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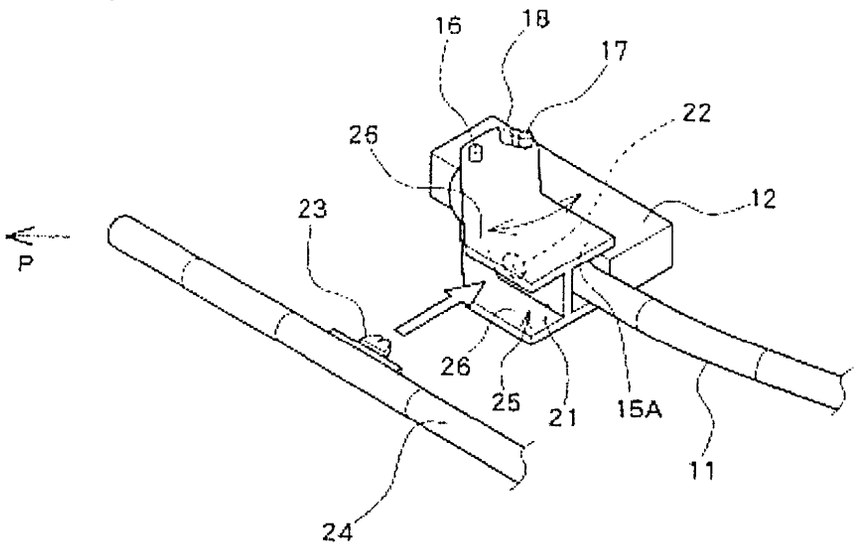
(54) Lever-type connector, wire harness-mounting structure and wire harness-removing method using the same

(57) A lever-type connector includes a frame-like connector-connecting portion for releasably receiving a connector 12 connected to a first wire harness 11, a lever piece 15A for being pivotally supported relative to the connector-connecting portion, and a cam mechanism 17, 18 for engaging the connector-connecting portion and the lever piece 15A with each other so as to bring the lever piece 15A into a connected condition and a released condition relative to the connector-connecting portion. The lever piece 15A has a mounting mechanism 22 for fixedly mounting a second wire harness 24 thereon. When a pulling force is applied to the second wire harness 24 fixedly mounted on the mounting mechanism of the lever piece 15A, the lever piece 15A is operated.

Fig. 7



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Description

BACKGROUND OF THE INVENTION

[0001] This invention relates to a lever-type connector used for connecting a connector, mounted on an end portion of a wire harness, to a mating connector, a wire harness-mounting structure and a wire harness-removing method, using this connector, and more particularly the invention relates to these techniques which facilitate the recycling.

[0002] As is well known, electric connection boxes, such as a junction box (J/B), a relay box (R/B) and an electronic control unit box (ECU/B), are mounted on an automobile to form circuits for connecting wire harnesses to electrical equipments. Such electric connection box has electric circuits (formed by metallic bus bars), such as a power distribution circuit, contained in a casing thereof, and a plurality of connector-connecting portions each for electrical connection to a connector, mounted on an end portion of the wire harness, are formed on the outside of the casing.

[0003] On the other hand, recently, the environmental problem has received wider appreciation, and the effective recycling of the resources has become a large problem to be solved. With respect to such a problem, even discarded automobiles are not an exception. The amount of wire harnesses, used in recent electronically-controlled automobiles, are vast, and the recycling of these wire harnesses can not be ignored in the existing circumstances.

[0004] Here, an example of a conventional connector-connecting structure in an electric connection box or the like will be schematically described with reference to Figs. 1 and 2. In these Figures, a connector portion 2 is mounted on a distal end of a wire harness 1. On the other hand, a connector-connecting portion 4 is formed on the electric connection box 3, and the connector portion 2 can be received in the interior 5 of this connector-connecting portion. A retaining claw 6 is provided at the connector portion 2, and the connector-connecting portion 4 has a retaining hole 7 for engagement with the retaining claw 6 to prevent the disengagement of the connector portion 2.

[0005] Incidentally, for removing a wire harness from a vehicle body to recover it at the time of disassembling a discarded vehicle, a lifting machine, such as a crane, is used, and in this case a J-shaped hook of the machine is brought into engagement with the wire harness, and is lifted so as to remove the wire harness. This is schematically shown in Fig. 3. In this Figure, reference numeral 8 denotes the J-shaped hook provided at the lifting machine such as a crane, and reference numeral 9 denotes the vehicle body. In the case where the connection between the connector portion 2 of the wire harness 1 and the connector-connecting portion 4 of the electric connection box 3 was very firm, the wire harness 1 was cut off when removing the wire harness, and part of the wire harness failed to be recovered, and therefore the problem with this method was the recovery rate.

[0006] There is known another conventional connecting structure using a lever-type connector. An example of such lever-type connector is schematically shown in Figs. 4 to 6. Fig. 4 is a perspective view of the lever-type connector, showing a condition before the connection is effected, Fig. 5 is a partly-broken view as seen from the side, Fig. 6A is a view similar to Fig. 5, but showing the process of the connecting operation, and Fig. 6B is a view similar to Fig. 5, but showing the connected condition.

