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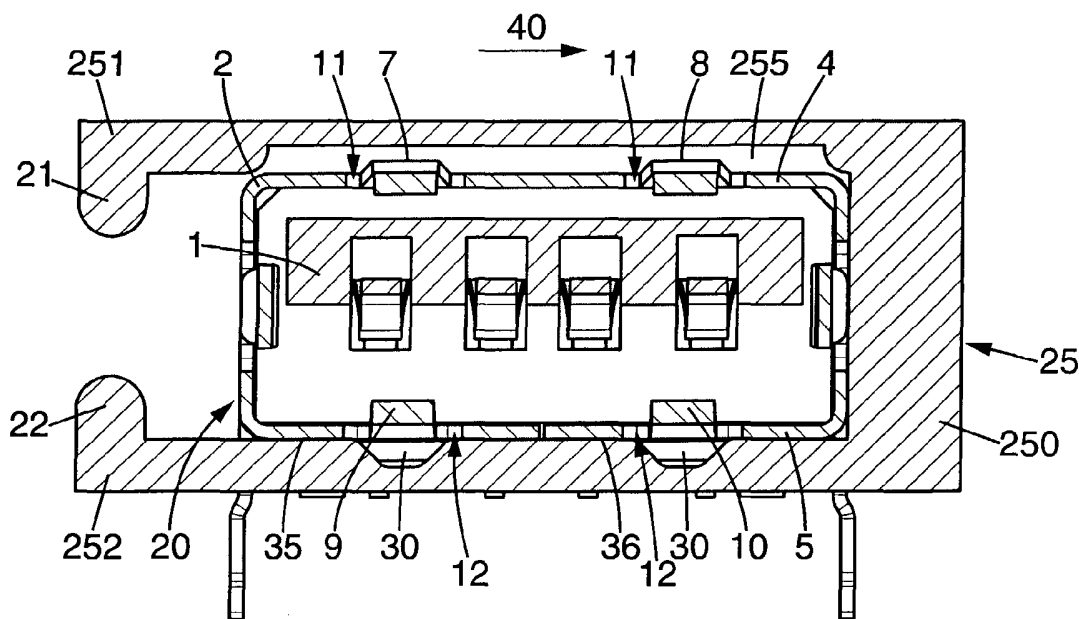
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(54) Title: SLIDING LOCK FOR AN USB PLUG



(57) Abstract: A plug-in socket connector (20) with an insulating body (1) carrying contacts and a shroud (2) surrounding said insulating body, at least one latching hook (7, 8, 9, 10) provided on said shroud, said latching hook being adapted to cooperate with a corresponding recess (11, 12) in a plug connector (14) when said plug connector is mated with said socket, said socket further comprising a sliding lock (25) movable between two positions respectively locking and unlocking the plug connector in its socket.

SLIDING LOCK FOR AN USB PLUG

The invention generally relates to the field of plug-in socket connectors, and more specifically relates to such connectors having a lock to secure a male
5 plug in mating position in a female plug or a socket.

This type of connectors comprises plugs that have become known and are of interest in particular in conjunction with the standardized USB (Universal Serial Bus) concept which is used extensively for data transfer. Usually, mating
10 plugs connectors (or male plugs) of that kind are directly connected to a printed circuit board (mother board) of a device such a PC via a standardized socket on the housing of this device.

The plug-in face of the printed circuit board (PCB) socket, also called receptacle, is essentially defined by a specification. It presents a plurality of strip-shaped contact springs which lie alongside one another in one insulating
15 body and, when the plug connector is plugged in. These contact springs cooperate with a corresponding contact rails or tracks arranged lying alongside one another in the mating plug connector for producing the electrical contact. The contact springs are arranged in the plug-in socket in an insulation body which is essentially constructed as a plastic tongue of rectangular cross-
20 section. These contact springs are bent over in their rear region to form downwardly projecting connecting legs which can be plugged into contact holes in the PCB. Both socket and mating connector are normally provided with a metallic screening housing, also called shroud. In the cover and bottom region of the receptacle shroud, latching hooks are provided which engage in suitable
25 recesses on the screening housing of the mating connector. These shrouds provide the earthing or grounding contact and the holding forces when pulling out the plug.

In FIG. 1 and 2 are displayed a prior art plug-in socket connector together with the corresponding mating connector (plug connector) in a not yet
30 plugged together position.

A plug connector 14 comprises a screening housing 13, to protect the transmitted signals from electro-magnetic interferences (EMI). Recesses or openings 11, 12 are providing on the screening housing 13.

A plug-in socket 20 presents a typical plug-in face. The socket 20 has an integrated plastic tongue 1 surrounded by a shroud 2 (also for EMI protection) having a cover 4 and a bottom 5, respectively carrying elastically deformable latching hooks 7, 8 and 9, 10 arranged in pairs. The latching hooks
5 are preferably offset inwardly. In addition, the plastic tongue carries spring contacts 17 that are to meet with corresponding contacts in the mating plug. An opening 18 is provided within the plug connector 14 to accommodate the plastic tong 1 and the spring contacts 17 in the mating position.

When the plug 14 is mated with the plug-in receptacle 20, the plastic
10 tongue 1 slides alongside opening 18. The edges of the screening housing 13 push outwardly the latching hooks 7, 8, 9 and 10, that snap back into recesses 11 and 12 respectively when the plug is fully mated with the receptacle 20. The latching hooks are thus adapted to cooperate with the recesses 11 and 12 when the plug is mated with the socket.

15 When pulling the plug 14 out of the receptacle 20, a given force needs to be applied to release the latching hooks from the recesses. During the unmating operation, the latching hooks are released from the recesses and deform temporarily outwardly (when in contact with the screening housing) and outside of shroud cover 4 and bottom 5. During the mating or unmating phase,
20 the latching hooks extend beyond the shroud limits.

In some instances, the release might occur by accident resulting in an interrupted data transfer. In other cases, a secured mating might be necessary.

Therefore, a need appears for a more secure mating, with a higher retention force. An object of the present invention is to provide such a plug-in
25 socket with a higher retention force.

