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(54) An electrical plug connector with spring tension clamp

(57) An electrical plug connector (1) having a lower part (3) and a cover (4) which form a housing (2). At least one terminal point having a receiving pocket (6) is formed within the lower part and the cover (4). A sub-assembly including a spring tension clamp (7) having an arcuate tension spring (8), for making contact with electrical conductors, and a conductor rail (9) having a contact region (10) for receiving a mating contact is po-

sitioned in the receiving pocket (6). The cover (4) has an actuator passageway (11) and an angled guide projection (12) extending into the actuator passageway (11) for guiding an actuating tool to actuate the clamp. The angled guide projection (12) is constructed as a web, the arcuate tension spring of the clamp (7) has an aperture (13), and the angled guide projection reaches through the aperture as the cover is engaged with the lower part placed over the contact sub-assembly.

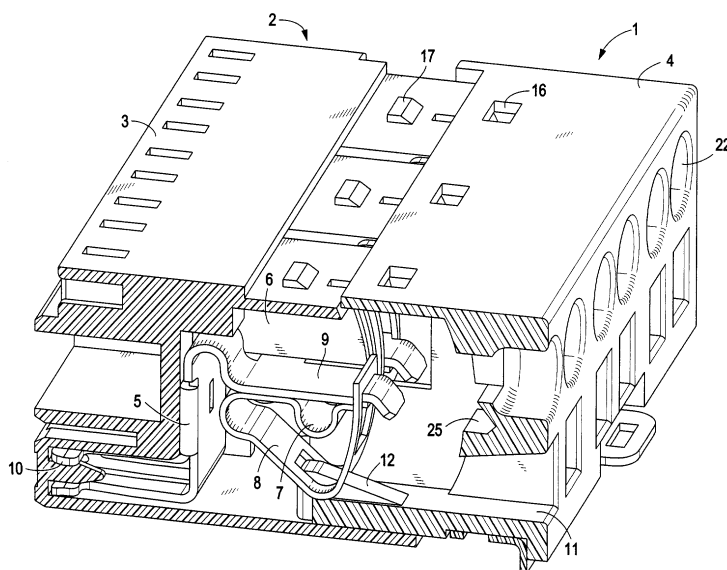


FIG. 2

Description

[0001] The invention relates to an electrical connector and more particularly to a plug connector having a two-part housing for receiving an electrical conductor upon activation of a clamp. Known electrical connector plugs of this type typically include a lower part housing and a cover, having at least one terminal point. A receiving pocket is formed within the lower part and the cover. A sub-assembly includes a spring tension clamp having an arcuate tension spring, for making contact with electrical conductors, and a conductor rail having a contact region which may be brought into plug contact with a corresponding mating contact. The sub-assembly is received in the receiving pocket of the cover which has a plug-in opening. A guide slope is located inside the plug-in opening for receiving an actuating tool which actuates the spring tension clamp.

[0002] A plug connector of this kind is shown in DE 196 10 958 C2. The object there was to make it possible to fit components using simple linear insertion movements. For this purpose, the contact sub-assembly is introduced into the receiving pocket in the cover and then joined to the lower part. In certain situations, however, fitting the sub-assembly into the cover may make the assembly procedure and the corresponding tool complicated.

[0003] An object of the invention is to further develop a plug connector of the type mentioned above such that it becomes possible to fit the sub-assembly into the lower part and cover using simple linear insertion movements.

[0004] This and other objects are achieved by an arrangement having the features of Claim 1. Advantageous further developments are specified in the sub-claims.

[0005] The particular construction of the angled guide projection and the arcuate tension spring is advantageous because it becomes possible to assemble the contact sub-assembly comprising the spring tension clamp having the arcuate tension spring and the conductor rail inside the lower part. It is furthermore particularly advantageous that this also gives rise to the additional possibility of adjusting the spring forces of the tension spring. The spring force of the tension spring can be adjusted through the width and length of the aperture. Moreover, the web serves as a stop for the contact region, which has proved particularly advantageous with high contact forces during mating.

[0006] Moreover, it is advantageous that as a result of interaction between the aperture, which extends in the longitudinal direction of the arcuate tension spring and divides it into two tension spring webs, and the web of the cover, it is ensured on assembly of the cover that the tension spring is correctly mounted in the receiving pocket.