[0007] In these Figures, a connector portion 12 is mounted on a distal end of a wire harness 11. On the other hand, a connector-connecting portion 14 is formed on an electric connection box 13, and the connector portion 12 can be received in the interior 15 of this connector-connecting portion. A lever piece 15 is pivotally mounted on the connector portion 12 by pin members 16, and cam members 17 are mounted on the connector portion 12. Cam grooves 18, corresponding respectively to the cam members 17, are formed in the lever piece 15. On the other hand, channel-shaped grooves 19 and channel-shaped grooves 20 are formed in inner surfaces of the connector-connecting portion 14 of the electric connection box 13, and the grooves 19 guide the pin members 16, respectively, and are engaged respectively with the pin members 16 when the connector portion 12 is connected to the connector-connecting portion, and the grooves 20 guide the cam members 17, respectively, and are engaged respectively with the cam members 17 when the connector portion 12 is connected to the connector-connecting portion.

[0008] In the above construction, the connector portion 12, connected to the distal end of the wire harness 11, is inserted into the connector-connecting portion 14, with the lever piece 15 held in a released condition (in an upper position) , as shown in Fig. 5. At the time of insertion of the connector portion 12, the pin members 16 are fitted respectively into the grooves 19 in such a manner that the cam members 17 move along the grooves 20, respectively. When the connector portion 12 is inserted to a certain degree, each pin member 16 reaches a lowermost portion of the corresponding groove 19 (Fig. 6A), and thereafter the lever piece 15 is pivotally moved right about the pin members 16 each held in this lowermost portion, and therefore each cam member 17 moves in accordance with the configuration of the cam groove 18. Finally, the lever piece 15 is brought into a recumbent condition as shown in Fig. 6B, and the connected condition is achieved, thus completing the connection of the connector portion 12 to the connector-connecting portion 14.

[0009] In the above construction, for disconnecting the connector portion 12 from the connector-connecting portion 14, the operator pulls the lever piece 15 up with the hand, so that the connection is canceled, and therefore the connector portion can be disconnected.

[0010] Even in the above conventional lever-type connector, however, when a pulling force is applied to the wire harness in order to remove the wire harness from a discarded vehicle to recover it, without canceling the retained condition by pulling the lever piece 15 up with the hand, the wire harness 11 is cut off, and fails to be recovered. And besides, the retained condition is canceled by pulling the lever piece 15 up by the hand of the operator, and therefore in the case where there are provided many lever-type connectors, much time and labor are required for the recovery, and therefore there is encountered problems that the efficiency of the operation is low and that the cost increases.

SUMMARY OF THE INVENTION

[0011] This invention is made in order to overcome the difficulties of the above conventional techniques, and an object of the invention is to provide a lever-type connector in which a wire harness can be easily removed and recovered efficiently with a simple structure without the use of any special member or the like at the time of disassembling a discarded vehicle, and also to provide a wire harness-mounting structure and a wire harness-removing method, using this connector.

[0012] In the present invention, the above problems is solved by adopting the following technical means.

(1) A lever-type connector comprising:

a frame-like connector-connecting portion for releasably receiving a connector connected to a first wire harness;
a lever piece for being pivotally supported relative to the connector-connecting portion; and
a cam mechanism for engaging the connector-connecting portion and the lever piece with each other so as to bring the lever piece into a connected condition and a released condition relative to the connector-connecting portion, wherein
the lever piece has a mounting mechanism for fixedly mounting a second wire harness thereon; and
when a pulling force is applied to the second wire harness fixedly mounted on the mounting mechanism of the lever piece, the lever piece is operated.

(2) A lever-type connector according to the above Item (1), in which the second wire harness has a clamp secured thereto, and the mounting mechanism of the lever piece is a mounting hole in which the clamp is mounted.

(3) A lever-type connector according to the above Item (1), in which the mounting mechanism of the lever piece is a withdrawal prevention member for preventing the withdrawal of the second wire harness after the second wire harness is mounted on the lever piece.

(4) A wire harness-mounting structure, wherein the wire harnesses are fixedly mounted by using a lever-type connector as defined in any one of the above Items (1) to (3).

(5) A wire harness-removing method for a wire harness-mounting structure as defined in the above Item (4), comprising the steps of applying a pulling force from a lifting machine to the second wire harness to operate the lever piece of the lever-type connector, removing the first wire harness, and removing the second wire harness.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig. 1 is a perspective view showing an example of a conventional connector-connecting structure.
Fig. 2 is a partly-cross-sectional view of the connector-connecting structure of Fig. 1.
Fig. 3 is a view showing the manner of removing a wire harness in the connector-connecting structure of Figs. 1 and 2.
Fig. 4 is a perspective view showing the structure of a conventional lever-type connector, showing a condition before the connection is effected.
Fig. 5 is a partly-broken side-elevational view of the conventional lever-type connector, showing the condition before the connection is effected.
Figs. 6A and 6B are partly-broken views of the conventional lever-type connector, and Fig. 6A shows the process of the connecting operation, and Fig. 6B shows the connected condition.
Fig. 7 is a perspective view showing the structure of a wire harness-side connector portion of a lever-type connector embodying the invention.
Fig. 8 is a partly-broken side-elevational view of the lever-type connector of the invention, showing a condition before the connection is effected.
Figs. 9A and 9B are partly-broken views of the lever-type connector of the invention, and Fig. 9A shows the process of the connecting operation, and Fig. 9B shows the connected condition.
Fig. 10 is a view showing one method of fixedly mounting a wire harness on a lever piece.
Fig. 11 is a view showing another method of fixedly mounting the wire harness on the lever piece.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] A preferred embodiment of the present invention will now be described.

