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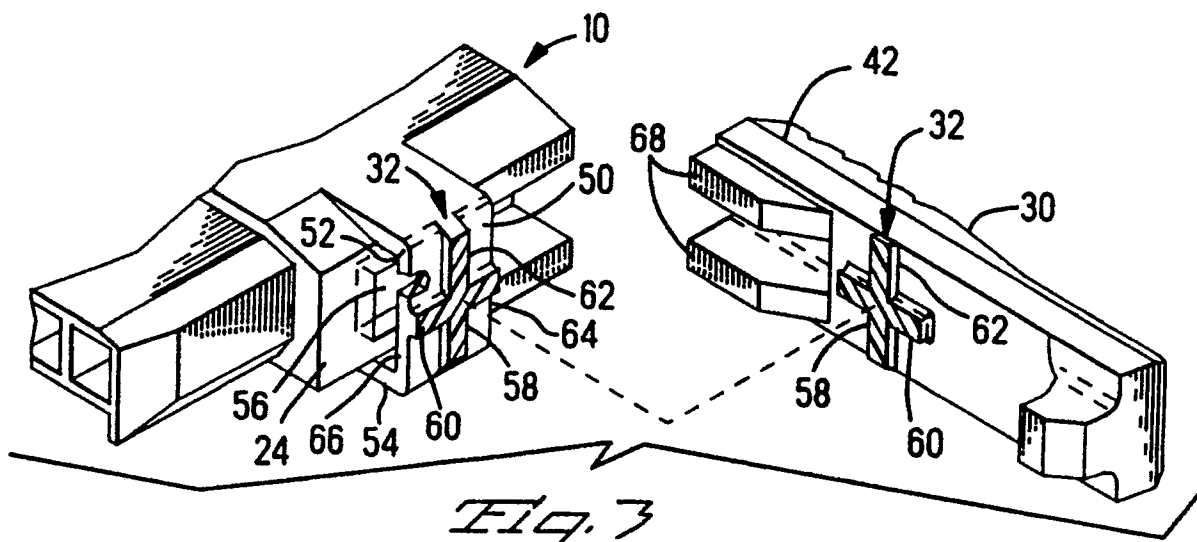
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(54) **Latch arm for electrical connector housing.**

(57) A connector housing (10) molded of plastic includes a pair of latch arms (30) along sides (24) thereof which extend forwardly to latch with corresponding latching means of a housing of a mating connector, during connector mating. Each latch arm (30) is joined integrally to the respective housing side (24) by a hinge joint (32) adapted to permit flexing during deflection of the latch arm (30) during mating and unmating. The hinge joint (32) includes a bight section (50) spaced from the housing side (24) and joined thereto by a pair of parallel upper (52)

and lower (54) legs, with the bight section (50) joined to the middle of the latch arm (30) by a cross-shaped rib section (58). The horizontal rib component (60) joins to the bight section (50) midway between the legs (52,54) and is able to locally elastically deform the bight section (50) inwardly at the rearward edge (64) thereof and outwardly at the forward edge (66) thereof, during latch arm deflection. The latch arms (30) can have rearward portions (42) deflectable inwardly toward the housing sides (24) to enable delatching and unmating.



**Fig. 3**

This relates to the field of electrical connectors and more particularly to connector housings.

Housings for certain electrical connectors are molded from dielectric plastic material and are intended to be secured to mating connector housings when the connectors have been moved together in a mated condition, in which the respective arrays of electrical contacts are mated to complete electrical connections. In some of these connectors, hardware is fastened to the respective housings to secure them together in their mated condition, but it is desirable that the housings have an integral latching means. Integrally molded latch arms are known, in which a pair of latch arms are disposed along opposed sides of the housing of one of the connectors and extend forwardly to latchingly engage corresponding latching surfaces of the housing of the other connector, when the connectors are moved together into a mated condition.

