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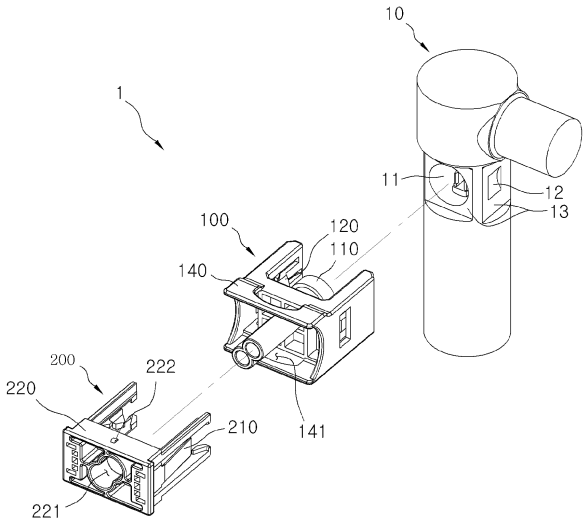
(54) Double locking connector for an injector

(57) There is provided a double locking connector (1) for an injector (10), which is used to connect, say, a tube to the injector (10) with enhanced binding force thereof so as not to be easily separated from the injector by external force, such as vibration. The double locking connector (1) includes a coupling connector (100) and a lock connector (200) coupled with each other. The coupling connector (100) includes a fitting tube (110) to be inserted into a fitting hole (11) formed in the injector (10), and an insert (120) to be fitted, via elastic movement thereof, into an insertion recess (12) formed at either side of the fitting hole (11) of the injector (10). The lock connector (200) includes a press arm (210) to press the insert (120) towards the insertion recess (12). As the press arm (210) of the lock connector (200) strongly presses the elastic insert (120) of the coupling connector (100), enhanced binding force between the coupling connector (100) and the injector (10) is accomplished.

FIG.1



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Description

[0001] The present invention relates to a connector devised to connect, e.g., a tube to a certain position of an injector, and more particularly, to a double locking connector for an injector, which may achieve enhanced binding force thereof, so as not to be easily separated from the injector by external force, such as vibration, etc.

[0002] An injector for use in an automobile generally has a hollow tubular shape, such that, e.g., a supply tube for mixed gas of fuel and air and a solenoid operating cable for injection of the mixed gas penetrate through the injector.

[0003] Accordingly, to connect the mixed gas supply tube and cable to the injector, the cylindrical injector is laterally perforated with a hole. A connector, to which a variety of tubes is coupled, is fitted into the hole of the injector, allowing the variety of tubes to be coupled to the injector.

[0004] The connector is separably coupled with the injector, to enable exchange of the injector as necessary.

[0005] In this case, although the coupling of the connector and injector may be accomplished via simple fitting or assembly of bolts and nuts, the connector generally includes an elastic means for easy separable coupling thereof.

[0006] The elastic means may be an elastic clip or band, or, may be an elastic protruding piece integrally formed with the connector, for elastic fitting of the connector.

[0007] The coupling of the connector using the elastic means allows a user to easily separate the connector from the injector by deforming the connector to overcome elasticity of the elastic means. However, if vibration caused during traveling of an automobile is transmitted to the elastic means, the elastic means may suffer from fatigue accumulation and consequently, elasticity thereof may be reduced.

[0008] The connector, which exhibits reduced elasticity due to long term operation of an automobile, may be unexpectedly separated from the injector during traveling of the automobile, resulting in a higher risk of serious traffic accidents.

[0009] Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to achieve secure coupling of an injector and a connector, so as to prevent the connector from being separated from the injector by vibration of an automobile.

[0010] It is another object of the present invention to provide a connector for an injector with elastic means to keep the connector coupled with the injector at a fixed position without movement despite vibration of an automobile, thereby eliminating loss of elasticity due to fatigue accumulation.

[0011] It is another object of the present invention to achieve enhanced securing force for elastic means.

[0012] It is another object of the present invention to assure that an elastic means fixing member is coupled at an accurate position.

[0013] It is another object of the present invention to achieve one-touch coupling of an injector and a connector.

[0014] It is another object of the present invention to allow an assembly of two connectors coupled with each other to be simultaneously coupled to an injector via a single push operation.

[0015] It is another object of the present invention to allow an assembly of two connectors to be easily separated from an injector when the connectors are disassembled.

[0016] It is a further object of the present invention to allow an assembly of two connectors to be easily separated from an injector via movement of elastic means when the connectors are disassembled.

[0017] In accordance with an aspect of the present invention, the above and other objects can be accomplished by the provision of a double locking connector for an injector including a coupling connector including a fitting tube to be inserted into a fitting hole formed in an injector, and an insert to be fitted, via elastic movement thereof, into an insertion recess formed at either side of the fitting hole of the injector, and a lock connector coupled with the coupling connector and including a press arm to press the insert toward the insertion recess.

[0018] The insert may have elasticity and may be configured to extend inward from an end of a housing facing the injector, the housing defining an outer contour of the coupling connector, and the press arm may be configured to be fitted between the insert and the housing and may act to press the insert so as to restrict the elastic movement of the insert.

[0019] The housing may include a raised push portion protruding toward the insert.

[0020] The insert may include a guide rail, along which a press protrusion formed at the press arm slides.

[0021] A flange having a locking hole may be formed at either side of an end of the coupling connector opposite to the injector, and an end of the lock connector opposite to the injector may be formed with a locking pin to be caught by the locking hole.

[0022] The lock connector may be coupled with the coupling connector after the coupling connector is completely coupled with the injector.

[0023] The fitting tube may be laterally formed with a transfer wing, the press arm may be formed with a press protrusion having an inclined end to pass over the transfer win, and the press arm may be further formed with a transfer protrusion, which presses the transfer wing to push the fitting tube to the fitting hole when the lock connector is inserted into the coupling connector.

[0024] The lock connector may further include a locking release arm to elastically move the insert away from the insertion recess, to allow the coupling connector to be separated from the injector when the lock connector is retreated to an end of the coupling connector opposite

to the injector.

[0025] The insert may be formed at a distal end portion thereof with an insertion ridge and an expanded holding portion, the insertion ridge being configured to be inserted into the insertion recess, and the expanded holding portion being configured to have a larger width than a remaining portion of the insert. The locking release arm may include a locking piece spaced parallel to and apart from the press arm and formed at a distal end thereof with a hook, the hook being configured to be caught by the expanded holding portion and acting to push the expanded holding portion away from the fitting tube, so as to allow the insertion ridge of the insert to be separated from the insertion recess.

[0026] 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:

FIG. 1 is a perspective view illustrating an injector and a double locking connector for the injector according to an exemplary embodiment of the present invention;

FIG. 2 is a perspective view illustrating a coupled state of the injector and double locking connector shown in FIG. 1;

FIG. 3A is a perspective view illustrating the cross-sectional configuration of a coupling connector involved in the double locking connector for the injector shown in FIG. 1;

FIG. 3B is a partially enlarged perspective view of the coupling connector shown in FIG. 3A;

FIG. 4 is a perspective view illustrating the cross-sectional configuration of a lock connector involved in the double locking connector for the injector shown in FIG. 1;

FIG. 5A is a longitudinal sectional view illustrating a partially assembled state of the coupling connector involved in the double locking connector for the injector shown in FIG. 1;

FIG. 5B is a cross-sectional view illustrating the partially assembled state of FIG. 5A;

FIG. 6A is a longitudinal sectional view illustrating a completely assembled state of the coupling connector involved in the double locking connector for the injector shown in FIG. 1;

FIG. 6B is a cross-sectional view illustrating the completely assembled state of FIG. 6A;

FIG. 7A is a longitudinal sectional view illustrating a coupling released state of the coupling connector involved in the double locking connector for the injector shown in FIG. 1; and

FIG. 7B is a cross-sectional view of the released state of FIG. 7A.

[0027] Hereinafter, functions, configurations, and operations of a double locking connector for an injector according to an exemplary embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0028] Referring to FIG. 1, the double locking connector 1 includes a coupling connector 100 to be secured to the injector 10 via elastic means, and a lock connector 200 coupled with the coupling connector 100 and serving to keep the elastic means at a fixed position.

