



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 0 991 144 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.04.2000 Bulletin 2000/14

(51) Int. Cl.⁷: **H01R 13/629**

(21) Application number: **99202881.1**

(22) Date of filing: **06.09.1999**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **29.09.1998 DE 19844689**

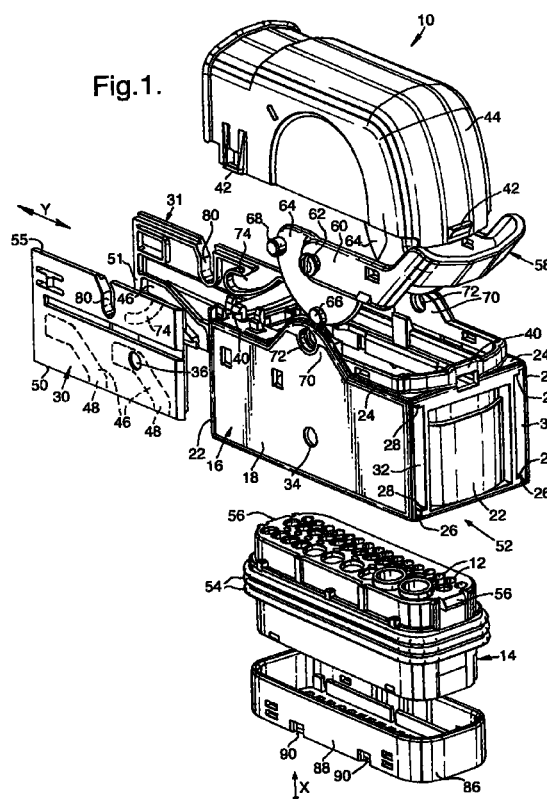
(71) Applicant:
Delphi Technologies, Inc.
Troy, MI 48007 (US)

(72) Inventor: **Drescher, Thomas**
42499 Hueckeswagen (DE)

(74) Representative:
Denton, Michael John
Delphi Automotive Systems
Centre Technique Paris
117 avenue des Nations
B.P. 60059
95972 Roissy Charles de Gaulle Cedex (FR)

(54) **An electrical connector with a transport device**

(57) An electrical connector (10), for mating with another electrical connector along an axis (X), comprising a housing (16) having opposed side walls (18,20) and opposed end walls (22), each side wall having an upper wall (24) and a lower wall (26) defining opposed slide surfaces (28) extending in a direction (Y) substantially perpendicular to the mating axis, and an aperture (34) in one of the side walls; a substantially U-shaped lever (58) having a pair of arms (60) pivotally mounted on the housing and movable between an unmated position and a mated position; a slider (30,31) positioned adjacent each side wall, each slider having an upper edge (55) and a lower edge (50) making a sliding engagement with the slide surfaces of the upper wall and the lower wall, respectively, of the side walls, engaging means for engaging the other connector, and an aperture (36) in the one slider positioned adjacent the one side wall and alignable with the aperture in the one side wall when the lever is in the unmated position; drive means (66,74;68,80) on each arm and each slider to slide each slider relative to the adjacent side wall on pivoting of the lever relative to the housing between the unmated and mated positions; a body (14) retaining electric contacts positioned inside the housing; an end cap (86) on the body adjacent the lower walls of the side walls of the housing; and a transport device (94) including a forked member (98) engaging the end cap, and a resilient button (102) making a snap fit in the aligned apertures in the one side wall and the one slider when the lever is in the unmated position. Secures the lever (58) and the contact body (14) during transportation.



Description

Technical Field

[0001] The present invention relates to an electrical connector having a lever for mating and unmating the connector with another electrical connector, and which has a transport device.

