via a releasable latch member of the frame. After detaching the second connector is floatable perpendicular to the mating direction.

[0004] In the prior art, it is typical to have a connector with a funnel shaped entry at the mating face for guiding the mating connector. The funnel shaped mating face increases the cross-sectional size of the connector. The larger the required tolerance adjustment, the larger the cross-section. This is sometimes a disadvantage, for example where connectors are positioned through cut-outs of a panel or support structure. Large cut-outs may structurally weaken the device. It would therefore be desirable to provide connectors with compact cross-sectional areas.

[0005] It would also be advantageous in certain applications to improve the adjustment for mispositioning in all six degrees of freedom (translation and rotation with respect to the 3 axes X, Y, Z of a cartesian system).

[0006] When assembling large devices, mispositioning in the direction of coupling may be quite large. Prior art connector assemblies, such as shown in DE 3903839 do not have the ability to adjust for large tolerances in the mating direction. It would be desirable in certain applications to have large tolerance absorption in the connector mating direction.

[0007] It is an object of this invention to provide a connector assembly that enables adjustment to large positional tolerances in a reliable manner. It would be advantageous to provide a connector assembly that allows large adjustment in the direction of coupling of the connectors, with respect to devices to which connectors of

the assembly are mounted. It would be advantageous to enable large positional tolerance adjustment in all 6 degrees of freedom in certain applications. It would be advantageous to provide a connector assembly that is compact, particularly with respect to a cross-section taken perpendicularly to the connector mating direction.

[0008] Objects of this invention have been achieved by providing a connector assembly according to claim 1.

[0009] Disclosed herein is a connector assembly comprising a first connector and second connector matable therewith, the second connector being securely mountable on a support via releasable latch members thereof, wherein the latch members and first connector have portions that co-operate during mating of the connectors for biasing the latch members such that the second connector is released from the support and floatable with respect to the support in the mating direction. The latch members may be provided with further latching shoulders that engage complementary latching shoulders of the first connector once the connectors are fully coupled and the second connector released from the support in order to secure the connectors together. The latch members further comprise camming surfaces engageable with a member fixed to the support during uncoupling of the connectors, engagement of the camming surface with the fixed member causing the latch member to disengage the first connector latching shoulder during uncoupling to enable automatic uncoupling of the connectors. The first connector may be provided floatably mountable to a device in a plane orthogonal to the mating direction, the connector also being rotatably floatable for angular misalignment.

[0010] Advantageously therefore, the connector assembly can adjust to large tolerances in the mating direction. Further advantageously, automatic uncoupling is provided during separation of devices to which the connectors are mounted. Also advantageous is the ability of the connector assembly to adjust for mispositioning in all six degrees of freedom, to a large extent and in a reliable manner.

[0011] Further advantageous aspects of this invention are set forth in the claims, or will be apparent from the following description and drawings.

[0012] An embodiment of this invention will now be described by way of example with reference to the figures in which;

figure 1 is a simplified isometric view of a connector assembly according to this invention in the uncoupled state;

figure 1a is an isometric view of one of the connectors of the assembly showing a slightly different embodiment of a guide protection;

figure 2 is an exploded isometric view of the assembly of figure 1;

figure 3 is a view towards a mating face of a first connector of the assembly;

figure 4 is a view in the direction of arrow 4 of figure

3;
 figure 5 is a view in the direction of arrow 5 of figure 4;
 figures 6a- 6f are simplified cross-sectional views through the connector assembly showing various stages of coupling of the connectors;
 figures 6g-6j are similar cross-sectional views showing various stages in uncoupling of the connectors;
 figures 7a-7j are partial detailed views of the connector latching members during various stages of coupling and uncoupling, the figures 7a-7j corresponding to the figures 6a-6j respectively;
 figure 8 is an exploded perspective view of another embodiment of a floating connector assembly according to this invention;
 figure 9 is a view similar to figure 8 viewed towards another end of the assembly of figure 8;
 figure 10a is a partial cross-sectional side view of the assembly of figure 8 prior to coupling of first and second connectors of the assembly;
 figures 10b-10d are views similar to figure 10a showing respectively successive stages of coupling of the connectors, where figure 10d shows the fully coupled state;
 figures 11a-11d are cross-sectional views through line 11-11 of figures 10a-10d respectively;
 figure 12 is a view in the direction of arrow 12 of figure 10d.

[0013] Referring to figures 1-5, an electrical connector assembly 2 comprises a first connector 4 and a second connector 6 matable therewith. Each of the connectors are provided with electrical terminals positioned in terminal receiving cavities thereof, the terminals and cavities not shown in order to enhance clarity, it being understood that the cavities and terminals may be of any conventional sort. In the first connector 4, the terminals are received in a housing 8 that extends in a mating direction Z from a terminal receiving face 10 to a mating face 12 (see figure 6a) facing the mating second connector 6. The second connector 6 also comprises a housing 14 extending from a terminal receiving face 16 (see figure 6a) to a mating face 18. The first connector 4 is mountable to a support of a first device, and the second connector 6 is mountable to a support of a second device for assembly to the first device the devices and supports are not shown.

[0014] Referring mainly to figures 2-5, the first connector 4 further comprises a fixed frame 20 mountable in a fixed manner to the device with screws or latches or other conventional fixing means (not shown). The frame has a central opening 22 within which is movably mounted a movable frame 24 having a pair of side walls 25 arranged parallel and spaced a part, and held together at ends by end walls 26. The walls 25,26 of the movable frame 24 thus form an opening 28 within which is movably received the connector housing 8. Side faces

30 and end face 32 of the connector housing are separated from the movable frame walls by a gap allowing tolerance adjustments therebetween. Likewise, the walls 25, 26 of the movable frame 24 are separated from walls 21,23 of the fixed frame 20 that forms the opening 22, by a gap to allow movement therebetween. Side walls 30 of the housing 8 are provided with lugs or projections 34 that engage in oblong recesses 36 that extend along opposed side walls 25 of the movable frame 24. The housing 8 is thus slidable in a direction X between end walls 26. The lugs 34 are provided with opposed arcuate surfaces 38 that enable the housing to rotate about a Y axis orthogonal to the X axis. The rotation about the Y axis is indicated in figure 4 by the curved arrow 40, and the translational movement along the X axis is shown by the arrow 42. The frame 24 is provided with lugs or projections 44 extending outwardly from opposed end walls 26 and received in oblong recesses 46 in end walls 23 of the fixed frame 20. The movable frame 24 can thus slide in the Y direction with respect to the fixed frame 20, and also rotate about the X axis whereby the lugs 44 are also provided with opposed arcuate surfaces 48. As shown in figure 5, rotation of the connector housing 8 about the X axis is shown by the arrow 50, and translation in Y direction is illustrated by the arrow 52. Engagement of the movable frame lugs 34,44 in the respective recesses 36, 46 of the fixed frame also allows a certain rotation of the connector 8 about the Z axis. The end walls 26 of the movable frame 24 are provided with arcuate outer surfaces 53 to enable rotation about the Z axis of the frame 24 in the fixed frame 20. The rotation about the Z axis is indicated in figure 3 by the arrow 54.

[0015] Referring to figures 1, 3, and 6a, the second connector 6 is provide with guide projections 58 proximate opposed ends 33 of the housing 14. The guide projections 58 extend in the mating direction Z from the mating face 18 towards the mating connector 4 and are positioned between terminals of the connector. The guide projections 58 are tapered, the pointed end 59 of the taper 60 remote from the mating face 18. The pointed end or tip 59 is substantially centrally positioned between opposed side walls 62 of the housing 14. The projections 58 each comprise a first thin wall 64 substantially parallel to a plane formed by the Y and Z axes, and a second thin wall 66 orthogonal to the first wall 64 (extending substantially parallel to a plane formed by the X and Z axes) . Although the walls (64, 66) are shown joined together in figures 1 and 3, they could also be separate as shown in figure 1a where the first thin wall provided proximate the end wall 33 and the orthogonal second thin wall substantially centrally between opposed end walls. The taper 60 is provided on upper guide edges 62 of the walls 64, 66, such that the walls extend substantially from the housing side and end walls 62,33 respectively and culminate in the tip 59. The tapered projections 58 are therefore able to reposition the mating connectors 6,4 in the Y direction by a distance

substantially half the width of the connector between side walls 62. The tolerance adjustment in the X direction depends on the length of the taper 60 of the second orthogonal walls 66 which extend from the end wall 32 to the first guide walls 64. In the present embodiment, the taper 60 of the second wall 66 is substantially the same as the tapers 60 provided on the first wall 64 such that the tolerance adjustment in the X and Y direction is substantially the same. The projections co-operate with guide walls 68 of the first connector housing 8, the guide walls 68 extending beyond the mating face 12 to a mating end 70 thereby forming a shroud receiving the second connector housing 14 therein. The guide walls 68 extend substantially in alignment with the connector side walls 62 and end walls 32 respectively such that the cross-sectional area of the connector remains compact. In other words, a guide funnel which enlargens the connector cross-sectional area (taken perpendicular to the mating direction Z) is avoided. Tolerance adjustment between the mating connectors 4, 6 thus occurs by engagement of the tapered guide projections 58 with the shroud or guide walls 68, the guide projections 58 subsequently being received within corresponding projection receiving cavities 72 (see figure 3) of the first connector housing 8. When viewing towards the mating face 12 of the first connector housing, the projection receiving cavities 72 have a T-shape corresponding to the T-shape of the projections 58. The latter construction ensures that minimum usage of cross-sectional area is taken up by the guide projections. For example, when viewing figure 3, terminal receiving cavities 74 for receiving corresponding terminals may be provided in corner portions 75 of the mating face formed by the T-shaped cavity 72. In other words, the projection 58 is provided among the terminals rather than externally of the mating face. A compact cross-sectional dimension of the connectors is thus achieved, which correspondingly reduces the size of a cut-out in a panel or support member of a device on which the first connector is mounted. The provision of thin orthogonal walls 64, 66 also reduces the cross-sectional surface area needed for the guide members to a minimum. The projection 58 may also have separated walls 64, 66 positioned at different locations (i.e. the walls 64, 66 do not have to be joined together in a "T"-shape), with corresponding cavities in the mating connector housing 8.

[0016] Referring to the figures 6a-6j, and the corresponding detailed figures 7a-7j, coupling of the connectors and floatability of the connectors in the Z direction will now be explained. Referring first to figures 6a, 7a, the second connector 6 comprises a first latch member 78 positioned along one of the end walls 33 of the housing 14, and a second latch member 79 positioned along one of the side walls 14. It would also be possible to provide a pair of each latch member for positioning on the pair of opposed end and side walls respectively. The latch members 78, 79 are securely attached to the housing 14, and in this embodiment the latch members are

integrally moulded from plastic with the housing 14. As also shown in figure 2, and 6a, the latch member 78, 79 are for latching the connector housing 14 to a frame 80 of the second connector 6. The frame 80 comprises side walls 82 substantially parallel and opposed to each other and joined by end walls 83 to form an opening 84 through which the connector housing 14 is received. The frame 80 is for fixing to a support member of a second device by fixing means (not shown) such as screws or latches or other conventional means.

[0017] The side latches 79 (see figure 2) comprise latching shoulders 85 that engage a lower edge (see figure 6a) 86 of the frame 80 for limiting the upward movement of the connector 6 towards the mating connector.

[0018] As best seen in figure 7a, the first latch member 78 comprises a frame latching shoulder 88 proximate an end 90 of the latch remote from the mating connector 4. The frame latching shoulder 88 engages a complementary latching shoulder 92 positioned in a recess on the end wall 83 of the frame 80 for limiting the downward movement of the housing 14 with respect to the frame 80 in a direction opposite to the mating first connector 4. The latch member 78 is elastically pivotally attached to the housing 14 substantially about a pivot axis 94 positioned between the remote end 90 and an end 96 facing the mating connector 4 (the near end). An inwardly tapered camming surface 95 is provided proximate the near end 96 for engaging the mating end 70 of the first connector 4, which is also provided with a inwardly tapered guide surface 93 for co-operating with the latch camming surface 95.