[0029] The injector 10 has an approximately cylindrical hollow tubular shape. A fitting hole 11 is perforated in a lateral position of the injector 10 and communicates with an interior space of the injector 10. Also, a pair of insertion recesses 12 is dented in an outer surface of the injector 10 at opposite sides of the fitting hole 11.

[0030] The insertion recesses 12 are oriented in a direction perpendicular to the fitting hole 11. All the fitting hole 11 and insertion recesses 12 have indented plane portions 13 therearound, enabling surface-to-surface contact between the coupling connector 100 and the injector 10.

[0031] The coupling connector 100 includes a fitting tube 110 configured to be fitted into the fitting hole 11. The coupling of the coupling connector 100 and injector 10 is accomplished as inserts 120 are fitted into the respective insertion recesses 12.

[0032] The lock connector 200 includes locking pieces 231 and press arms 210 protruding from a body 220 thereof in a given direction. As the locking pieces 231 and press arms 210 are inserted into the coupling connector 100, the lock connector 200 is coupled with the coupling connector 100. In a coupled state of both the connectors 100 and 200, a rear portion of the fitting tube 110 protrudes from a rear end of the lock connector 200 by passing through an opening 221 perforated in the body 220.

[0033] The lock connector 200 may be fastened to the coupling connector 100 via various fastening means, such as bolts, clutch members, etc.

[0034] In this case, to assure simplified configurations and easy coupling of both the lock connector 200 and coupling connector 100, the coupling connector 100 may be formed at opposite sides of a rear end thereof with flanges 140 each having a locking hole 141, whereas the lock connector 200 may be formed at the rear end thereof with locking pins 222 to be caught by the respective locking holes 141.

[0035] More specifically, as shown in FIG. 2, the lock connector 200 is able to be inserted into the coupling connector 100 as the locking pins 222 push the flanges 140 outward and then, is able to be secured to the coupling connector 100 as the locking pins 222 are caught by edges of the respective locking holes 141. Thereafter, if a user forcibly retracts the lock connector 200, the flanges 140 are again pushed outward, allowing the lock connector 200 to be separated from the rear end of the coupling connector 100.

[0036] Referring to FIG. 3A, the coupling connector 100, as described above, includes a housing 130 spaced apart from the centrally formed fitting tube 110 thereof,

the housing 130 defining an outer contour of the coupling connector 100. A sealing member 111, such as a rubber ring, may be fitted around the fitting tube 110, to achieve enhanced air tightness between an outer periphery of the fitting tube 110 and an inner periphery of the fitting hole 11.

[0037] The inserts 120 extend from a front end of the housing 130, i.e. extend from an insertion beginning end of the housing 130 toward the injector 10. The inserts 120 have elasticity and are arranged at opposite sides of the coupling connector 100 to face each other thus corresponding to the respective insertion recesses 12 of the injector 10.

[0038] Transfer wings 112 are formed at opposite sides of an outer periphery of the fitting tube 110 so as to be spaced apart from the housing 130. Each of the transfer wings 112 has an inclined front end 112a. In this case, spaces defined between the respective transfer wings 112 and the housing 30 serve as elastic movement passages of the press arms 210. The transfer wing 112 is configured such that a front surface 113 thereof comes into contact with a peripheral region of the fitting hole 11 of the injector 10, thus also serving as a stopper of the coupling connector 100.

[0039] Referring to FIG. 3B illustrating the insert 120 in enlarged scale, each of the inserts 120 is formed at a distal end portion thereof with an insertion ridge 122, the inserting ridge 122 protruding inward, i.e. toward the center of the coupling connector 100. In this case, the insertion ridge 122 may be formed into various shapes based on the shape of the corresponding insertion recess 12.

[0040] The insert 120 may be further formed at the distal end portion thereof with an expanded holding portion 123. The expanded holding portion 123 is configured such that it slightly protrudes in a direction perpendicular to a longitudinal direction of the insert 120 and thus, has a larger width than a remaining portion of the insert 120. The expanded holding portion 123 may have an inclined front end 123a.

[0041] The insert 120 further includes a center guide rail 121, which takes the form of an elongated groove and serves to guide a press protrusion that will be described hereinafter.

[0042] Referring to FIG. 4, the lock connector 200 includes the elongated elastic press arms 210 extending from opposite sides of the body 220 and configured to be inserted into the coupling connector 100 and in turn, press protrusions 211 and transfer protrusions 212 protrude from facing surfaces of both the press arms 210. In this case, each of the press protrusions 211 has an inclined front end 211a and an inclined rear end 211b, and each of the transfer protrusions 212 has an inclined rear end 212b.

[0043] In addition, the lock connector 200 may include locking release arms 230 provided at opposite sides of each of the press arms 210. The locking release arms 230 serve to prevent the lock connector 200 from being completely separated from the coupling connector 100 when the lock connector 200 is retracted from the coupling connector 100 and also, serve to assure easy separation of the coupling connector 100 and injector 10.

[0044] The locking release arms 230 may include a pair of the locking pieces 231, which extend from the body 220 in a direction parallel to the corresponding press arm 210, the locking pieces 231 being longer than the press arm 210. Hooks 232 are formed at front ends of the respective locking pieces 231, so as to face each other. Each of the hooks 232 has an inclined front end 232a and an inclined rear end 232b, both the inclined front and rear ends 232a and 232b having approximately the same inclination and being arranged to extend parallel to each other.

[0045] Referring to FIGS. 5A and 5B, for the purpose of achieving one-touch coupling of the injector 10 and double locking connector 1, first, the lock connector 200 is inserted into the coupling connector 100 through the rear end of the coupling connector 100 and acts to press the coupling connector 100 toward the injector 10. Alternatively, the lock connector 200 may be inserted into the coupling connector 100 after completion of elastic coupling of the coupling connector 100 and injector 10.

[0046] Specifically, a direction of pressing the coupling connector 100 to couple the coupling connector 100 to the injector 10 is identical to a direction for pressing the lock connector 200 to couple the lock connector 200 to the coupling connector 100. Therefore, by pressing the front end of the coupling connector 100 placed on the injector 10 one time in a state wherein a front portion of the lock connector 200 is partially inserted into the coupling connector 100 (hereinafter, this state is referred to as a "partially assembled state"), coupling of the double locking connector 1 and injector 10 may be accomplished.

[0047] More specifically, owing to the inclined front ends 211a of the press protrusions 211 provided at the press arms 210, the press arms 210 are able to be elastically pushed outward of the body 220 under the guidance of the transfer wings 112, allowing the lock connector 200 to be partially inserted into the coupling connector 100.

[0048] The transfer protrusions 212 are located closer to the body 220 than the press protrusions 211 formed at distal ends of the press arms 210. As front ends of the transfer protrusions 212 come into contact with the transfer wings 112 in a direction perpendicular to the direction of pressing the lock connector 200, the lock connector 200 is caught so as not to be further inserted into the coupling connector 100. That is, with engagement of the transfer protrusions 212 and transfer wings 112, it is impossible to insert the lock connector 200 further into the coupling connector 100. If the lock connector 200 is pushed in this state, the coupling connector 100 is moved toward the injector 10.

[0049] Referring to FIGS. 6A and 6B, if the lock connector 200 is further pressed toward the injector 10, the

inserts 120 of the coupling connector 100 are first pushed and moved toward inner wall surfaces of the housing 130 by the peripheral regions of the insertion recesses 12 of the injector 10 and then, are elastically restored in the insertion recesses 12 as indentations formed in the outer surface of the injector 10, thereby being fitted into the insertion recesses 12.

[0050] In this case, the press arms 210 are inserted until distal ends thereof reach certain positions in the peripheral region of the fitting hole 11 of the injector 10. Thereafter, when the coupling connector 100 is further pushed to the injector 10 thus causing the inserts 120 to be elastically moved toward the housing 130 of the coupling connector 100 by the peripheral regions of the insertion recesses 12, the distal ends of the press arms 210 are also pushed toward the housing 130 of the coupling connector 100 by the outer periphery of the injector 10.

[0051] As the press arms 210 are pushed outward toward the housing 130 of the coupling connector 100 by the outer periphery of the injector 10, the transfer protrusions 212 of the press arms 210 are also moved outward of the transfer wings 112, thereby being more deeply inserted into the coupling connector 100 beyond the transfer wings 112. Thereafter, the lock connector 200 is coupled to the coupling connecter 100 after the coupling connector 100 is coupled to the injector 10.