[0007] It is moreover advantageous that the receiving pocket is constructed in the lower part such that the con-

tact sub-assembly comprising the spring tension clamp having the arcuate tension spring and the conductor rail may be introduced into the receiving pocket in the lower part in the direction of plugging in. This further simplifies putting together the housing and the contact.

[0008] It is furthermore advantageous that the receiving pocket is constructed in the cover such that the cover may be placed on the contact sub-assembly in the lower part. Assembly is therefore particularly simple if both the contact and the cover can be assembled in one direction.

[0009] It is furthermore advantageous that the contact region of the spring tension clamp is constructed as a receptacle contact which has on two opposing sides an odd number of spring contact arms. This has the effect of optimum utilization of the stamped and formed conductive material.

[0010] It is furthermore advantageous that the conductor rail has three regions which are at an angle with respect to one another, in particular in each case an angle of approximately 90°. This has the effect that despite the short overall construction and hence the small overall volume, good spring properties are achieved.

[0011] An example embodiment of the invention will now be described with reference to the drawings.

[0012] Figure 1 is a perspective view of a partly cut-away housing with a contact introduced, with the cover not placed on the lower part.

[0013] Figure 2 is a perspective view of a partly cut-away housing with a contact introduced, with the cover not yet fully placed on the lower part.

[0014] Figure 3 is a perspective view of a partly cut-away housing with a contact introduced, with the cover fully placed on the lower part and latched thereto.

[0015] Figure 4 is a perspective view of a spring tension clamp.

[0016] Figure 5 is a perspective view of a conductor rail with a contact region.

[0017] Figure 6 is a further perspective view of a conductor rail with a contact region.

[0018] Figures 1 - 3 illustrate an electrical plug connector 1 in perspective view, in various stages of being put together. The connector has a two-part housing 2, comprising a lower part 3 and a cover 4, and a contact 5. In Figures 1 - 3, the contact 5 has already been introduced into the lower part 3, but the cover 4 is in different positions with respect to the lower part 3.

[0019] The plug connector illustrated has at least six (or more) terminal points with contacts 5. A terminal point comprises a receiving pocket 6, which is formed in the lower part 3 and the cover 4, and a contact 5 which in turn comprises a sub-assembly comprising a clamp 7 having an arcuate tension spring 8, for making contact with electrical conductors, and a conductor rail 9 having a contact region 10 which may be brought into plug contact with a corresponding mating contact (not shown).

[0020] The cover 4 has an actuator passageway 11 having an angled guide projection 12 for guiding an ac-

tuating tool to actuate the clamp 7. Furthermore, as best shown in Figure 3, the cover 4 has a conductor receiving passageway 22 corresponding to each terminal point, for receiving a conductor.

[0021] The sub-assembly comprising a clamp 7 having an arcuate tension spring 8 and a conductor rail 9 may be introduced into the receiving pocket 6 in the lower part 3 in the mating direction. The cover 4 may then be placed over the lower part 3 and the two are engaged by sliding the cover 4 toward the lower part 3 along the mating direction.

[0022] Referring to Figure 2, to make this type of engagement possible despite the angled guide projection 12, the angled guide projection 12 is constructed as a web, and the arcuate tension spring 8 of the clamp 7 has an aperture 13 so that the angled guide projection 12 passes through the aperture 13 when the cover 4 is placed on the contact sub-assembly 7 in the lower part 3. This particular construction makes it possible simply to put the parts together along the mating direction.

[0023] As best shown in Figure 4, the aperture 13 extends in the longitudinal direction of the arcuate tension spring 8 and divides it into two tension spring webs 14, 15. This division makes it possible for the tension spring forces to be adjusted by selecting the length and width of the tension spring webs 14, 15.

[0024] The cover 4 and the lower part 3 have complementary latching means 16, 17 and latch into one another upon engagement as shown in Figures 1-3.

[0025] In the engagement position shown in Figure 3, the contact 5 is fixed between the cover 4 and the lower part 3 in a recesses 25. The web having the angled guide projection 12 comes to lie above the contact region 10 and forms an contact stop when a contact 9 is inserted into the contact region 10. Guide grooves 24 are provided for slidably receiving the clamp 7 after final assembly.