Background of the Invention

[0002] A two-part electrical connector with a lever for mating and unmating of the two parts is disclosed in EP-A-0722203. The lever is substantially U-shaped and is pivotally mounted on the housing of one part of the connector. A pair of sliders are also mounted on the same housing and slide on pivoting of the lever. The sliders have cam surfaces which engage corresponding cam followers on the housing of the other part of the connector. Pivoting of the lever causes the sliders to slide to mate or unmate the two parts of the connector. The same housing has electric contacts mounted in a body which is positioned in the housing. During transportation there is a risk that the lever may move from its unmated position, and a risk that the body may unintentionally become dislodged from the housing.

Summary of the Invention

[0003] The object of the present invention is to overcome the above mentioned problems.

[0004] An electrical connector in accordance with the present invention, for mating with another electrical connector along an axis, comprises a housing having opposed side walls and opposed end walls, each side wall having an upper wall and a lower wall defining opposed slide surfaces extending in a direction substantially perpendicular to the mating axis, and an aperture in one of the side walls; a substantially U-shaped lever having a pair of arms pivotally mounted on the housing and movable between an unmated position and a mated position; a slider positioned adjacent each side wall, each slider having an upper edge and a lower edge making a sliding engagement with the slide surfaces of the upper wall and the lower wall, respectively, of the side walls, engaging means for engaging the other connector, and an aperture in the one slider positioned adjacent the one side wall and alignable with the aperture in the one side wall when the lever is in the unmated position; drive means on each arm and each slider to slide each slider relative to the adjacent side wall on pivoting of the lever relative to the housing between the unmated and mated positions; a body retaining electric contacts positioned inside the housing; an end cap on the body adjacent the lower walls of the side walls of the housing; and a transport device including a forked member engaging the end cap, and a resilient button making a snap fit in the aligned aper-

tures in the one side wall and the one slider when the lever is in the unmated position.

[0005] The present invention provides means for securing the position of the lever and sliders, and ensures retention of the body with the contacts, during transportation of the electrical connector.

Brief Description of the Drawings

[0006] The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is an exploded view of an electrical connector in accordance with the present invention without a transport device;

Figure 2 is a perspective of the connector of Figure 1 with the lever in the fully unmated position and the cover omitted;

Figure 3 is a perspective view of the transport device;

Figure 4 is a perspective view of the connector of Figures 1 and 2, with the transport device of Figure 3, in accordance with the present invention;

Figure 5 is a perspective of an alternative embodiment of the connector of Figure 1 with the lever in the fully unmated position and the cover omitted; and

Figure 6 is a perspective view of the connector of Figure 5, with the transport device of Figure 3, in accordance with the present invention.

Description of the Preferred Embodiment

[0007] The present invention is an electrical connector 10 having a transport device 94. The connector 10, as shown in Figures 1 and 2, is capable of mating with a corresponding electrical connector (not shown). Both connectors have electrical contacts or terminals (not shown) mounted therein. On mating of the connectors, the contacts in the connector 10 mate with, and complete an electrical connection with, the corresponding contacts in the other connector. Any suitable type of contacts may be used. The connector 10 mates (mechanically and electrically connects) or unmates (mechanically and electrically disconnects) with the other connector by moving the parts relative to one another in an axial direction X.

[0008] The electrical connector 10 comprises a housing 16 of electrically insulating material, which is preferably plastics material, and which is preferably moulded in one piece. The housing 16 comprises first and second side walls 18,20 and end walls 22. Each side wall 18,20 has an upper wall 24 and a lower wall 26. The upper wall 24 and the lower wall 26 of each side wall 18,20 define, internally of the housing 16, slide surfaces 28 for a slider 30,31, respectively, positioned adjacent the side wall. Each slide surface 28 extends in a direc-

tion Y which is substantially perpendicular to the mating axis X. Each slider 30,31 (which is preferably moulded in one piece from plastics material) is inserted into the housing 16 by way of slots 32 formed between the side walls 18,20 and the end walls 22. A pair of spaced apertures 38 are formed in the lower wall 26 of each side wall 18,20 and are spaced apart in the direction Y. The upper wall 24 of each side wall 18,20 has latch means 40 on its outer surface which makes a snap fit with corresponding latch means 42 on a cover 44 of the one part 10 of the connector.