Accordingly, the present invention provides a plug-in socket connector according to claim 1.

According to the invention a sliding lock can be moved to a position where it blocks the latching hook from moving out of the recess. The mating of
30 the socket and the plug is thus reinforced. An increased retention force is achieved.

Other features and advantages of this invention, corresponding to one or several depending claims, will further appear in the hereafter description when considered in connection to the accompanying drawings, wherein:

- FIG. 1 is a perspective view of a known plug-in socket connector together with a mating connector which are not yet plugged together,
- FIG. 2 is a cross-sectional view of the plug connector pair according to FIG. 1;
- FIG. 3A is a section view of the plug-in socket connector, as seen in FIG. 4A along line AA, according to the invention with the sliding lock in an unlocked position,
- FIG. 3B corresponds to the same view as FIG. 3A, with the sliding lock in a locked position,
- FIG. 3C is a perspective with of the sliding lock,
- FIG. 4A is a view from beneath of the unmated plug connector pair with the sliding lock in a first unlocked position,
- FIG. 4B is a view from beneath of the mated plug connector pair with the sliding lock in the unlocked position,
- FIG. 4C is a view from beneath of the mated plug connector pair with the sliding lock in the locked position according to a first embodiment of the invention, and
- FIG. 4D is a view from beneath of the mated plug connector pair with the sliding lock in the locked position according to a second embodiment of the invention,
- FIG. 5 is a schematic front view of a socket according to a third embodiment of the invention,
- FIG. 6 is a schematic view of a socket according to a fourth embodiment,
- FIG. 7 is a schematic section view of the socket connector as seen in FIG. 6 along line DD,
- FIG. 8A and 8B are schematic section views of the socket connector according to a fifth embodiment.

A first embodiment of the invention is illustrated by FIGS. 3A to 4C.

FIG. 3A and 3B are section views of a receptacle 20 equipped with a sliding lock, as seen in FIG. 4A and 4C, along lines AA and CC respectively. In this first embodiment according to the invention, the receptacle itself 20 is similar to the one displayed in FIG. 1 and 2.

5 According to the invention, a sliding lock 25 is positioned around the receptacle 20 and its shroud 2. The sliding lock 25, as seen on FIG. 3C, presents a U shape which comprises a wall 250, out of which extends two parallel arms 251 and 252. Each arm 251 and 252 is terminated respectively with abutments 21 and 22. Arm 252 is provided with grooves 30
10 accommodated inside the U shaped lock, i.e. the grooves of arm 252 are provided on the side of the arm 252 that faces the other arm 251. The sliding lock 25 can be made either of plastic that is inject-molded or of a stamped metal piece.

 The two arms can be identical, with grooves 30 on respective arms
15 facing each other, or different, if the blocking is only needed on one side of the receptacle 20. In the hereafter description, reference is made to a shroud carrying two pairs of latching hooks on opposite sides of the shroud, i.e. on the shroud cover 4 and its bottom 5, but the man skilled in the art can apply the teaching of this invention to a different number of latching hooks and grooves,
20 starting from one latching hook provided on the shroud 2.

 The sliding lock 25 can also have a rectangular shape made of a single piece or of two pieces. The following description, described for a U shaped sliding lock, can be easily adapted to a rectangular shaped sliding lock.

 The sliding lock 25 is dimensioned so that it fits tightly around the
25 receptacle 20 as seen on FIG. 3A. The lock is inserted onto the receptacle through the front plug-in face or its rear face when possible. One other possibility is to insert it from one side by opening the U shaped arms to accommodate the receptacle between the 2 arms. In all instances, the two arms sandwich the shroud.

30 In its unlocked position, as seen on FIG. 3A, the grooves 30 are facing the latching hooks 7, 8, 9, 10 so that the plug connector can be mated and unmated like the known USB plugs, as described before as the latching hooks can move freely outwardly out of the recesses 11 and 12, and into the room

provided by the grooves 30 and the gap 255. In this first embodiment, the arms 251 and 252 are longer than the side of the shroud carrying the latching hooks, so that the sliding lock can slide in the arms direction. Thus the sliding lock can slide between the unlocked position (FIG. 3A) wherein the wall 250 is in contact with a lateral side of the shroud 2 to a position wherein the abutments 21 and 22 are positioned against the shroud 2, as seen in FIG. 3B.

When the sliding lock is slid to the locked position of FIG. 3B, the grooves move away from the latching hooks, and are replaced by blocking sections, here inner walls 35 and 36 of the sliding lock 25. As the arms 251 and 252 fit tightly the receptacle 25 and its cover 4 and bottom 5, the latching hooks no longer have the room to deflect outwardly when the plug connector is pulled as they are held by the blocking sections into the recesses. Therefore the plug connector is locked with the socket connector, and a more secure and reliable mating is ensured.

In FIG. 3B, the lock position is obtained when the abutments 21, 22 are in contact with the shroud 2. In a variation, the grooves 30 can be shifted along the arm length so that the lock position is obtained when the wall 250 of the sliding lock is in contact with the shroud.

FIG. 4A to 4C are views from beneath of the same embodiment. In FIG. 4A, which corresponds to FIG. 3A, the plug connector is unmated, and the sliding lock 25 is positioned laterally with the wall 250 into contact with the shroud 2. The grooves 30 are facing the latching hooks 9 and 10 so that any outward movement is allowed. In FIG. 4B, the plug is mated and the latching hooks are positioned within the recesses 11 and 12 (not shown) of the plug. In FIG. 4C, the sliding lock has been moved to the locked position so that the latching hooks are now facing the walls 35 and 36 and tightly fitting against the shroud cover 4 and bottom 5 (not represented).

