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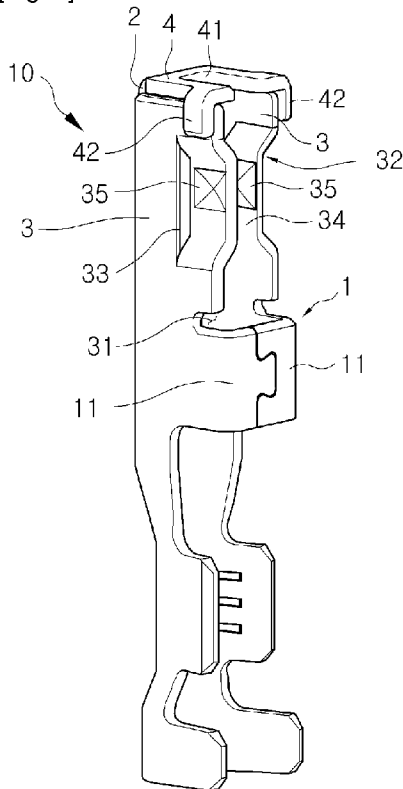
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(54) Title: CONNECTOR FOR LOW PROFILE FUSE

[Fig. 1]



(57) Abstract: Disclosed is a connector for a Low Profile (LP) fuse, which is electrically connected to the LP fuse inserted in a vehicular fuse box and provides the LP fuse with a fixing force, assuring easy insertion of the LP fuse and preventing the LP fuse from being separated by external shock, such as vehicle vibration. The connector includes a body inserted into a mounting recess defined in a fuse box and fixed to a bottom surface of the mounting recess, a lower end of which is electrically connected to an electric wire, a rear piece extending from the body into the mounting recess, and a pair of supporting pieces bent from opposite sides of the rear piece to extend parallel to each other in a direction orthogonal to an insertion direction of an electrode terminal of the LP fuse inserted into the mounting recess, serving to fix the electrode terminal.

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Description

CONNECTOR FOR LOW PROFILE FUSE

Technical Field

- [1] The present invention relates to a connector, which is provided in a vehicular fuse box, in which a Low Profile (LP) fuse is inserted, and is electrically connected to the LP fuse so as to provide the LP fuse with a fixing force, and more particularly, to a connector for an LP fuse, which can assure easy insertion of an LP fuse and prevent an installed LP fuse from being separated by external shock, such as vibration of a vehicle, etc.

Background Art

- [2] A Low Profile (LP) fuse is a kind of small fuse designed to reduce manufacturing costs and has a smaller size, more particularly, a smaller height than other kinds of fuses. Referring to FIG. 6, a general LP fuse 200 includes a body 220, a protrusion 230 protruding from the center of a lower surface of the body 220 so as to be inserted into a fuse box, and electrode terminals 210 provided at opposite ends of the protrusion 230, the electrode terminals 210 being made of a conductive metal.
- [3] The fuse box is provided with connectors. The connectors are electrically connected to the electrode terminals, respectively, and provide the LP fuse with a fixing force to prevent separation of the LP fuse inserted into the fuse box.
- [4] The connectors used in the fuse box should be designed to be assure easy insertion of the LP fuse because a plurality of LP fuses may be inserted into the fuse box and may be exchanged several times during a vehicle's lifespan. In addition, the connectors should provide the LP fuse with a fixing force sufficient to prevent separation of the LP fuse inserted into the fuse box even if external shock, such as vibration of a vehicle, etc., is applied. The connectors also should have a sufficient cross sectional area in consideration of the quantity of current passing through the LP fuse.
- [5] FIG. 7 illustrates one of connectors provided in a fuse box according to the related art.
- [6] The illustrated connector includes a body 310 configured to be fixed to the bottom of a recess defined in a fuse box and having a fixture formed at a lower end thereof for the connection of an electric wire, and a pair of elastic pieces 320 extending from an upper end of the body 310 to protrude from the recess of the fuse box so as to enable insertion and fixation of electrode terminals of an LP fuse.
- [7] The elastic pieces 320 are obliquely bent such that a distance between both the elastic pieces 320 is reduced upward. Upper ends of the elastic pieces 320 are bent outward to extend away from each other such that a corresponding electrode terminal can be

easily inserted downward to the top of the elastic pieces 320.