[0019] As best seen in figures 7b and 7c, coupling together of the connectors causes the mating end 70 to bias apart the near end 96 of the latch 78, which causes inward biasing of the remote end 90. The frame latching shoulder 88 thus disengages from the corresponding latching shoulder 92 of the frame end wall 83 such that the connector assembly is freed in the mating direction Z. The connector assembly descends in the direction Z until engagement of an intermediate shoulder 99 of the latch member 78 with an upper shoulder 91 of the frame end wall 83. The connector assembly is thus blocked from further movement in the mating direction Z such that the first connector 4 can be fully coupled towards the second connector 6 until their respective mating faces 12, 18 are substantially in abutment as shown in figures 6d and 6e. In the fully coupled position, a connector latching shoulder 97 engages a complementary latching shoulder 89 of the first connector thereby securely latching the connectors together. Engagement of the latching shoulders 97, 89 allows the latch 78 to resiliently bias into its natural position such that the intermediate shoulder 99 of the latch disengages the upper shoulder 91 of the support frame end wall 83, thereby allowing further movement in the mating direction Z of the mated connector assembly. Large positional tolerances in the mating direction Z can thus be absorbed. The intermediate shoulder 99 ensures that the connectors are fully cou-

pled before the latch member 78 fully releases from the support frame 80.

[0020] De-coupling of the connectors will now be explained referring to figures 6g-6j and corresponding figures 7g-7j. When separating the first connector 4 from the second connector 6, an outwardly tapered release camming surface 98 proximate the remote end 90 of the latch 78 engages a corresponding release camming surface 100 of the support end wall 83 thereby inwardly pivoting the remote end 90 as shown in figure 7h. Pivoting of the latch member 78 releases the connector latching shoulders 97, 89 as best seen in figure 7i thereby allowing separation of the connectors as shown in figure 7j. The second connector housing 14 is biased back to its initial position where the frame latching shoulder 88 engages with the corresponding latching shoulder 92. The return to the initial position is assisted by the resilient force of the latch member 78 acting on the oblique co-operating camming surfaces 98, 100. As best seen in figure 7g, the camming surface 98 of the latch remote end 90 is not fully biased inwardly when passing the projection 101 on which the support wall latching shoulder 92 is provided, such that the connectors are only unlatched once the frame latching shoulder 88 passes the latching shoulder 92.

[0021] Referring now to figures 8-12, another embodiment of this invention will be described. The embodiment of figures 8-12 is floatable in the mating direction (Z) according to a similar principals of function as the previously described embodiment. Elements of the assembly 2' that have the same or similar function to previously described elements will be given the same number but with a prime ('). The embodiment of figures 8-12 is not provided with any particular means for absorbing tolerances in the X and Y directions as in the previously described embodiment, however similar tolerance adjustment means for absorbing misalignment in the X and Y directions as described in the previous embodiment could be incorporated into the assembly of figures 8-12 if desired.

[0022] The connector assembly 2' comprises a first connector 4' and a second connector 6'. The first connector 4' comprises an insulative housing 8' extending from a terminal receiving end 10' to a mating end 12' and receiving a plurality of terminals 11' that are matable with complementary terminals of the second connector 6'. The second connector 6' comprises an insulative housing 14' extending between a terminal receiving face 16' and a mating face 18' that faces the mating face 12' of the first connector 4' just prior to coupling as best seen in figure 8 or 9. The housing 14' may be made of one or more parts assembled together, and comprise a plurality of terminal receiving cavities 74' for receiving terminals therein.

[0023] The terminals may be pre-mounted to a housing module 15' that is inserted into the main housing 14'. The first connector 4' is mountable to a first device (not shown) which may be in the form of a panel or other

structure, and similarly the second connector 6' is mountable to a second device which is to be assembled to the first device. An application may for example be the assembly of a steering wheel of an automobile to a steering column, or various body parts of an automobile to other body parts, where electrical interconnection is required. Such devices may be many times larger than the connectors themselves, and it would be advantageous to provide large absorption in relative positioning, particularly in the mating or assembly directions of the devices in order to provide reliable automated assembly including electrical interconnection.

[0024] The first connector 4' may be attached to the first device via a frame similar to that already described for the previous embodiment. The second connector 6' is in this embodiment mountable to a frame 80' that is mountable to the second device (not shown) by any conventional means, or may be mounted floatably in the X and Y directions with respect to the second device by any conventional means.

[0025] The frame 80' comprises opposed side walls 82' and opposed end walls 83' that form an approximately rectangular member with an opening or cavity 84' for receiving the second connector housing 14' therein. The opening or cavity 84' co-operates with the second connector housing outer periphery such that the housing is slideably movable in the mating direction (Z) after the connectors 4', 6' are fully coupled. The second connector 6' is provided with one or more resilient releasable latch members 78' that are formed on the frame 80'. It may be noted that in the embodiment of figures 1-7, the resilient latch 78 was provided on the second connector housing 14 whereas in the embodiment of figures 8-12, the resilient releasable latch 78' is provided on the frame 80'.

[0026] As best seen in figures 8 and 10, the latch 78' is in the form of a resilient beam integrally moulded with the frame 80' and extending from an attachment end 94' proximate the far end 86' of the frame (with respect to the mating end) and extending therefrom to a free end 96' where frame latching shoulders 88' are provided. The frame latching shoulders 88' are engageable against latching shoulders 92' of the second connector housing 14' to retain the second connector 6' to the frame 80' in the mating direction (Z) when the connectors 4', 6' are uncoupled. Co-operation of the latching shoulders 88', 92' is best seen in figures 10a or 10b, whereby the second connector housing 14' is prevented from movement in the mating direction (Z) towards the remote end 86' of the frame 80'. In order to prevent the connector housing 14' from removal from the frame 80' in the opposite direction, the frame and housing are provided with complementary latches 105, 107, which as best seen in figure 11a, 10a, or 11b-11d, have complementary locking shoulders 108, 109 that prevent removal of the housing 14' towards the mating end 91' of the frame 80'. The latches 105, 107 however allow movement of the housing 14' towards the remote end 86' of

the frame 80' as best seen in figure 11d.

[0027] The resilient latches 78' are further provided with camming surfaces 95' that are engaged by complementary camming or guide surfaces 93' of the first connector 4' during coupling. As best seen in figure 10c, once the connectors 4', 6' are coupled, the first connector camming surface 93' rides over the latch camming surface 95' and biases the resilient latch 78' out of engagement with the complementary latching shoulders 92' of the second connector housing 14'. At this moment, the first and second connector housings 8', 14' are latched together and free to move in the mating direction (Z) towards the remote end 86' of the frame 80'. The latter is best seen by looking at figures 10d and 11d.

[0028] The second connector 6' is latched to the first connector 4' by provision of complementary latch protrusion and locking recesses 97', 89' on the second and first connector housings 14', 8' respectively (or the inverse). The protrusions and recesses are provided with tapered locking shoulders 97', 89' that fully engage simultaneously with the release of the housing and frame latching shoulders 92', 88' respectively at the position shown in figures 10c and 11c. The functioning of this embodiment thus differs slightly from the previous embodiment, in that the latching of the connector housings 8', 14' occurs simultaneously with the release of the second connector housing 14' from the frame 80' whereas in the previous embodiment latching of the connectors 4, 6 occurred prior to release of the fully coupled connectors from the frame 80.

[0029] In the present embodiment, the connector latching recesses or shoulders 89' are provided on substantially planar flexible extensions 110 projecting from the connector housing mating face 12' to provide a particularly compact yet effective latching arrangement. The extensions 110 are received in complementary slots 112 within the second connector housing 14', the latching protrusions 97' protruding into the slot 112 from side walls of the second connector housing 14'.

[0030] When uncoupling, the second connector housing 14' and/or release camming surfaces 100' of the first connector housing engage the complementary release camming surface 98' of the resilient latch 78' for biasing the latch during passage of the second connector latching surfaces 92' therepast, until the latching shoulders 92' engage with the resilient latch locking shoulders 88', which defines the initial latching positions shown in figures 10b and 11b. The connector housings 8', 14' can then be unlatched to the positions shown in figures 10a and 11a whereby the second connector housing 14' is retained to the frame 80' by the retention shoulders 108, 109.

[0031] The advantages of large positioning adjustment in the mating direction is thus provided in a particularly compact and reliable arrangement, that allows automatic interconnection of electrical connectors during assembly and disassembly of components.

Claims

1. A connector assembly comprising a first connector (4, 4') and second connector (6, 6') matable therewith in a mating direction (Z) and a fixed support frame (80, 80'), the second connector (6, 6') being securely mountable on the fixed support frame (80, 80') via a releasable latch member (78, 78') of the second connector (6) or frame (80'), **characterised in that** the latch member (78, 78') and first connector (4, 4') have camming portions (93, 93', 95, 95') that co-operate during mating of the connectors for biasing the latch member (78, 78') out of engagement with the fixed support frame (80) or second connector (6') such that the second connector (6, 6') is released from the fixed support frame (80, 80') and floatable in the mating direction (Z).
2. The assembly of claim 1, **characterised in that** the latch member (78) is provided with a connector latching shoulder (97) that engages a complementary latching shoulder (89) of the first connector (4) once the connectors are fully coupled and the second connector is released from the fixed support frame (80), such that the connectors are securely latched together in the fully coupled position.
3. The assembly of claim 1 or 2 **characterised in that** the latch member comprises a release camming surface (98) engageable with a release camming surface (100) of the support frame (80) during uncoupling of the connectors, engagement of the release camming surfaces (98, 100) causing the latch member (78) to disengage the connector latching shoulders (89, 97) to enable automatic uncoupling of the connectors.
4. The assembly of any one of claims 1-3 **characterised in that** the first connector (4) is floatably mountable to a fixed support frame (20) in a plane (XY) orthogonal to the mating direction (Z), the first connector comprising a housing (8) receiving terminals therein, and a movable frame (24) movably mounted in the fixed support frame (20) in at least one first direction (Y), the housing (8) being movably mounted in the movable frame (24) in at least one second direction (X) orthogonal to the first direction (Y).
5. The assembly of any one of claims 1-4 **characterised in that** the first connector (4) is rotatably floatable about axes (XY) in a plane orthogonal to the mating direction (Z) for adjusting angular misalignment, the first connector comprising a housing rotatably mounted about a first axis (Y) in the orthogonal plane to a movable frame (24), the movable frame (24) rotatably mounted about a second axis (X) in the orthogonal plane, orthogonal to the first

axis (Y), to a fixed support frame (20) for mounting on a device.

6. The connector assembly of claim 1 **characterised in that** the resilient latch member (78') is integrally formed with the frame (80'). 5
7. The connector assembly of claim 1 or 6 **characterised in that** a pair of resilient latch members (78') are provided extending along side opposed ends (83') of the frame (80'). 10
8. The connector assembly of claims 1, 6, or 7 **characterised in that** the support frame (80') comprises a pair of side walls (82') and end walls (83') forming an approximately rectangular member with a cavity or opening (84') extending therethrough in the mating direction (Z) for slideably receiving a housing (14') of the second connector (6') therein when the first and second connectors are fully coupled. 15
9. The connector assembly of claim 1, 6, 7 or 8 **characterised in that** the first connector (4') is provided with extensions (110) projecting beyond a mating face (12') of a housing (8') of the first connector, the extensions (110) provided with latching shoulders (89') cooperable with complementary latching members (97') on a housing (14') of the second connector (6'). 20 25
10. The connector assembly of claim 9 **characterised in that** the latching members (97') of the second connector housing (14') are provided within slots (112) of the housing (14') in which the latching extensions (110) are received. 30 35
11. The connector assembly of claim 9 or 10 **characterised in that** the latching extensions (110) are substantially planar and extend in the mating direction (Z). 40
12. The connector assembly of claim 1 or any one of claims 6-11 **characterised in that** the camming portions (93') of the first connector (4') are provided on extensions (110) that project beyond a mating face (12') of a housing (8') of the first connector (4') in the mating direction (Z). 45
13. The connector assembly of claim 12 **characterised in that** the extensions (110) are provided along opposed sides (30') of the first connector housing (8') and the camming portions (93') project beyond end walls (32') of the first connector housing (8'). 50

Patentansprüche

1. Verbinderanordnung, die aufweist: einen ersten

Verbinder (4, 4'); und einen zweiten Verbinder (6, 6'), der damit in einer Eingriffsrichtung (Z) und in einem stationären Halterahmen (80, 80') in Eingriff kommen kann, wobei der zweite Verbinder (6, 6') sicher auf dem stationären Halterahmen (80, 80') mittels eines ausklinkbaren Einklinkelementes (78, 78') des zweiten Verbinders (6) oder des Rahmens (80') sicher montierbar ist, **dadurch gekennzeichnet, daß** das Einklinkelement (78, 78') und der erste Verbinder (4, 4') Nockensteuerabschnitte (93, 93', 95, 95') aufweisen, die während des Eingriffes der Verbinder für das Vorspannen des Einklinkelementes (78, 78') außer Eingriff mit dem stationären Halterahmen (80) oder dem zweiten Verbinder (6') zusammenwirken, so daß der zweite Verbinder (6, 6') aus dem stationären Halterahmen (80, 80') ausklinkbar und in der Eingriffsrichtung (Z) schwimmfähig ist.