FIG. 4D presents the receptacle 20 and the sliding lock 25 according to a second embodiment of the invention. In this embodiment, the sliding lock slides from the unlocked position to a locked position in FIG. 4D parallel to the direction 45. The arms 251 and 252 are preferably shorter than in the previous embodiment as no lateral movement is actually needed. The sliding movement 45 is substantially parallel to the mating direction. When the sliding lock 25 is in

place, the abutments 21 and 22 are in contact with the lateral side of the receptacle, as is the lateral wall 250 with the opposite side. The grooves 30 and the blocking sections 33 follow each other in the direction 45. When the sliding lock 25 is moved parallel to the direction 45 and away from the plug 14, the
5 grooves 30 are replaced by blocking sections 33, here the front walls 37 and 38 of the arms. In this embodiment, the grooves 30 do not extend along the whole width of the arms, leaving front wall 37 and 38 for each arm provided with no groove. These front walls can tightly fit against the shroud cover 4 and bottom 5 (not represented), leaving no room for the latch hooks to deflect when the plug
10 is pulled.

The blocking sections 33 are preferably flat sections of the arm(s), thus leaving no room to the latching hooks as the arms are tightly fitted against the shroud.

In some instances, it is desirable not to lock the latching hooks on
15 cover 4 and bottom 5 of the shroud. As seen in FIG. 3C, the arms 251 and 252 can be distinct, the arm 251 carrying a gap 255 that runs along the arm length that allows the latching hooks facing that arm 251 to move freely out of the recesses of the plug. In a variant, a third arm 256 is provided parallel to the arm 251. This arm is provided with a free end and attached either at the base of
20 arm 251 or to the wall 250. Arm 256 can further comprises on its free end a latch 257 that snaps onto the shroud when the sliding lock is positioned in the unlocked position, and snaps out when the sliding lock 25 is slid to the locked position.

This permits to maintain the sliding lock when in the unlocked position.
25 Moreover, this arm provides a click when it snaps onto the shroud, enabling the user to know that the sliding lock is disengaged. A corresponding arm may also be used for the locked position for example. However, this third arm 256, snapping onto the shroud may also be transverse to the arm 251. Moreover, this snapping arm 256 may also be replaced by other devices insuring the
30 function of snapping onto the shroud, like a spring biased arm or plunger.

According to a third embodiment shown on FIG. 5, the sliding lock 25 comprises a spring tongue 50. This spring tongue 50 biases elastically the sliding lock 25 toward the first position, namely the locked position. Thus, the

plug connector 14 is automatically locked in the socket 20 when the sliding lock 25 is released. In this example, the movement of the sliding lock is transversal. However, a spring tongue may be easily adapted for a movement parallel to the insertion direction. This automatic lock provides a user friendly USB connector.

5 According to a fourth embodiment, shown in FIG. 6 and FIG. 7, the socket connector 20 may comprise withdrawal springs 51 and 52. These springs 51 and 52 may be arranged so that their elastic force biasing an inserted plug connector permits to eject the plug connector when the sliding lock, not shown on FIG. 6 and FIG. 7, is in the unlocked position. This elastic
10 force has to be sufficient to compensate the retaining force of the latching hooks 7 and 9. Accordingly, when a user moves the sliding lock into the unlocked position, the plug connector is automatically ejected from its socket.

 This embodiment may be combined to the third embodiment. Then, the sliding lock 25 is in the locked position when released. To eject a plug
15 connector 14, it only requires translating the sliding lock in the unlocked position. The withdrawal springs 51 and 52 then eject the plug connector from the socket.

 A fifth embodiment is depicted by FIG. 8A and FIG. 8B. In this embodiment, the latching hooks 7 and 9 comprise a blocking portion 7b and 9b
20 respectively and a slope portion 7a and 9a, respectively. The slope portions 7a and 9a are in contact with respective support surfaces 57 and 59 of the sliding lock 25. These latching hooks 7 and 9 are elastically mounted on the shroud 2 of the receptacle 20, so that the sliding lock 25 is biased by the latching hooks 7 and 9 in the locked position shown on FIG. 8A. In this locked position, the
25 blocking portions 7b and 9b of the latching hooks are inserted in the respective recesses 11 and 12 of the plug connector. As opposed to the first and second embodiments, these latching hooks 7 and 9 are configured to block the plug connector 14 in the socket connector 20, since the blocking portions 7b and 9b, entering the recesses, are essentially perpendicular to the insertion direction.

30 Consequently, when the sliding lock 25 is in the locked position, a plug connector 14 may be inserted into the socket connector due to the slope portions 7a and 9a, but may not be withdrawn, because of the blocking portions. When the sliding lock 25 is brought to the unlocked position, parallel

to the plug insertion direction, the latching locks 7 and 9 are raised by the support portions 57 and 59 of the sliding lock. Thus, the blocking portions 7b and 9b are pulled away from the recesses of the plug connector 14, which is then unlocked. As in the fourth embodiment, the connector socket may
5 comprise a withdrawal spring, not shown on FIG. 8A or 8B, for ejecting the plug connector 14.

This embodiment provides a connector socket in which a plug connector may be inserted even if the sliding lock is in locked position. This automatic ejection is user friendly, since the user only has to operate the sliding
10 lock to withdraw the connector plug 14. In this example, the sliding lock 25 translates along a direction parallel to the insertion direction. However, with diagonal support surfaces, it is possible to operate the sliding lock along a direction transverse to the insertion direction.

The elastic force of the latching hooks biasing the sliding lock in the
15 locked position may be reinforced by a spring, as in the third embodiment.

CLAIMS

1. A plug-in socket connector (20) with an insulating body (1) carrying contacts (17) and a shroud (2) surrounding said insulating body, at least one latching hook (7, 8, 9, 10) provided on said shroud, said latching hook being adapted to be moveable between a first configuration where the latching hook (7, 8, 9, 10) is engaged in a corresponding recess (11, 12) in a plug connector (14) when said plug connector is mated with said socket, and a second configuration where the latching hook is disengaged from said connector recess, said socket further comprising a sliding lock (25) slidably movable between a first position corresponding to said first configuration and in which the plug connector is locked in its socket, and a second position corresponding to said second configuration and in which the plug connector can be unmated with its socket.
2. A socket connector according to claim 1, wherein when said sliding lock (25) is in the first position, the sliding lock prevents said latching hook to move out of the recess (11, 12) and thus locks said plug connector within said socket connector, and wherein when said sliding lock is in the second position, said latching hook can move freely out of said recess when said plug connector is unmated.
3. A socket connector according to claim 2 or claim 3, wherein the sliding lock comprises at least one groove (30) that faces the latching hook in the first position to allow said latching hook to move out of the recess and into said groove when the plug connector is unmated.
4. A socket connector according to any one of the preceding claims, wherein the sliding lock further comprises a blocking section (33, 35, 36, 37, 38) that faces the latching hook in the second position to prevent said latching hook from moving out of the recess to lock the plug connector with the socket connector.