[0009] Each slider 30,31 has a pair of inclined channels 46 formed therein which open at an opening 48 through a lower edge 50 of the slider. The channels 46 are open sided and formed on the internal surface 51 of each slider 30,31. The openings 48 in each slider 30,31 have the same spacing as the apertures 38 in the lower wall 26 of the corresponding side wall 18,20, such that the openings 48 can align with the apertures. The channels 46 in each slider 30,31 are inclined in the same direction at the same angle and open inwardly towards the other slider. The channels 46 in each slider 30,31 are inclined in the same direction. The upper edge 55 and the lower edge 50 of each slider 30,31 makes a sliding fit with the slide surface 28 of the upper wall 24 and the lower wall 26 of the corresponding side wall 18,20.

[0010] The connector 10 further comprises a substantially U-shaped lever 58. Each arm 60 of the lever 58 has a pivot pin 62 defining the centre of an arc-shaped portion 64 at the free end of each arm. The arc-shaped portion 64 has first and second pins 66,68 which are substantially equally radially spaced from the pivot pin 62. The upper wall 24 of each side wall 18,20 has an upward extension 70 (substantially centrally positioned in the direction Y) with a pivot aperture 72 formed therein which receives one of the pivot pins 62 with a snap fit. With this arrangement the lever 58 can pivot relative to the housing 16 about the pivot apertures 72 between an unmated position (as shown in the drawings) and a mated position. In the unmated position of the lever 58, the first pin 66 of each arm 60 is positioned in a first channel 74 formed in internal surface 51 of the corresponding slider 30,31. The first channel 74 of each slider 30,31 is open sided and arc-shaped, and opens through the upper edge 55 of the slider. In the mated position of the lever 58, the second pin 68 of each arm 60 is positioned in a second channel 80 formed as a slot in the corresponding slider 30,31. The second channel 80 of each slider 30,31 is open sided, extends substantially in the direction of the mating axis X, and opens through the upper edge 55 of the slider. As the lever 58 pivots relative to the housing 16 from the unmated position to the mated position, the first pin 66 on each arm 60 slides in its respective first channel 74 and leaves the first channel through the open end thereof, and the second pin 68 enters the second channel 80 through the open end thereof, slides in the second channel, and

engages the side edges of the second channel. As the lever 58 pivots relative to the housing 16 from the mated position to the unmated position, the reverse action occurs. With this arrangement, the lever 58 drives (moves) the sliders 30,31 in the direction Y relative to the side walls 18,20. In the unmated position of the lever 58, an aperture 34 in one side wall 18 of the housing 16 aligns with an aperture 36 in the adjacent slider 30. Other arrangements for the drive means between the lever and the sliders may be provided, and other arrangements for the pivot connection between the lever and the housing may be provided.

[0011] The electric contacts of the connector 10 are positioned in bores 12 in a body 14 which makes a sliding fit inside the housing 16 through the lower side 52 of the housing. Annular seals 54 are positioned around the body 14. Resilient latch tangs 56 secure the body 14 in the housing 16. An end cap 86 makes a snap fit on the body and retains the contacts in the bores 12. The end cap 86 has a side wall 88 which is positioned adjacent the side wall 18 of the housing 16 having the aperture 34, and which has a pair of spaced apertures 90 therein.

[0012] On assembly of the connector 10, an annular slot 92 is formed between the end cap 86 and body 14 and the housing 16 at the lower side 54 of the housing. The other electrical connector (not shown) has a pair of pins projecting from each side of a housing. The pins have the same spacing as the apertures 38 in the lower wall 26 of the corresponding side wall 18,20 of the housing 16 of the connector 10. During mating and unmating, the housing of the other connector fits into the annular slot 92 with the pins on the other connector passing through the apertures 38 and sliding along the inclined channels 46 formed in the sliders 30,31 in such a manner that the pins define cam followers and the channels define cam surfaces.