[0015] A preferred embodiment of a lever-type connector of the invention is schematically shown in Figs. 7 to 9. Fig. 7 is a schematic, perspective view showing

a wire harness-side portion of the lever-type connector of the invention. Fig. 8 is a view similar to Fig. 5, but showing the lever-type connector of the invention. Fig. 9A is a view similar to Fig. 8, but showing the process of a connecting operation, and Fig. 9B is a view similar to Fig. 8, but showing a connected condition. In these Figures, those elements, similar to those of Figs. 3 to 6, are designated by identical reference numerals, respectively. In Figs. 8 and 9, the showing of a clamp and a clamp-mounting hole (described later) is omitted for convenience' sake.

[0016] In the lever-type connector of this embodiment, a connector portion 12 is mounted on a distal end of a wire harness 11 as in the conventional type. On the other hand, a connector-connecting portion 14 is formed on an electric connection box (not shown), and the connector portion 12 can be received in the interior of this connector-connecting portion. A lever piece 15A is pivotally mounted on the connector portion 12 by pin members 16, and cam members 17 are mounted on the connector portion 12. Cam grooves 18, corresponding respectively to the cam members 17, are formed in the lever piece 15A. On the other hand, the electric connection box is similar in structure to that shown in Figs. 3 to 6, and channel-shaped grooves 19 and channel-shaped grooves 20 are formed in inner surfaces of the connector-connecting portion 14, and the grooves 19 guide the pin members 16, respectively, and are engaged respectively with the pin members 16 when the connector portion 12 is connected to the connector-connecting portion, and the grooves 20 guide the cam members 17, respectively, and are engaged respectively with the cam members 17 when the connector portion 12 is connected to the connector-connecting portion.

[0017] Although the above structure is similar to that of the conventional type of Figs. 4 to 6 except the lever piece 15A, the lever-type connector of this embodiment much differs in structure from the conventional type in the following points. Namely, the clamp-mounting hole 22 is formed in a rear portion of the lever piece 15A, and wall portions 26, which form a receiving portion 25 for receiving a wire harness 24 having the clamp 23 secured thereto, extend from the rear portion 21. The clamp-mounting hole 22 serves to retain and fix the clamp 23 secured to the wire harness 24. The clamp 23 is fixedly secured to the wire harness 24 by known fixing means such as a winding tape or a fastening band.

[0018] In the above construction, the clamp 23, secured to the wire harness 24, is inserted into the mounting hole 22, formed in the lever piece 15A, and is retained and fixed relative thereto. As a result, the wire harness 24 is fixedly secured to the lever piece 15A. In this condition, that portion of the wire harness 24, to which the clamp 23 is secured, is received in the receiving portion 25, and is prevented by the wall portions 26 from lateral movement.

[0019] The subsequent connecting operation is similar to that shown in Figs. 3 to 6, and the connector portion 12, connected to the distal end of the wire harness 11, is inserted into the connector-connecting portion 14, with the lever piece 15A held in a released condition (in an upper position), as shown in Fig. 8. At the time of insertion of the connector portion 12, the pin members 16 are fitted respectively into the grooves 19 in such a manner that the cam members 17 move along the grooves 20, respectively. When the connector portion 12 is inserted to a certain degree, each pin member 16 reaches a lowermost portion of the corresponding groove 19 (Fig. 9A), and thereafter the lever piece 15A is pivotally moved right about the pin members 16 each held in this lowermost portion, and therefore each cam member 17 moves in accordance with the configuration of the cam groove 18. Finally, the lever piece 15A is brought into a recumbent condition as shown in Fig. 9B, and the connected condition is achieved, thus completing the connection of the connector portion 12 to the connector-connecting portion 14.

[0020] In the above construction, for disconnecting the connector portion 12 from the connector-connecting portion 14, a pulling force is applied to the wire harnesses 11 and 24 through a J-shaped hook (not shown) of a lifting machine such as a crane, thereby pulling the wire harnesses up. At this time, when the pulling force is applied in a direction of arrow P (Fig. 7) , this pulling force is transmitted to the lever piece 15A through the wire harness 24, so that the lever piece 15A is operated or moved from its recumbent condition into its lifted condition. As a result, the connected condition of the lever-type connector is automatically canceled. By further applying the pulling force, not only the wire harness 11 but also the wire harness 24 can be removed and recovered without being cut off at their intermediate portion. And besides, the connection and disconnection of the connector can be easily effected with the simple structure without the use of any special part or the like, and the wire harnesses can be efficiently removed and recovered.