- [8] Accordingly, the pair of elastic pieces 320 acts to be elastically bent outward to receive an electrode terminal and to press and fix the electrode terminal via a restoration force thereof.
- [9] The elastic pieces 320 of the connector according to the related art, however, extend lengthily upward from the body 310 and do not exhibit a strong fixing force, thus causing an LP fuse to be easily separated from the fuse box due to vibration generated during driving of a vehicle. Specifically, despite the fact that fixation of the LP fuse depends on only a press force of the elastic pieces 320 used to fix an electrode terminal of the LP fuse, the elastic pieces 320 take the form of cantilevers extending lengthily upward from the body 310 and thus, are greatly affected by vibration, showing deterioration in a fixing force.
- [10] To solve the above described disadvantage of the connector according to the related art, attempts have been made to maximize a restoration force of the elastic pieces 320 when the elastic pieces 320 are pushed away from each other upon insertion of the electrode terminal. To this end, the elastic pieces 320 have been configured to be closer to each other upward such that the upper ends of the elastic pieces 320 come into contact with each other.
- [11] However, the above described configuration does not provide a basic solution to the continuous vibration generated in the course of a vehicle's lifespan, and also, entails difficulty in assembly of an LP fuse because the elastic pieces 320, the upper ends of which come into contact with each other, cause an increased insertion force required to press and insert the LP fuse in order to push the elastic pieces 320 away from each other.
- [12] In particular, in the case where a plurality of LP fuses is assembled simultaneously into a fuse box during an assembly operation of a vehicle, a significant insertion force is required on a per LP fuse basis, causing difficulty in assembly of all the LP fuses.

Disclosure of Invention

Technical Problem

- [13] Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a Low Profile (LP) fuse with an increased fixing force, so as to prevent a fixed LP fuse from being separated by external shock, such as vibration of a vehicle, etc.
- [14] It is another object of the present invention to provide a connector, used to elastically fix an electrode terminal of an LP fuse, with an improved configuration to increase an elastic force of the connector.
- [15] It is another object of the present invention to achieve reliable electric connection

between a connector and an electrode terminal of an LP fuse.

[16] It is another object of the present invention to allow an LP fuse to be easily inserted even with a low force, assuring easy insertion of all LP fuses.

[17] It is another object of the present invention to prevent damage to an electrode terminal of an LP fuse due to improper assembly of the LP fuse.

[18] It is a further object of the present invention to prevent an elastic fixing piece of a connector used to elastically fix an LP fuse from being excessively deformed in a direction and thus, being broken down.

Technical Solution

[19] In accordance with an aspect of the present invention, the above and other objects can be accomplished by the provision of a connector for a Low Profile (LP) fuse including a body fixed to a bottom surface of a mounting recess defined in a fuse box, a rear piece extending from the body into the mounting recess, and a pair of supporting pieces bent from opposite sides of the rear piece to extend parallel to each other in a direction orthogonal to an insertion direction of an electrode terminal of the LP fuse inserted into the mounting recess, thus serving to fix the electrode terminal.

[20] The pair of supporting pieces may respectively include holding pieces, each being vertically incised to have upper and lower ends connected to the corresponding supporting piece, and both the holding pieces of the supporting pieces may be inwardly indented to be closer to each other.

[21] The holding pieces may respectively have flat surfaces to face each other, and a press protrusion may protrude inward from the flat surface to press the electrode terminal.

[22] The connector may further include a cover piece extending throughout an upper end of the rear piece and upper ends of the supporting pieces and defining an entrance for the passage of the electrode terminal.

[23] The cover piece may include a pair of reinforcing pieces bent from opposite sides of the cover piece to surround the upper ends of the supporting pieces, thus serving to prevent the supporting pieces from being excessively pushed outward away from each other.

Advantageous Effects

[24] A connector for a Low Profile (LP) fuse according to an embodiment of the present invention has the following several effects.

[25] First, supporting pieces of the connector, which produce from a rear piece to have a small length, exhibits a considerably increased fixing force for the LP fuse, thereby preventing the LP fuse from being separated by external shock, such as vibration of a vehicle and resulting in enhanced reliability in the fixation of the LP fuse.

[26] Second, as a result of providing the supporting pieces with press protrusions, it is

possible to further increase the fixing force for the LP fuse and to achieve accurate electric connection between the connector and the LP fuse, resulting in enhanced reliability in the electric connection.

