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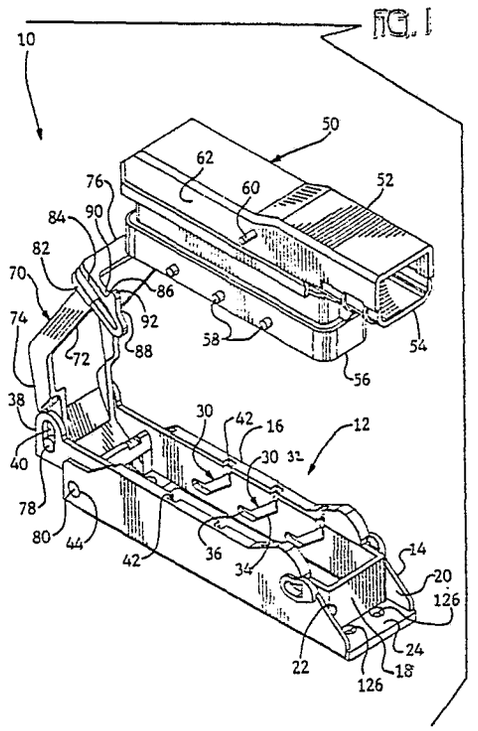
(54) Latching mechanism for plug and socket type electrical connector.

(57) This invention is directed to a latching mechanism (70,93,60) for a plug and socket type electrical connector assembly (10) comprising matable housing (12) and cover (50) members, respectively containing a plurality of male tabs or plugs (130), and a like plurality of female contacts or sockets (140) matable therewith. The housing member (12) comprises a fixed member (14) and a movable member (18) in sliding engagement therewith, where said movable member (18) is provided with at least one cam groove (30), a portion (36) of which extends in the sliding direction. The cover member (50) includes at least one cam projection (58) which engages in said cam groove (30) in the mated condition for said cover (50) and said movable member (18). The latching mechanism (70,93,60) preferably comprises a lever arm (72,94), one end (74,96) of which contains dual pivot points (78,80,100,102) where such pivot points are pivotal with respect to said fixed member (14) and said movable member (18). The opposite end (76,98) of the lever are contains a latching slot (86,110) engageable with a projection (60) on said cover member, where said latching slot is formed by an angled arm member (88,110), such that on pivoting the lever arm to bring the members into full mating engagement, the projection (60) on said cover member contacts said angled arm member (88,110) during mating of said members prior to engagement with said latching slot, the latter representing a condition of full mating engagement.

FIG. 1



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LATCHING MECHANISM FOR PLUG AND SOCKET TYPE ELECTRICAL CONNECTOR

The present invention relates to a latching mechanism for a plug and socket type electrical connector assembly. Assemblies of this type typically are elongated and contain a multitude of electrical terminals. A typical arrangement, as more fully described in U.S. Patent Nos. 4586,766 and 4,435,033, consists of two or three rows, each containing a number of terminals. One housing of such assembly is provided with male terminals, as arrayed above, or plugs, blades or tabs, with the terminals aligned parallel to the axis of the elongated housing. A cover member, matable therewith, is provided with complementary arrayed series of female terminals, such as blade-type terminals, where opposed spring-pressed contacts are provided to receive such male terminals.

An ideal application for connector assemblies of this type is in the automobile. For example, they are particularly suitable to connect numerous electrical devices, such as sensors, output elements, and the like, to a microprocessor in which the sensors and output elements form components of the electrical system of an automobile.

A key requirement of such a connector assembly is ease of mating engagement, while maintaining its reliability. Since the electrical connector assemblies of the type described above are often placed in remote locations of the automobile, or locations which are not readily accessible to an operator, it is implicit that the assembly be mated such as by a single hand. Further, such assembly must be able to withstand vibrations, typically associated with automobiles, and other adverse conditions. As a consequence of the need for ease of terminal engagement and reliability, the present invention evolved as an answer sought by the automotive industry.