[0021] Although one preferred embodiment of the present invention is described above in detail, the invention is not limited to the above embodiment, but various modifications and changes can be made.

[0022] For example, in the above embodiment, the wire harness 24 is fixedly secured to the lever piece 15A by the retaining engagement of the clamp 23 (mounted on the wire harness 24) in the mounting hole 22 formed in the lever piece 15A, as shown in Fig. 10. However, the fixing of the wire harness 24 to the lever piece may be effected by withdrawal prevention members 27 formed respectively on the inner surfaces of the wall portions 26, as shown in Fig. 11. In another modification, the wall portions, forming the receiving portion 25, may be deformed into such a configuration as to fix the wire harness in a gripping manner. In a further modification, any suitable fixing member for fixing the wire harness 24 may be provided at the rear portion of the lever piece.

[0023] In the above embodiment, although the cam

members 17 and the cam grooves 18, which jointly form the cam mechanism, are provided at the lever piece (15A) side, there may be adopted a construction in which the cam members are provided at the lever piece side while the cam grooves are provided at the connector-connecting portion of the electric connection box, or there may be adopted the reverse combination thereof.

[0024] In the present invention, the first and second wire harnesses, fixedly secured respectively to the connector portion and the lever piece, may be separate from each other, or may be two wire harnesses branching off from one wire harness.

[0025] The lever piece and the connector-connecting portion of the electric connection box are not limited to the respective illustrated configurations, but can be changed into desired configurations, respectively.

[0026] The lever-type connector of the present invention is described in the foregoing, and according to the present invention, there is provided the wire harness-mounting structure, using this lever-type connector. For the reasons described above, this mounting structure has advantages that the recovery of the wire harnesses can be effected easily and that the mounting of the wire harnesses is easy.

[0027] Further, according to the present invention, there is provided the method in which the pulling force of the hook of the lifting machine is caused to act on the second wire harness in the wire harness-mounting structure, and by doing so, the lever piece of the lever-type connector is automatically operated so as to effect the removal of the first wire harness, and also the removal of the second wire harness is effected. Therefore, advantageously, the wire harness-removing operation is easy, and the recovery cost can be reduced, and besides the recovery rate can be increased.

[0028] As described above in detail, in the present invention, the above construction and method are adopted, and therefore the wire harnesses can be smoothly removed and recovered without being cut at their intermediate portion at the time of disassembling a discarded vehicle. Therefore, the efficiency of the wire harness-removing operation is enhanced, and the recovery cost is reduced, and besides the recovery rate is increased.

Claims

1. A lever-type connector comprising:

a frame-like connector-connecting portion for releasably receiving a connector connected to a first wire harness;
a lever piece for being pivotally supported relative to said connector-connecting portion; and
a cam mechanism for engaging said connector-connecting portion and said lever piece with each other so as to bring said lever piece into a connected condition and a released condition relative to said connector-connecting portion, wherein
said lever piece has a mounting mechanism for fixedly mounting a second wire harness thereon; and
when a pulling force is applied to said second wire harness fixedly mounted on said mounting mechanism of said lever piece, said lever piece is operated.

2. The lever-type connector according to claim 1, wherein
said second wire harness has a clamp secured thereto, and
said mounting mechanism of said lever piece is a mounting hole in which said clamp is mounted.

3. The lever-type connector according to claim 1, wherein
said mounting mechanism of said lever piece is a withdrawal prevention member for preventing the withdrawal of said second wire harness after said second wire harness is mounted on said lever piece.

4. The wire harness-mounting structure, wherein
said wire harnesses are fixedly mounted by using a lever-type connector as defined in any one of claims 1 to 3.

5. A wire harness-removing method for a wire harness-mounting structure as defined in claim 4, comprising the steps of:

applying a pulling force from a lifting machine to said second wire harness to operate said lever piece of said lever-type connector,
removing said first wire harness, and
removing the second wire harness.