[0052] Accordingly, by pushing the lock connector 200, which was partially assembled with the coupling connector 100, toward the injector 10, the coupling of the injector 10 and coupling coupler 100 and the coupling of the coupling connector 100 and lock connector 200 are sequentially accomplished via a single push operation, resulting in simplified rapid and convenient assembly operation with enhanced assembly efficiency.

[0053] Meanwhile, for the purpose of keeping the inserts 120 at fixed positions without movement despite external force, such as vibration of an automobile, etc., so as to prevent the loss of elasticity due to fatigue accumulation, the press arms 210 are configured to be fitted between the inserts 120 and the housing 130, thereby acting to push the inserts 120 so as to restrict elastic movement of the inserts 120.

[0054] The press arms 210 also serve to press the elastically movable inserts 120 into the insertion recesses 12, thereby achieving more strong coupling of the coupling connector 100 and injector 10.

[0055] In conclusion, the elastic press arms 210 may function to further press the inserts 120 into the insertion recesses 12, or may function to restrict elastic movement of the inserts 120 so as to further reinforce the resulting structure.

[0056] In this case, since the lock connector 200 additionally presses the inserts 120 while being coupled to the coupling connector 100, the coupling force of the coupling connector 100 and injector 10 may be enhanced, thereby eliminating a risk of easy separation.

[0057] Specifically, the press arms 210 are fitted into the spaces between the housing 130 and the respective inserts 120 of the coupling connector 100 when the lock connector 200 is coupled to the coupling connector 100, thereby acting to strongly press the inserts 120 into the insertion recesses 12.

[0058] For this, a thickness of each press arm 210 is preferably greater than a distance from each insert 120 to the inner wall surface of the housing 130 of the coupling connector 100 at least when the insert 120 is inserted into the insertion recess 12. Given such a thickness, the press arm 210 may press the insert 120 towards the insertion recess 12.

[0059] As a result of the press arm 210 being tightly fitted between the housing 130 and the insert 120 of the coupling connector 100, the insert 120 fitted in the insertion recess 12 may exhibit no elastic movement even by external force, such as vibration of an automobile, etc. Accordingly, the insert 20 has no loss of elasticity even after it has been coupled and used with the injector 10 for a long time.

[0060] Meanwhile, to enhance the pressure of the press arms 210 required to press the inserts 120 into the insertion recesses 12, the housing 130 of the coupling connector 100 may be further formed with raised push portions 131 such that the push portions 131 protrude towards the inserts 120.

[0061] Specifically, each of the raised push portions 131 occupies a part of the space between the insert 120 and the housing 130, thus reducing a width of the space. This allows the press arm 210 to push the insert 120 towards the insertion recess 12 with a stronger force.

[0062] The raised push portion 131 has an inclined end 131a, to allow the press arm 210 to be smoothly introduced between the insert 120 and the housing 130 based on a coupling direction of the coupling connector 100 and lock connector 200.

[0063] In this way, the raised push portion 131 may achieve enhanced binding force of the press arm 210, resulting in more strong coupling of the coupling connector 100 and injector 10.

[0064] Meanwhile, for the purpose of allowing the press arms 210, used to push the inserts 120, to be coupled at accurate positions between the inserts 120 and the housing 130, the inserts 120 may be formed with the guide rails 121, along which the press protrusions 211 of the press arms 210 slide.

[0065] Specifically, each of the press arms 210 takes the form of an elongated plate, and the press protrusion 211 extends vertically from the distal end of the plate-shaped press arm 210 to the insert 120 so as to press the insert 120.

[0066] Each of the inserts 120 has the insertion ridge 122 configured to be inserted into the insertion recess 12. The guide rail 121, along which the press protrusion 211 slides, is formed at the center of the insert 120 at an opposite side of the insertion ridge 122.

[0067] Specifically, when the press arm 210 enters between the housing 130 and the insert 120 of the coupling

connector 100, the press protrusion 211 formed at the press arm 210 may slide on the guide rail 121 in the form of the elongated groove, allowing the press arm 210 to accurately push the portion of the insert 120.

[0068] Thereby, as a result of allowing the press arm 210 to press an accurate position of the insert 120, the coupling of the coupling connector 100 and lock connector 200 may be accurately accomplished every time. This may prevent assembly failure and connector breakage due to deformation of the connectors during coupling, resulting in enhanced product reliability.

[0069] Referring to FIGS. 7A and 7B, in the double locking connector 1 according to the embodiment of the present invention, preferably, the coupling of the lock connector 200 and coupling connector 100 is released when the double locking connector 1 is separated from the injector 10, so that the coupling of the coupling connector 100 and injector 10 is smoothly released as the lock connector 200 is retreated from the coupling connector 100.

[0070] In this case, to release the coupling of the lock connector 200 and coupling connector 100, the lock connector 200 is forcibly separated from the coupling connector 100 as the flanges 140 of the coupling connector 100 are pushed outward as described above. Thereafter, the coupling connector 100 is separated from the injector 10 as the lock connector 200 is retracted to the rear end of the coupling connector 100.

[0071] In this case, to prevent the press arms 210 from being caught by the transfer wings 112 when the lock connector 200 is retracted to the rear end of the coupling connector 100, the front ends 112a of the transfer wings 112, the rear ends 211b of the press protrusions 211, and the rear ends 212b of the transfer protrusions 212 are inclined.

[0072] Specifically, to allow the transfer protrusions 212 and press protrusions 211 of the press arms 210 to pass over the transfer wings 112 when retracting the lock connector 200, the front ends 112a of the transfer wings 112 are inclined.

[0073] In this case, to allow the transfer protrusions 212 and press protrusions 211 of the press arms 210 to more easily pass over the inclined front ends 112a of the transfer wings 112, the rear ends of the transfer protrusions 212 and press protrusions 211, which come into contact with the front ends 112a of the transfer wings 112, are also inclined by an angle corresponding to that of the transfer wings 112.

[0074] Thereby, the lock connector 200 may be smoothly retracted, rather than being caught by the transfer wings 112.

[0075] Also, to separate the inserts 120 from the insertion recesses 12 while preventing the lock connector 200 from being completely separated from the coupling connector 100, the lock connector 200 is provided with the locking release arms 230.

[0076] Each of the locking release arms 230 may be formed with the hook, which is caught by a certain portion of the coupling connector 100 when the lock connector 200 is retracted from the coupling connector 100. With partial deformation of the hook, the locking release arms 230 may change a direction of the retracting force of the lock connector 200, causing elastic outward movement of the inserts 120.

[0077] For example, the locking release arm 230 having the above-described function may include the locking piece 231 formed at the distal end thereof with the hook 232.

[0078] Specifically, the lock connector 200 includes the pair of locking pieces 231 spaced parallel to and apart from the respective press arms 210 and formed at the distal ends thereof with the hooks 232 to be caught by the expanded holding portions 123 of the inserts 120. A length of the locking pieces 231 is preferably determined such that the distal ends of the locking pieces 231 reach the front end of the coupling connector 100 in a state wherein the lock connector 200 is completely inserted into and secured to the coupling connector 100.

[0079] The front end 232a of each of the hooks 232 is inclined, to allow the hook 232 to pass over the expanded holding portion 123 of the corresponding insert 120 when the lock connector 200 is inserted into the coupling connector 100.

[0080] Thereby, if the coupling of the lock connector 200 and coupling connector 100 is released and the lock connector 200 is retracted from the coupling connector 100, the hooks 232 are first retracted along the inserts 120, but are caught by the expanded holding portions 123 of the inserts 120, preventing the lock connector 200 from being completely separated from the coupling connector 100.

[0081] That is, the lock connector 200 is retracted to the rear end of the coupling connector 100 only by a distance corresponding to a movement distance of the hooks 232 starting from a position near the front end of the coupling connector 100 to a position where the hooks 232 are caught by the expanded holding portions 123 of the inserts 120.

[0082] In this way, it is possible to prevent the lock connector 200 from being completely separated from the coupling connector 100 and this prevents loss of the lock connector 200 and/or the coupling connector 100 upon exchange of the double locking connector 1.

[0083] Meanwhile, for the purpose of easily separating the coupling connector 100 from the injector 10 via elastic movement of the inserts 120 when the coupling of the lock connector 200 and coupling connector 100 is released, the hooks 232 may act to push the expanded holding portions 123 away from the fitting tube 110 when the lock connector 200 is retracted to the rear end of the coupling connector 100, thereby allowing the insertion ridges 122 to be separated from the insertion recesses 12.