5 5. A socket connector according to claim 4, wherein at least one arm carries the blocking section and the groove, said arm being tightly fitted against the side of the shroud carrying the latching hook, and slidably mounted on said side, so that said arm can move from the first to the second position.

10 6. A socket connector according to claim 4 or 5, wherein the blocking section is a flat section (35, 36, 37, 38) that prevents the latching hook from moving outwardly of the shroud.

15 7. A socket connector according to any one of claims 4 to 6, wherein the arm carrying the blocking section and the groove is longer than the side of the shroud carrying the latching hook, so that in the sliding lock can slide along the length of said arm.

20 8. A socket connector according to any one of claims 2 to 7, wherein at least one latching hook is provided on a first and a second opposite sides of the shroud, a first arm of the sliding lock in contact with a first side of said shroud carrying at least one blocking section and one groove, the second arm comprising a gap (255) running along said arm to allow the latching hook of the second side of said shroud to move freely.

25 9. A socket connector according to claim 1, wherein when said sliding lock is in first position, the latching hook is arranged to allow the insertion of said plug connector into said socket connector and arranged to prevent the withdrawal of said plug connector, and wherein, when said sliding lock is in said second position, the latching hook is maintained by said sliding lock out of said recess, so that the plug connector is unmated.

30 10. A socket connector according to claim 9, wherein the latching hook comprises at least one slope portion (7a, 9a), said slope portion being substantially in contact with a support part (57, 59) of the sliding lock, so that

when the sliding lock is moved from the first position to the second position, the latching hook is raised out of the recess of the plug connector.

11.A socket connector according to claim 10, wherein the latching hook is
5 elastically mounted onto the shroud, and wherein the slope portion (7a, 9a) biases the support part of the sliding lock toward the first position of the sliding lock when the sliding lock is in the second position.

12.A socket connector according to any of the previous claims, further
10 comprising at least one withdrawal spring device (51, 52), said withdrawal spring device being adapted to bias the plug connector in a direction opposed to an insertion direction of said plug connector, so that the plug connector is withdrawn when the sliding lock is in said second position.

15 13.A socket connector according to any of the previous claims, wherein the latching hook is carried by one side of said shroud and the sliding lock has a U shaped body comprising two arms (251, 252) that sandwich said shroud.

14.A socket connector according to any of the preceding claims, wherein the
20 sliding lock is adapted to move parallel to an insertion direction.

15.A socket connector according to any of the preceding claims, wherein the sliding lock is elastically biased toward the first position.

25 16. A socket connector according to any of the previous claims, wherein the plug-in socket connector and the plug connector are USB connectors, the shroud carrying at least two latching hooks.

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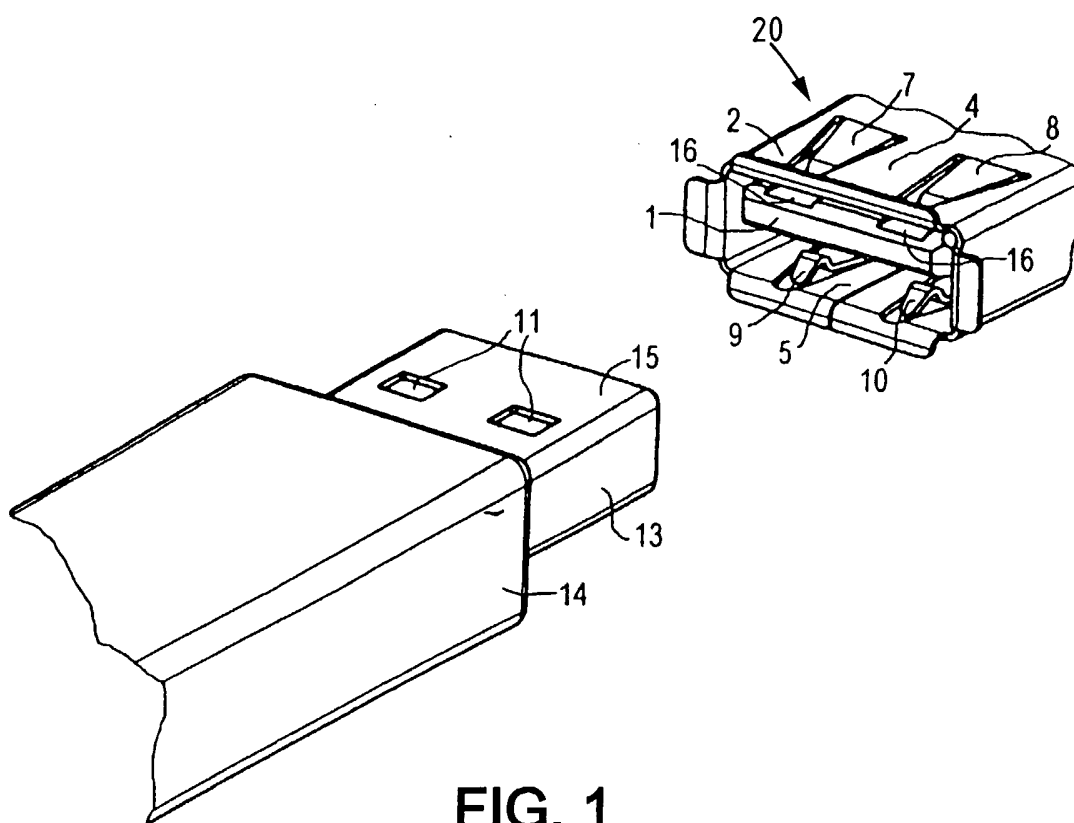