2. Anordnung nach Anspruch 1, **dadurch gekennzeichnet, daß** das Einklinkelement (78) mit einem Verbindereinklinkvorsprung (97) versehen ist, der mit einem komplementären Einklinkvorsprung (89) des ersten Verbinders (4) in Eingriff kommt, sobald die Verbinder vollständig gekoppelt sind, und der zweite Verbinder aus dem stationären Halterahmen (80) ausgeklinkt ist, so daß die Verbinder miteinander in der vollständig gekoppelten Position sicher eingeklinkt werden. 20 25 30
3. Anordnung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, daß** das Einklinkelement eine Freigabenockensteuerfläche (98) aufweist, die mit einer Freigabenockensteuerfläche (100) des Halterahmens (80) während des Auskoppelns der Verbinder in Eingriff kommen kann, wobei der Eingriff der Freigabenockensteuerflächen (98, 100) bewirkt, daß das Einklinkelement (78) die Verbindereinklinkvorsprünge (89, 97) trennt, um das automatische Auskoppeln der Verbinder zu ermöglichen. 35 40
4. Anordnung nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, daß** der erste Verbinder (4) am stationären Halterahmen (20) in einer Ebene (XY) orthogonal zur Eingriffsrichtung (Z) schwimmfähig montierbar ist, wobei der erste Verbinder ein Gehäuse (8), das Anschlußklemmen darin aufnimmt, und einen beweglichen Rahmen (24) aufweist, der beweglich im stationären Halterahmen (20) in mindestens einer ersten Richtung (Y) montiert ist, wobei das Gehäuse (8) beweglich im beweglichen Rahmen (24) in mindestens einer zweiten Richtung (X) orthogonal zur ersten Richtung (Y) montiert ist. 45 50 55
5. Anordnung nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, daß** der erste Verbinder (4) um die Achsen (XY) in einer Ebene orthogonal

zur Eingriffsrichtung (Z) für das Regulieren der Winkelverlagerung drehbar schwimmfähig ist, wobei der erste Verbinder ein Gehäuse aufweist, das um eine erste Achse (Y) in der orthogonalen Ebene zu einem beweglichen Rahmen (24) drehbar montiert ist, wobei der bewegliche Rahmen (24) um eine zweite Achse (X) in der orthogonalen Ebene, orthogonal zur ersten Achse (Y), an einem stationären Halterahmen (20) für das Montieren an einer Vorrichtung drehbar montiert ist.

6. Verbinderanordnung nach Anspruch 1, **dadurch gekennzeichnet, daß** das elastische Einklinkelement (78') zusammenhängend mit dem Rahmen (80') gebildet wird.

7. Verbinderanordnung nach Anspruch 1 oder 6, **dadurch gekennzeichnet, daß** ein Paar elastische Einklinkelemente (78') vorhanden ist, die sich längsseits der gegenüberliegenden Enden (83') des Rahmens (80') erstrecken.

8. Verbinderanordnung nach Anspruch 1, 6 oder 7, **dadurch gekennzeichnet, daß** der Halterahmen (80') ein Paar Seitenwände (82') und Stirnwände (83') aufweist, die ein annähernd rechteckiges Element mit einem Hohlraum oder einer Öffnung (84') bilden, der sich dort hindurch in der Eingriffsrichtung (Z) für ein verschiebbares Aufnehmen eines Gehäuses (14') des zweiten Verbinders (6') darin erstreckt, wenn der erste und der zweite Verbinder vollständig gekoppelt sind.

9. Verbinderanordnung nach Anspruch 1, 6, 7 oder 8, **dadurch gekennzeichnet, daß** der erste Verbinder (4') mit Verlängerungen (110) versehen ist, die über eine Eingriffsfläche (12') eines Gehäuses (8') des ersten Verbinders hinaus vorstehen, wobei die Verlängerungen (110) mit Einklinkvorsprüngen (89') versehen sind, die mit komplementären Einklinkelementen (97') an einem Gehäuse (14') des zweiten Verbinders (6') zusammenwirken können.

10. Verbinderanordnung nach Anspruch 9, **dadurch gekennzeichnet, daß** die Einklinkelemente (97') des zweiten Verbindergehäuses (14') innerhalb der Schlitz (112) des Gehäuses (14') vorhanden sind, in denen die Einklinkverlängerungen (110) aufgenommen werden.

11. Verbinderanordnung nach Anspruch 9 oder 10, **dadurch gekennzeichnet, daß** die Einklinkverlängerungen (110) im wesentlichen eben sind und sich in der Eingriffsrichtung (Z) erstrecken.

12. Verbinderanordnung nach Anspruch 1 oder einem der Ansprüche 6 bis 11, **dadurch gekennzeichnet, daß** die Nockensteuerabschnitte (93') des ersten

Verbinders (4') an Verlängerungen (110) vorhanden sind, die über eine Eingriffsfläche (12') eines Gehäuses (8') des ersten Verbinders (4') in der Eingriffsrichtung (Z) hinaus vorstehen.

13. Verbinderanordnung nach Anspruch 12, **dadurch gekennzeichnet, daß** die Verlängerungen (110) längs der gegenüberliegenden Seiten (30') des ersten Verbindergehäuses (8') vorhanden sind, und daß die Nockensteuerabschnitte (93') über die Stirnwände (32') des ersten Verbindergehäuses (8') hinaus vorstehen.

15 Revendications

1. Assemblage de connecteur comprenant un premier connecteur (4, 4') et un deuxième connecteur (6, 6') pouvant y être accouplé dans une direction d'accouplement (Z), et un cadre de support fixe (80, 80'), le deuxième connecteur (6, 6') pouvant être fermement monté sur le cadre de support fixe (80, 80') par l'intermédiaire d'un élément de verrouillage libérable (78, 78') du deuxième connecteur (6) ou du cadre (80'), **caractérisé en ce que** l'élément de verrouillage (78, 78') et le premier connecteur (4, 4') comportent des parties à came (93, 93', 95, 95') coopérant au cours de l'accouplement des connecteurs pour dégager l'élément de verrouillage (78, 78') du cadre de support fixe (80) ou du deuxième connecteur (6'), de sorte que le deuxième connecteur (6, 6') est dégagé du cadre de support fixe (80, 80') et peut flotter dans la direction d'accouplement (Z).

2. Assemblage selon la revendication 1, **caractérisé en ce que** l'élément de verrouillage (78) comporte un épaulement de verrouillage du connecteur (97), s'engageant dans un épaulement de verrouillage complémentaire (89) du premier connecteur (4) après l'accouplement complet des connecteurs, le deuxième connecteur étant dégagé du cadre de support fixe (80), de sorte que les connecteurs sont assemblés fermement par verrouillage dans la position complètement accouplée.

3. Assemblage selon les revendications 1 ou 2, **caractérisé en ce que** l'élément de verrouillage comprend une surface à came à dégagement (98) pouvant s'engager dans une surface à came de dégagement (100) du cadre de support (80) au cours du désaccouplement des connecteurs, l'engagement des surfaces à came à dégagement (98, 100), entraînant le dégagement de l'élément de verrouillage (78) des épaulements de verrouillage du connecteur (89, 97) pour permettre un désaccouplement automatique des connecteurs.

4. Assemblage selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** le premier connecteur (4) peut être monté de manière flottante sur un cadre de support fixe (20) dans un plan (XY) orthogonal à la direction d'accouplement (Z), le premier connecteur comprenant un boîtier (8) de réception des bornes, un cadre mobile (24) étant monté de manière mobile dans le cadre de support fixe (20) dans au moins une première direction (Y), le boîtier (8) étant monté de manière mobile dans le cadre mobile (24) dans au moins une deuxième direction (X) orthogonale à la première direction (Y). 5
5. Assemblage selon l'une quelconque des revendications 1 à 4, **caractérisé en ce que** le premier connecteur (4) peut tourner de manière flottante autour des axes (XY) dans un plan orthogonal à la direction d'accouplement (Z) pour ajuster un désalignement angulaire, le premier connecteur comprenant un boîtier monté par rotation autour d'un premier axe (Y) dans le plan orthogonal sur un cadre mobile (24), le cadre mobile (24) étant monté par rotation autour d'un deuxième axe (X) dans le plan orthogonal, de manière orthogonale au premier axe (Y) sur un cadre de support fixe (20) en vue du montage sur un dispositif. 20
6. Assemblage de connecteur selon la revendication 1, **caractérisé en ce que** l'élément de verrouillage élastique (78') est formé d'une seule pièce avec le cadre (80'). 30
7. Assemblage de connecteur selon les revendications 1 ou 6, **caractérisé en ce que** qu'une paire d'éléments de verrouillage élastiques (78') s'étend le long des extrémités latérales opposées (83') du cadre. 35
8. Assemblage de connecteur selon les revendications 1, 6 ou 7, **caractérisé en ce que** le cadre de support (80') comprend une paire de parois latérales (82') et de parois d'extrémité (83') formant un élément pratiquement rectangulaire avec une cavité ou une ouverture (84') les traversant dans la direction d'accouplement (Z) en vue de la réception par glissement d'un boîtier (14') du deuxième connecteur (6') lors de l'accouplement complet des premier et deuxième connecteurs. 40
9. Assemblage de connecteur selon les revendications 1, 6, 7 ou 8, **caractérisé en ce que** le premier connecteur (4') comporte des extensions (110) débordant au-delà d'une face d'accouplement (12') d'un boîtier (8') du premier connecteur, les extensions (110) comportant des épaulements de verrouillage (89') pouvant coopérer avec des éléments de verrouillage complémentaires (97') sur un boîtier (14') du deuxième connecteur (6'). 50
10. Assemblage de connecteur selon la revendication 9, **caractérisé en ce que** les éléments de verrouillage (97') du boîtier du deuxième connecteur (14') sont agencés dans des fentes (112) du boîtier (14') dans lequel sont reçues les extensions de verrouillage (110). 55
11. Assemblage de connecteur selon les revendications 9 ou 10, **caractérisé en ce que** les extensions de verrouillage (110) sont pratiquement planes et s'étendent dans la direction d'accouplement (Z).
12. Assemblage de connecteur selon la revendication 1 ou selon l'une quelconque des revendications 6 à 11, **caractérisé en ce que** les parties à came (93') du premier connecteur (4') sont agencées sur des extensions (110) débordant au-delà de la face d'accouplement (12') d'un boîtier (8') du premier connecteur (4') dans la direction d'accouplement (Z).
13. Assemblage de connecteur selon la revendication 12, **caractérisé en ce que** les extensions (110) sont agencées le long des côtés opposés (30') du boîtier du premier connecteur (8'), les parties à came (93') débordant au-delà des parois d'extrémité (32') du boîtier du premier connecteur (8').