Latch arms used for securing connectors together are known in U.S. Patent No. 4,867,700. The latch arms include rearward portions which are deflectable to unlatch the latch arms when it is desired to separate and unmate the connectors, in which case the latch arms can be said to be hingedly joined to the housing. Such latch arms are subjected to stress and torque during mating and unmating of the connectors, and the hinge joint must be rugged and durable to withstand many cycles of mating and unmating, especially taking into consideration that the hinge joint is molded of plastic material which can commonly lose strength over time when worked and subjected to temperature cycling as well.

It is desired to provide a hinge joint for latch arms of connector housings which is designed to resist stress and torque and yet be flexible to allow many cycles of deflection of the latch arm.

The present invention is a hinge joint for joining a latch arm to an outer surface of a plastic connector housing, with the latch arm extending forwardly from the hinge joint to a latching means at the forward end adapted to latchingly engage a corresponding latching means of a mating connector housing, and a gripping portion extending rearwardly from the hinge joint to an inwardly deflectable portion for delatching the forward latching means for connector unmating, the latch arm commonly used as an opposed pair each on one of the opposed sides of the housing. Each hinge joint defines a vertical hinge axis with the forward arm portion deflectable outwardly away from the respective housing side while riding over a corresponding portion of the mating connector housing forwardly of the respective corresponding latching means thereof just prior to latching, or during delatching. Correspondingly the rearward arm portion

is deflectable inwardly about the vertical hinge axis to urge the forward arm portion outwardly; thus the pair of gripping portions of the pair of latch arms can be gripped by a person and urged toward each other to unmate the connectors.

The hinge joint for each latch arm comprises a pair of vertically spaced parallel legs coextending outwardly a short distance from the side surface of the housing to a bight section joined integrally to each leg and spaced outwardly from the housing side; each leg is essentially a thin web having a substantial horizontal forward/rearward dimension. Extending between and integrally joining the vertical bight section to about the middle of the latch arm spaced outwardly therefrom, is a rib section having at least a horizontal rib component, and preferably having intersecting vertical and horizontal components defining a cross-shaped rib cross-section. The legs allow flexure of the bight section, permitting it to deform slightly about the hinge axis sufficiently to allow deflection of the latch arm for latching and delatching; the horizontal rib component slightly elastically deforms the center of the bight section intermediate the spaced legs.

The present invention provides an integral hinge joint for each latch arm of a connector housing which is capable of flexure to allow deflection of the latch arm during mating and unmating of the connector with a mating connector.

Such a hinge joint resists stress and torque and is durable over many cycles of latch arm deflection, allowing many cycles of connector mating and unmating.

Such a hinge is moldable as an integral portion of a plastic connector housing in a two-draw molding process.

An embodiment of the improved integral flexible hinge joint will now be described with respect to the accompanying drawings, in which:

FIGURE 1 is a perspective view of a connector housing having a pair of latch arms joined thereto by hinge joints of the present invention, with a mating connector housing spaced therefrom;

FIGURES 2A and 2B are enlarged longitudinal part section views of the mating connectors of Figure 1 showing latching of a latch arm during connector mating, with Figure 2A taken along lines 2A-2A of Figure 1;

FIGURE 3 is a part perspective view of a latch arm of Figure 1 broken away from the housing to expose the hinge joint of the present invention; and

FIGURES 4 and 5 are enlarged cross-section views of the hinge joint of Figure 3, with Figure 4 taken along lines 4-4 of Figure 1 and Figure 5 taken along lines 5-5 of Figure 4.

Figures 1, 2A and 2B illustrate a pair of dielectric housings 10,70 for a pair of electrical connector

assemblies. Housings 10,70 are molded of plastic material such as glass-filled polyester and are shaped and dimensioned to be matable, with housing 10 having a forward plug portion 12 shaped to be received into a corresponding large cavity 72 of housing 70, so that mating face 14 of housing 10 is disposed proximate the reduced-dimension rearward portion 74 of cavity 72. Shown along mating face 14 are a plurality of passageways 16 within which are housed respective contact sections of terminal means (not shown) secured within housing 10, to mate with corresponding contact means (not shown) secured within housing 70 upon connector mating. Housing 10 has a rear face 18, wide and flat upper and lower outer surfaces 20,22 and low profile sides 24,26. Mating housing 70 has a leading end 78, wide and flat upper and lower outer surfaces 80,82, low profile sides 84,86 and rear face 88; mating housing 70 is also shown having a pair of right-angled mounting flanges 90 for being secured to a printed circuit board (not shown) in either a horizontal or a vertical orientation. Housings 10,70 as shown have a low profile and are especially suitable for use as connectors for connecting a terminated flat power cable to a printed circuit board.