FIG. 1
(PRIOR ART)

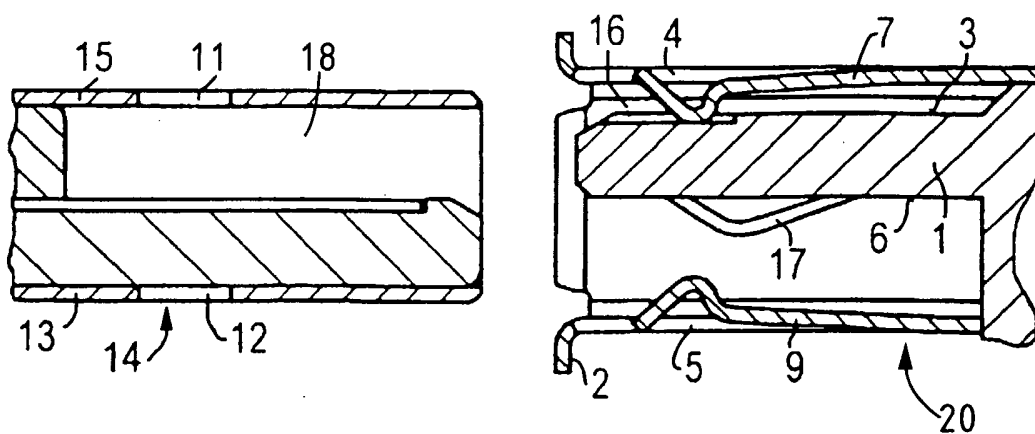


FIG. 2
(PRIOR ART)