Such answer, as described in more detail in the specification which follows, comprises matable housing and cover members, respectively containing a plurality of male tabs or plugs, and a like plurality of female contacts or sockets matable therewith. The housing member comprises a fixed member and a movable member in sliding engagement therewith, where said movable member is provided with at least one cam groove, a portion of which extends in the sliding direction.

The cover member, which includes at least one cam projection for engagement in said cam groove of the movable member, may be placed by "feel" by an operator onto the housing member. Once the cover and housing members are in this premating position, the operator may activate the latching mechanism comprising a lever arm, one end of which contains dual pivot points where such pivot points are pivotal with respect to said fixed member and said movable member. The opposite end of the lever arm contains a latching slot engageable with a projection on said cover member, where said latching slot is formed by an angled arm member, such that on pivoting the level arm by the operator to bring the members into full mating engagement, the projection on said cover member contacts said angled arm member during mating of said members prior to engagement with said latching slot. The latter position represents the condition of full mating engagement.

An exemplary embodiment of the invention will now be described in conjunction with the accompanying drawings in which:

FIGURE 1 is an exploded perspective view of an electrical connector assembly suitable for utilizing the latching mechanism according to this invention.

FIGURE 2 is an exploded side view of the assembly shown in Figure 1.

FIGURE 3 is a perspective view of the assembled and latched electrical connector assembly of Figures 1 and 2.

FIGURE 4 is a perspective view of a second embodiment for the lever arm and latching mechanism according to this invention.

FIGURE 5 is a perspective view of the arrayed male contacts suitable for use in the electrical connector assembly of this invention.

FIGURE 6 is a perspective view of a single female contact suitable herein for mating with the type of male contact shown in Figure 5.

Figures 1 and 2 illustrate an exemplary type of electrical connector assembly 10 suitable for practicing this invention. Such assembly 10 comprises an elongated housing 12 composed of a fixed member 14 having an internally directed longitudinal flange 16, and a movable member 18 in sliding engagement therewith. More particularly, movable member 18 is contiguous with and slidably engages side walls 20,22 and base 24, while underlying the flange 16. The bottom 26 of movable member 18, and base 24, are open, for reasons more fully explained hereinafter, to accommodate and receive the electrical terminal component shown in Figure 5.

The movable member 38 is further characterized by one or more opposing pairs of cam grooves 30 having an entry leg 32, a slanted leg 34, and a horizontal leg 36 which lies in the relative sliding direction of the housing members 14,18. At one end 38 of movable member 18, there is provided a vertically oriented slot 40, the function of which will be described hereinafter.

The fixed member 14 is provided along the flange 16 with one or more pairs of notches 42, which notches 42 are aligned with entry legs 32 of the cam grooves 30 in the unmated condition. The end of fixed member 14, corresponding to end 38, is provided with projection receiving openings 44, the purpose of which shall become apparent in the description which follows.

Matable with said housing 12 is cover member 50 comprising an elongated wire receiving housing 52, where wire, in the form of a multi-conductor cable, enters the cover member 50 through end opening 54. The mating portion 56 thereof, within which are provided the electrical terminals for engagement with complementary terminals in housing 12, is situated below housing portion 52. Along side the mating portion 56 are one or more pairs of cam projections 58 whose size is such as to be capable of being received in cam grooves 30. A further and final feature of the cover member 50 is the single pair of latching projections 60 along side walls 62.

The full engagement of the cover member 50 with housing 12, and electrical engagement of the complementary terminals therein, is achieved by means of the pivotal motion of the lever arm 70, and the latching thereof at the end of the rotation cycle. The lever arm 70, formed of a flexible plastic material, consists of a body portion 72 separating the pivot end 74 from the latching end 76. The pivot end 74 is characterized by dual pivot points 78,80 each of which are provided with pivot projections. Pivot point 80, containing the longer projections, is intended to engage openings 44 for rotational movement therein. The adjacent pivot projections 78 are to be received in sliding relationship within slot 40.