[27] Third, the supporting pieces of the connector are further provided with holding pieces spaced apart from each other. The holding pieces can function to reduce a force required for the initial insertion of the LP fuse, thus enabling an easy assembly operation.

[28] Fourth, the connector includes a cover piece to prevent breakdown of the supporting pieces caused when the LP fuse is eccentrically inserted into the connector. This can reduce assembly error, resulting in enhancement in productivity.

[29] Fifth, when the cover piece is provided with reinforcing pieces, it is possible to prevent the supporting pieces from being excessively pushed outward away from each other upon improper assembly of the LP fuse and thus, prevent deterioration in the elastic force of the supporting pieces.

Brief Description of Drawings

[30] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

[31] FIG. 1 is a perspective view illustrating a connector for a Low Profile (LP) fuse according to an embodiment of the present invention;

[32] FIG. 2 is a sectional view illustrating the use of the connector for the LP fuse illustrated in FIG. 1;

[33] FIG. 3 is a partial cut-away perspective view illustrating the use of the connector for the LP fuse illustrated in FIG. 2;

[34] FIG. 4 is a schematic sectional view taken along the line a-a of FIG. 3;

[35] FIG. 5 is a perspective view illustrating a modified configuration of the connector for the LP fuse illustrated in FIG. 1;

[36] FIG. 6 is a view illustrating a general LP fuse; and

[37] FIG. 7 is a view illustrating the related art.

Best Mode for Carrying out the Invention

[38] Hereinafter, functions, configuration, and operation of a connector for a Low Profile (LP) fuse according to a preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[39] FIG. 1 is a perspective view illustrating a connector for a Low Profile (LP) fuse according to an embodiment of the present invention, and FIG. 2 is a sectional view illustrating the use of the connector for the LP fuse illustrated in FIG. 1.

[40] The connector 10 for the LP fuse according to the preferred embodiment of the

present invention includes a body 1, a rear piece 2, and a pair of supporting pieces 3. The body 1 is inserted into a mounting recess defined in a fuse box and is fixed to a bottom surface of the mounting recess, and a lower end of the body 1 is electrically connected to an electric wire 120. The rear piece 2 extends from the body 1 into the mounting recess. The pair of supporting pieces 3 is bent from opposite sides of the rear piece 2 and extends parallel to each other in a direction orthogonal to an insertion direction of an electrode terminal of the LP fuse, thus serving to fix the electrode terminal.

[41] The body 1, as illustrated in FIG. 2, is fixed to the bottom surface of the mounting recess 110 defined in the fuse box 100. The body 1 may be inserted and fixed by use of a lance, or may be formed by insert injection molding. The lower end of the body 1 may have a known configuration to be electrically connected to the electric wire 120.

[42] The rear piece 2 extends upward from the body 1, and takes the form of a flat plate extending from either inner side surface of the mounting recess 110.

[43] The supporting pieces 3, which are bent from opposite sides of the rear piece 2 and extend parallel to each other, come into contact with the electrode terminal 210 of the LP fuse 200 so as to provide the electrode terminal 210 with a fixing force.

[44] In this case, to assure the flow of a sufficient quantity of current required for normal operation of the LP fuse 200, it is important that the rear piece 2 has a horizontal width larger than a thickness of the electrode terminal 210, so as to achieve a sufficient cross sectional area for the flow of current. Thus, to allow the electrode terminal 210 to be caught by the supporting pieces 3, the supporting pieces 3, which are bent from opposite sides of the rear piece 2 having the large horizontal width, may be additionally provided with holding pieces that will be described hereinafter. Alternatively, the supporting pieces may be bent by a great inclination to become close to each other.

[45] The electrode terminal 210, inserted between both the supporting pieces 3, acts to push the supporting pieces 3 away from each other, and the supporting pieces 3 pushed away from each other serve to press and fix the electrode terminal 210 via a restoration force thereof.

[46] Lower ends of the supporting pieces 3 are integrally formed with the body 1, to assure a further increased restoration force of the supporting pieces 3. Specifically, the body 3 may include L-shaped lateral pieces 11 extending horizontally from opposite sides immediately beneath the rear piece 2 to constitute a block together, and the lower ends of the supporting pieces 3 may be connected to the lateral pieces 11.