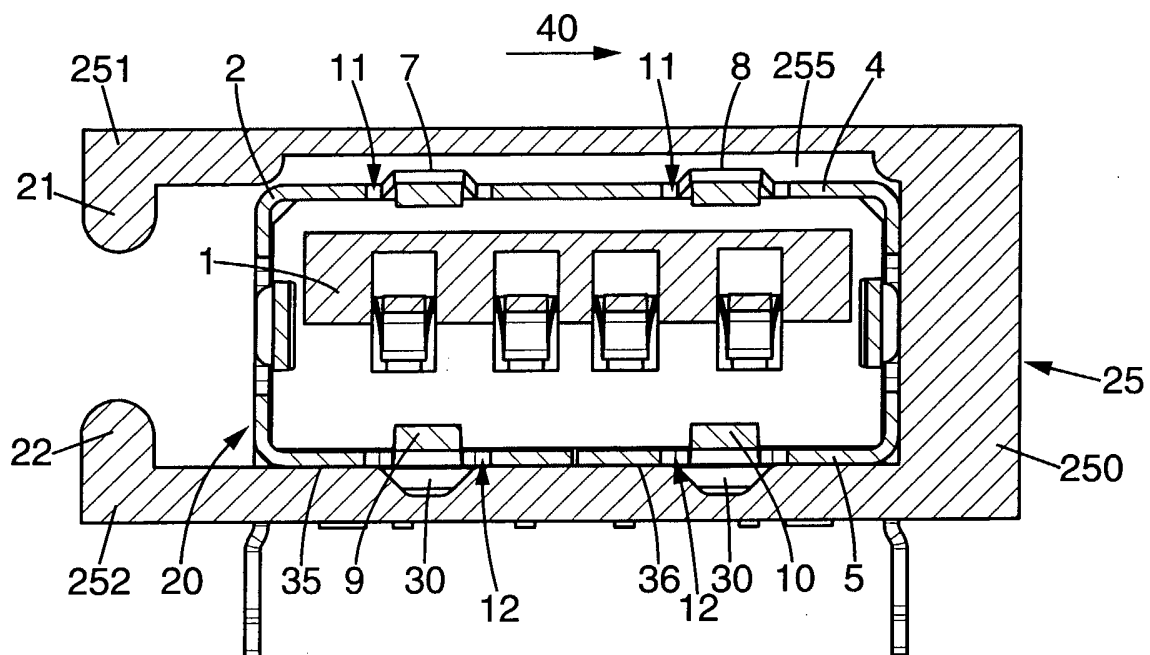


FIG. 3A

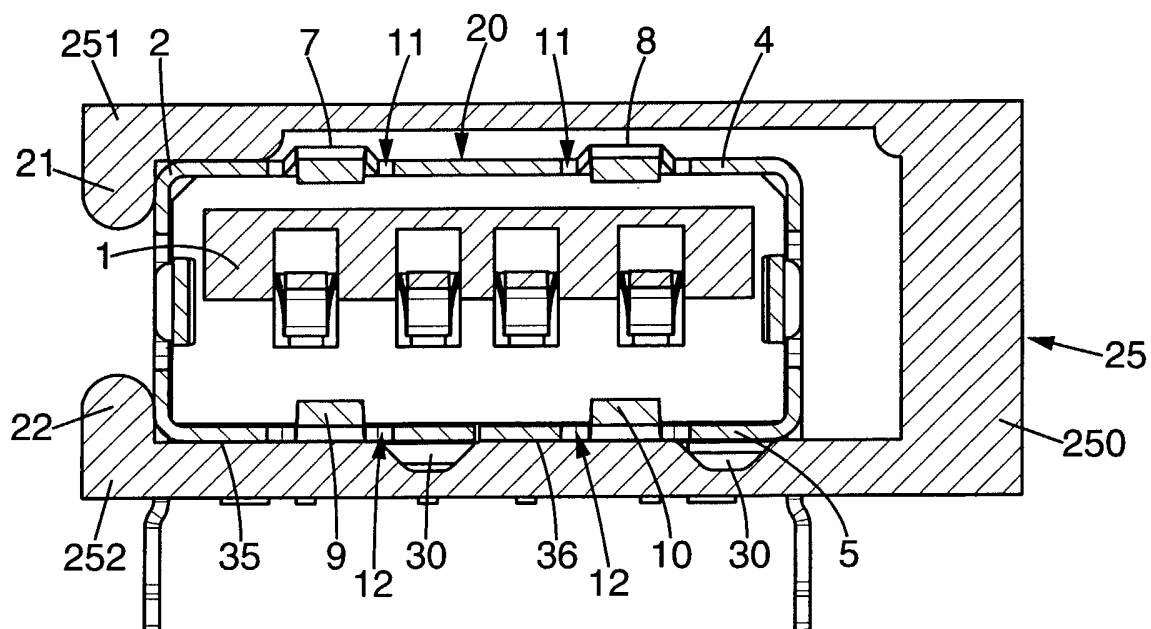
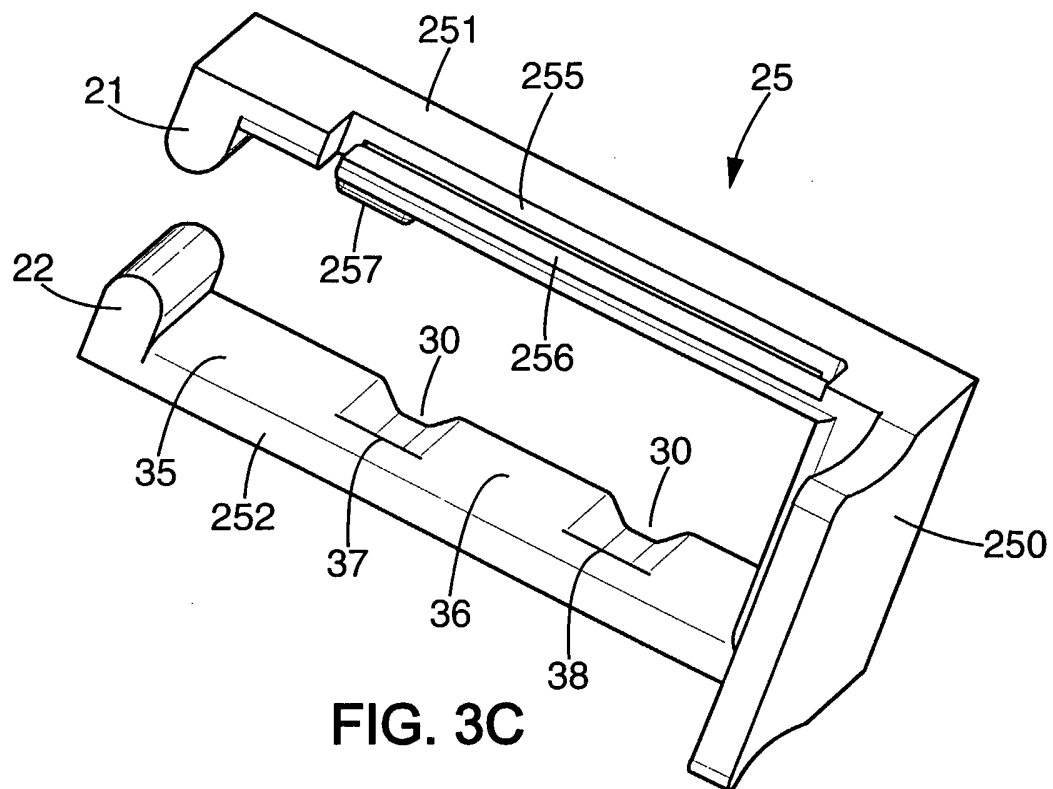