A pair of latch arms 30 are joined integrally to sides 24,26 of housing 10 at respective flexible integral hinge joints 32 located approximately midway along the latch arms. Each latch arm 30 includes a forward portion 34 concluding in a free end 36 having a latching projection 38 extending toward housing sides 24,26 defining a latching surface 40 facing rearwardly and preferably angled slightly outwardly as seen in Figure 2A. Housing 70 includes a pair of latching recesses 92 along sides 84,86 defining corresponding latching surfaces 94 facing rearwardly and angled slightly inwardly; latching recesses 92 are adapted to receive therein latching projections 38. Latch arms 30 further include rearward portions 42 extending rearwardly from hinge joints 32, adapted to be gripped.

During mating of the connectors, latch arms 30 are deflected slightly outwardly as latching projections 38 ride over portions 96 of housing sides 84,86 forwardly of latching recesses 92; upon mating, latching projections 38 enter latching recesses 92 with latching surfaces 40 latching behind corresponding latching surfaces 94. The slight angle of the latching surfaces 40,94 provides resistance to inadvertent delatching during stress and vibration when the connectors are in their mated condition by tending to hold latch arms 30 toward the sides 84,86 of housing 70. The connector-proximate portion of latch arm free ends 36 preferably includes an angled surface portion 44 to engage corresponding portions of leading end 78 of housing 70 and bear thereagainst to initiate deflection of

latch arms 30 outwardly. During unmating, rearward latch arm portions 42 are adapted to be urged toward each other, rotating latch arms 30 about their respective hinge joints to delatch latching projections 38 from recesses 92, whereupon housing 10 may be moved rearwardly and away from housing 70.

Hinge joint 32 is shown in particular detail in Figures 3 to 5 and is capable of flexure during latch arm deflection. Hinge joint 32 includes a bight section 50 joined to housing side 24 by upper and lower legs 52,54 spaced vertically apart and creating a relief area 56 between bight section 50 and housing side 24. A rib section 58 at least has a horizontal rib component 60 and preferably also a vertical rib component 62 which intersect to provide rib section 58 with a cross-shaped cross-section. Horizontal rib component 60 is joined to bight section 50 across the outwardly facing surface thereof midway between upper and lower legs 52,54; upon deflection of latch arm 30 in the horizontal plane, horizontal rib component 60 elastically deforms the central portion of bight section 50 into relief area 56 along the first or rearward edge 64 of bight section 50 and away from relief area 56 along the second or forward edge 66 thereof. Vertical rib component 62 provides substantial strength to rib section 58 and bight section 50 to enable long-term resistance to stress and torque. Rearward latch arm portion 42 may preferably be provided with inwardly directed projections 68 adapted to engage housing sides 24,26 to limit the extent of deflection during unmating, as anti-overtress mechanisms.

Those skilled in the art may make modifications to the specific embodiment disclosed hereinabove, which would be within the spirit of the invention and the scope of the claims.

## Claims

1. A hinge joint (32) for joining a deflectable section (30) integrally to a plastic article (10), the plastic article including a surface portion (24,26) along which the hinge joint (32) is located and the deflectable section (30) being deflectable relatively toward and away from the surface portion (24,26) by being rotated about the hinge joint (32), characterized in that:

the hinge joint (32) includes a bight section (50) joined integrally to said surface portion (24,26) at a pair of spaced joints (52,54) and extending over a relief area portion (56) of said surface portion (24,26) between said spaced joints (52,54), said bight section (50) defining a first free edge (64) and a second free edge (66) spaced from said first free edge (64); and

means (58) joining said bight section (50) to said deflectable section (30) about midway between said pair of spaced joints (52,54), said joining means (58) at least joining said deflectable section (30) to said bight section (50) proximate said first free edge (64) of said bight section (50) and proximate said second free edge (66) thereof, whereby upon deflection of said deflectable section (30) relative to said article (10), said bight section (50) is flexible by being adapted to be locally elastically deformed by said joining means (58) relatively toward said article surface portion (24,26) at one of said first (64) and second (66) free edges and relatively away therefrom at the other of said first (64) and second (66) free edges.