[0084] Specifically, surfaces of the hooks 232, which come into contact with the expanded holding portions 123, push the front end 123a of the expanded holding

portions 123 upon retreat of the hooks 232, causing the inserts 120 to be elastically moved toward the housing 130 of the coupling connector 100.

[0085] For this, the inclined rear end 232b of each of the hooks 232 is parallel to the inclined front end 232a and similarly, the inclined front end 123a of the expanded holding portions 123 is parallel to the inclined rear end 232b of the hook 232. Thereby, the insert 120 may be separated from the insertion recess 12 by retracting the hook 232.

[0086] In this case, by pulling the lock connector 200 rearward, the insert 12 of the coupling connector 100 is separated from the insertion recess 12 of the injector 10, enabling easy separation of the injector 10 and coupling connector 100.

[0087] Hereinafter, operation of the double locking connector for the injector according to the exemplary embodiment of the present invention will be described with reference to FIGS. 5A to 7B.

[0088] As shown in FIGS. 5A and 5B, first, the lock connector 200 is inserted into the coupling connector 100 from the rear side thereof to reach a partially assembled position thereof where the press protrusions 211 of the press arms 210 pass over the transfer wings 112 and the transfer protrusions 212 located at the rear of the press protrusions 211 are caught by the transfer wings 112.

[0089] Thereafter, as shown in FIGS. 6A and 6B, if the user presses the lock connector 200 in a state wherein the front end of the coupling connector 100 is placed on the injector 10, the coupling connector 100 is pushed toward the injector 10 by the transfer wings 112 caught by the transfer protrusions 212.

[0090] In this case, the inserts 120, which are spaced apart from the inner wall surfaces of the housing 130 of the coupling connector 100, are elastically moved toward the housing 130 by the peripheral regions of the insertion recesses 12 provided at opposite sides of the injector 10. Then, the coupling of the coupling connector 100 and injector 10 is completed as the insertion ridges 122 of the inserts 120 are fitted into the insertion recesses 12.

[0091] Thereafter, as the front ends 211a of the press protrusions 211 formed at the distal ends of the press arms 210 are brought into contact with the outer periphery of the injector 10 and the press arms 210 are pushed toward the housing 130 of the coupling connector 100, the transfer protrusions 212 are able to pass over the transfer wings 112, allowing the lock connector 200 to be more deeply inserted into the coupling connector 100.

[0092] Furthermore, in the deeply inserted state of the lock connector 200, the press protrusions 211 of the press arms 210 slidably move along the guide rails 121 of the inserts 120 so as to be fitted between the inserts 120 and the housing 130. In this way, the press protrusions 211 are coupled to restrict elastic movement of the inserts 120.

[0093] Meanwhile, when the lock connector 200 is inserted into the coupling connector 100, the hooks 232 of the locking pieces 231 pass over the transfer wings 112 owing to the inclined front ends 232a thereof and are brought into contact with the expanded holding portions 123 formed at the distal ends of the inserts 120. In this way, the locking pieces 231 are elastically moved to be close to the housing 130 of the coupling connector 100 and pass over the expanded holding portions 123. The hooks 232, having passed through the expanded holding portions 123, are returned to original positions thereof by restoration force and are moved along side surfaces of the inserts 120 until they approach the front end of the coupling connector 100.

[0094] On the other hand, as shown in FIGS. 7A and 7B, when it is desired to separate the double locking connector 1 from the injector 10, first, the flanges 140 are pushed outward and the lock connector 200 is pulled rearward from the coupling connector 100.

[0095] With the rearward movement of the lock connector 200, the hooks 232 of the locking pieces 231 are brought into contact with the expanded holding portions 123 of the inserts 120, causing the inserts 120 having the expanded holding portions 123 to be elastically moved toward the housing 130. Thereby, the insertion ridges 122 of the inserts 120 are separated from the insertion recesses 12 of the injector 10, and the user is able to separate the coupling connector 100 from the injector without separate manipulation.

[0096] As apparent from the above description, a double locking connector for an injector according to the embodiment of the present invention has the following effects.

[0097] Firstly, the double locking connector includes a coupling connector to be elastically inserted into the injector and a lock connector to be coupled to the coupling connector from a rear end of the coupling connector. The coupling connector includes elastic inserts configured to be inserted into the injector, whereas the lock connector includes press arms to press the inserts with great force, achieving enhanced binding force between the coupling connector and the injector.

[0098] Secondly, the press arms of the lock connector are configured to be fitted between the inserts and a housing of the coupling connector, thereby serving to restrict unwanted elastic movement of the inserts caused by, e.g., vibration of an automobile. This may prevent the inserts from being deprived of elasticity due to accumulation of vibration fatigue and consequently, may prevent the coupling connector from being unexpectedly separated from the injector. In this way, enhanced product reliability may be accomplished.

[0099] Thirdly, by providing the housing with raised push portions, it is possible to allow the press arms to press the inserts with greater force, and further enhanced binding force between the coupling connector and the injector may be accomplished.

[0100] Fourthly, the inserts are formed with guide rails so that press protrusions of the press arms are fitted into the guide rails. This prevents the press arms from being fitted at misaligned and incorrect positions. As a result,

it is possible to eliminate, e.g., damage to the press arms due to assembly failure and to achieve more stable assembly performance.

[0101] Fifthly, as locking pins of the lock connector are fixedly caught by locking holes formed in the flanges of the coupling connector, the lock connector may be more easily secured to the coupling connector.

[0102] Sixthly, by pushing the lock connector partially assembled with the coupling connector in a state wherein the coupling connector is placed on the injector, the coupling of the injector and coupling connector and the coupling of the coupling connector and lock connector may be accomplished simultaneously. This assures easy and rapid assembly of the double locking connector as well as convenient use thereof.

[0103] Seventhly, with provision of transfer wings and transfer protrusions, the coupling of the coupling connector and lock connector may be sequentially accomplished following the coupling of the coupling connector and injector. That is, the coupling of the coupling connector and injector may be confirmed from the coupling of the coupling connector and lock connector, and this has the effect of preventing assembly failure.

[0104] Eighthly, even if the lock connector is retracted from the coupling connector, the lock connector is not completely separated from the coupling connector owing to the use of hooks and expanded holding portions. This eliminates a risk of loss of any one of the coupling connector and lock connector that may occur when the coupling connector and lock connector are separately stored.

[0105] Finally, with the use of the hooks to separate the inserts from the insertion recesses, the user may separate the coupling connector from the injector without separate manipulation, resulting in convenient use.

[0106] Although the preferred embodiment of the present invention has been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope of the invention as disclosed in the accompanying claims.

Claims

1. A double locking connector (1) for an injector (10) comprising:

a coupling connector (100) including a fitting tube (110) adapted to be inserted into a fitting hole (11) formed in an injector (10), and an insert (120) adapted to be fitted, via elastic movement thereof, into an insertion recess (12) formed at either side of the fitting hole (11) of the injector (10); and

a lock connector (200) coupled with the coupling connector (100) and including a press arm (210) to press the insert (120) towards the insertion recess (12).

2. The connector according to claim 1, wherein:

the insert (120) has elasticity and is configured to extend inward from an end of a housing (130) for facing the injector (10), the housing (130) defining an outer contour of the coupling connector (100); and

the press arm (210) is configured to be fitted between the insert (120) and the housing (130) and is adapted to press the insert (120) so as to restrict the elastic movement of the insert (120).

3. The connector according to claim 2, wherein the housing (130) includes a raised push portion (131) protruding towards the insert (120).

4. The connector according to claim 1, 2 or 3, wherein the insert (120) includes a guide rail (121), along which a press protrusion (211) formed at the press arm (210) slides.

5. The connector according to any preceding claim, wherein:

a flange (140) having a locking hole (141) is formed at either side of an end of the coupling connector (100) adapted to be opposite to the injector (10); and

an end of the lock connector (200) adapted to be opposite to the injector (10) is formed with a locking pin (222) to be caught by the locking hole (141).

6. The connector according to any preceding claim, wherein the lock connector (200) is adapted to be coupled with the coupling connector (100) after the coupling connector (100) is adapted to be completely coupled with the injector (10).