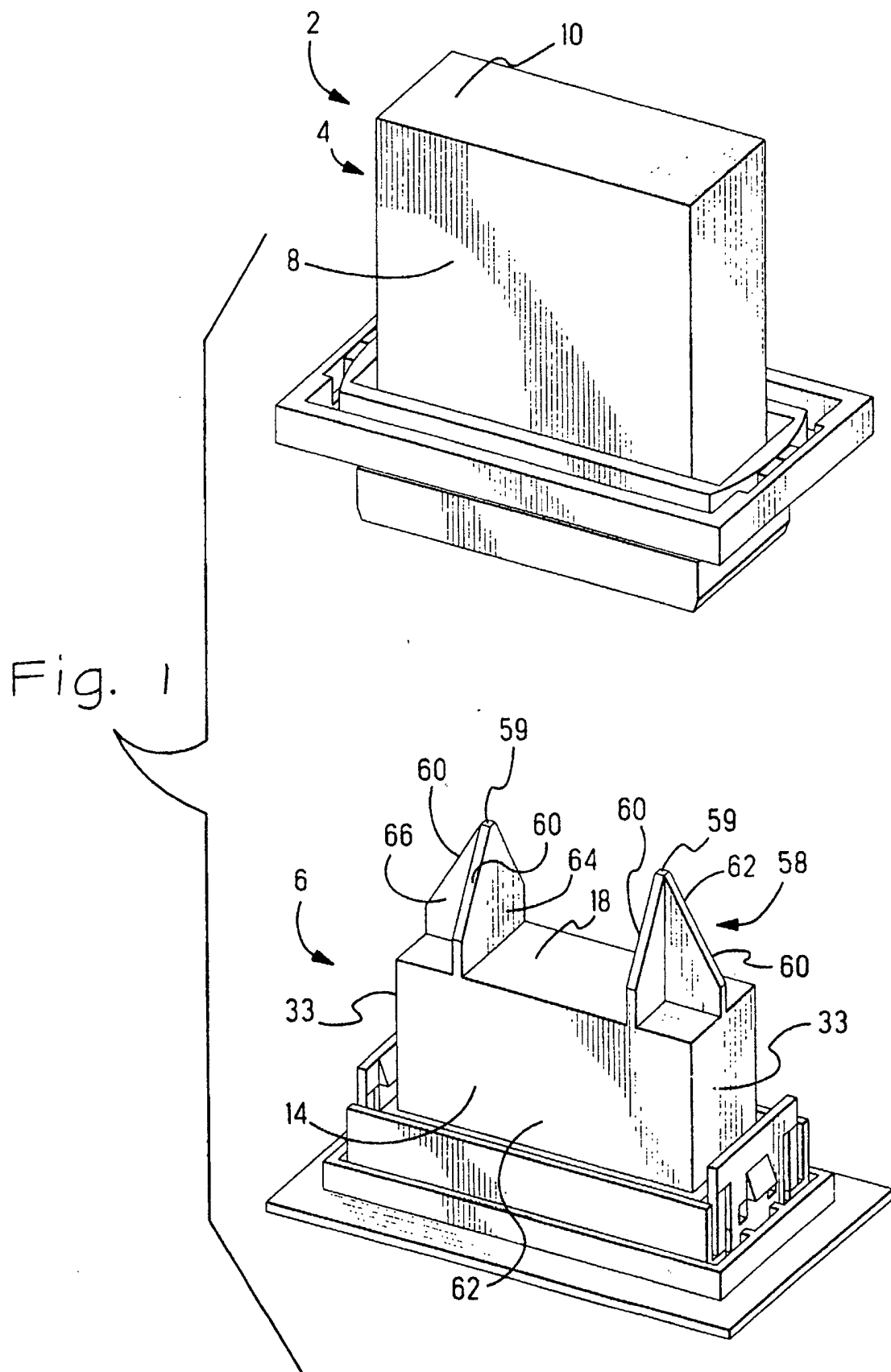
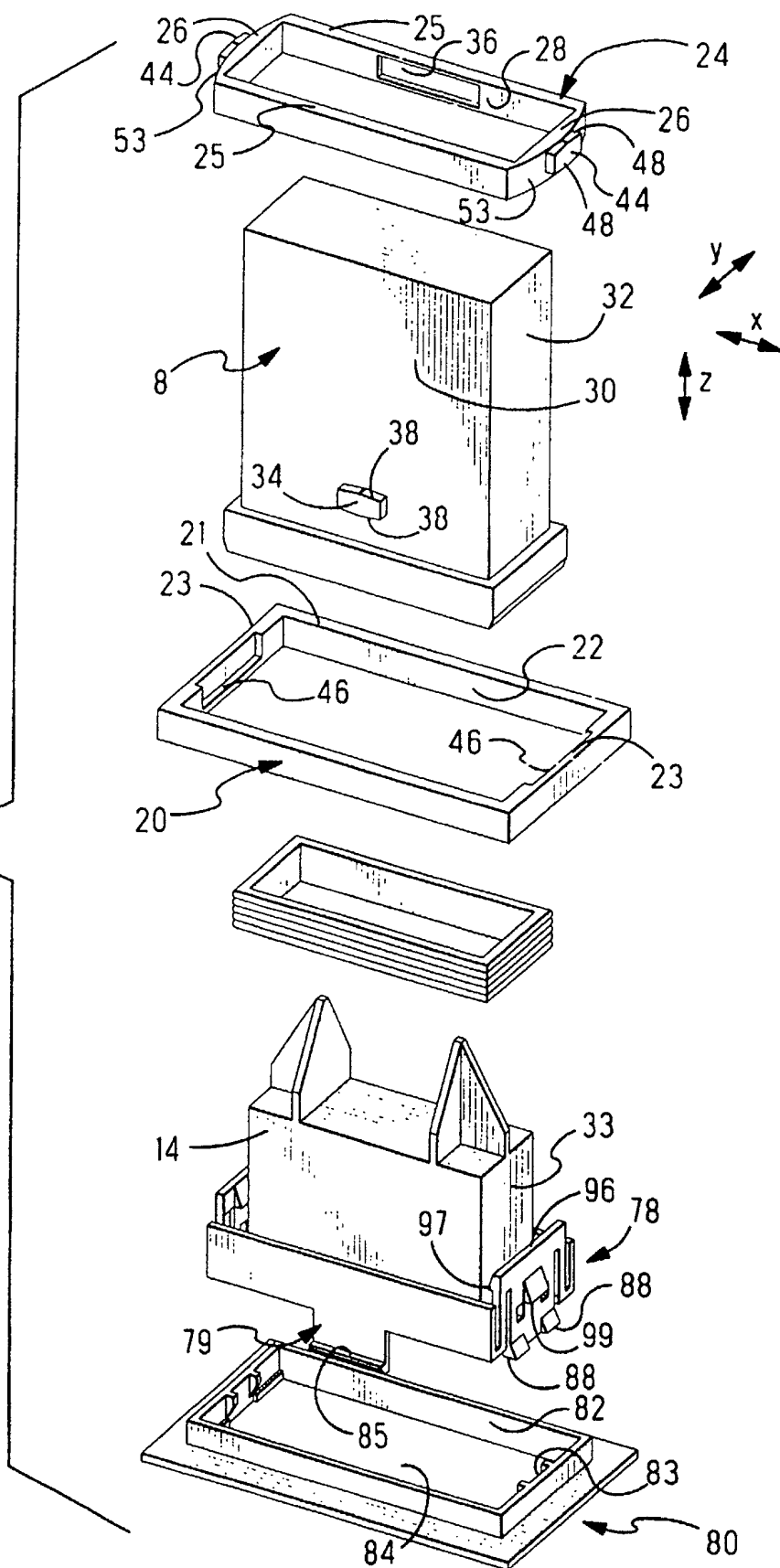