2. A hinge joint (32) as set forth in claim 1 further characterized in that said joining means (58) comprises a rib section (58) joining said deflectable section (30) to said first (64) and second (66) free edges.

3. A hinge joint (32) as set forth in claim 1 or 2 further characterized in that said spaced joints (52,54) comprise respective leg sections (52,54) extending between said article (10) and said bight section (50).

4. A hinge joint (32) as set forth in claim 3 further characterized in that said joining means (58) comprises a rib section (58) joining said deflectable section (30) to said first (64) and second (66) free edges and having at least a first rib component (60) joined to said bight section (50) substantially parallel to said leg sections (52,54) and midway therebetween and extending from proximate said first edge (64) to proximate said second edge (66).

5. A hinge joint (32) as set forth in claim 4 further characterized in that said rib section (58) includes a second rib component (62) perpendicular to said first rib component (60) and joining said deflectable section (30) and said bight section (50), whereby said rib section (58) has a cross-shaped cross-section.

6. A connector housing (10) molded of plastic material and matable with a corresponding connector housing (70) and having a pair of latch arms (30,30) on opposite sides thereof each having respective latching projections (38) at forward free ends (36) thereof latchable with corresponding latching means (92,94) of said corresponding connector housing (70), each said latch arm (30) joined to a respective said side (24,26) of said housing (10) at a hinge joint (32) spaced a selected distance rearwardly from said forward free end (36) of said latch arm (30), characterized in that:

each said hinge joint (32) includes a bight section (50) joined integrally to a respective side (24,26) of said housing (10) at a pair of spaced joints (52,54) and extending over a relief area portion (56) of said housing side (24,26) between said spaced joints