[0013] The transport device 94, as shown in Figure 3, comprises an upright member 96, and a forked member 98 which is substantially perpendicular to the upright member. The forked member 98 comprises a pair of spaced legs 100 which extend away from the upright member 96. The upright member 96 has a button 102 comprising spaced resilient arms 104 which extend away from the upright member in the same direction as the legs 100.

[0014] The electrical connector 10 is assembled as shown in Figure 2 with the end cap 86 projecting out of the lower side 52 of the housing 16. The lever 58 is placed in the unmated position such that the aperture 34 in the side wall 16 and the aperture 36 in the slider 30 are aligned. The transport device 94 is then secured to the connector 10 by sliding the legs 100 of the forked member 98 through the apertures 90 in the side wall 88 of the end cap 86, and then pushing the button 102 through the aligned apertures 34,36 such that the resilient arms 104 make a snap fit, as shown in Figure 4. With this arrangement, the lever 58 and sliders 30,31

are retained in the unmated position during transportation of the connector 10, and the body 14 with the contacts is prevented from leaving the housing 16.

[0015] In the alternative embodiment shown in Figures 5 and 6, the electrical connector 10 is assembled as shown in Figure 5 with the outer face 106 of the end cap 86 substantially aligned with the lower side 52 of the housing 16. The lever 58 is placed in the unmated position such that the aperture 34 in the side wall 16 and the aperture 36 in the slider 30 are aligned. The transport device 94 is then secured to the connector 10 by sliding the legs 100 of the forked member 98 across the outer face 106 of the end cap 86, and then pushing the button 102 through the aligned apertures 34,36 such that the resilient arms 104 make a snap fit, as shown in Figure 6. Again, with this arrangement, the lever 58 and sliders 30,31 are retained in the unmated position during transportation of the connector 10, and the body 14 with the contacts is prevented from leaving the housing 16.

[0016] The present invention is applicable to any design of electrical connector which comprises a lever driving a pair of sliders used in the mating and unmating of the connector with another electrical connector, and not just the embodiments described above.

[0017] The transport device 94 is removed from the connector 10 before the connector is mated with the other connector.

Claims

1. An electrical connector (10), for mating with another electrical connector along an axis (X), comprising a housing (16) having opposed side walls (18,20) and opposed end walls (22), each side wall having an upper wall (24) and a lower wall (26) defining opposed slide surfaces (28) extending in a direction (Y) substantially perpendicular to the mating axis, and an aperture (34) in one of the side walls; a substantially U-shaped lever (58) having a pair of arms (60) pivotally mounted on the housing and movable between an unmated position and a mated position; a slider (30,31) positioned adjacent each side wall, each slider having an upper edge (55) and a lower edge (50) making a sliding engagement with the slide surfaces of the upper wall and the lower wall, respectively, of the side walls, engaging means for engaging the other connector, and an aperture (36) in the one slider positioned adjacent the one side wall and alignable with the aperture in the one side wall when the lever is in the unmated position; drive means (66,74;68,80) on each arm and each slider to slide each slider relative to the adjacent side wall on pivoting of the lever relative to the housing between the unmated and mated positions; a body (14) retaining electric contacts positioned inside the housing; an end cap (86) on the body adjacent the lower walls of the side walls of the housing; and a transport device (94) including a forked member

(98) engaging the end cap, and a resilient button (102) making a snap fit in the aligned apertures in the one side wall and the one slider when the lever is in the unmated position.

2. An electrical connector as claimed in Claim 1, wherein the resilient button (102) is on an upright member (96) which is substantially perpendicular to the forked member (98).
3. An electrical connector as claimed in Claim 1 or Claim 2, wherein the forked member (98) comprises a pair of spaced legs (100) which make a sliding fit through corresponding apertures (90) in a side wall (88) of the end cap (86).
4. An electrical connector as claimed in Claim 1 or Claim 2, wherein the forked member (98) comprises a pair of spaced legs (100) which engage an outer face (106) of the end cap (86).
5. An electrical connector as claimed in any one of Claims 1 to 4, wherein the resilient button (102) comprises spaced resilient arms (104).