At latching end 76, a first leg 82, fixed relative to the lever body portion 72, and an adjacent leg 84, is provided, where said leg 84 is free to move relative to the first leg 82. The free leg 84 is provided with a latching catch 86 which is formed by angled arm 88 and a horizontal catch surface 90. In operation, assuming all components are suitably aligned for engagement with complementary components, the lever arm is rotated whereby the latching projection 60 first contacts angled arm 88 riding up the surface thereof until it reaches end 92 whereupon it snaps into position along horizontal catch surface 90 adjacent free leg 84. To unmate the components, the respective legs 82,84 are squeezed toward one another, while putting a lifting motion on the lever arm 70. The free leg 84 laterally shifts a sufficient amount to free the latching projection 60.

Figure 4 is a perspective view of an alternative latching arm 93, where such arm is characterized by a body portion 94, a double action pivot end 96, and a latching end 98. The pivot end 96 features two pairs of pivot projections 100,102, respectively for engagement with the fixed member 14 and movable member 18, in a manner similar to lever arm 70.

The opposite end, or latching end 98, comprises a fixed leg 104 and free leg 106, that is free relative to the body portion 94. The lower end of free leg 106 features angled arm 108 joined to the base of fixed leg 104, and a latching slot 110 formed by the diverging angled arm 108 and the vertically oriented free leg 106. Joining the remote ends 112 of the free legs 106 is a transverse bar 114 which can function to provide visual confirmation of the full mating and latching, and to assist in unmating of the respective components.

As with the latching mechanism illustrated in Figures 1-3, unmating of the housing components is accomplished by squeezing together the free leg 106 and fixed leg 104. Since the fixed leg 104 is secured to the body portion 94, the net effect of such squeezing is to move the free leg 106 toward the fixed leg 104 thereby releasing the latching projection 60 from the latching slot 110.

Considering now the electrical interconnection of the connector assembly 10 of this invention, reference is made to Figure 5. The male tab housing 120 comprises an intermediate, elongated plate 122 adapted to be secured to base 24 of fixed member 14, such as by fasteners through aligned holes 124,126. Upstanding from such plate 122 is wall enclosure 128 within which are provided a plurality of arrayed male tabs 130, or blades, aligned parallel to the major axis of plate 122. As noted previously, the base 24 and bottom 26, respectively of the fixed and movable members, are open to receive the male tab housing 120. The dimensions of the wall enclosure 128 are limited only to the extent that the movable member 18 must be free to slide between the wall thereof, and side walls 20,22.

To mate the cover member 50 with elongated housing 12, and thereby achieve electrical contact between male tabs 130 and female contacts (Figure 6), to be more fully discussed hereinafter, the cover member 50 is placed onto housing 12 with cam projections 58 received in notches 42 and cam grooves 30. The cover member 50 is urged downward along entry legs 32 to a premating condition where corresponding male and female contacts are about to mate.

The mating of the electrical terminals involves direct or aligned engagement. That is, the female terminal, preferably comprises a stamped and formed, one-piece, blade type terminal 140 (Figure 6), which features opposing spring-pressed contact arms 142 capable of directly receiving a complementary blade, i.e. male tab 130 therebetween. Briefly, the respective female terminals 140 and

male tabs 130 are vertically aligned such that each male tab 130 enters between the opposing contact arms 142 of a corresponding female terminal 140..

To effect mating of the contacts, the cover member 50 moves toward fixed member 14 as the cam projections 58 ride along cam grooves 30. Pivotal or downward movement of lever arm 70 causes movable member 18 to move horizontally, while at the same time causing the cover member 50 to move vertically downwardly toward fixed member 14 to fully mate the terminals provided therein.

At the end of the rotational movement of lever arm 70, or the alternative embodiment of the lever are shown in Figure 4, the latching projections 60 snap into position along horizontal catch surface 90,110 of leg 84,108.