FIG. 3B



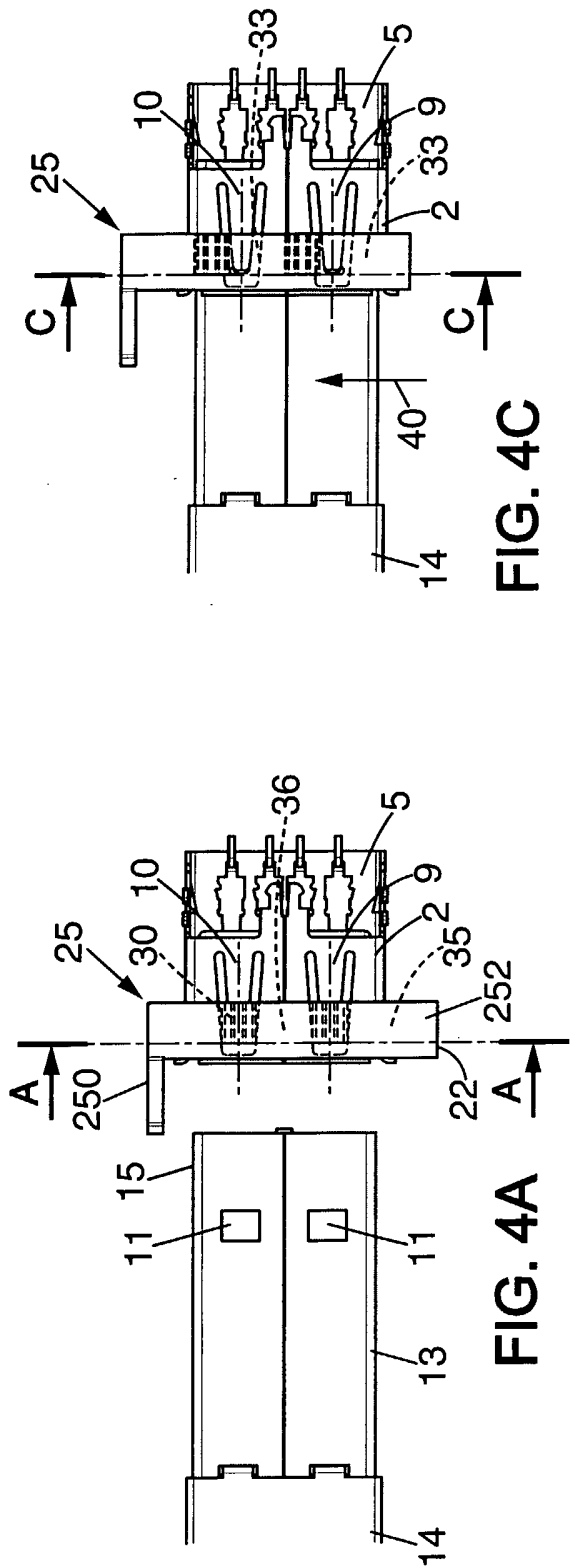


FIG. 4C

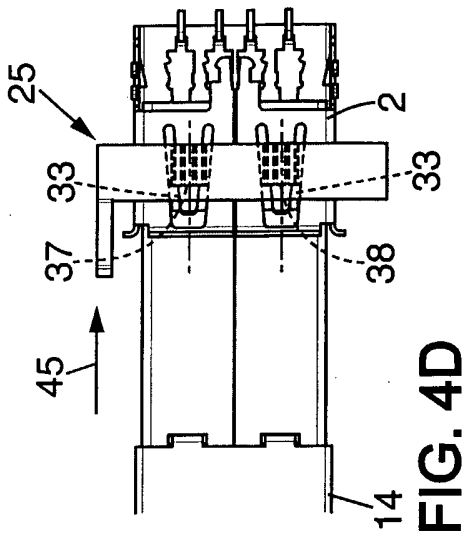


FIG. 4D

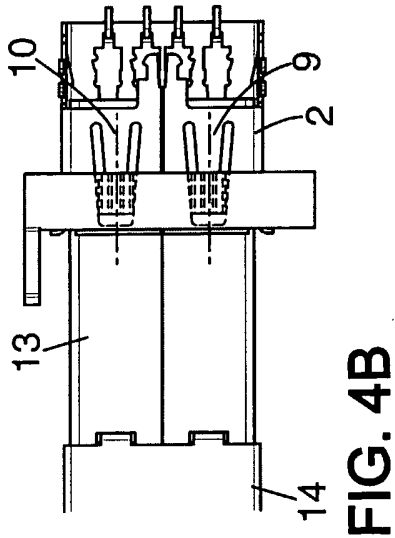
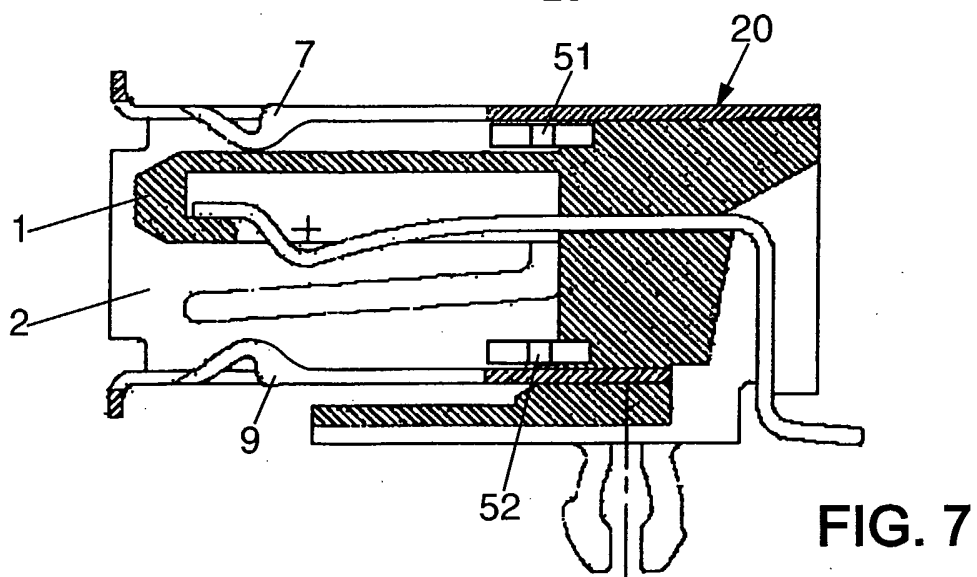
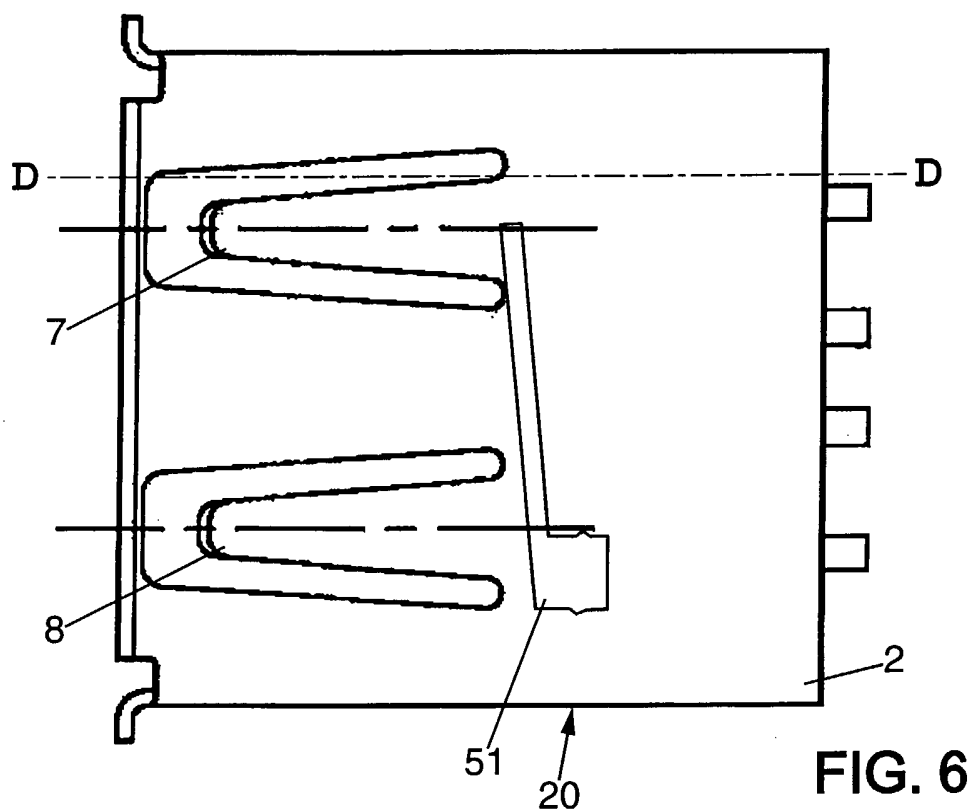
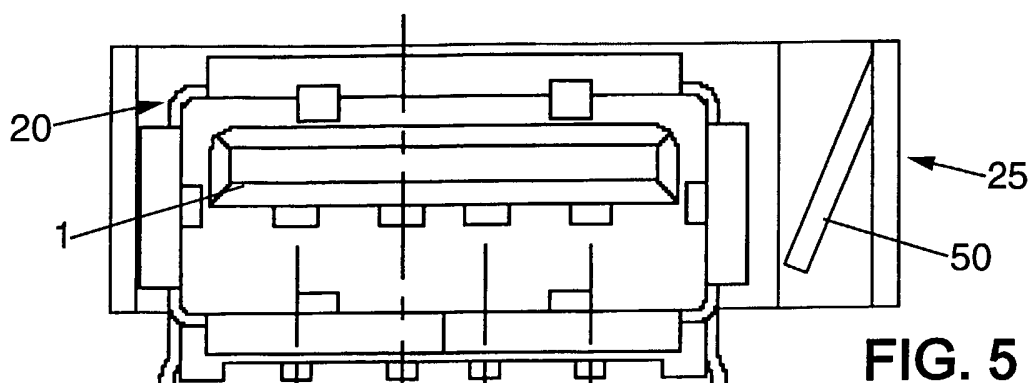


