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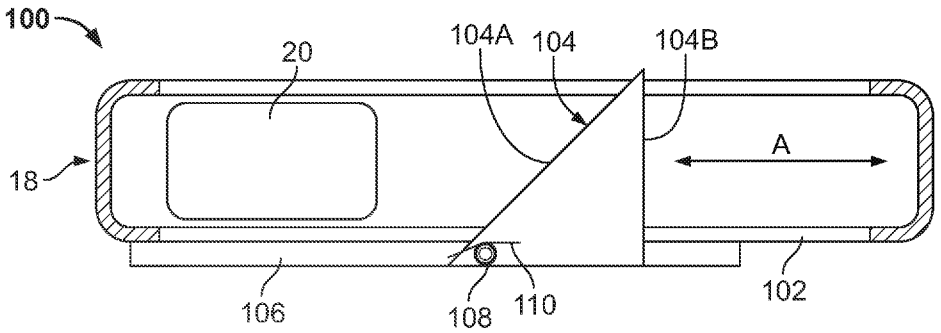

FIG. 14A

(57) Abstract: A guide assembly (100) for a roof airbag arrangement (10) of a vehicle includes a guide member (18), at least a first sliding member (20) and a locking member (104). The first sliding member (20) is carried by the guide member (18) and translatable relative to the guide member (18) along a translation axis. The locking member (104) is carried by the guide member (18) and is operable in a first position to permit the first sliding member (20) to translate past the locking member (104) in a first direction and operable in a second position to prevent translation of the first sliding member (20) past the locking member (104) in a second direction. The second direction being opposite to the first direction.

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GUIDE ASSEMBLY FOR GUIDING AN AIRBAG OF A ROOF AIRBAG ARRANGEMENT OF A VEHICLE

FIELD

[0001] The present disclosure generally concerns inflatable occupant restraint systems for vehicles. More particularly, the present disclosure relates to a guide arrangement for guiding an airbag of a roof airbag arrangement of a vehicle from a stowed position to a deployed position and maintaining the airbag in the deployed position.

BACKGROUND

[0002] This section provides background information related to the present disclosure which is not necessarily prior art.

[0003] Inflatable occupant restraints or airbags are commonly included on motor vehicles for passive occupant protection. Airbags used for frontal impact protection are generally installed in the vehicle steering wheel for the driver and behind the vehicle instrument panel for other front seat occupants. In addition to frontal impact protection, inflatable restraints are used for occupant protection from side impacts. For example, side curtain airbags are typically mounted along the roof rail of a vehicle and deploy in a downward direction to provide an energy absorbing structure between the head and upper torso of an occupant and the vehicle interior components.

[0004] In the event of an accident or impending accident, a sensor within the vehicle measures abnormal deceleration, for example, the airbag is triggered to inflate within a few milliseconds with gas produced by a device commonly referred to as an “inflator”. The inflated airbag cushions the vehicle occupant from impact forces.

[0005] To a more limited extent, it has been generally proposed to provide an airbag system for a vehicle having a roof airbag. Such a roof airbag is intended to even further protect occupants of the vehicle by providing an inflatable barrier between the occupants and the roof of the vehicle.

[0006] While known occupant restraint systems, including systems having a roof airbag, may have generally proven to be suitable for their intended uses, a continuous need for improvement in the relevant art remains.

SUMMARY

[0007] This section provides a general summary of the disclosure, and is not a comprehensive disclosure of its full scope or all of its features.

[0008] It is a general object of the present teachings to provide a roof airbag arrangement having an airbag that quickly and reliably deploys in along a horizontal trajectory.

[0009] In accordance with one particular aspect, the present teachings provide a guide assembly for a roof airbag arrangement of a vehicle. The guide arrangement includes a guide member, at least a first sliding member, and a locking member. The first sliding member is carried by the guide member and translatable relative to the guide member along a translation axis. The locking member is carried by the guide member and is operable in a first position to permit the first sliding member to translate past the locking member in a first direction and operable in a second position to prevent translation of the first sliding member past the locking member in a second direction. The second direction being opposite to the first direction.