Claims

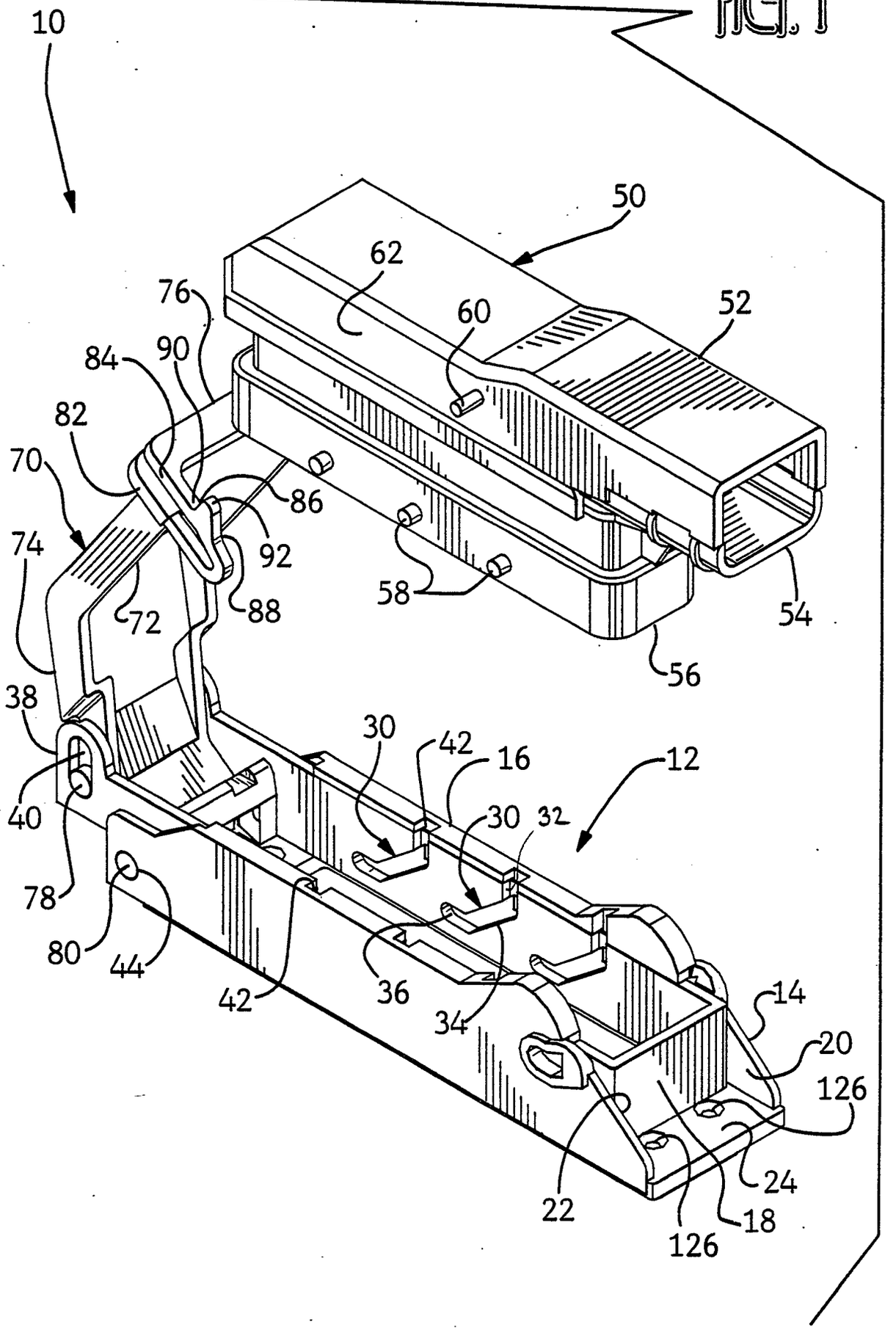
1. A latching mechanism (70,93,60) for a plug and socket type electrical connector assembly (10), said assembly including a fixed housing member (14), a movable member (18) in sliding engagement with said fixed housing member (14), where said movable member (18) is provided with at least one cam groove (30), a portion (36) of which extends in the sliding direction; a cover member (50) matable with said movable member (18) and including at least one cam projection (58) which engages in said cam groove (30) in the mated condition for said cover (50) and said movable memeber (18), and latching means (70, 93) to secure the respective members in latching engagement,
characterized in that said latching means (70,93) comprises a lever arm (72,94), one end (74,96) of which contains dual pivot points (78,80,100,102) where such pivot points are pivotal with respect to said fixed housing member (14) and said movable member (18), and the opposite end (76,98) contains a latching slot (86,110) engageable with a projection (60) on said cover member, characterized further by said latching slot (86,110) being formed by an angled are member (88,108), thereby said projection (60) on said cover member (50) contacts said angled arm member (88,108) during mating of said members prior to engagement with said latching slot (86,110).