[47] More specifically, the body 1 may define a block as the lateral pieces 11 extend in an L-shaped form from opposite sides immediately beneath the rear piece 2 and facing distal ends of the lateral pieces 11 are coupled to each other. In this case, the lateral pieces 11, coming into contact with each other, may be welded to each other. Alter-

natively, one of the lateral pieces 11 may be formed with a recess and the other lateral piece 11 may be formed with a protrusion corresponding to the recess, such that both the lateral pieces 11 are fixed to each other via engagement of the recess and the protrusion.

[48] When the lower ends of the supporting pieces 3 are integrally formed with the block of the body 1, the supporting pieces 3 are able to acquire an increased elastic force that is applied to push both the supporting pieces 3 away from each other.

[49] In addition, a recess 31 may be indented in a connection region between the lower end of the supporting piece 3 and the lateral piece 11. With this configuration, a length from the rear piece 2 to the recess 31, i.e. a horizontal length of the supporting piece 3 is partially reduced, which causes a reduction in a force required to push the supporting pieces 3 outward away from each other.

[50] Accordingly, when the LP fuse 200 is inserted into the mounting recess 110, an initial insertion force required to push the supporting pieces 3 away from each other can be reduced.

[51] In the meantime, as described above, to fix the electrode terminal 210 of the LP fuse 200 using the supporting pieces 3, the supporting pieces 3 may be provided respectively with holding pieces 32.

[52] The holding pieces 32 are centrally indented such that center portions of the supporting pieces 3 are closer to each other than the remaining portions of the supporting pieces 3. In this case, one side end of each holding piece 32 is not connected to the corresponding supporting piece 3 through provision of a vertical incision 33, whereas upper and lower ends of the holding piece 32 are connected to the supporting piece 3.

[53] The holding pieces 32 are inwardly indented from the respective supporting pieces 3 such that a distance d between the holding pieces 32 is smaller than a thickness D of the electrode terminal 210 (in FIG. 4, $d < D$).

[54] The above described holding pieces 32 function to increase a cross sectional area for the passage of current and also, to define a space into which the electrode terminal 210 can be fitted.

[55] The holding pieces 32 may have flat surfaces 34 facing each other, and press protrusions 35 may be formed at the flat surfaces 34 to press the electrode terminal 210 fitted between the holding pieces 32. Specifically, the flat surfaces 34 are formed respectively at the holding pieces 32 to be parallel to each other, and the press protrusions 35 are raised from the facing flat surfaces 34 by, for example, punching.

[56] The press protrusions 35 come into point contact with the electrode terminal 210. This can further increase a press force applied to the electrode terminal 210 and achieve perfect electric connection between the electrode terminal 210 and the

connector 10.

[57] FIG. 5 is a perspective view illustrating a modified configuration of the connector for the LP fuse illustrated in FIG. 1.

[58] An upper end of the connector 10 is exposed to the outside from the top of the mounting recess 110 and therefore, the supporting pieces 3 may be easily deformed due to deformation interference caused by invasion of impurities from the outside or improper assembly of the LP fuse 200. Accordingly, to protect the supporting pieces 3, a cover piece 4 may further extend from the rear piece 2 to cover the upper ends of the supporting pieces 3.

[59] The cover piece 4 extends throughout the upper end of the rear piece 2 and the upper ends of the supporting pieces 3 to have a U-shaped form, and thus, is formed with an entrance 41 for the passage of the electrode terminal 210.

[60] In this case, if the electrode terminal 210 is eccentrically inserted between the supporting pieces 3 rather than being inserted on a median axis between the supporting pieces 3, a lower end of the electrode terminal 210 is caught by the cover piece 4. This can prevent excessive deformation of the supporting pieces 3 caused when the LP fuse 200 is inserted in an incorrect direction and invasion of impurities.

[61] In addition, the cover piece 4 may be formed at opposite sides thereof with reinforcing pieces 42. The reinforcing pieces 42 extend downward orthogonally from opposite sides of the cover piece 4 to surround the upper ends of the supporting pieces 3, thereby serving to prevent the supporting pieces 3 from being excessively pushed outward away from each other.