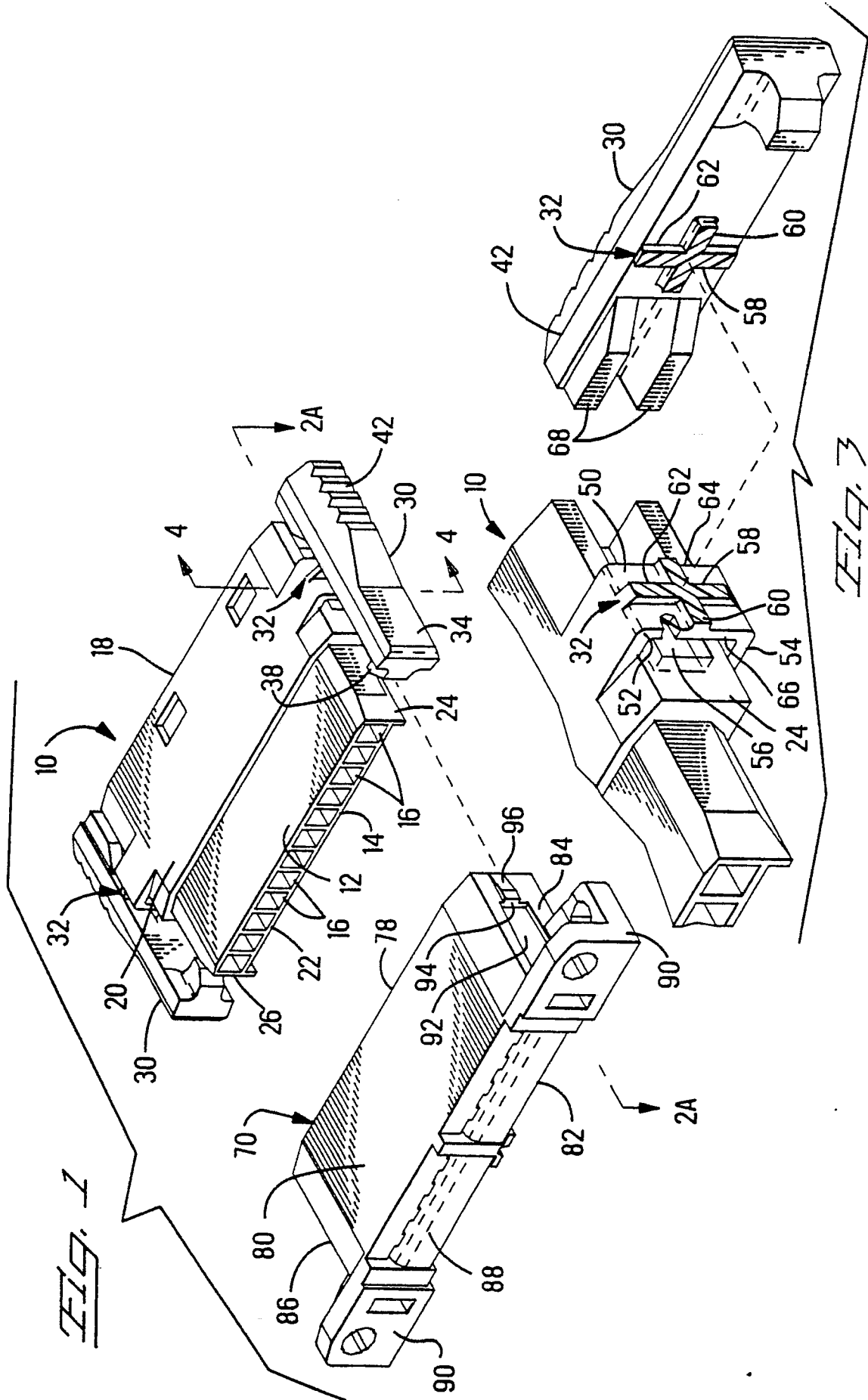
(52,54) and defining a first free edge (64) and a second free edge (66) spaced from said first free edge (64), and means (58) joining said bight section (50) to said latch arm (30) about midway between said pair of spaced joints (52,54), said joining means (58) at least joining said latch arm (30) to said bight section (50) proximate said first free edge (64) of said bight section (50) and proximate said second free edge (66) thereof, whereby upon deflection of each said latch arm (30) relative to said housing (10), the respective said bight section (50) is flexible by being adapted to be locally elastically deformed by said joining means (58) relatively toward the respective said housing side (24,26) at one of said first (64) and second (66) free edges and relatively away therefrom at the other of said first (64) and second (66) free edges.