2. The latching mechanism for a plug and socket type electrical connector assembly according to claim 1, characterized in that adjacent to said angled arm member (88,108) is a cooperating arm (82,104) secured to said lever arm (72,94), and that said angled arm member (88,108) is movable relative to said cooperating arm (82,104).

3. The latching mechanism for a plug and socket type electrical connector assembly according to claim 1 or 2, characterized in that there are a pair of angled are members (88,108), each having an extension (84, 106), where said extensions (84, 106) are joined by an arm (114).

4. The latching mechanism for a plug and socket type electrical connector assembly according to claim 3, characterized in that said arm (114) is movable toward said cooperating arm (82,104) during mating and unmating of connector assembly (10).

FIG. 1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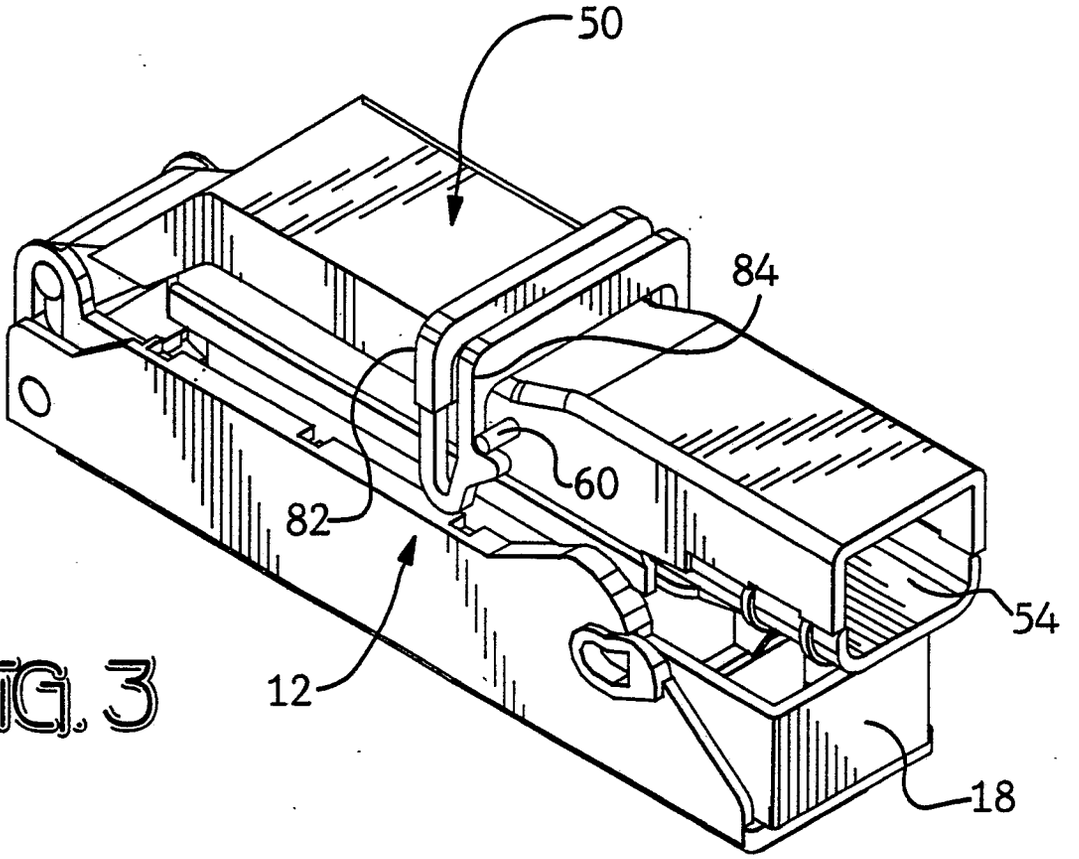