[62] Specifically, the reinforcing pieces 42 are formed at opposite distal ends of the cover piece 4 to surround front corners of the supporting pieces 3 since the front corners exhibit the greatest outward displacement upon insertion of the LP fuse 200. In this case, the reinforcing pieces 42 are spaced apart from the supporting pieces 3, rather than coming into contact with the supporting pieces 3.

[63] In this case, a distance between the supporting piece 3 and the reinforcing piece 42 is determined in consideration of an outwardly moved distance of the supporting piece 3 caused when the supporting piece 3 is pushed outward by the electrode terminal 210 upon insertion of the LP fuse 200. When the LP fuse 200 is obliquely inserted, the supporting piece 3 is supported by the reinforcing piece 42, which can prevent the supporting piece 3 from being excessively pushed outward.

[64] Moreover, since the supporting piece 3 and the reinforcing piece 42 do not normally come into contact with each other, the supporting piece 3 does not act to push the reinforcing piece 42 outward under a normal LP fuse assembly situation, and thus, there is no need for an additional insertion force to elastically deform the reinforcing piece 42 upon insertion of the LP fuse 200.

- [65] Accordingly, the reinforcing piece 42 can prevent the supporting piece 3 from being excessively pushed outward without an increase in the insertion force of the LP fuse 200.
- [66] Hereinafter, operation of the connector 10 for the LP fuse 200 according to the present invention will be described with reference to FIGS. 1 to 4.
- [67] The connector 10 for the LP fuse 200 according to the embodiment of the present invention, as described above, is configured such that the symmetrical supporting pieces 3 come into contact with the electrode terminal 210 and thus, function to fix the electrode terminal 210.
- [68] The supporting pieces 3, as illustrated in FIG. 2, extend from the rear piece 2 in a direction orthogonal to a vertical insertion or separation direction (a Z-axis direction) of the LP fuse 200, thereby serving to elastically support the electrode terminal 210.
- [69] More specifically, referring to FIGS. 3 and 4 clearly illustrating the insertion and fixation relationship between the electrode terminal 210 and the connector 10, the electrode terminal 210 has a large length in the insertion direction (a vertical direction or Z-axis direction) of the LP fuse 200, but has a relatively small length in a front and rear direction (an X-axis direction) orthogonal to the insertion direction. The small length portion of the electrode terminal 210 is caught by the connector 10.
- [70] In this case, assuming that the rear piece 2, which does not undergo elastic deformation upon insertion of the LP fuse 200, is a stationary wall, and that the supporting pieces 3, which extend from the rear piece 2 and are elastically displaced by the electrode terminal 210, are cantilevers fixed to the stationary wall, each supporting piece 3 can take the form of a cantilever that has a lengthy vertical connection length with respect to the stationary wall, but has a relatively small protruding length.
- [71] It will be appreciated that the above described cantilever (the supporting piece 3), having a lengthy connection length and a small protruding length, exhibits a greater elastic force against an external force than that of a conventional elastic piece in the form of an elongated cantilever.
- [72] In conclusion, according to the present invention, the supporting piece 3, provided at the connector 10 for the LP fuse, extends by a small length from the rear piece 2 in an X-axis direction orthogonal to the insertion direction (a Z-axis direction) of the LP fuse 200, thus exhibiting a great elastic force and consequently, providing the LP fuse 200 inserted in the mounting recess 110 with a considerably great fixing force.
- [73] Accordingly, the supporting piece 3 can keep the LP fuse 200 fixed despite vibration caused during driving of a vehicle and furthermore, does not exhibit deterioration in an elastic force when faced with continuous, long time vibration.
- [74] The great fixing force of the supporting piece 3 may be further increased by providing the holding piece 32 with the press protrusion 35. That is, a fixing force for

the inserted LP fuse can increase a vertical drag force by double indentations defined by the holding piece 32 and the press protrusion 35, resulting in a considerably increased frictional force when the LP fuse is pulled out.

[75] In the meantime, a distal end of the press protrusion 35 exhibits a reliable local surface contact with a surface of the electrode terminal 210. Thus, the press protrusion 35 functions to prevent short circuiting between the LP fuse 200 and the connector 10 and to achieve reliable electrical connection between the electrode terminal 210 and the supporting pieces 3.