Fig.1.

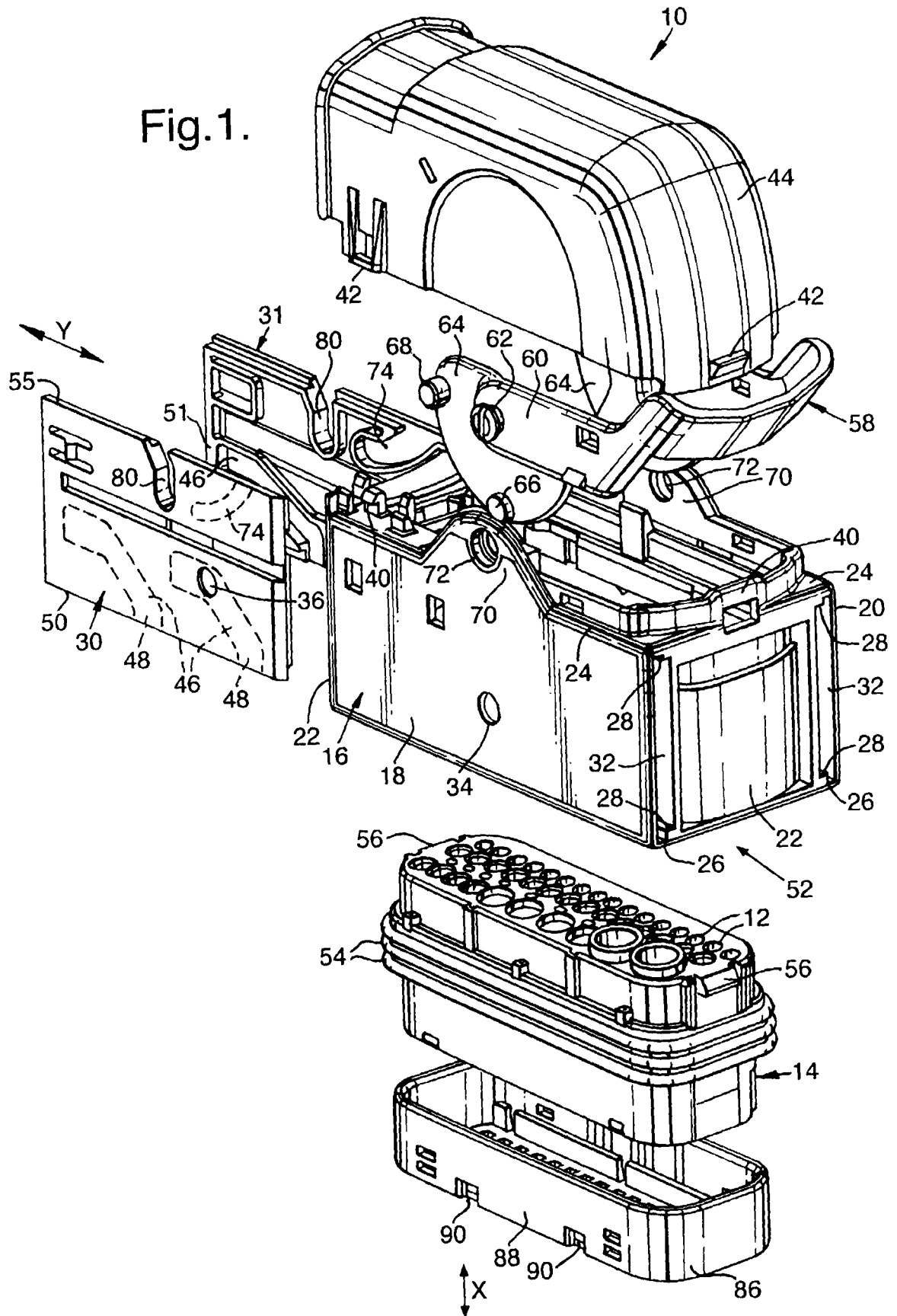


Fig.2.