FIG. 3

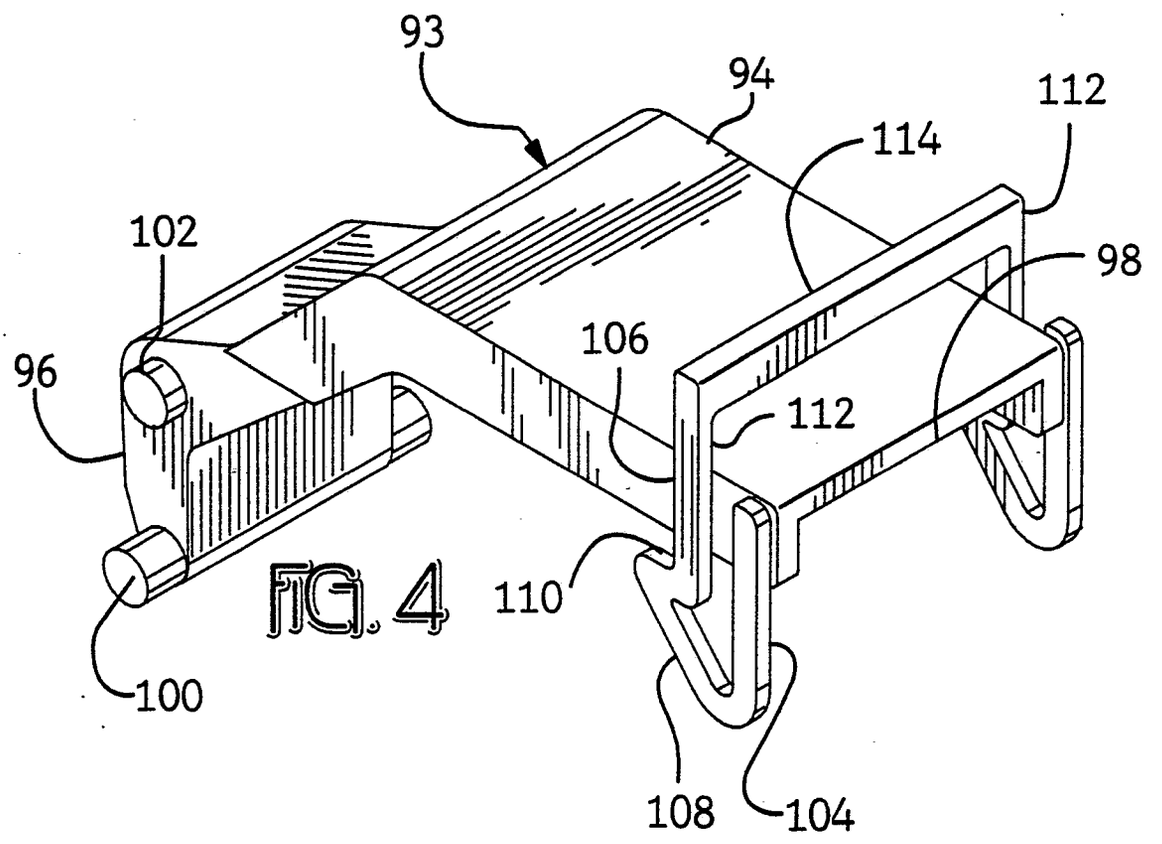


FIG. 4

FIG. 2