FIG. 4B

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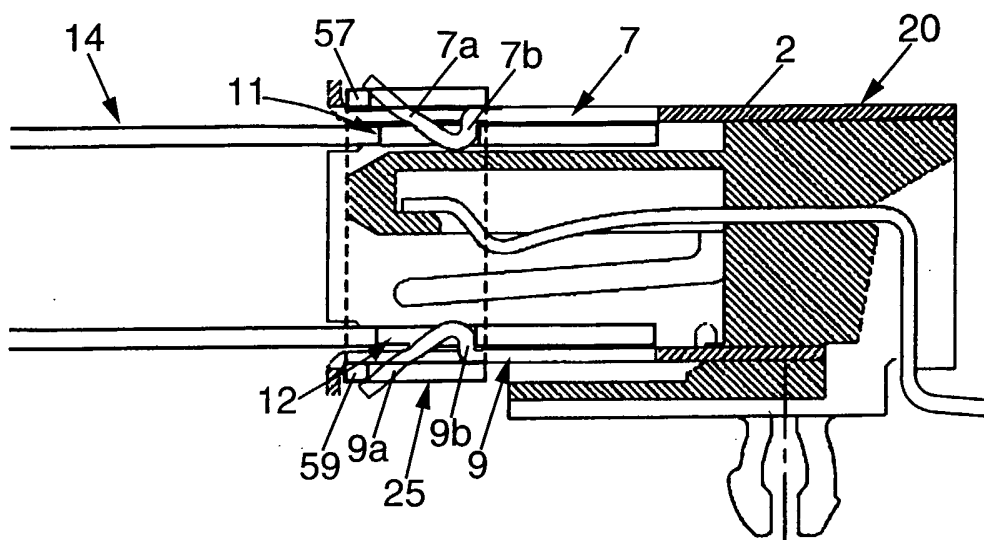


FIG. 8A

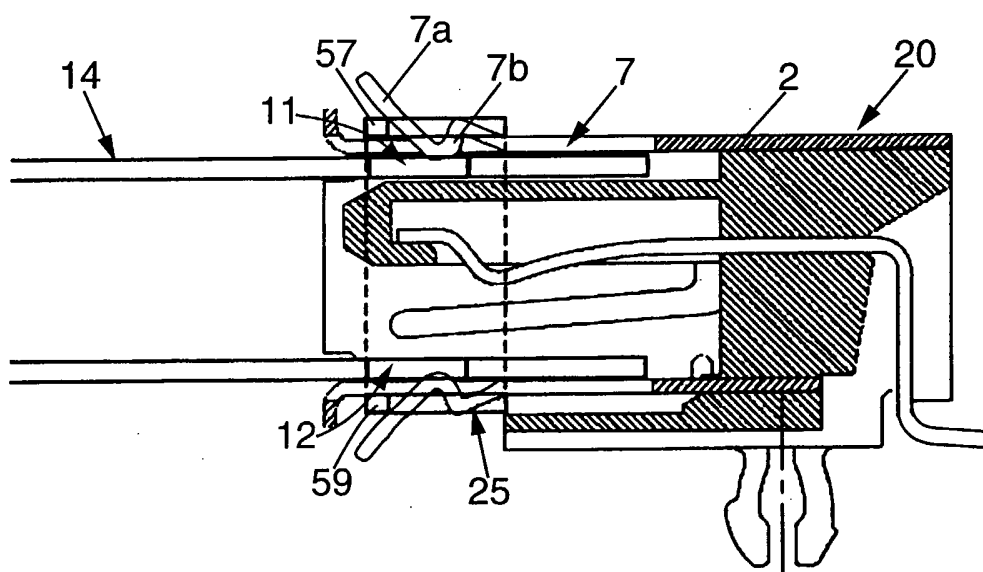


FIG. 8B

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2005/005214

A. CLASSIFICATION OF SUBJECT MATTER H01R13/639		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) H01R		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 823 915 A (HEWLETT PACKARD CY) 25 October 2002 (2002-10-25) page 11, line 9 - page 13, line 26; figures 6-9, 14A, 14B -----	1-16
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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 2823915	A	25-10-2002	NONE	