[0026] The contact 5 is composed of the sub-assembly having the clamp 7 which includes the arcuate tension spring 8, for making contact with electrical conductors, and the conductor rail 9 having a contact region 10. The contact 5 is illustrated in Figures 4 to 6 in its individual constituent parts.

[0027] The contact 5 may be made by stamping and forming a conductive material such as a metal sheet. It does not need much space and has a high current carrying capacity, a low normal mating force and good spring properties.

[0028] The clamp 7 has an arc 23 opposite the arcuate tension spring 8. This arc 23 serves as a stop when the spring tension clamp is opened, and acts to counter any oversteering of the clamp 7.

[0029] The conductor rail 9 may be made by stamping and forming a piece of conductive material, such as a metal sheet. As a result of the particular construction, particularly good utilization of the stamped and formed material is ensured.

[0030] Referring to Figure 5, the conductor rail 9 has

three regions 10, 19, 20 which are at an angle with respect to one another, in particular in each case an angle of approximately 90°. The first region 19 comes to lie next to the clamp 7. The second region 20 is arranged approximately perpendicular to the mating direction and the third region 10 is formed by the contact region.

[0031] Located between the first and second regions 19, 20 is a U-shaped loop 21. This loop 21 makes possible a spring action in the mating direction and ensures that the regions 10 and 19 are mechanically uncoupled. An aperture 23 is provided for the purpose of adjusting the spring force of the loop 21.

[0032] Terminating a conductor in the plug connector 1 will now be described in greater detail. The clamp 8 is opened using an actuating tool (not shown) introduced through the actuator passageway 11. The actuate tension spring 8 slides within the guide grooves 24. The conductor can then be introduced through the conductor receiving passageway 22. The conductor then comes to lie between the conductor rail 9 and the clamp 7, which applies contact pressure as soon as the actuating tool is removed.

[0033] The contact region 10 is constructed as a receptacle contact. The receptacle contact has on two opposing sides an odd number of spring contact arms 18.

[0034] The spring contact arms 18 of the receptacle contact are angled with respect to a central region 20 of the conductor rail 9. In the central region 20, the material is arranged in two layers, at least in certain regions. The opposing spring contact arms 18 are each angled away from a respective layer of the material.

Claims

1. An electrical plug connector (1) having a lower part (3) and a cover (4) which form a housing (2), at least one terminal point having a receiving pocket (6) formed within the lower part and the cover (4), a sub-assembly including a spring tension clamp (7) having an arcuate tension spring (8), for making contact with electrical conductors, and a conductor rail (9) having a contact region (10) for receiving a mating contact; the contact sub-assembly being positioned in the receiving pocket (6), the cover (4) having a an actuator passageway (11) and an angled guide projection (12) extending into the actuator passageway (11) for guiding an actuating tool to actuate the clamp, the plug connector being **characterised in that:**

the angled guide projection (12) is constructed as a web, the arcuate tension spring of the clamp (7) has an aperture (13), and the angled guide projection reaches through the aperture as the cover is engaged with the lower part placed over the contact sub-assembly.