Fig. 1

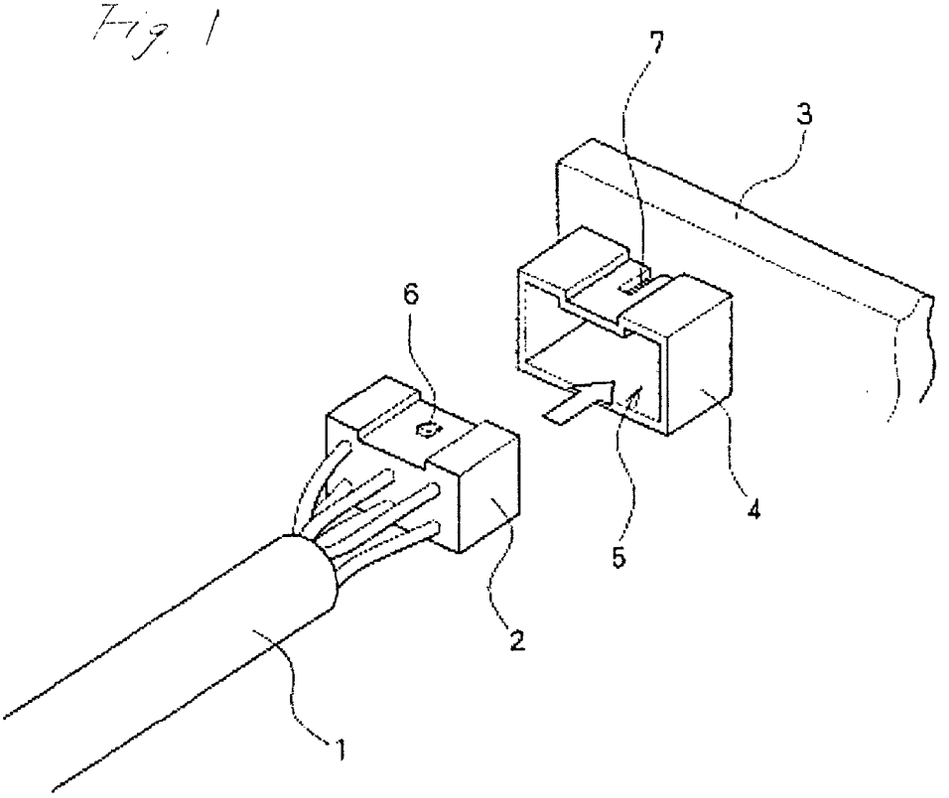

Fig 2

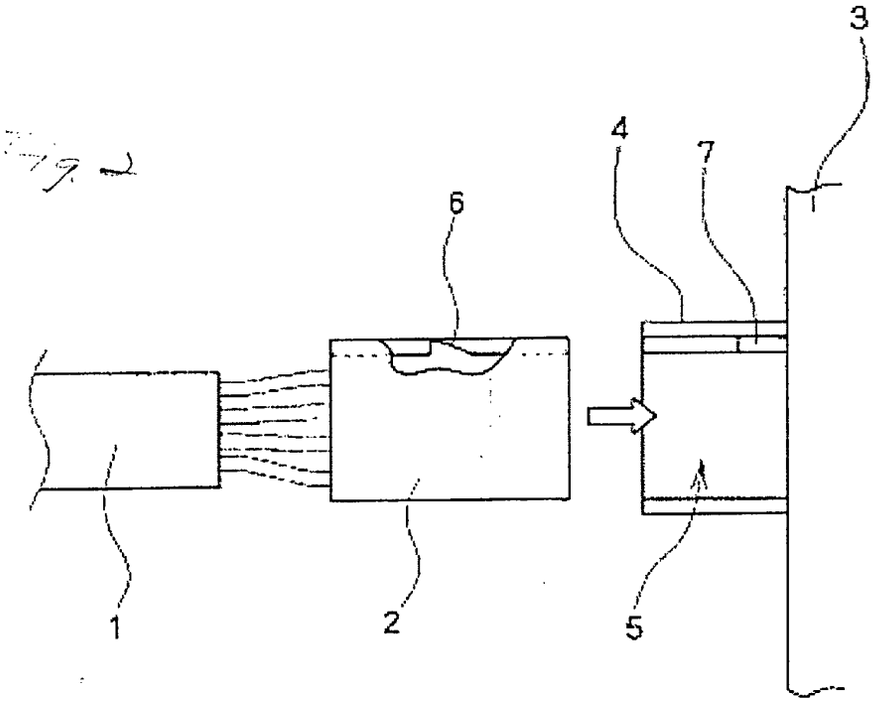

Fig. 3

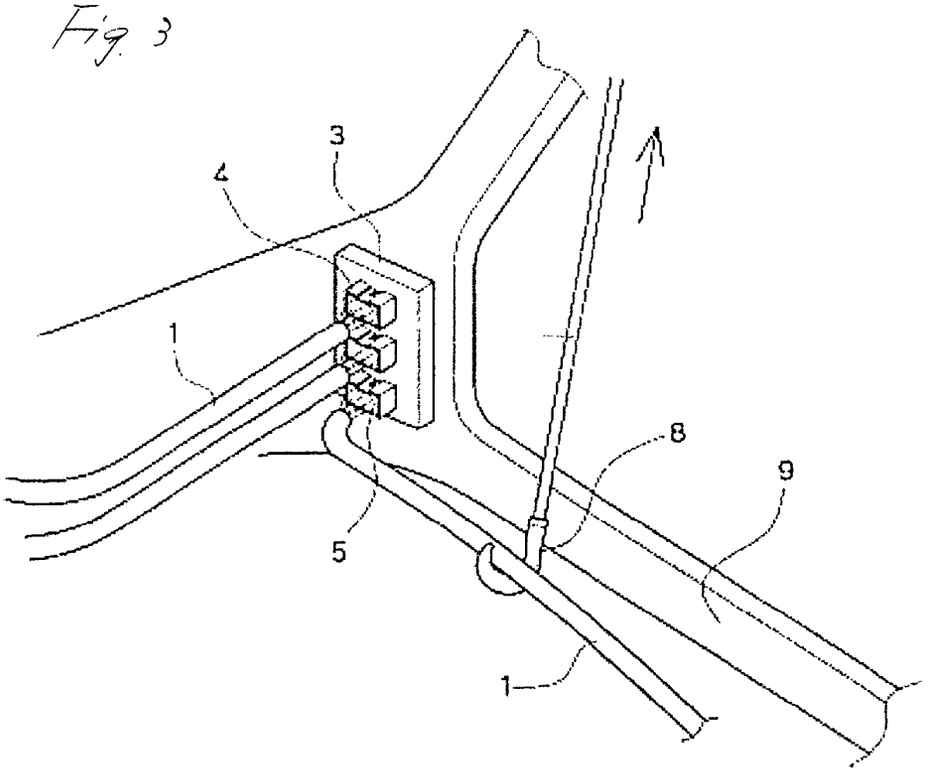

Fig. 4

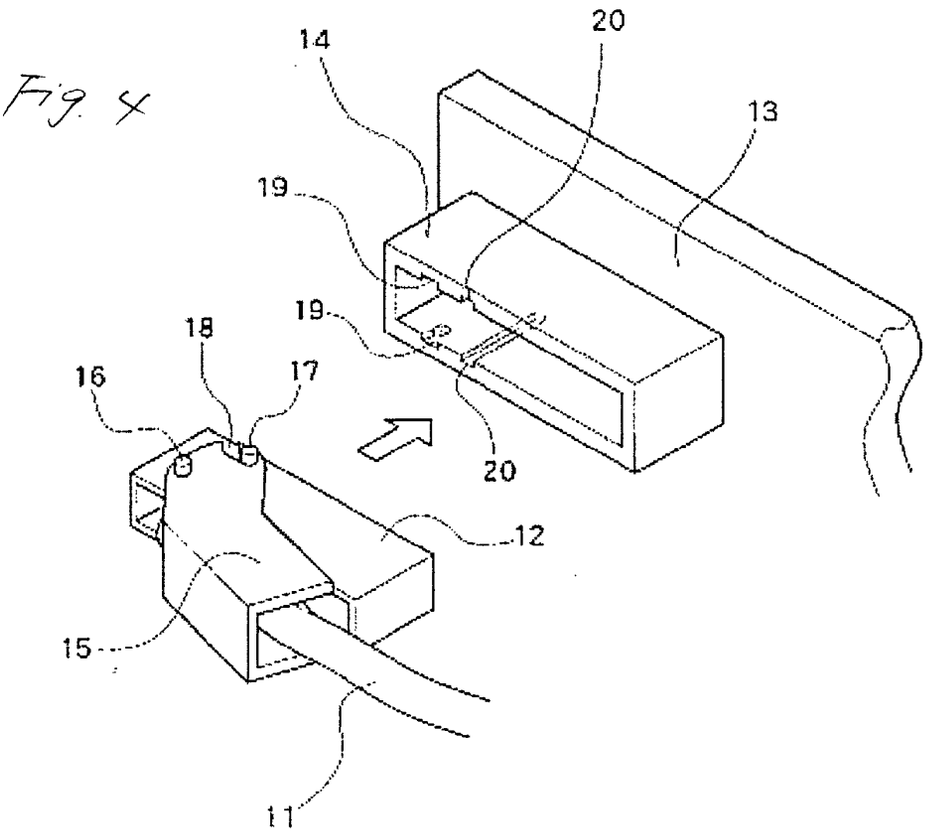