7. The connector according to any preceding claim, wherein:

the fitting tube (110) is laterally formed with a transfer wing (112);

the press arm (210) is formed with a press protrusion (211) having an inclined end (211a) to pass over the transfer wing (112); and

the press arm (210) is further formed with a transfer protrusion (212), which is adapted to press the transfer wing (112) to push the fitting tube (110) to the fitting hole (11) when the lock connector (200) is inserted into the coupling connector (100).

8. The connector according to any preceding claim, wherein the lock connector (200) further includes a locking release arm (230) adapted to elastically move the insert (120) away from the insertion recess

(12), to allow the coupling connector (100) to be separated from the injector (10) when the lock connector (200) is retreated to an end of the coupling connector (100) arranged to be opposite the injector (10).

9. The connector according to claim 8, wherein:

the insert (120) is formed at a distal end portion thereof with an insertion ridge (122) and an expanded holding portion (123), the insertion ridge (122) being configured to be inserted into the insertion recess (12), and the expanded holding portion (123) being configured to have a larger width than a remaining portion of the insert (120); and
the locking release arm (230) includes a locking piece (231) spaced parallel to and apart from the press arm (210) and formed at a distal end thereof with a hook (232), the hook (232) being configured to be caught by the expanded holding portion (123) and adapted to push the expanded holding portion (123) away from the fitting tube (110), so as to allow the insertion ridge (122) of the insert (120) to be separated from the insertion recess (12).

10. The double locking connector (1) according to any preceding claim in combination with an injector (10).

11. A method of coupling a double locking connector (1) according to any preceding claim with an injector (10), wherein the lock connector (200) is coupled with the coupling connector (100) after the coupling connector (100) is completely coupled with the injector (10).