2. A plug connector according to Claim 1, **characterised in that** the aperture (13) extends in the longitudinal direction of the arcuate tension spring (8) and divides it into two tension spring webs (14, 15).
5
3. A plug connector according to Claim 1, **characterised in that** the receiving pocket (6) is constructed in the lower part (3) such that the contact sub-assembly comprising the clamp (7) having the arcuate tension spring (8) and the conductor rail (9) may be introduced into the receiving pocket (6) in the lower part (3) in the mating direction.
10
4. A plug connector according to Claim 3, **characterised in that** the receiving pocket (6) is constructed in the cover (4) such that the cover (4) may be placed on the contact sub-assembly over the lower part(3).
15
5. A plug connector according to Claim 1, **characterised in that** the cover (4) and the lower part (3) have complementary latching means (16, 17) and latch into one another when engaged with each other.
20
6. A plug connector according to Claim 1, **characterised in that** the contact region of the conductor rail (9) is constructed as a receptacle contact (10).
25
7. A plug connector according to Claim 6, **characterised in that** the receptacle contact (10) has on two opposing sides and an odd number of spring contact arms (18).
30
8. A plug connector according to Claim 1, **characterised in that** the conductor rail (9) has three regions (10, 19, 20) which are at approximately a right angle with respect to one another.
35
9. A plug connector according to one of the preceding claims, **characterised in that** the conductor rail (9) is made by being stamped and formed from a piece of sheet metal.
40
10. A plug connector according to one of the preceding claims, **characterised in that** the spring contact arms (18) of the receptacle contact are angled with respect to a central region (20) of the conductor rail in which the sheet metal is arranged in two layers, at least in certain regions.
45
50
11. A plug connector according to Claim 10, **characterised in that** the opposing spring contact arms (18) are each angled away from a respective layer of the sheet metal.
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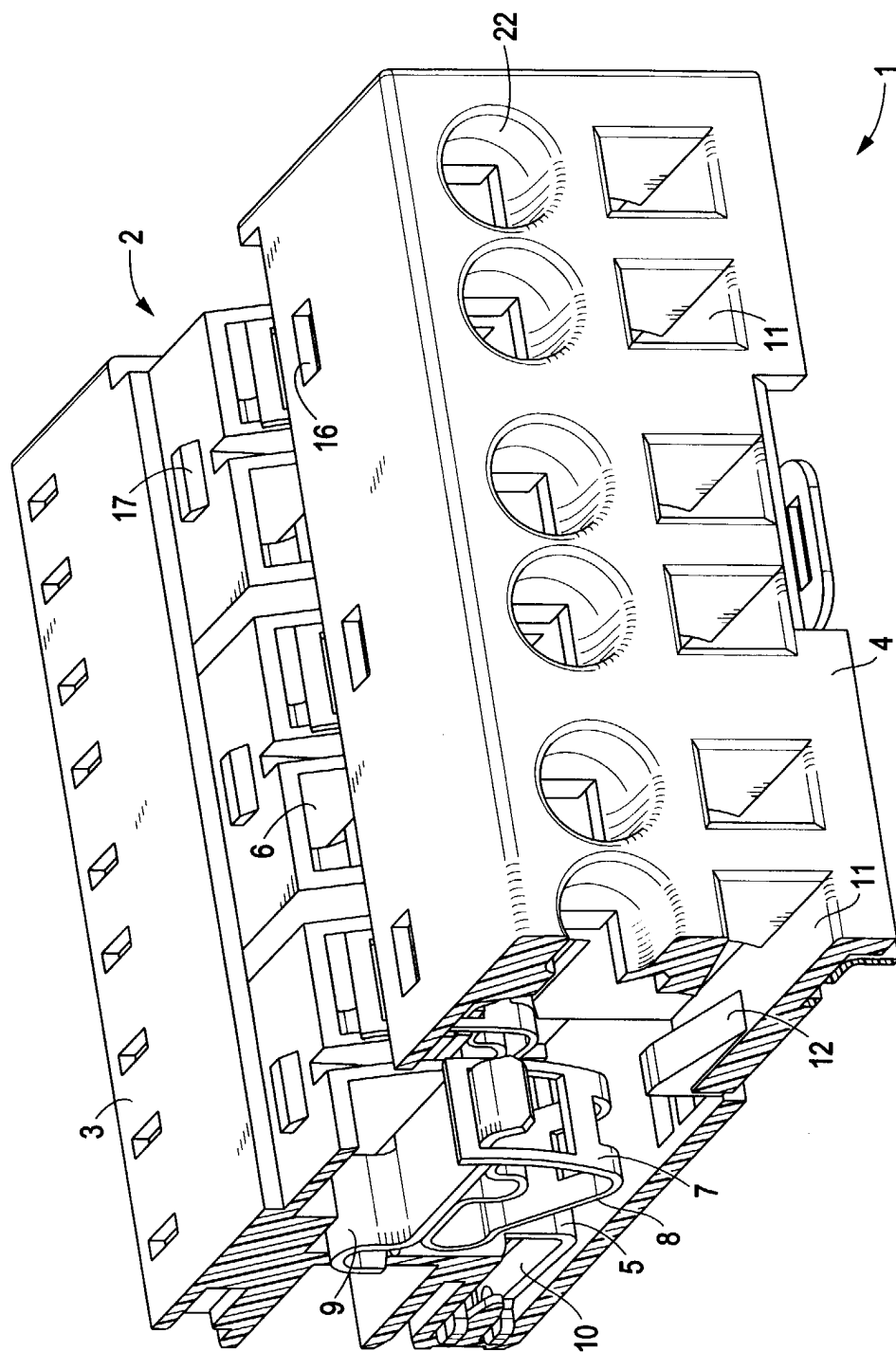