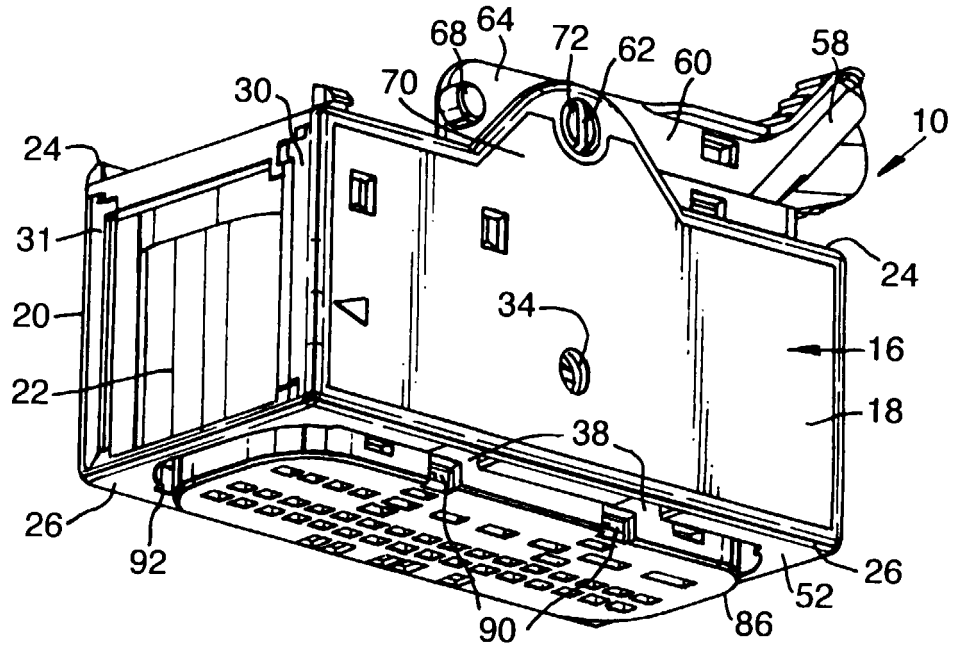


Fig.5.