FIG.1

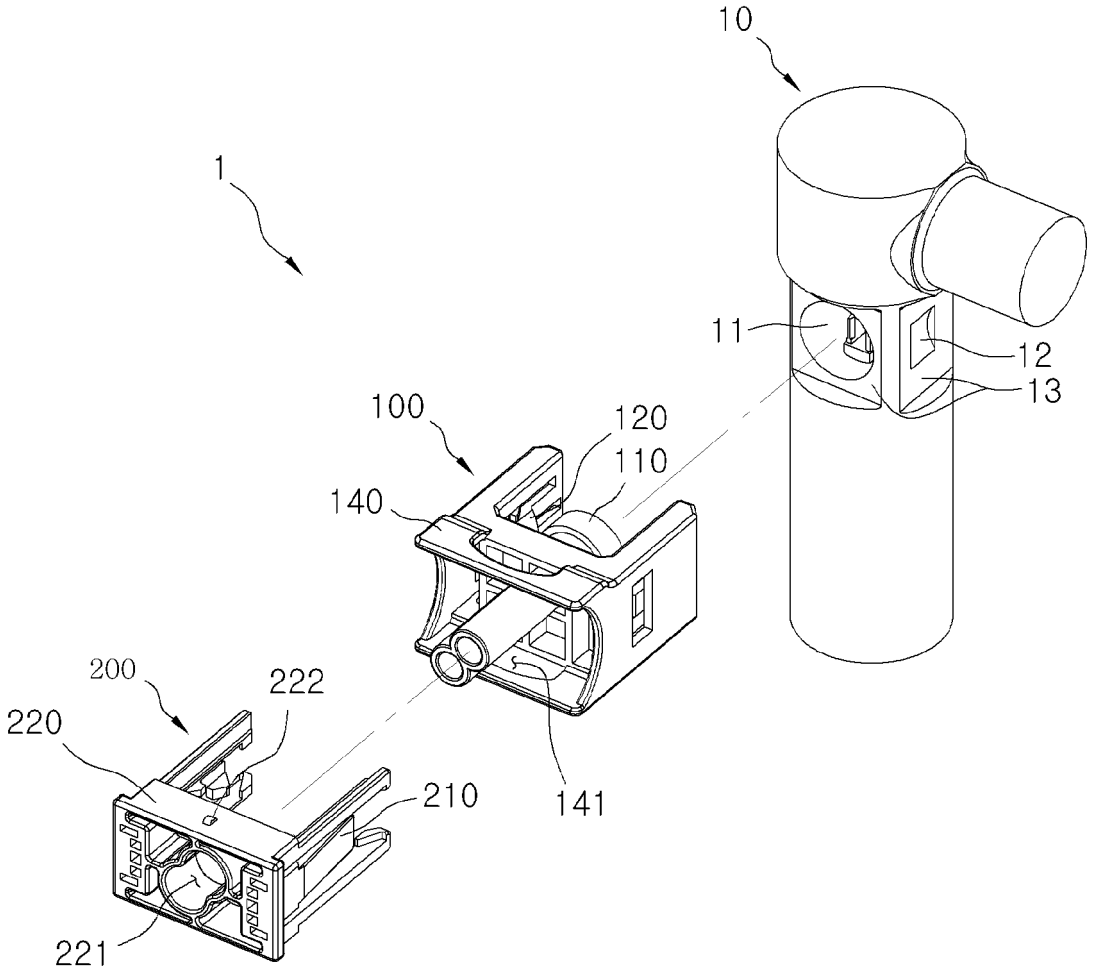


FIG.2

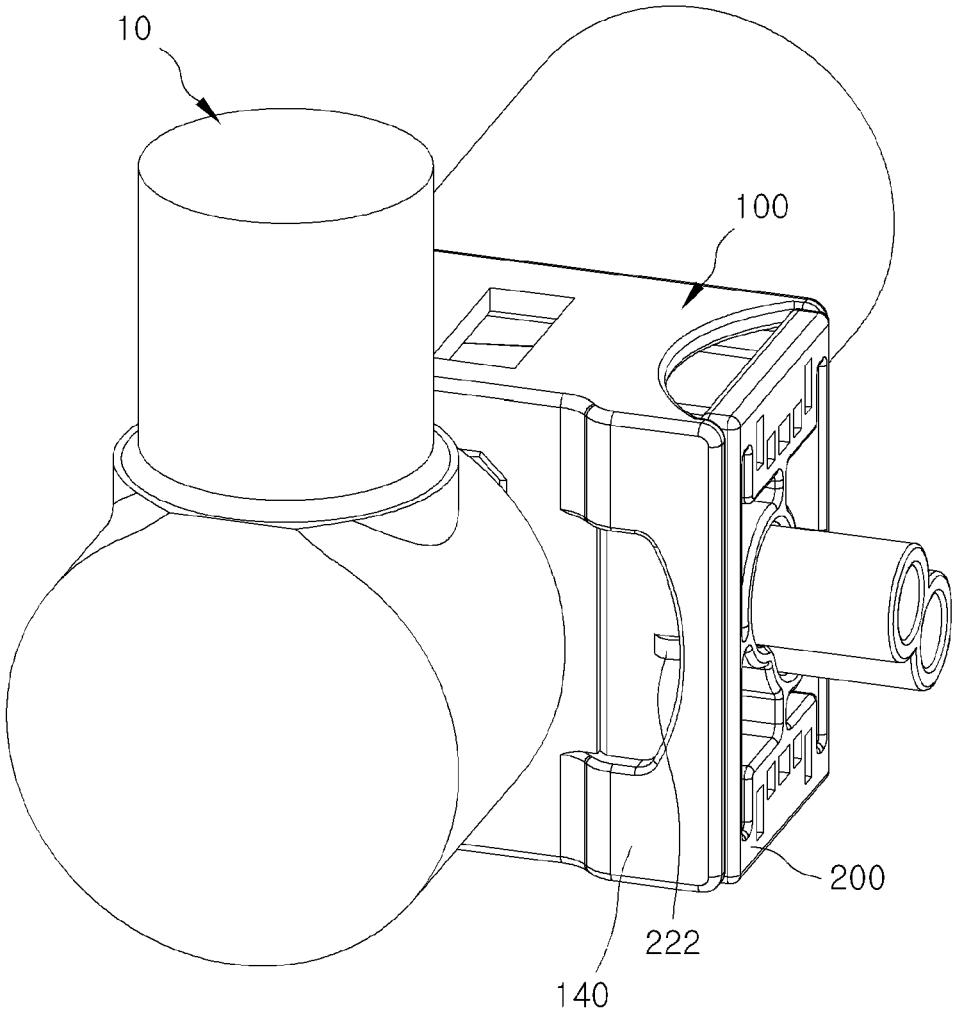


FIG.3a

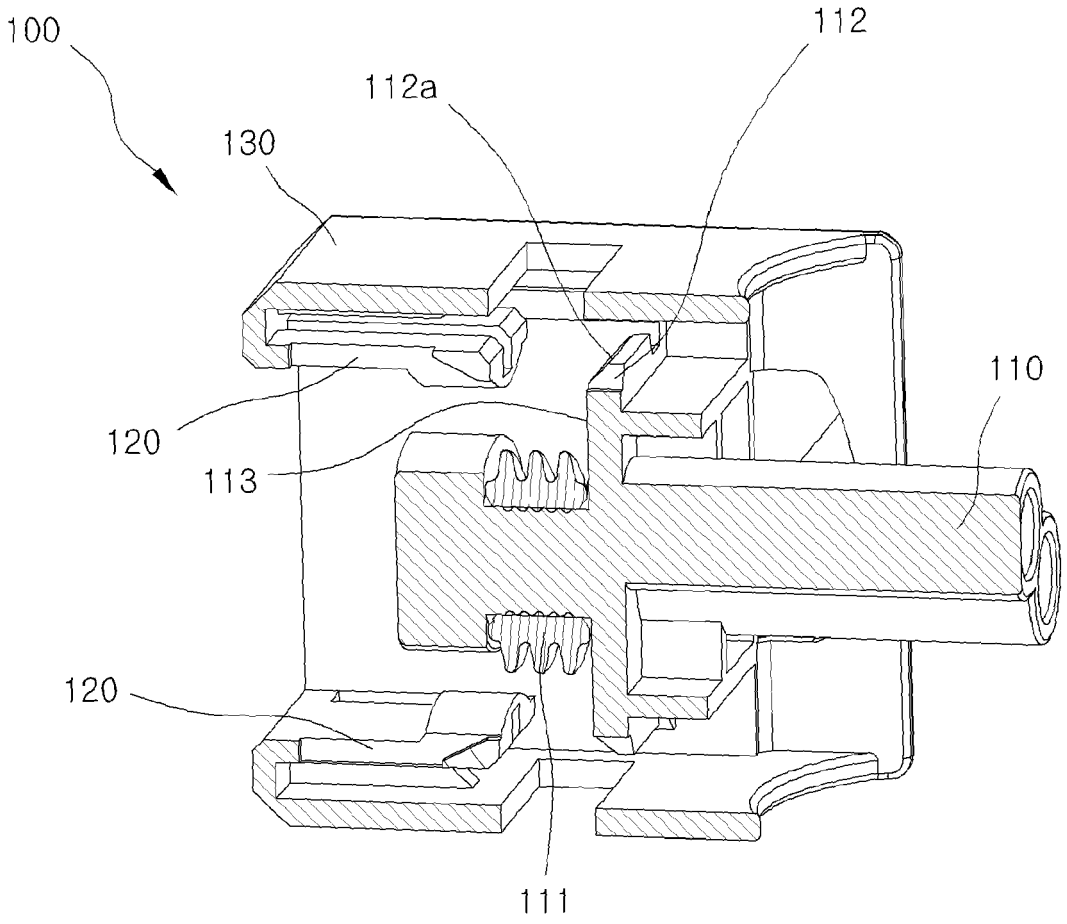


FIG.3b

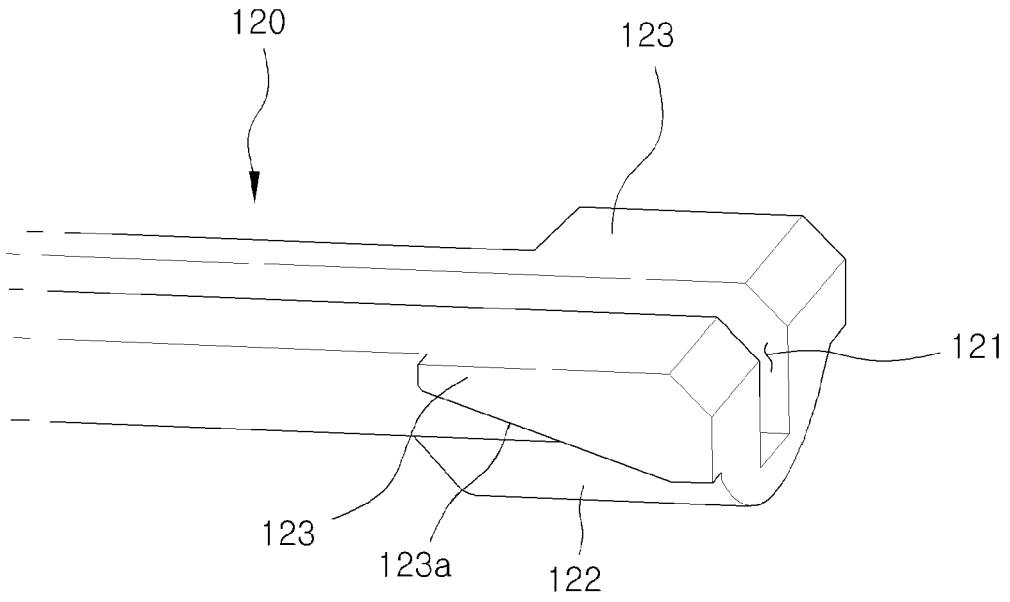
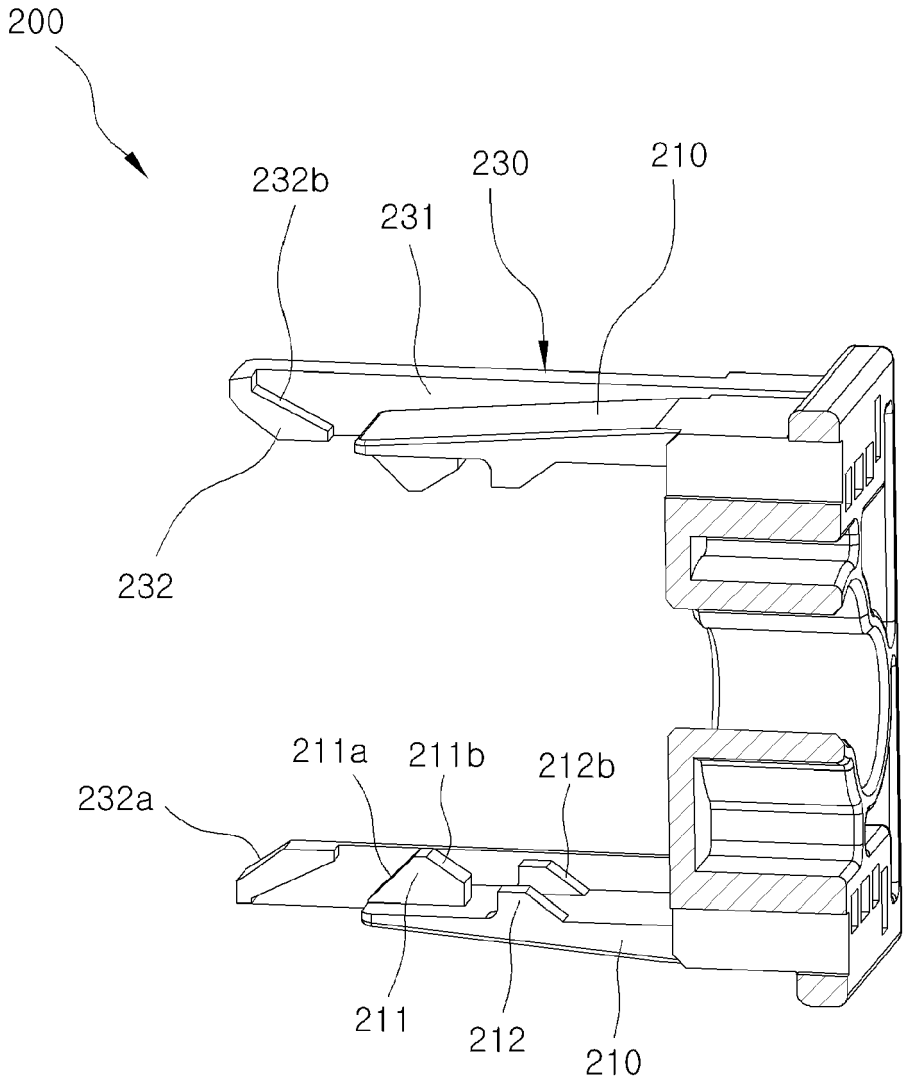