[76] Both the holding pieces 32 and more particularly, both the press protrusions 35 are spaced apart from each other and thus, it is unnecessary to provide the LP fuse 200 with a great insertion force upon initial insertion thereof. As illustrated in FIG. 4, since the flat surfaces 34 of the holding pieces 32 are originally spaced apart from each other, the supporting pieces 3 can exhibit a small deformation length when they are elastically displaced by the electrode terminal 210.

[77] In addition, the incision 31 punched between the supporting piece 3 and the body 1 can allow the supporting piece 3 to be pushed outward even by a small insertion force upon insertion of the LP fuse 200.

[78] With the above described configuration, it is possible to reduce an insertion force required to insert and fix the LP fuse and to prevent the inserted LP fuse from being unintentionally separated by external shock, such as vibration of a vehicle, etc. As a result, enhanced assembly efficiency and operation reliability of the LP fuse can be accomplished.

Mode for the Invention

[79] Various embodiments have been described in the best mode for carrying out the invention.

[80] Although the preferred embodiments of the present invention have been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions, and substitutions are possible, without departing from the scope and spirit of the invention as described in the accompanying claims.

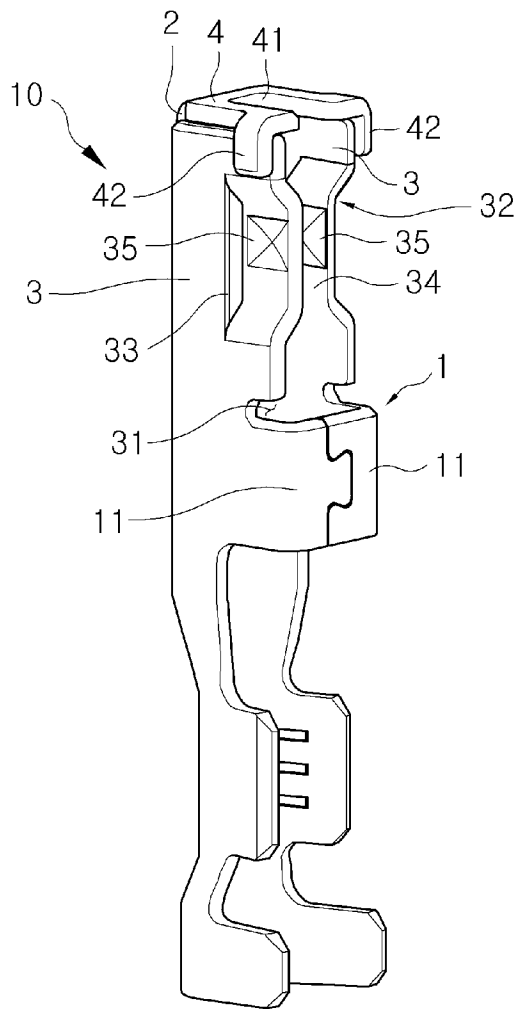
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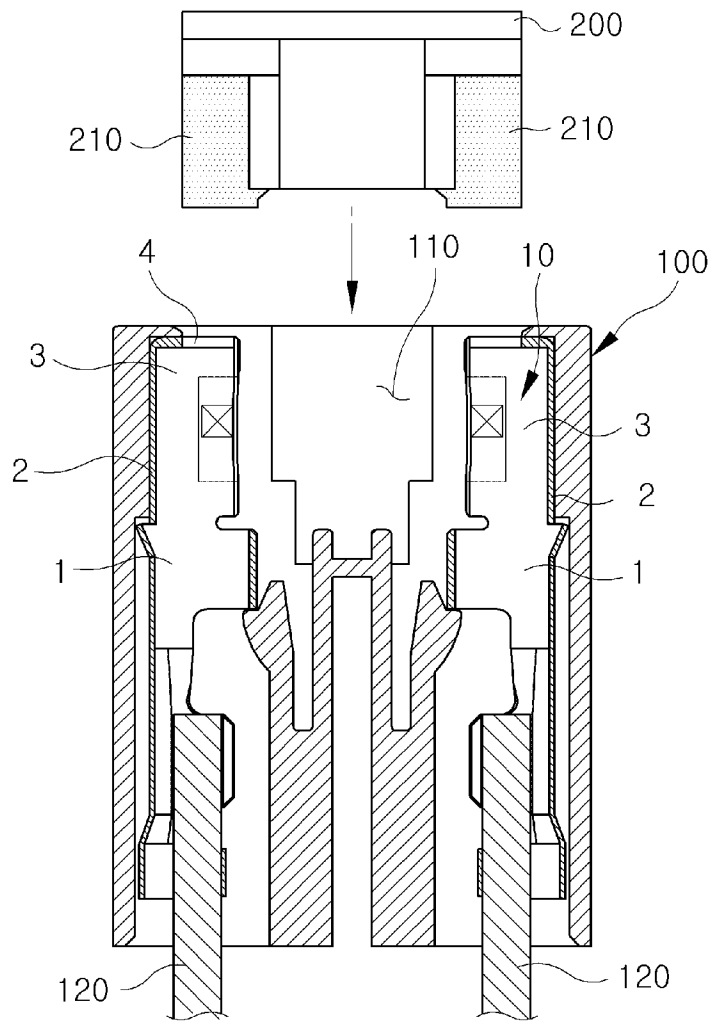
Claims