Fig. 2



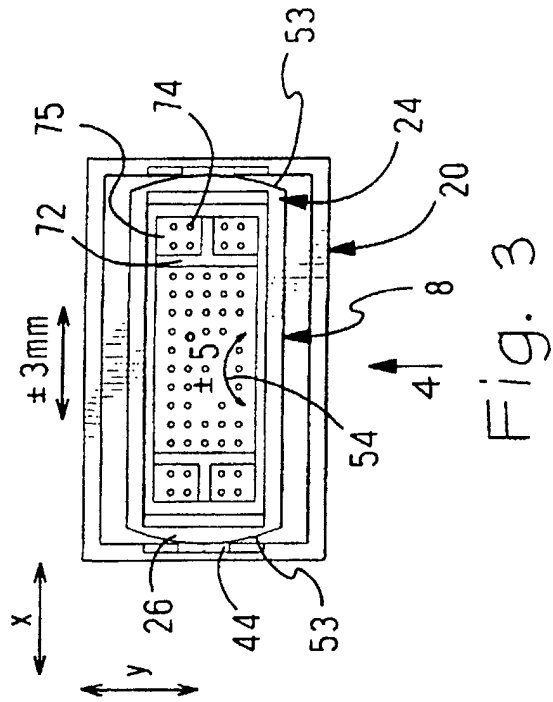


Fig. 3

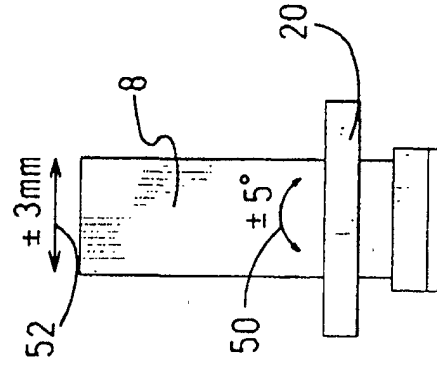


Fig. 5

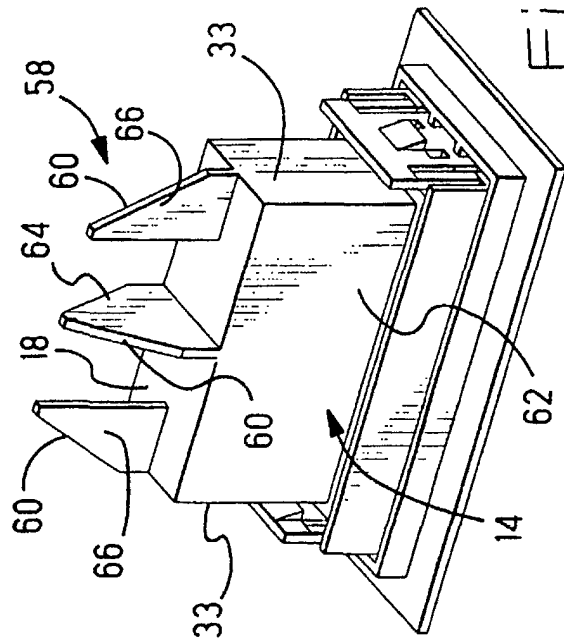


Fig. 1a

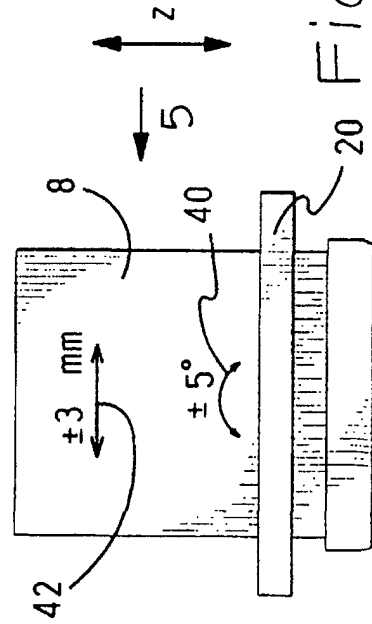


Fig. 4

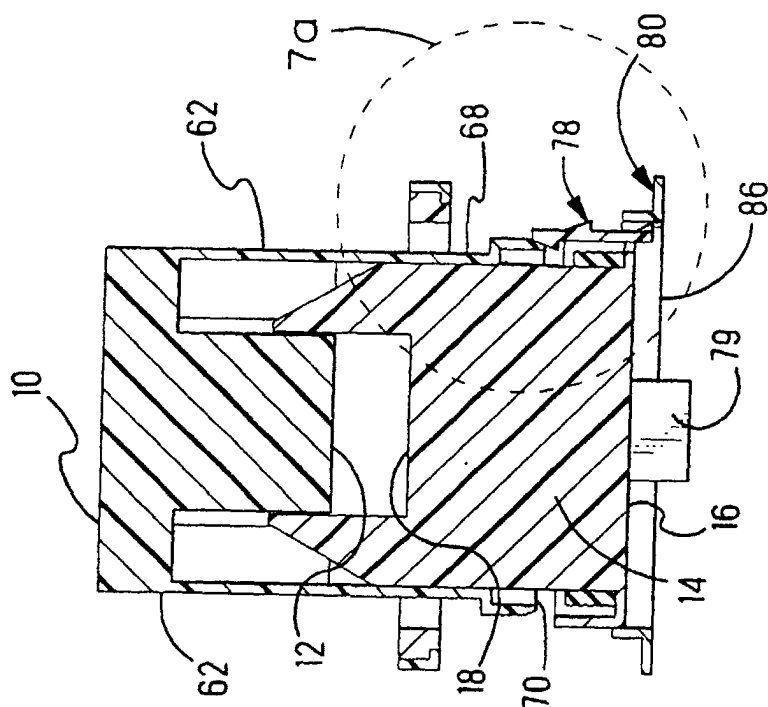


Fig. 6a

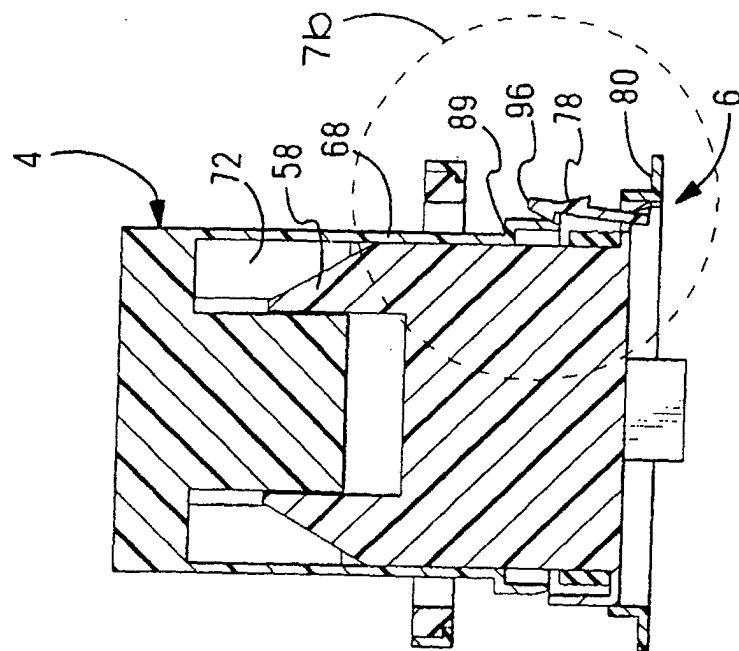


Fig. 6b

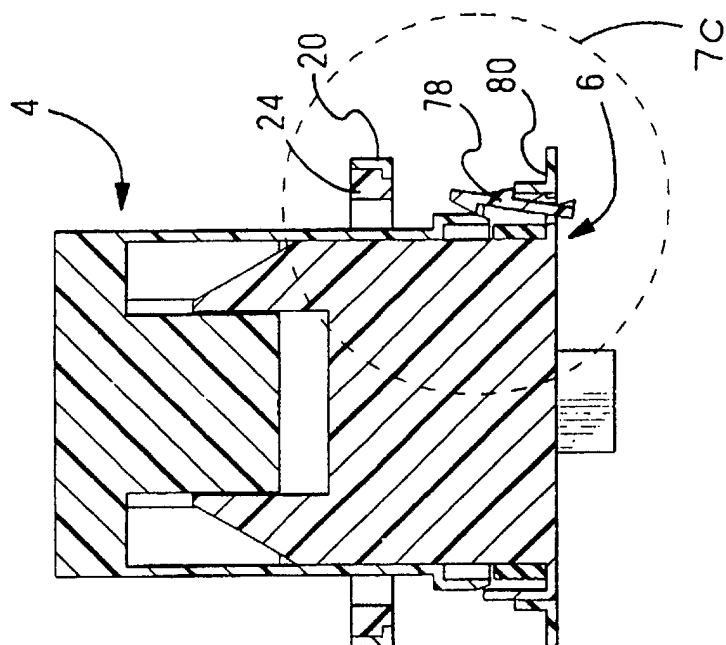


Fig. 6c

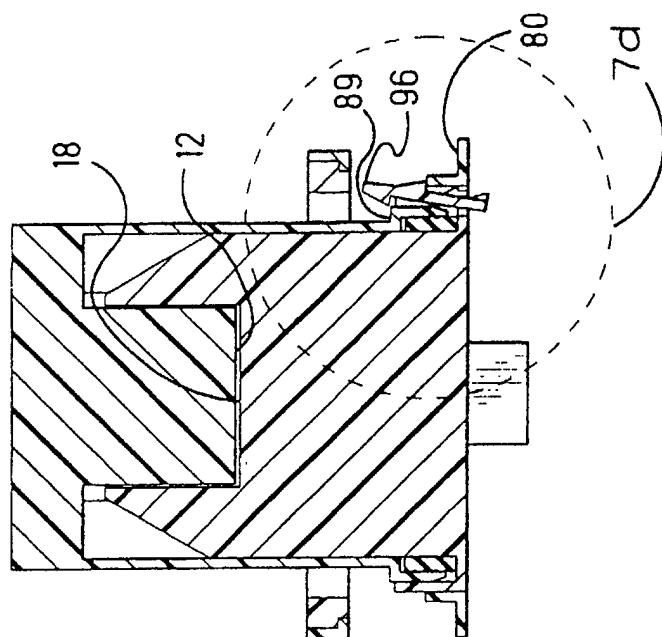


Fig. 6d