Fig. 5

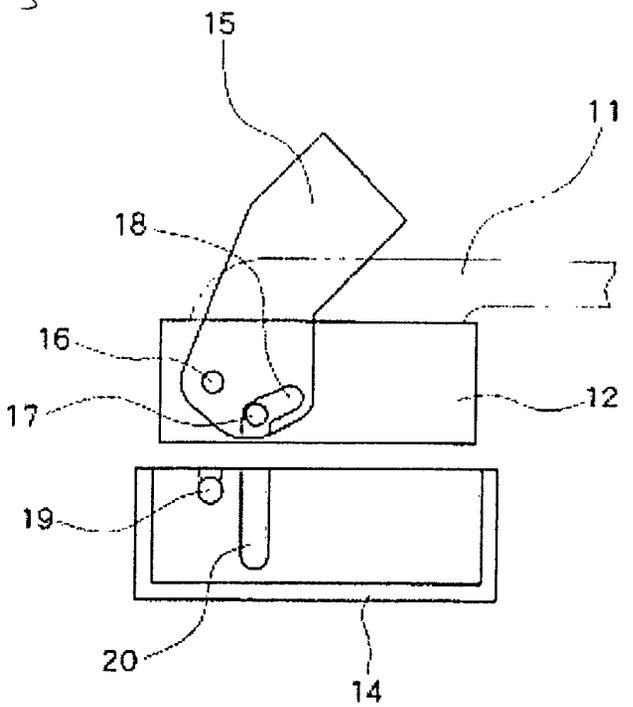

Fig. 6A ~~(a)~~

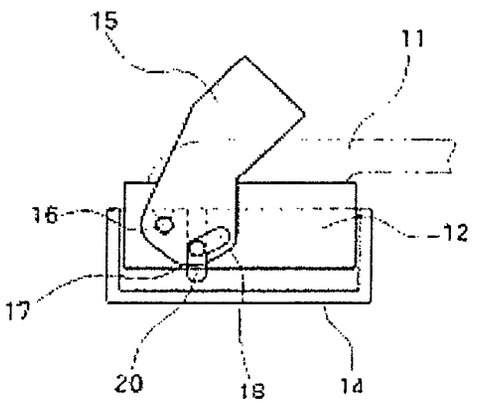

Fig. 6B ~~(b)~~

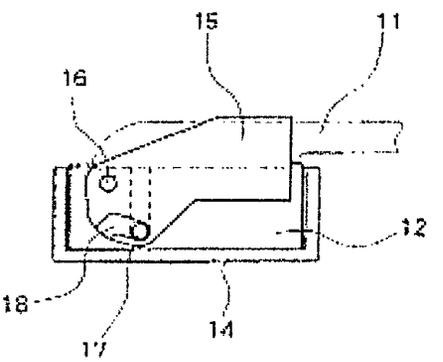

Fig. 7