- [1] A connector for a Low Profile (LP) fuse comprising:
a body inserted into a mounting recess defined in a fuse box and fixed to a bottom surface of the mounting recess, a lower end of which is electrically connected to an electric wire;
a rear piece extending from the body into the mounting recess; and
a pair of supporting pieces bent from opposite sides of the rear piece to extend parallel to each other in a direction orthogonal to an insertion direction (a Z-axis direction) of an electrode terminal of the LP fuse inserted into the mounting recess, thus serving to fix the electrode terminal.
- [2] The connector according to claim 1, wherein:
the pair of supporting pieces respectively includes holding pieces, each being vertically incised to have upper and lower ends connected to the corresponding supporting piece; and
both the holding pieces of the supporting pieces are inwardly indented to be closer to each other.
- [3] The connector according to claim 2, wherein:
the holding pieces respectively have flat surfaces to face each other; and
a press protrusion protrudes inward from the flat surface to press the electrode terminal.
- [4] The connector according to claim 1, further comprising a cover piece extending throughout an upper end of the rear piece and upper ends of the supporting pieces and defining an entrance for the passage of the electrode terminal.
- [5] The connector according to claim 4, wherein the cover piece includes a pair of reinforcing pieces bent from opposite sides of the cover piece to surround the upper ends of the supporting pieces, thus serving to prevent the supporting pieces from being excessively pushed outward away from each other.

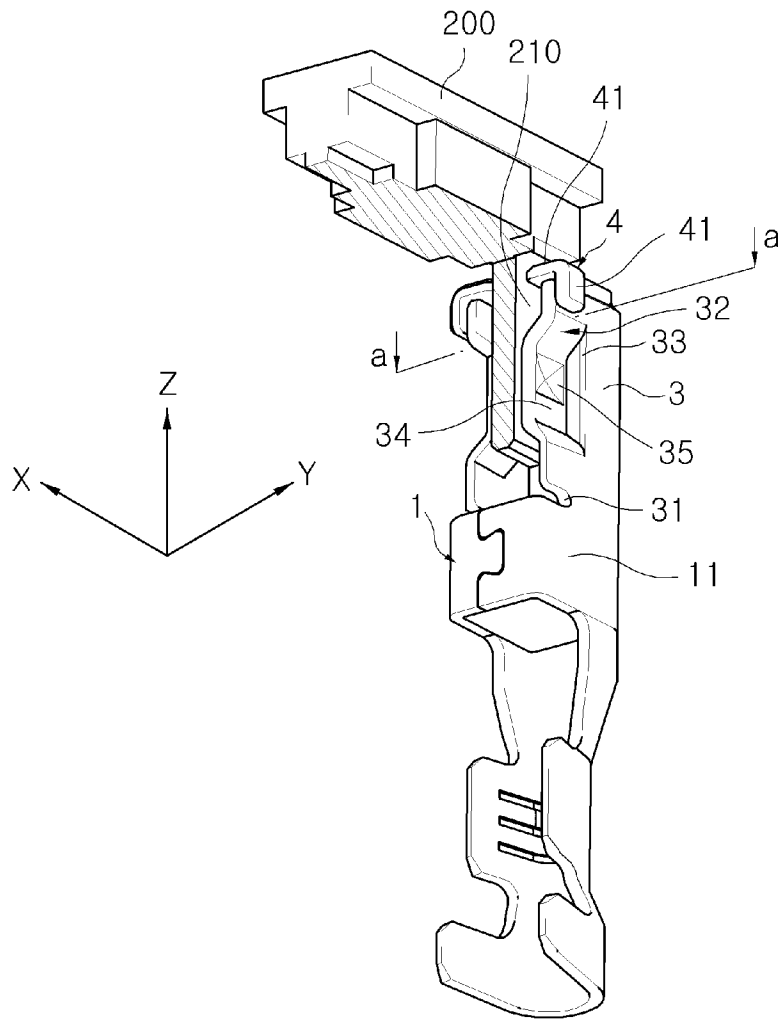
[Fig. 1]