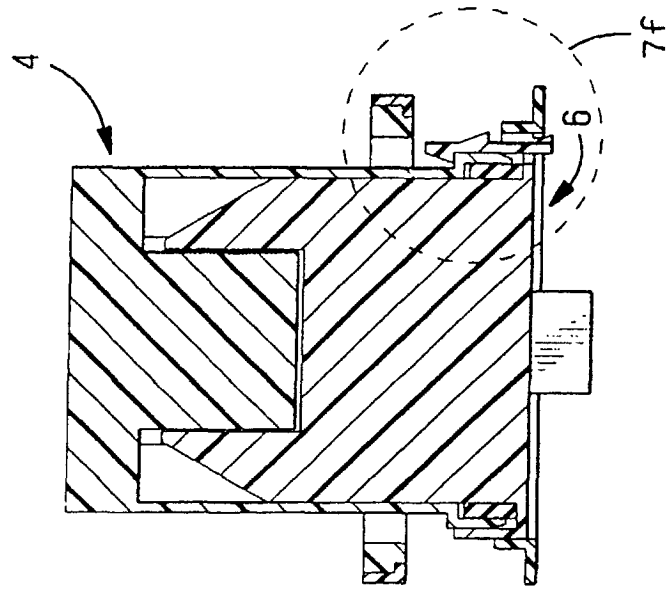


Fig. 6f

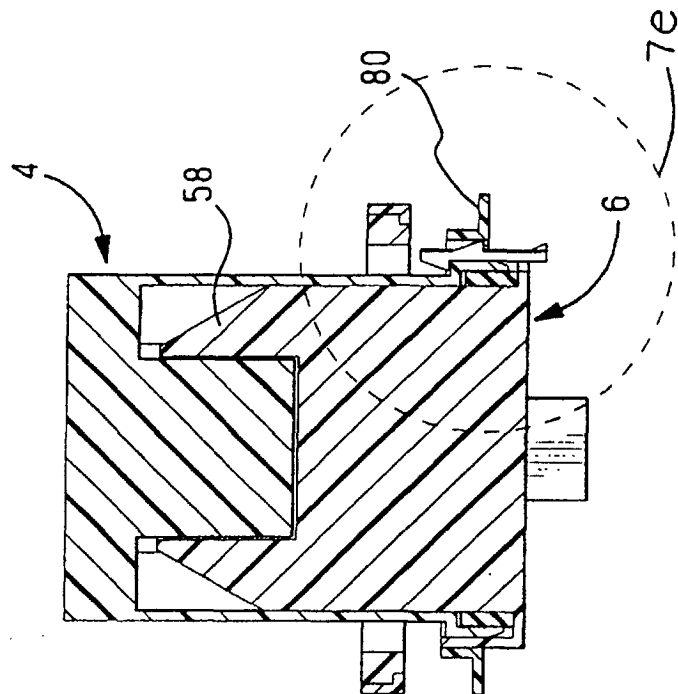


Fig. 6e

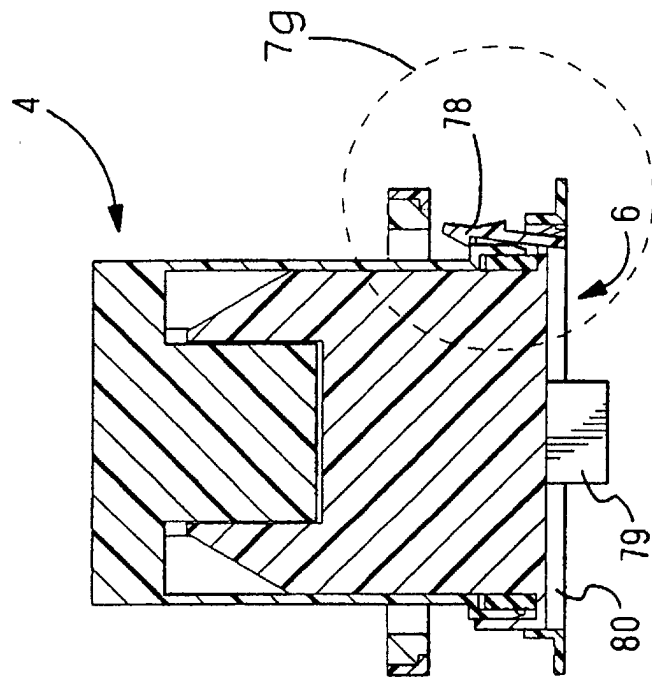


Fig. 6g

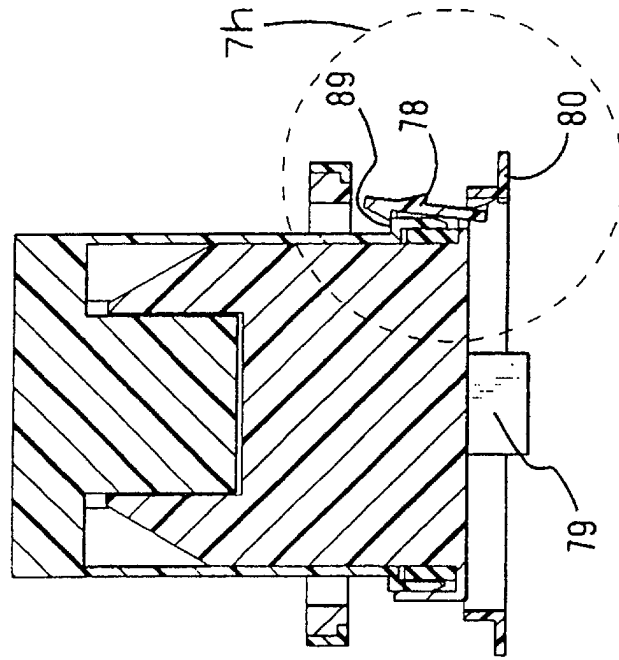


Fig. 6h

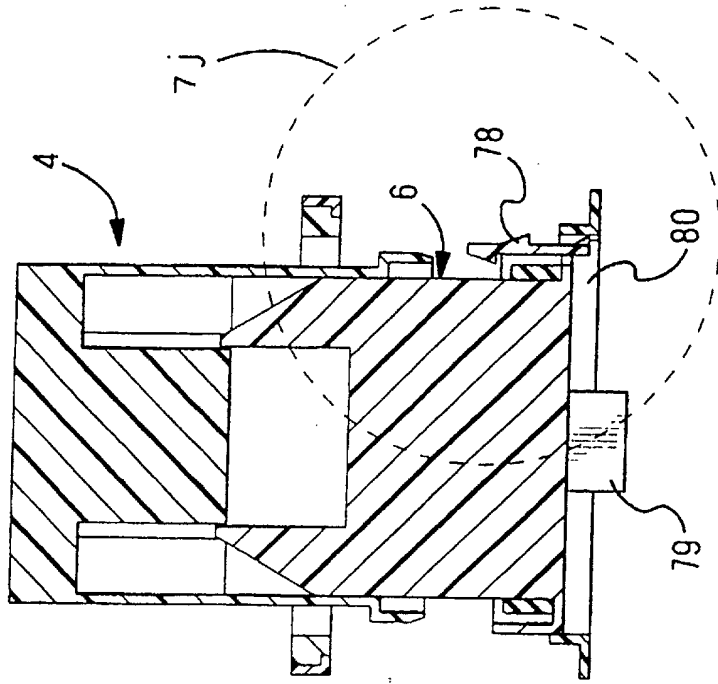


Fig. 6j

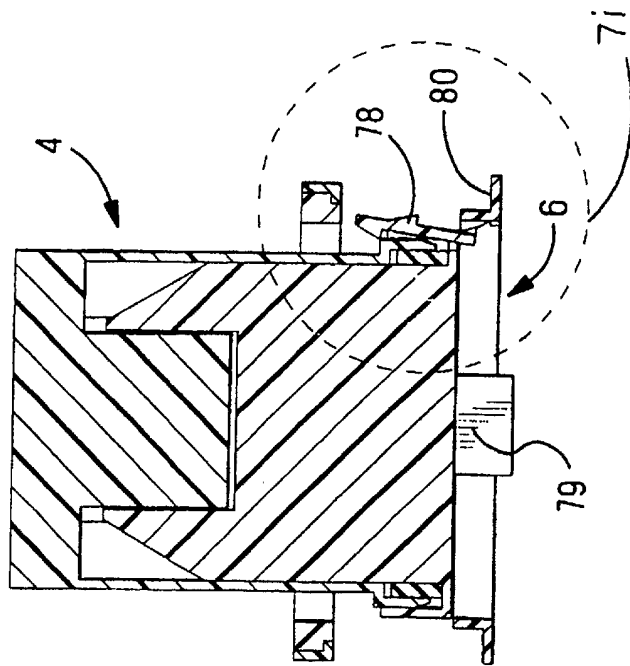


Fig. 6i

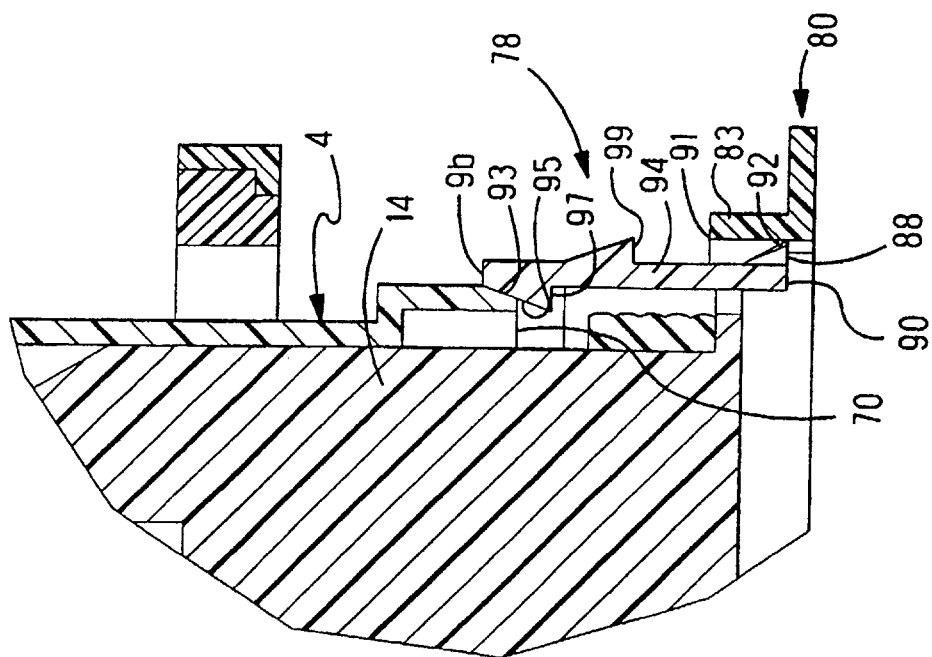


Fig. 7a

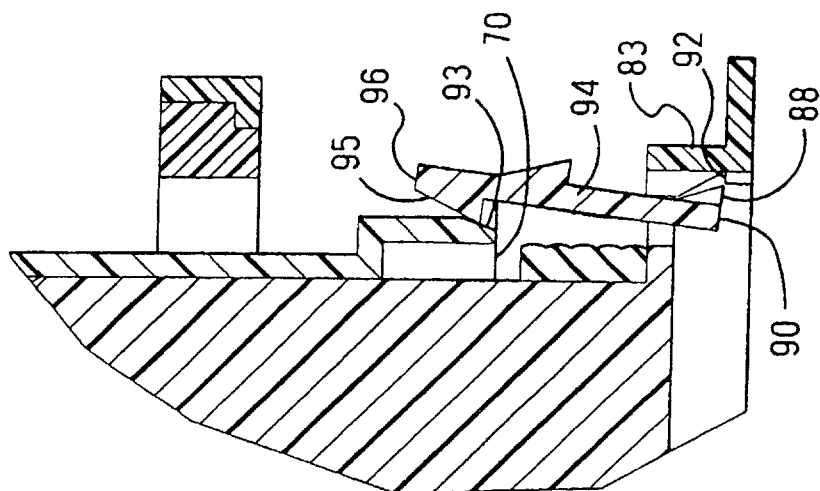


Fig. 7b