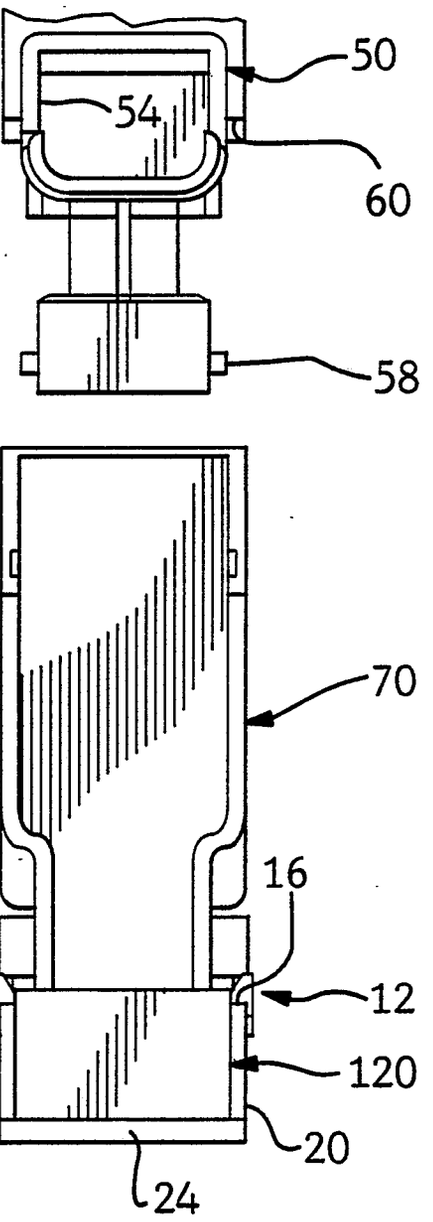
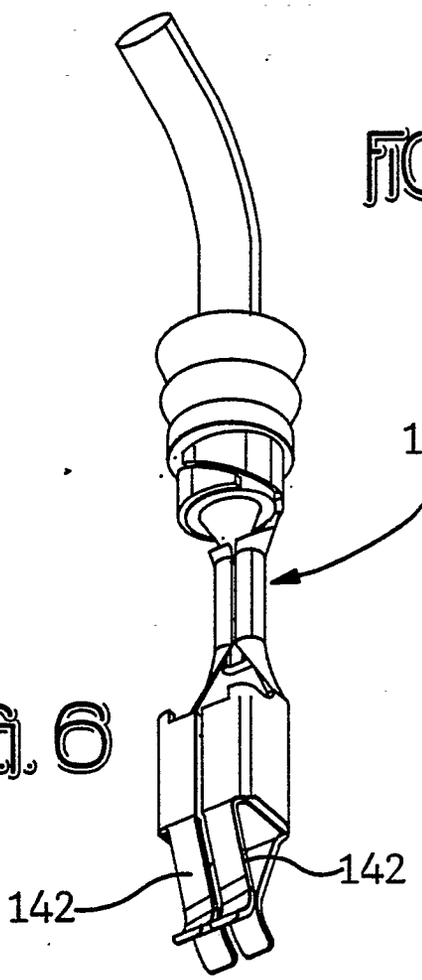