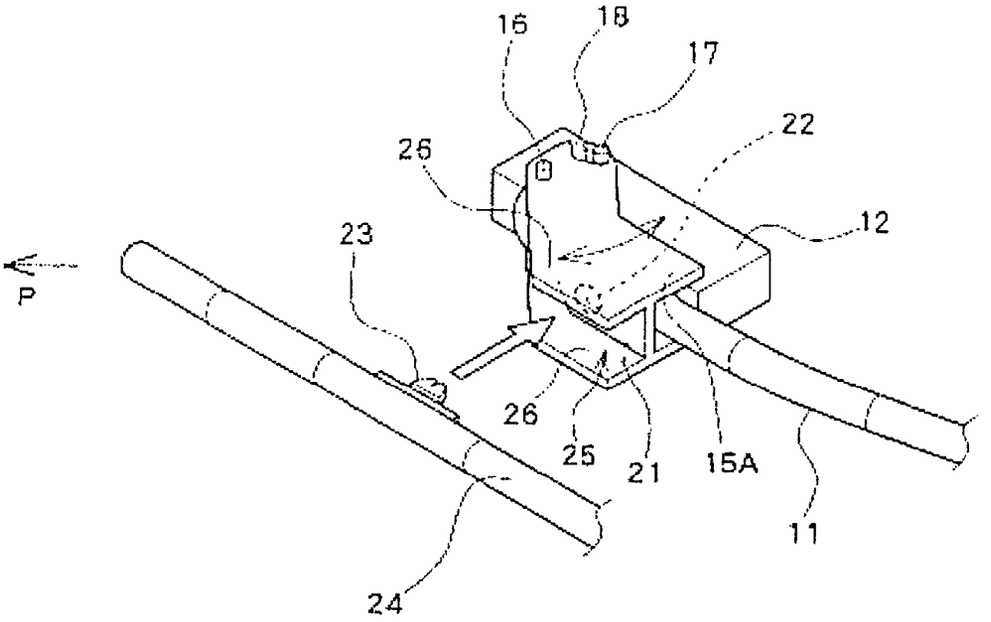
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Fig. 8

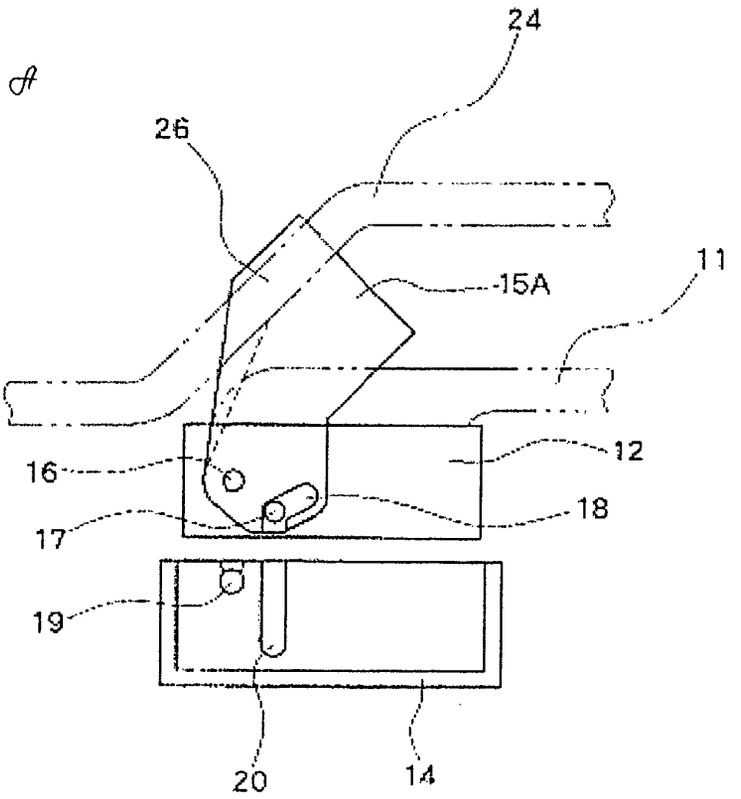
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Fig. 9A (a)