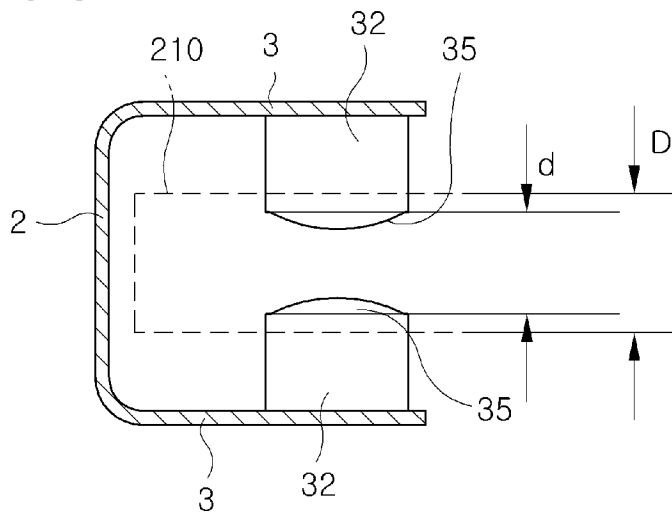
[Fig. 2]



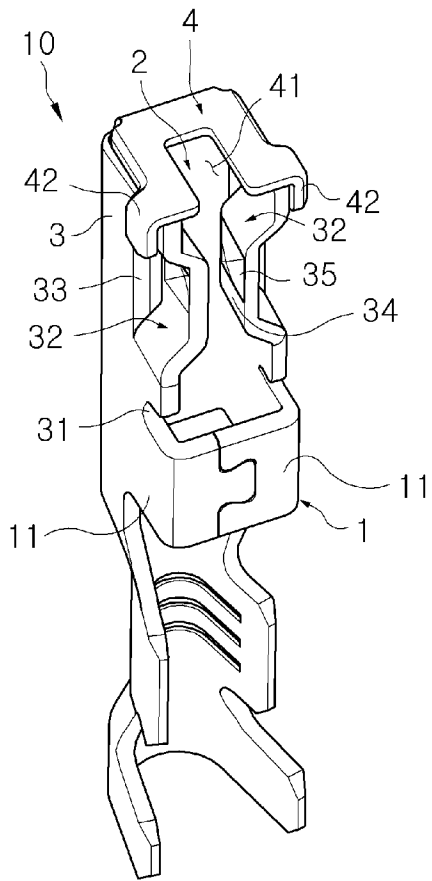
[Fig. 3]



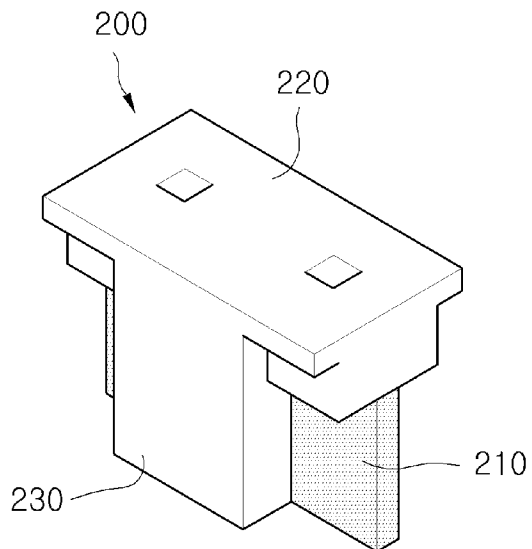
[Fig. 4]



[Fig. 5]



[Fig. 6]



[Fig. 7]