FIG. 6



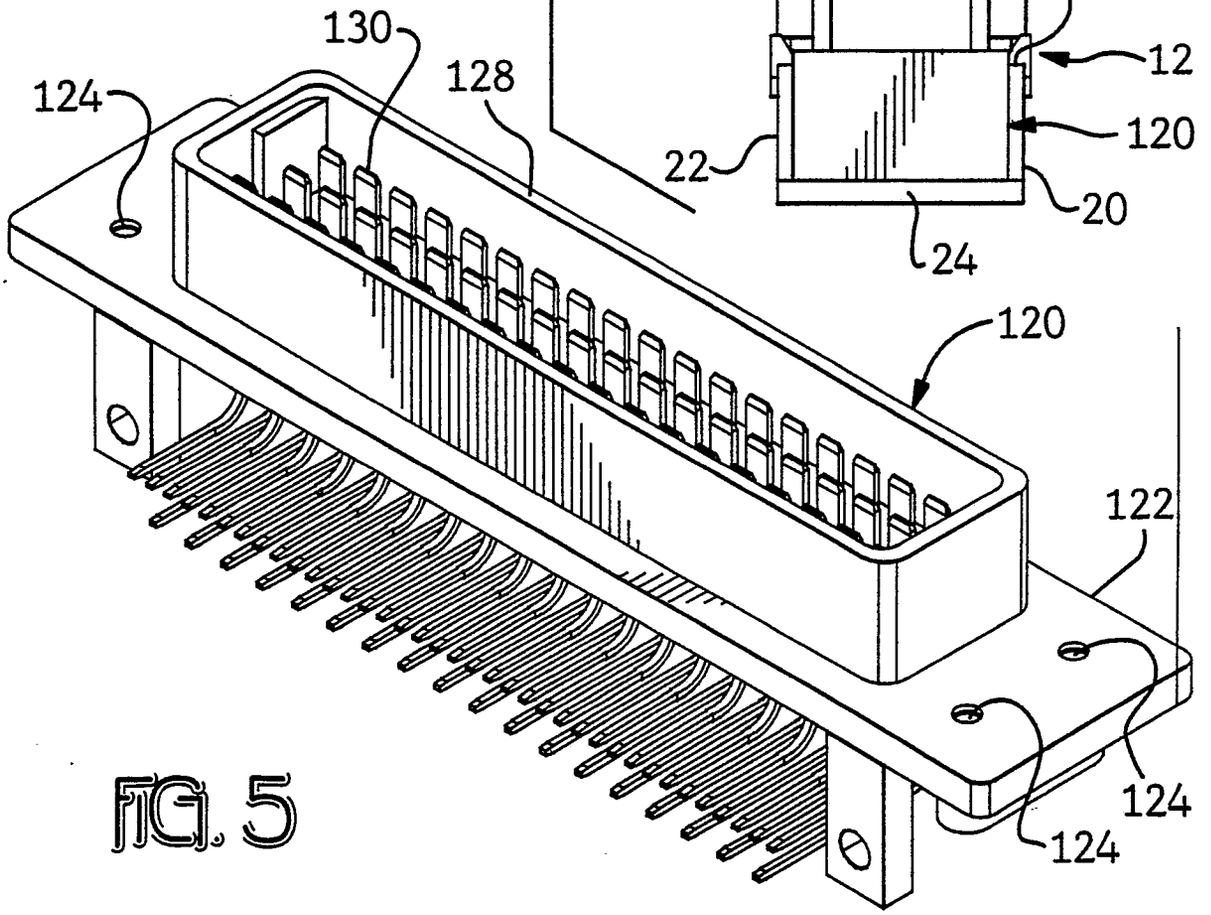


FIG. 5

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EUROPEAN SEARCH REPORT

Application Number

EP 89 11 8417

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.5)
A	US-A-4332432 (COLLERAN) * abstract; figure 1 *	1	H01R13/629
A	US-A-4586771 (KRAEMER ET AL.) * abstract; figure 1 *	1	
A	US-A-4542951 (MUMMEY ET AL.) * abstract * * column 3, lines 1 - 51; figure 1 *	1 1	
A	FR-A-2563950 (AIR LB INTERNATIONAL S.A.) * abstract; figure 1 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	04 DECEMBER 1989	HORAK A. L.

CATEGORY OF CITED DOCUMENTS

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