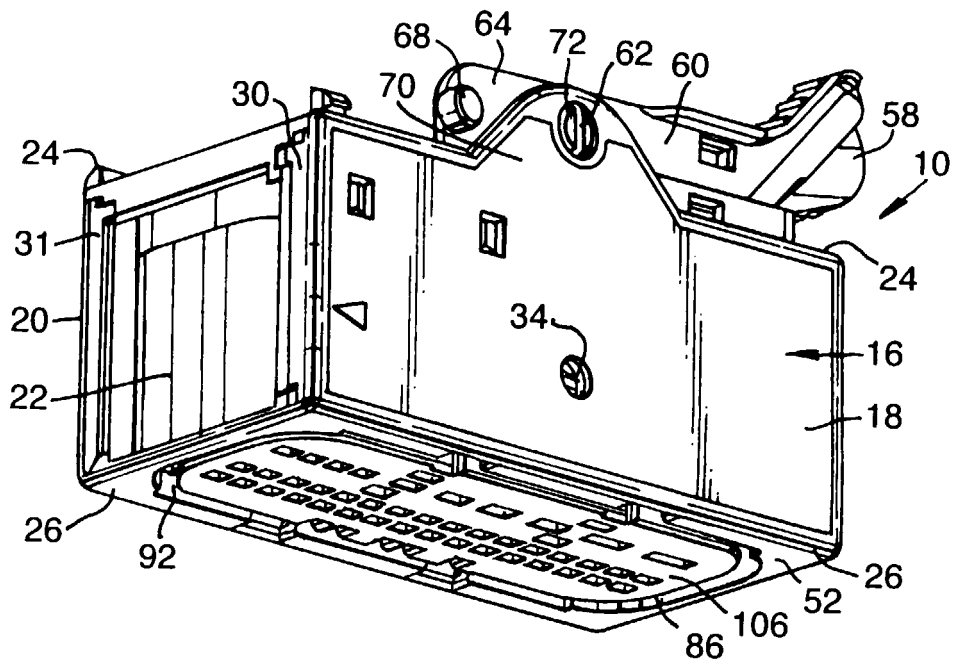


Fig.3.

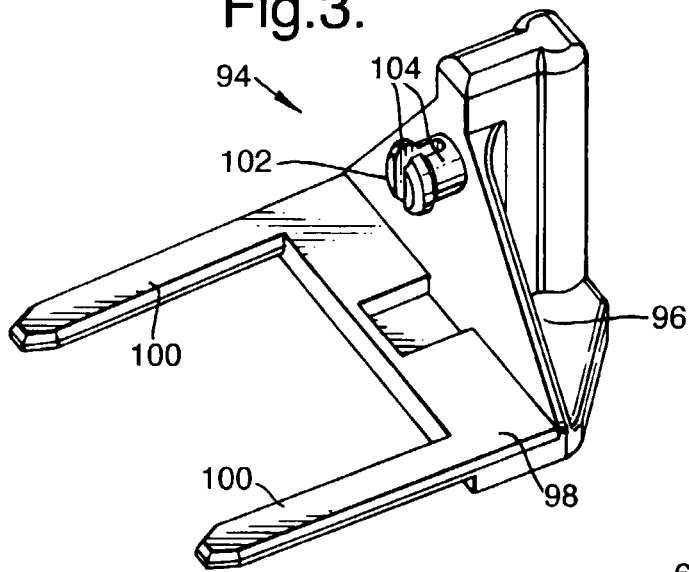


Fig.4.

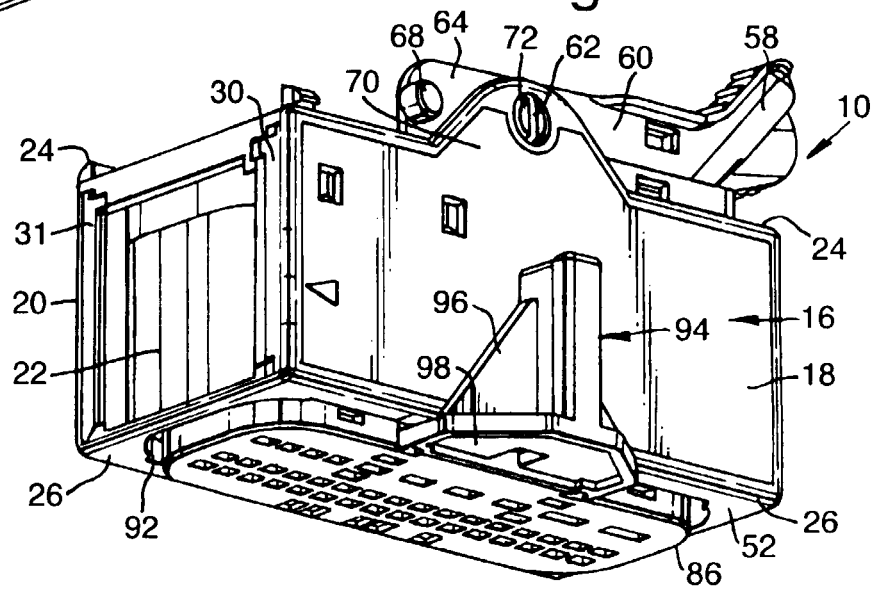


Fig.6.