FIG. 1

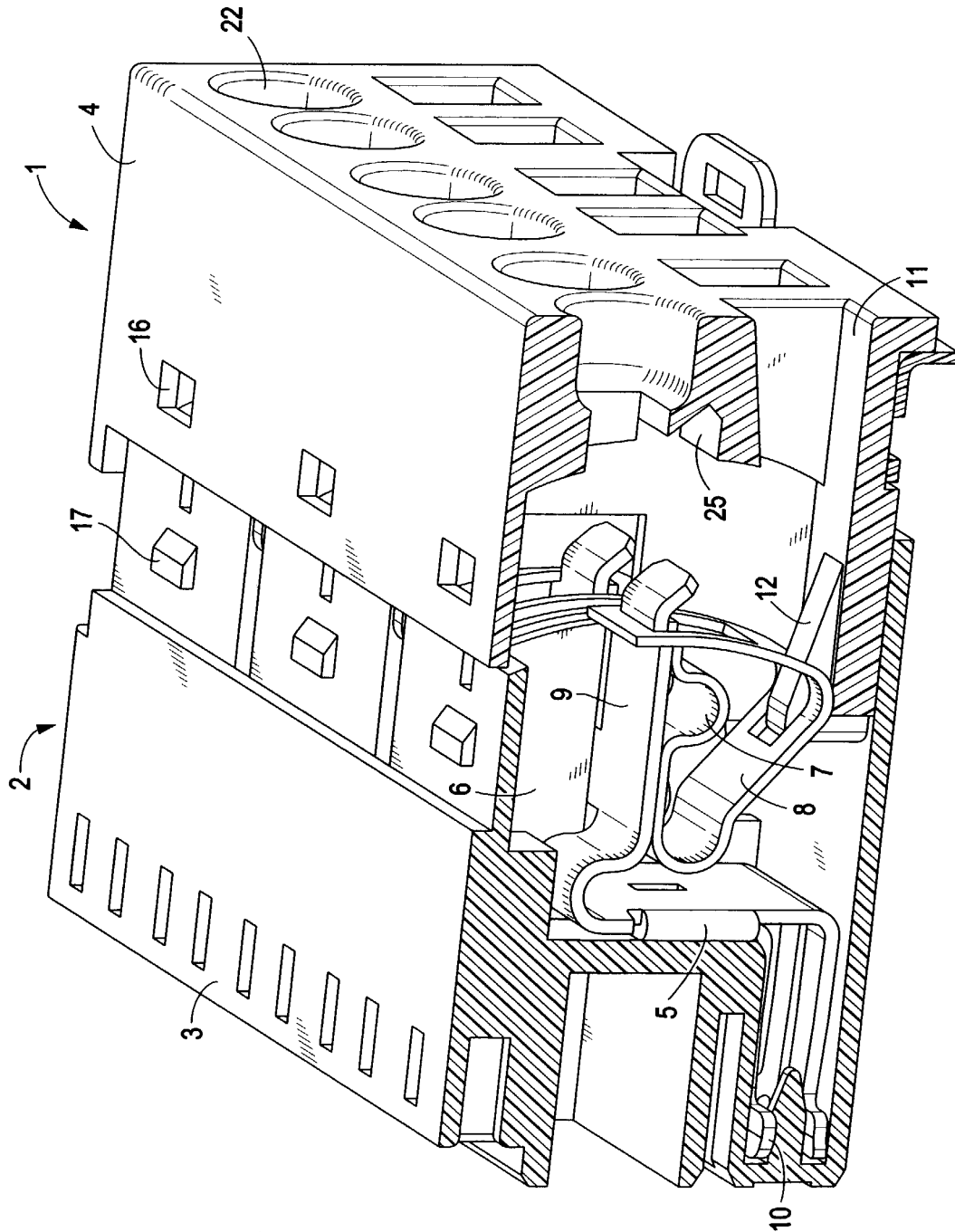


FIG. 2

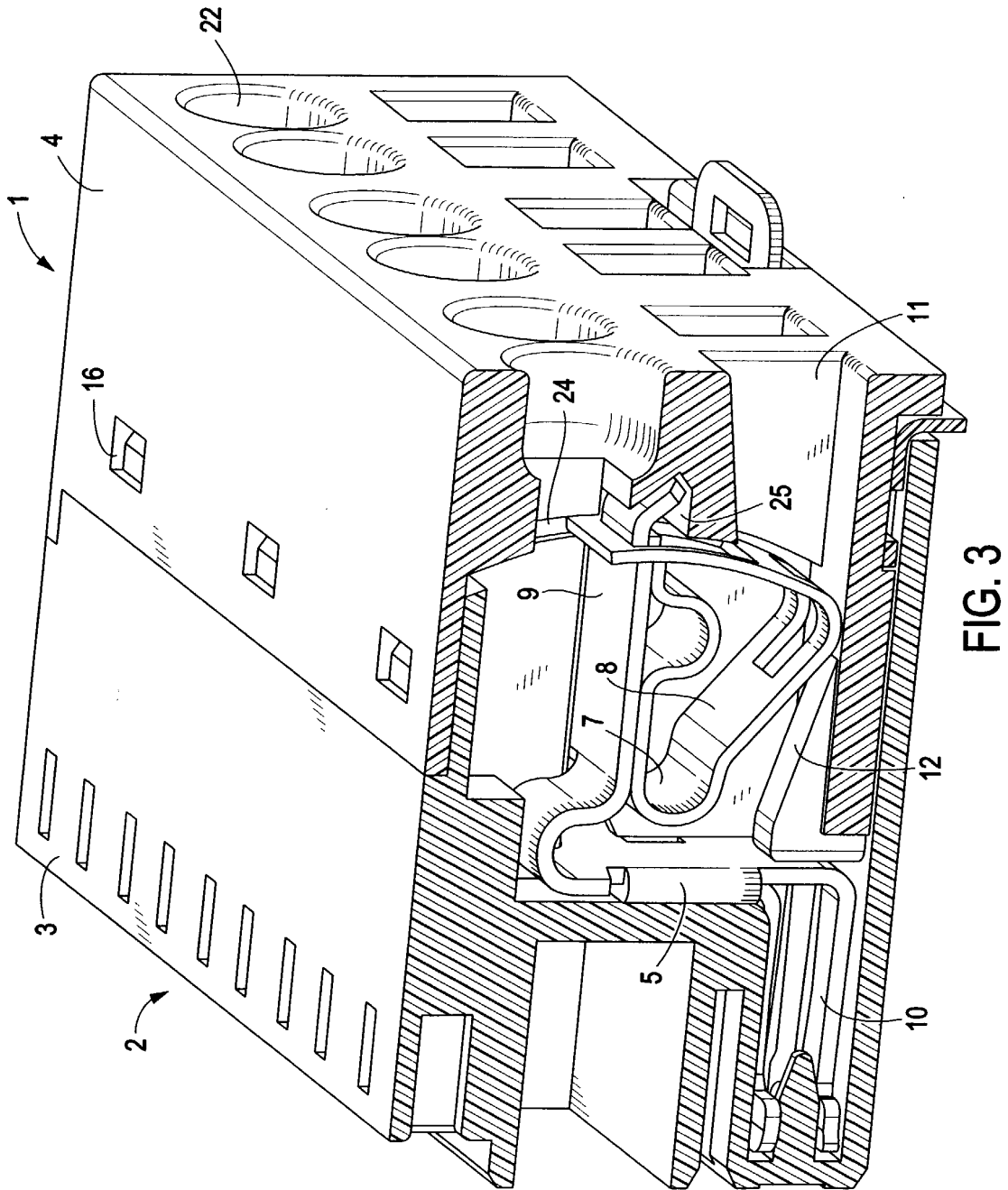


FIG. 3

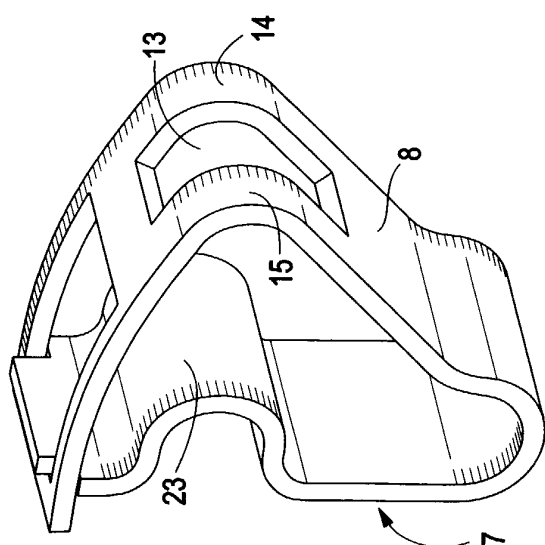


FIG. 4

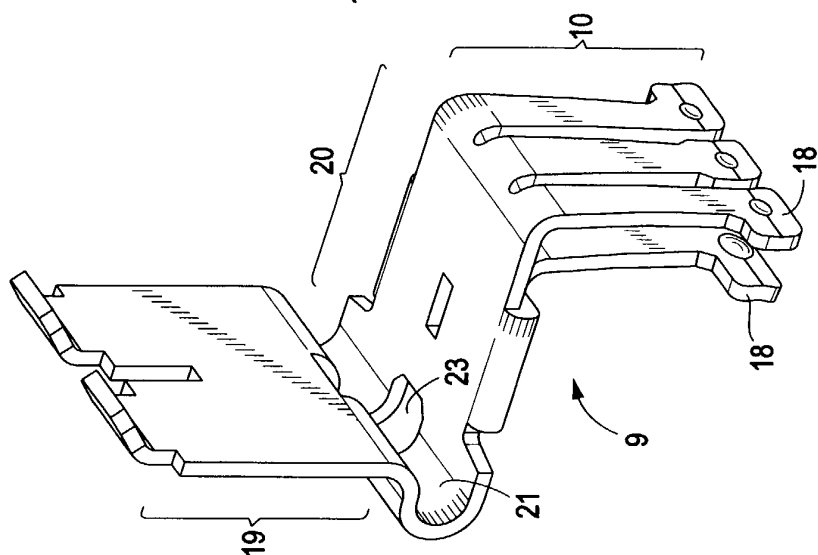


FIG. 5

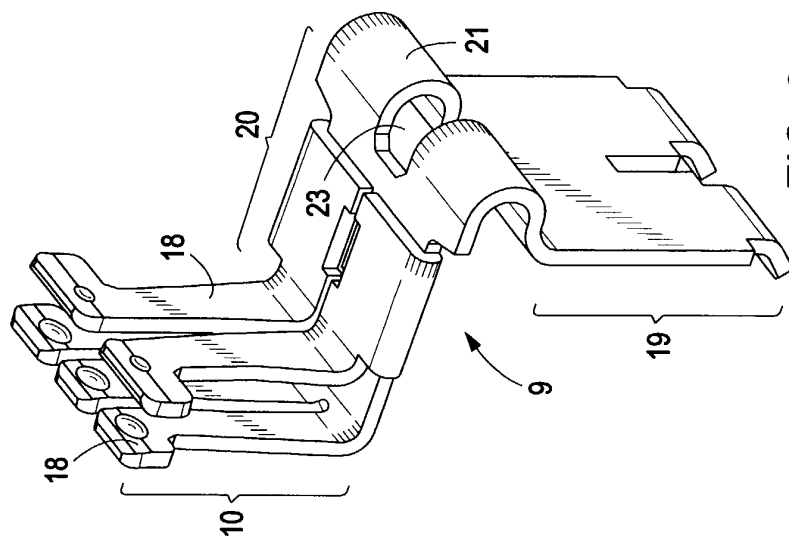


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 03 01 0435

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.7)
Y,D	DE 196 10 958 A (WEIDMÜLLER) 25 September 1997 (1997-09-25) * column 5, line 54 - column 6, line 61; figures 1,2 *	1-6,9	H01R4/48 H01R13/506
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01R
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 16 October 2003	Examiner Alexatos, G
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 03 01 0435

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