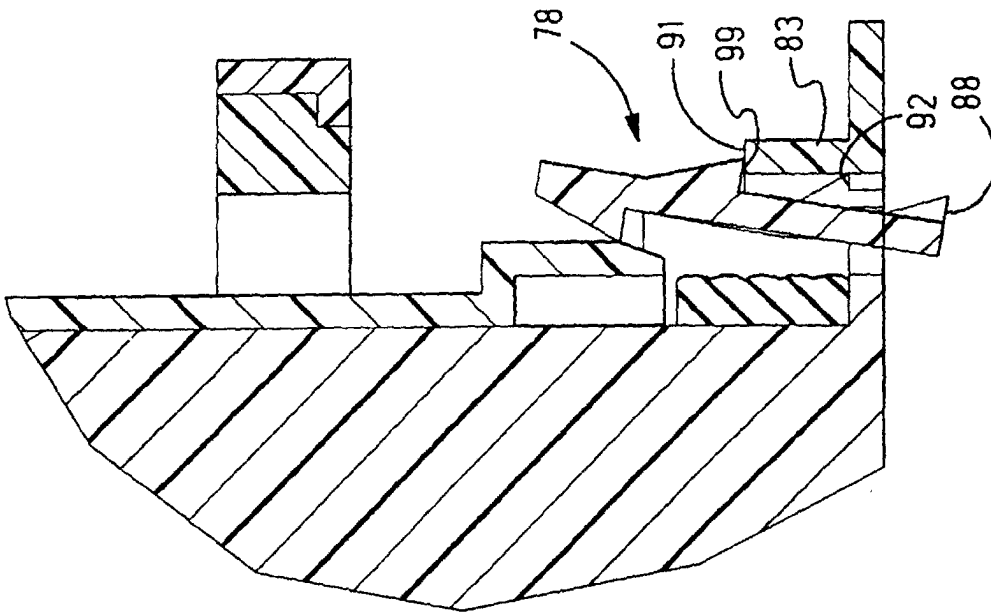


Fig. 7c

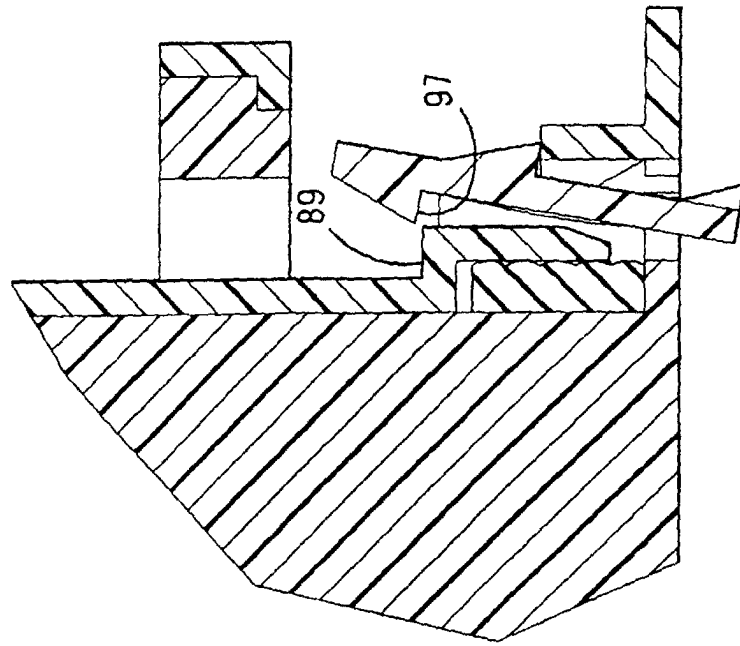


Fig. 7d

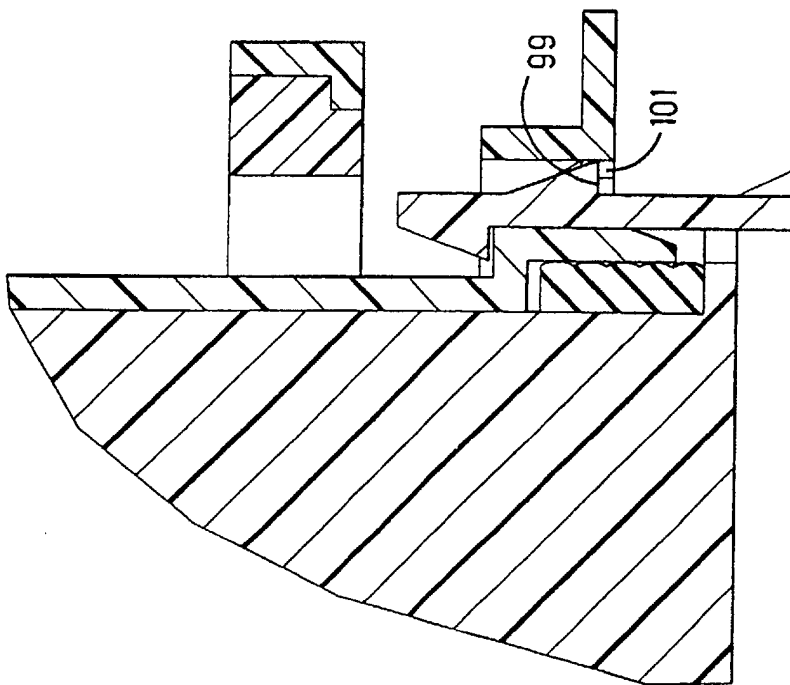


Fig. 7e

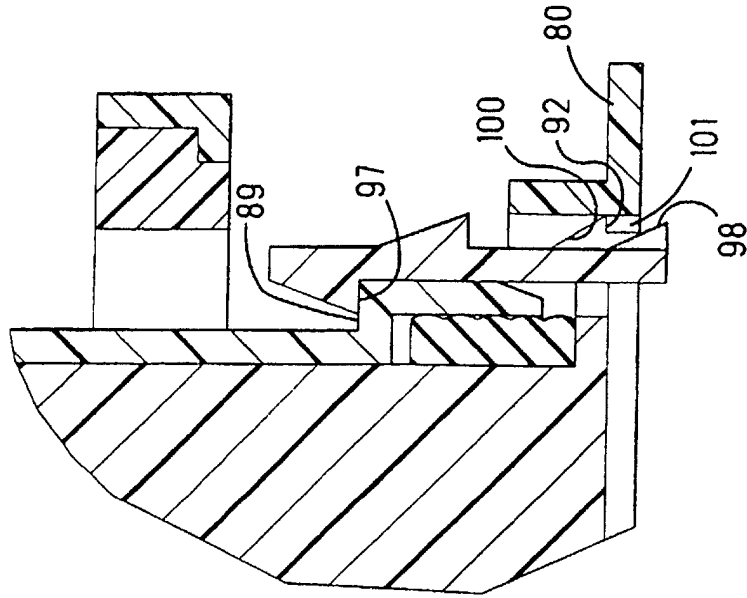


Fig. 7f

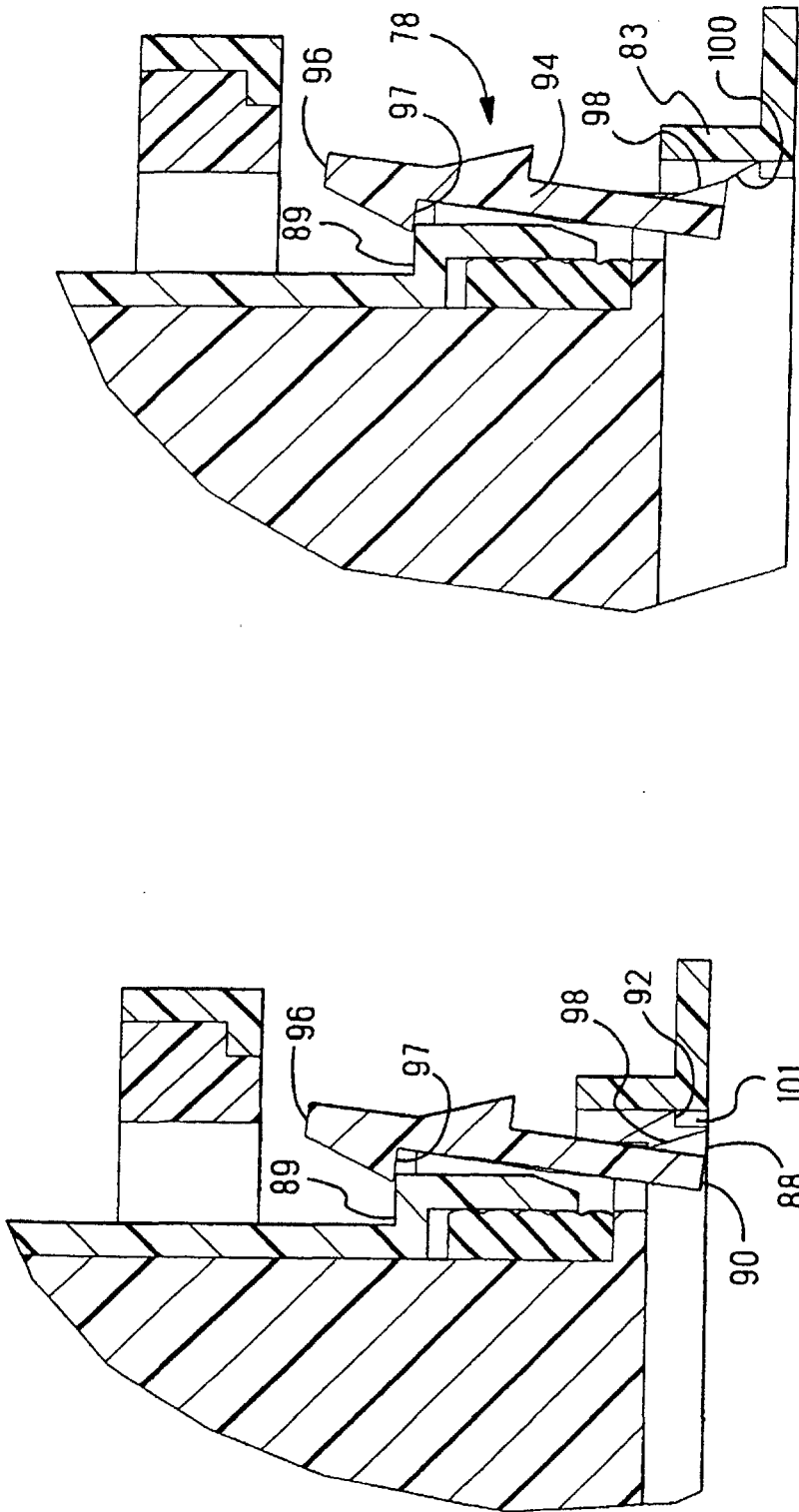


Fig. 7h

Fig. 7g

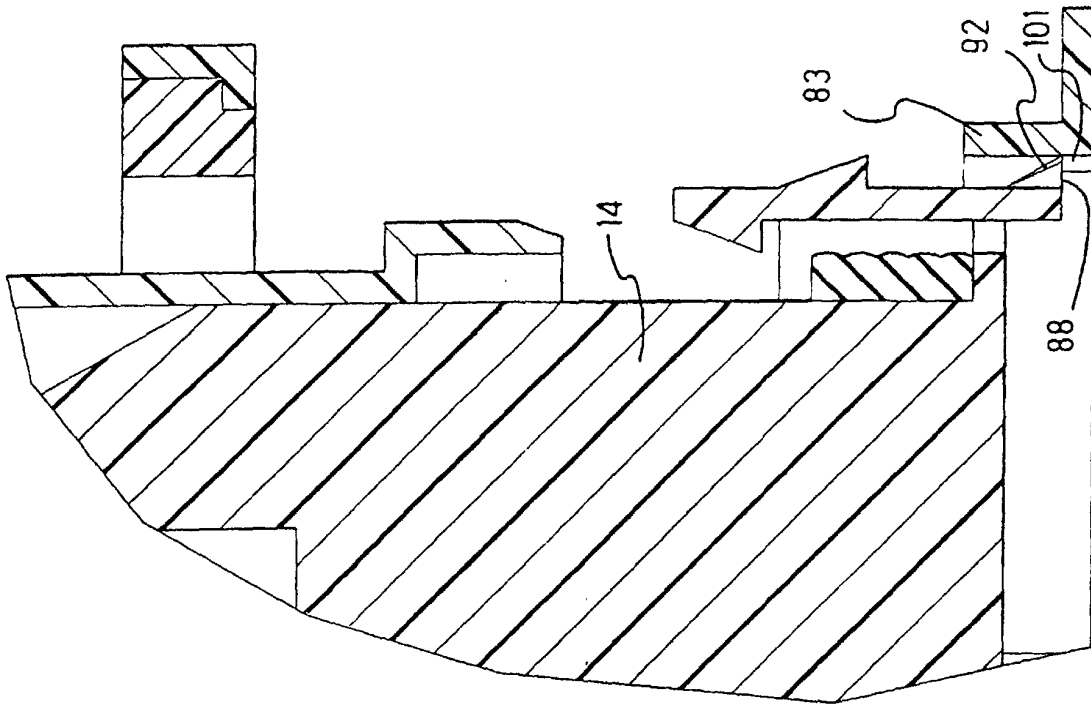


Fig. 7j

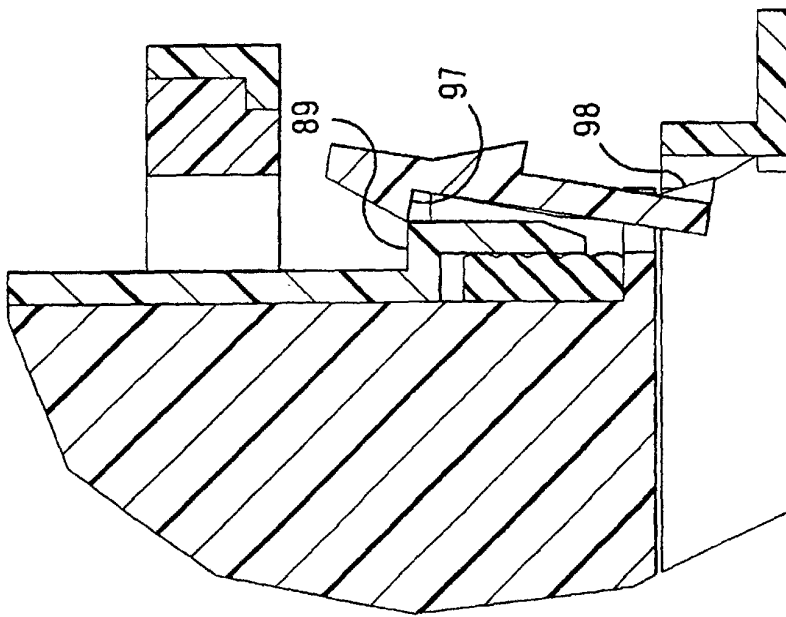
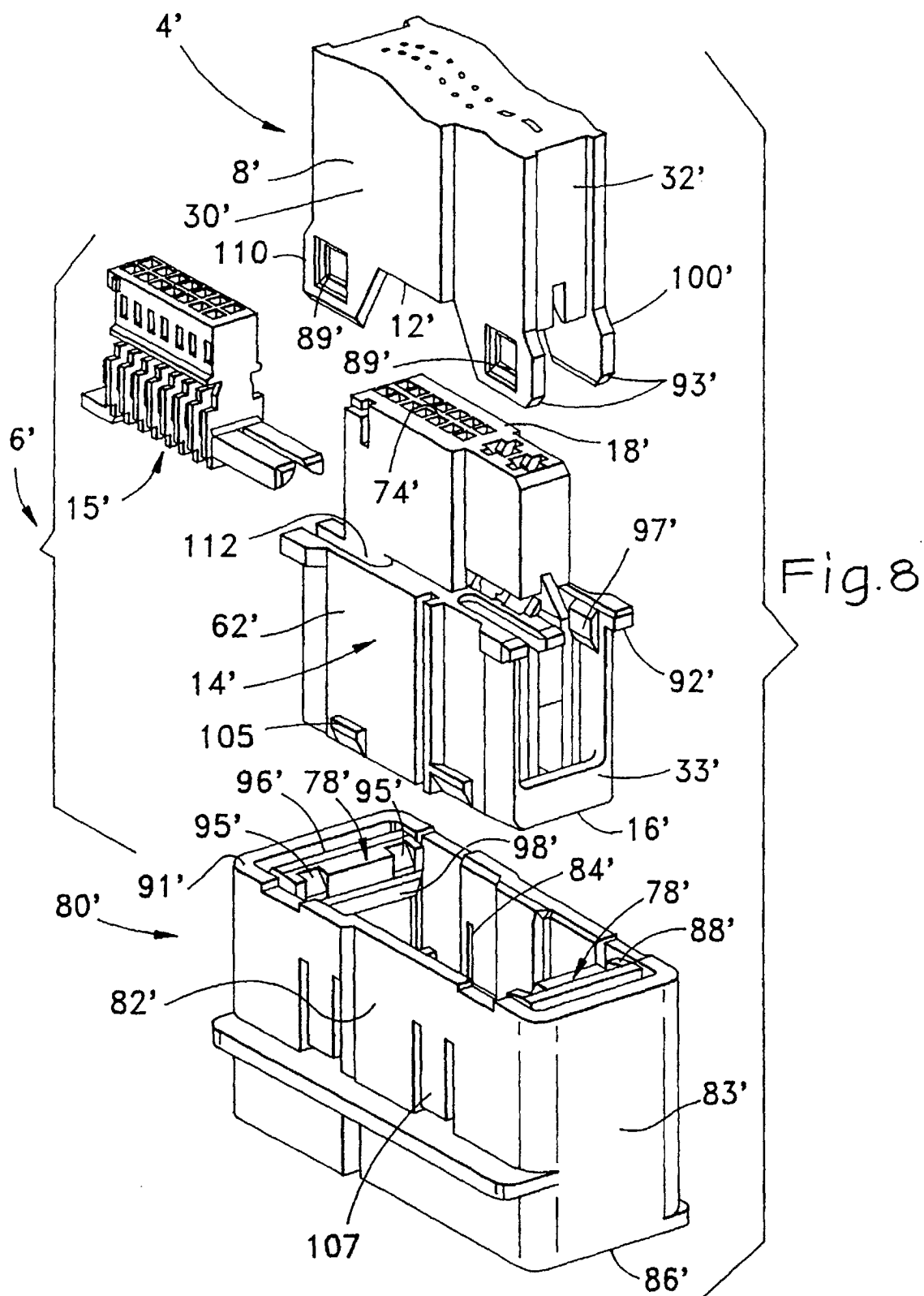
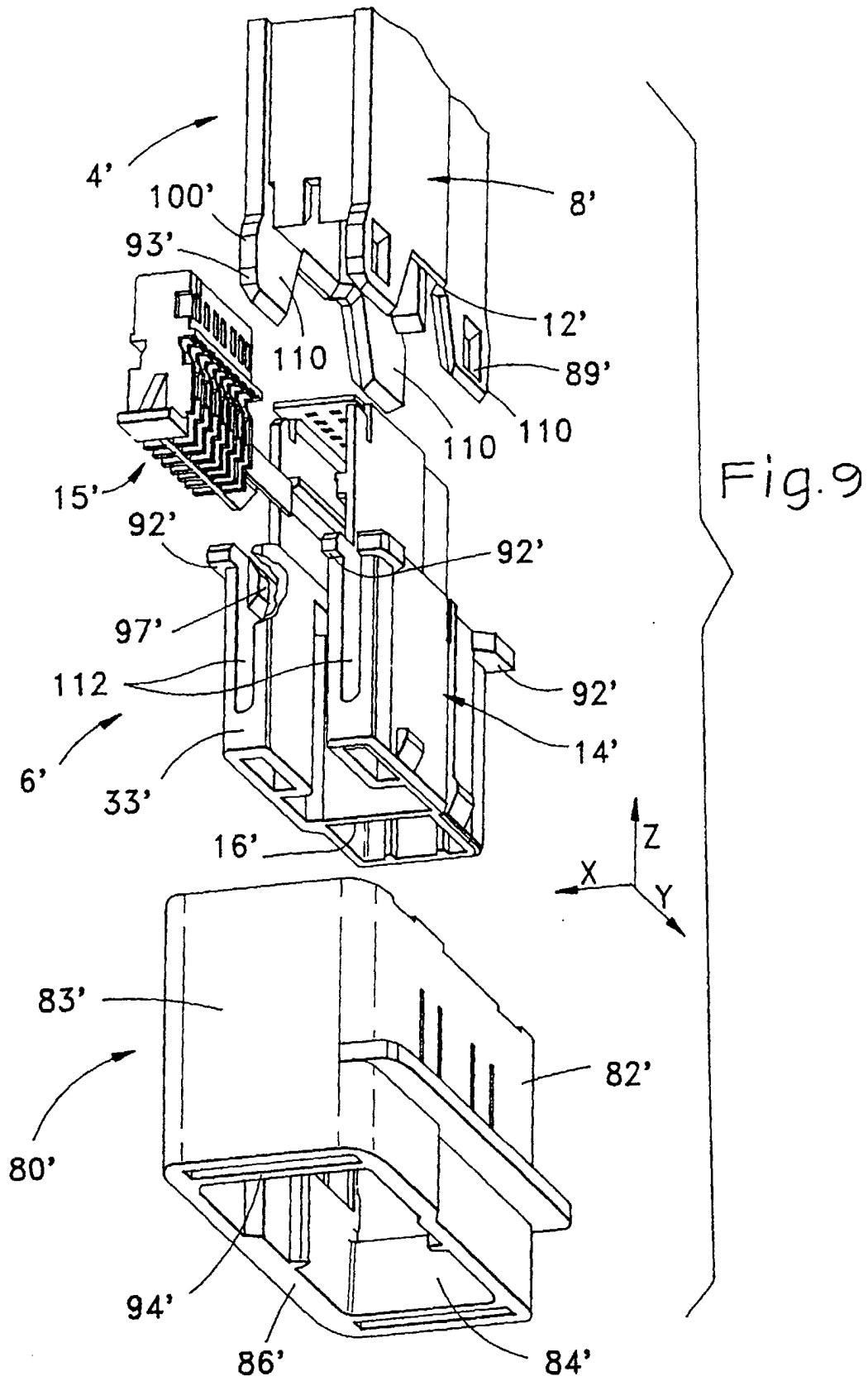