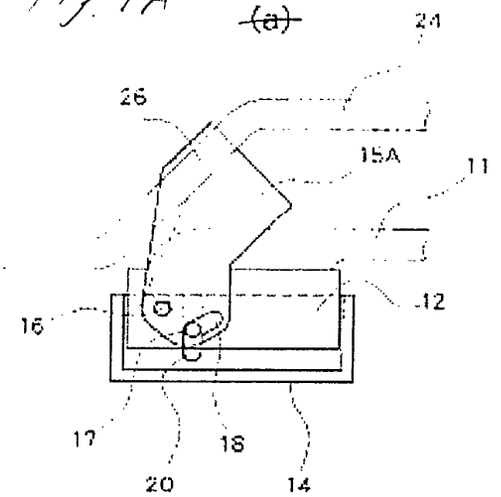


Fig. 9B (b)

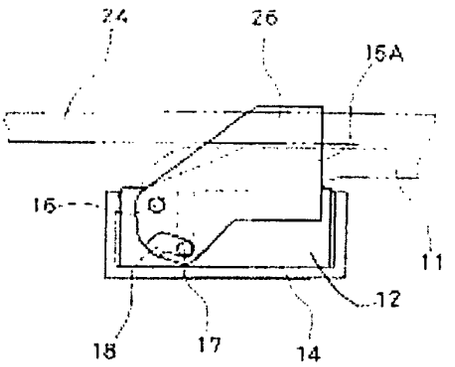


Fig. 10

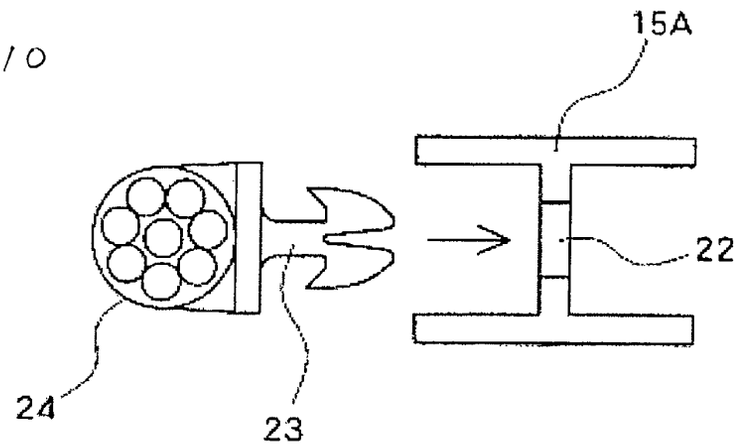
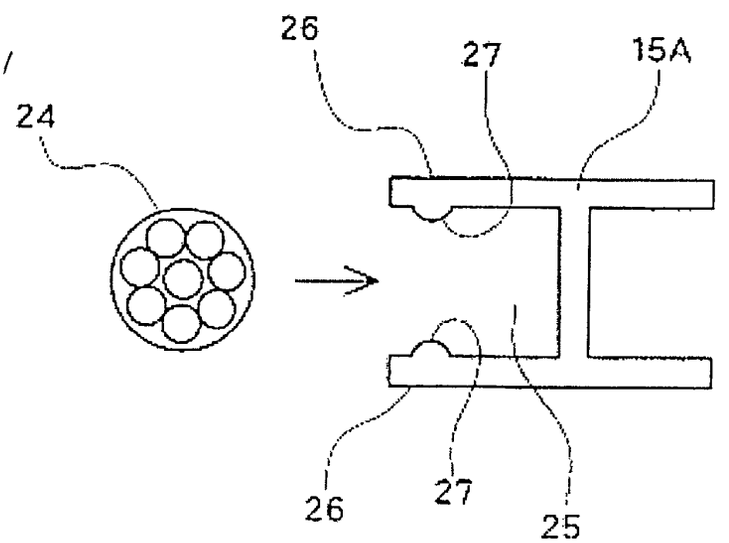


Fig. 11



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 01 8712

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 42 14 016 A (V.BREUST) 4 November 1993 (1993-11-04) * column 2, line 39 - line 47 * * column 2, line 64 - column 3; claim 10; figures 2,3 *	1,3-5	H01R13/633 H01R13/629
A	FR 2 659 502 A (BERNIER) 13 September 1991 (1991-09-13) * page 9, line 9 - line 24; figure 10 *	1-5	
A	US 5 330 411 A (M.FUJITANI ET AL) 19 July 1994 (1994-07-19) * column 1, line 5 - line 34; figures 1,2 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	10 December 2002	Alexatos, G

CATEGORY OF CITED DOCUMENTS

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