FIG.4



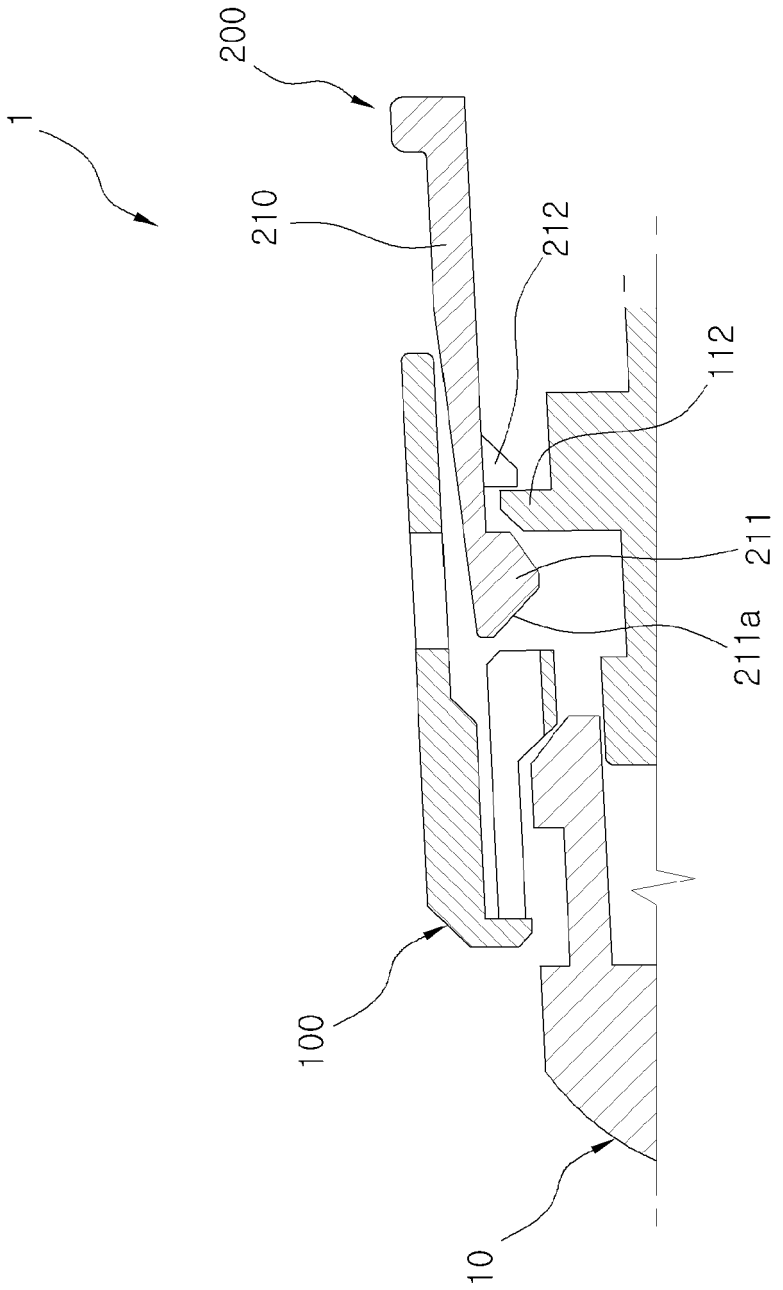


FIG.5a

FIG.5b

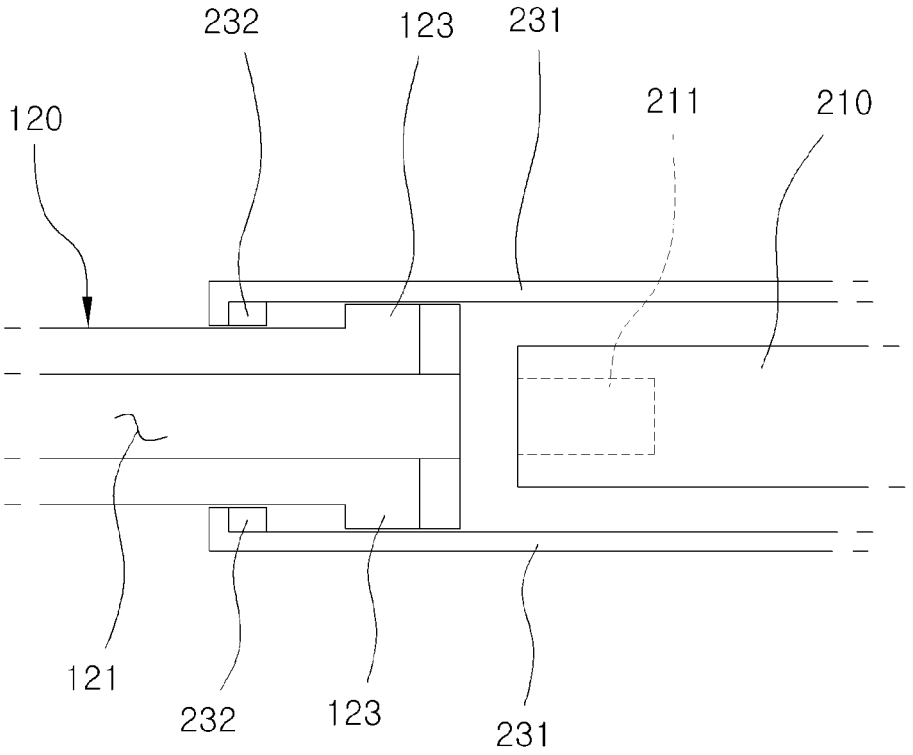


FIG.6a

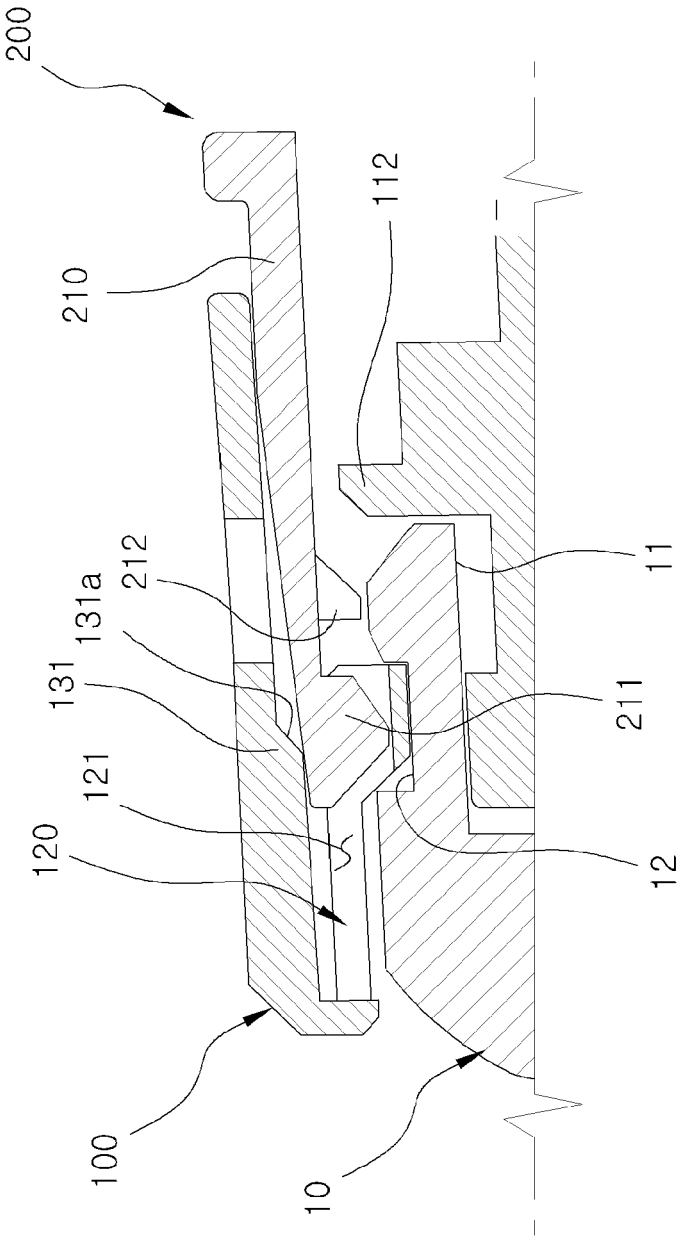


FIG.6b

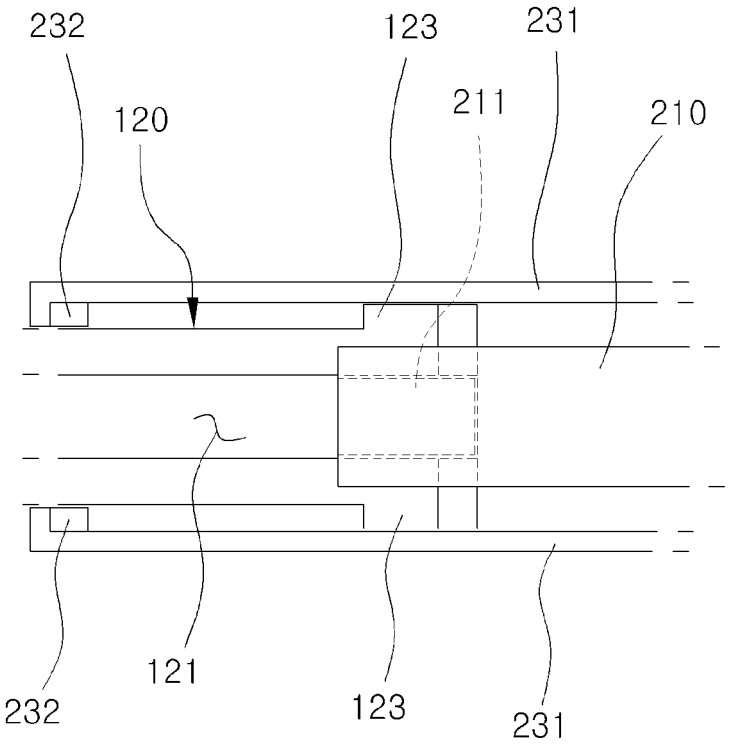


FIG.7a

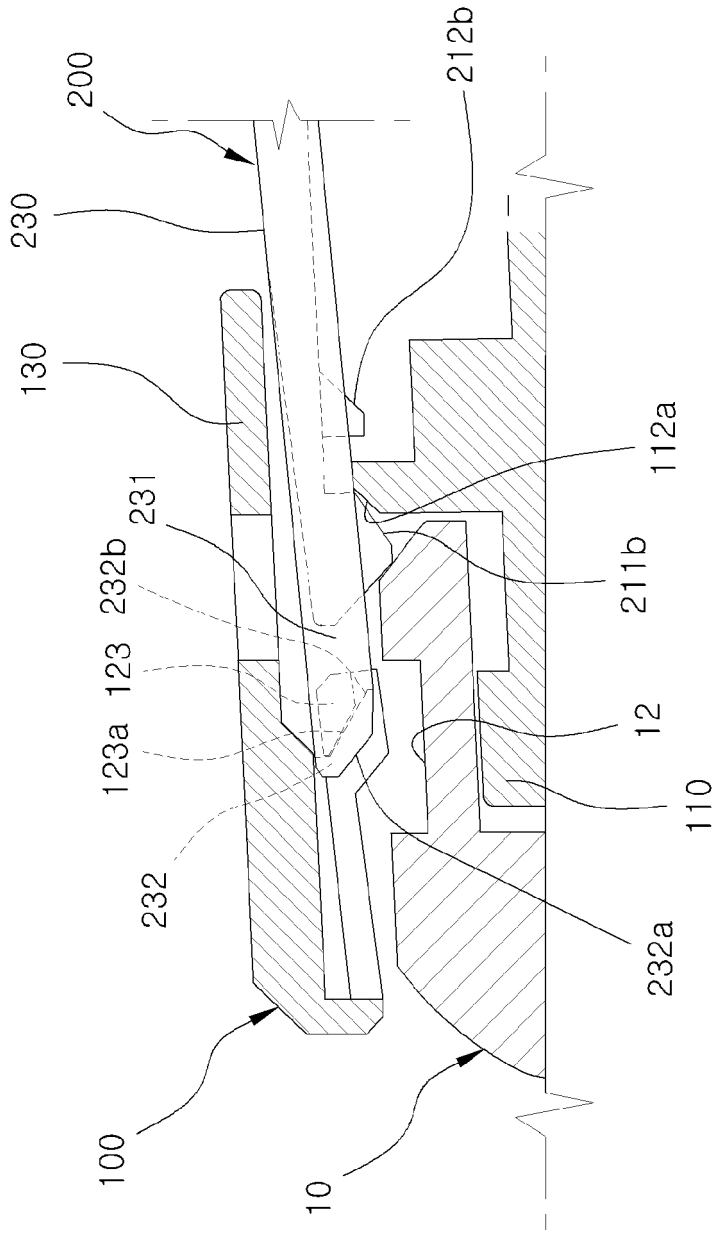
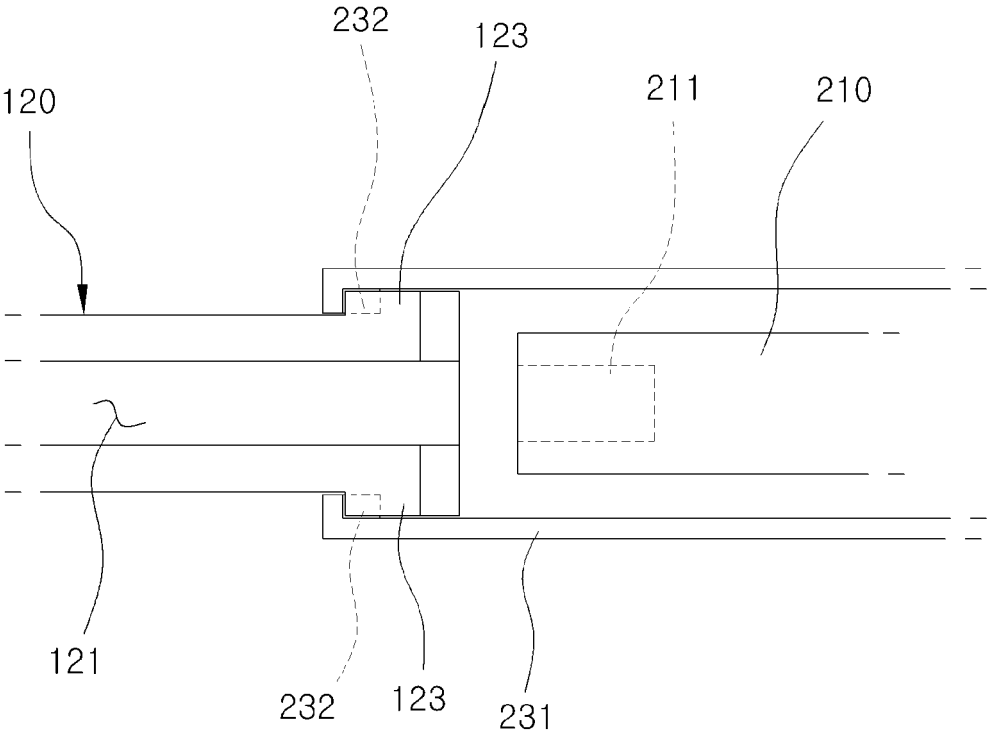

200
212b
230
130
112a
231
232b
211b
123
12
123a
110
232
232a
100
10

FIG.7b



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EUROPEAN SEARCH REPORT

Application Number
EP 09 16 9669

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	EP 0 568 075 A (VOSS ARMATUREN [DE]) 3 November 1993 (1993-11-03) * column 3, line 3 - column 4, line 20; figures 1,3 *	1-11	
A	US 6 539 920 B1 (SPIERS DEAN LEIGH [US]) 1 April 2003 (2003-04-01) * abstract; figures 1A,1B,1C *	1-11	
A	EP 0 918 156 A (RENAULT [FR]) 26 May 1999 (1999-05-26) * abstract; figure 1 *	1-11	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 January 2010	Etschmann, Georg

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12-01-2010

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