Fig. 7i





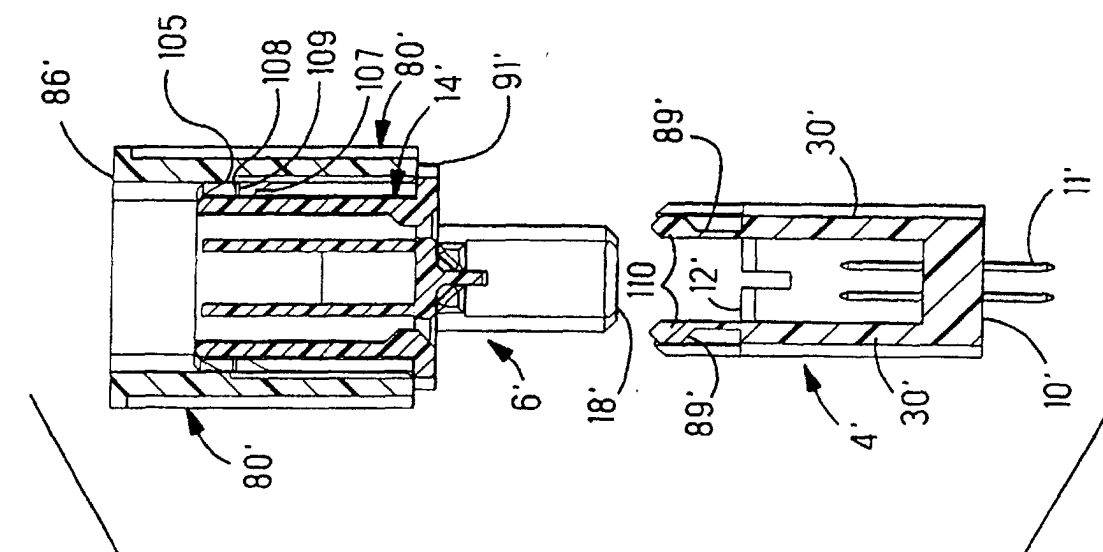


Fig. 11a

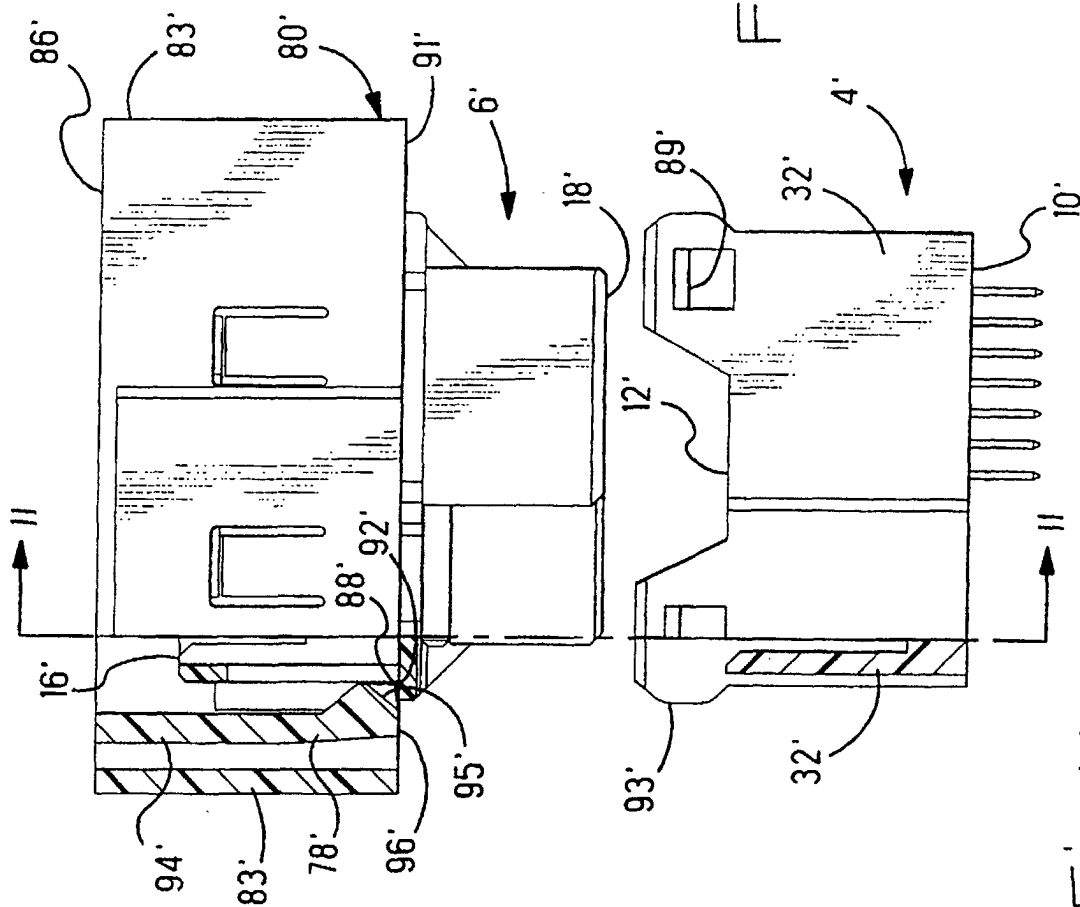


Fig. 10a

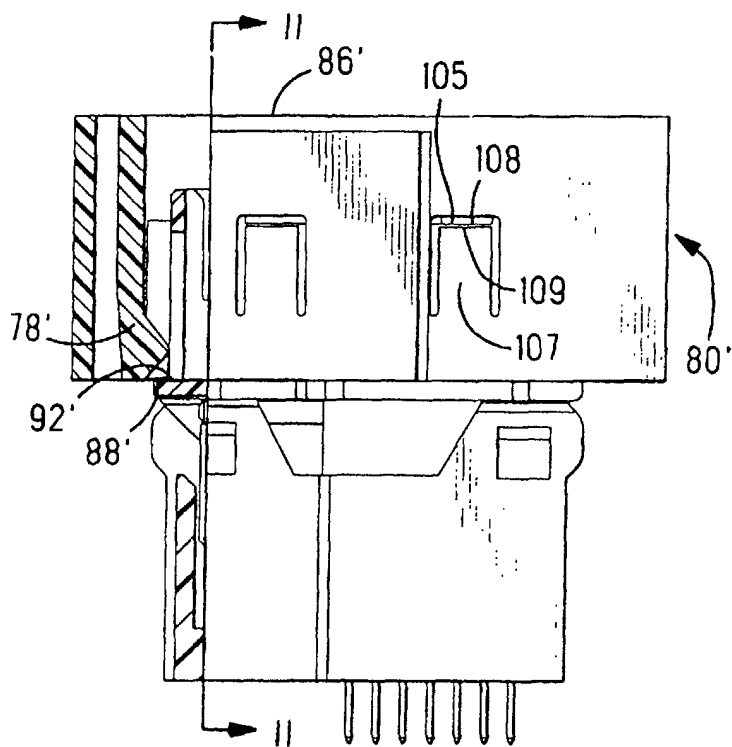


Fig.10b

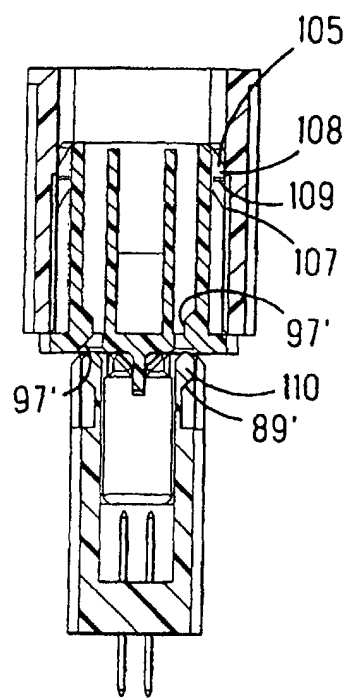


Fig.11b

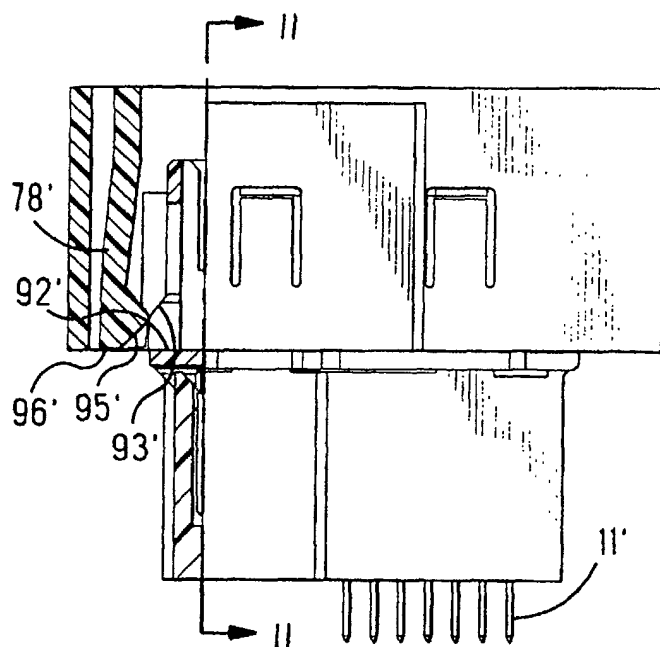


Fig.10c

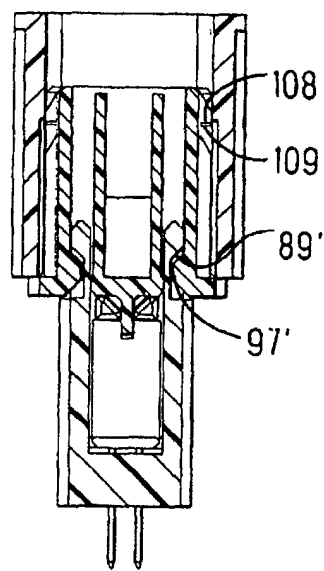


Fig.11c