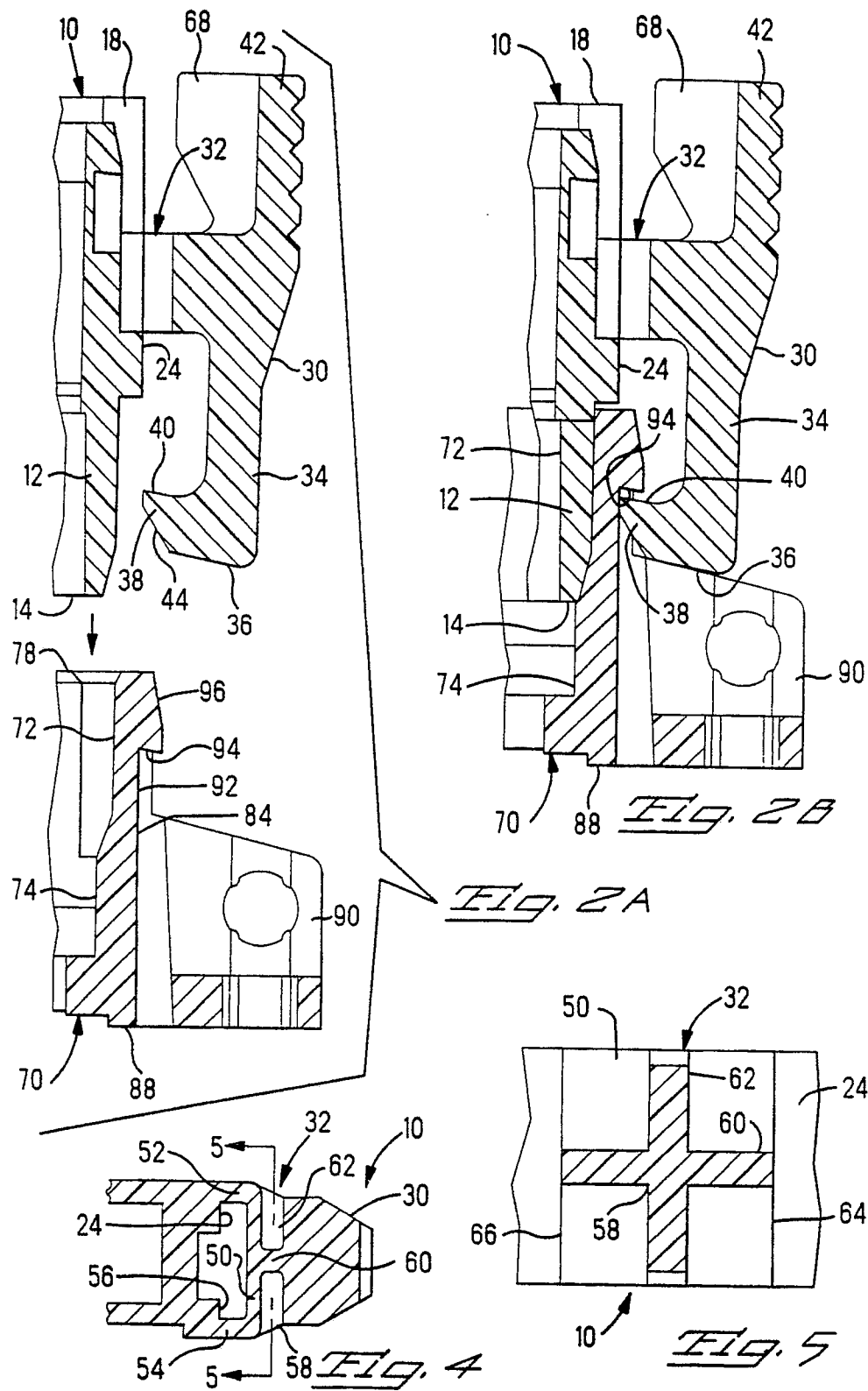
7. A connector housing (10) as set forth in claim 6 further characterized in that said latch arms (30,30) include rearward portions (42) extending rearwardly from respective said hinge joints (32,32) to define a pair of inwardly deflectable latch arm portions enabling delatching and unmating of said connector housing (10) from said corresponding connector housing (70).

8. A connector housing (10) as set forth in either of claims 6 or 7 further characterized in that said spaced joints (52,54) comprise respective leg sections (52,54) extending between said housing (10) and said bight section (50).

9. A connector housing (10) as set forth in any of claims 6 to 8 further characterized in that said joining means (58) comprises a rib section (58) joining said latch arm (30) to said first (64) and second (66) free edges and having at least a first rib component (60) joined to said bight section (50) substantially parallel to said leg sections (52,54) and midway therebetween and extending from proximate said first edge (64) to proximate said second edge (66).

10. A connector housing (10) as set forth in claim 9 further characterized in that said rib section (58) includes a second rib component (62) perpendicular to said first rib component (60) and joining said latch arm (30) and said bight section (50), whereby said rib section (58) has a cross-shaped cross-section.







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## EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 90114518.5
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	<u>US - A - 4 787 860</u> (BENDER) * Column 4, lines 3-25; fig. 3 *	1,6	H 01 R 13/639
A	-- <u>FR - A1 - 2 493 613</u> (BUNKER RAMO CORPORATION) * Fig. 8; page 4, lines 40, 41; page 5, lines 1-22 *	1,6	
A	-- <u>US - A - 4 641 902</u> (FUSSELMANN) * Column 3, lines 52-61; fig. 1,3,4 *	1,6	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			H 01 R 13/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 02-11-1990	Examiner SCHMIDT
<b>CATEGORY OF CITED DOCUMENTS</b> 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 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			