[0010] In accordance with another particular aspect, the present teachings provide a roof airbag arrangement for a vehicle. The roof airbag arrangement includes an airbag and first and second guide assemblies. The airbag longitudinally extends along a length between first and second longitudinal sides and laterally extends along a width between first and second lateral sides. The first and second guide assemblies are disposed on laterally opposite sides of the airbag and each include a guide member, at least a first sliding member, and a locking member. The first sliding member is connected to the airbag, is carried by the guide member, and is translatable relative to the guide member along a translation axis. The locking member is carried by the guide member and is operable in a first position to permit the first sliding member to translate past the locking member in a first direction and operable in a second position to prevent translation of the first sliding member past the locking member in an opposite second direction.

[0011] In accordance with still yet another particular aspect, the present teachings provide a method of deploying an airbag of a roof airbag arrangement. The method includes inflating the airbag and translating at least a first sliding member in a first direction along both of first and second guide assemblies to deploy the airbag to a desired position. The method further includes preventing translation of the first sliding member of both guide assemblies in an opposite second direction with a locking member to maintain the airbag in the desired position.

[0012] Further areas of applicability will become apparent from the description provided herein. The description and specific examples in this summary are intended for purposes of illustration only and are not intended to limit the scope of the present disclosure.

DRAWINGS

[0013] The drawings described herein are for illustrative purposes only of selected embodiments, not all possible implementations, and are not intended to limit the scope of the present disclosure.

[0014] Figure 1 is a bottom view of the roof airbag arrangement for a vehicle in accordance with the present teachings, the roof airbag arrangement shown operatively associated with a roof frame of a vehicle, an airbag of the roof airbag arrangement shown after deployment.

[0015] Figure 2 is cross-sectional view taken along the line 2-2 of Figure 1, illustrating one of the guide rails of the roof airbag arrangement, a sliding member mounted within the guide rail, and an interconnection between the sliding member and a tether mounted to the airbag.

[0016] Figure 3 is a cross-sectional view similar to Figure 2 illustrating an alternative arrangement for slidably coupling the airbag to the guide rail.

[0017] Figure 4 is another cross-sectional view similar to Figure 2 illustrating another alternative arrangement for slidably coupling the airbag to the guide rail.

[0018] Figure 5 is another cross-sectional view similar to Figure 2 illustrating another alternative arrangement for slidably coupling the airbag to the guide rail.

[0019] Figure 6 is a bottom view of an airbag similar to the airbag of Figure 1, the airbag shown removed from the environment of Figure 1 for purposes of illustration.

[0020] Figure 7 is a view similar to Figure 6 illustrating another airbag in accordance with the present teachings.

[0021] Figure 8 is another view similar to Figure 6 illustrating another airbag in accordance with the present teachings.

[0022] Figure 9 is another view similar to Figure 6 illustrating another airbag in accordance with the present teachings.

[0023] Figure 10 is another view similar to Figure 6 illustrating another airbag in accordance with the present teachings.

[0024] Figure 11 is another view similar to Figure 6 illustrating another airbag in accordance with the present teachings.

[0025] Figure 12 is a view similar to Figure 1 illustrating the airbag in a stowed position.

[0026] Figure 13 is a view similar to Figure 12, illustrating the airbag as the airbag is deployed from the stowed position to the deployed position.

[0027] Figures 14A-14C is a series of simplified views further illustrating a guide assembly of the present teachings for guiding the airbag of the roof airbag arrangement from the stowed position to the deployed position.

[0028] Figures 15A-15C is a series of simplified views illustrating another guide assembly of the present teachings for guiding the airbag of the roof airbag arrangement from the stowed position to the deployed position.

DETAILED DESCRIPTION

[0029] One or more example embodiments will now be described more fully with reference to the accompanying drawings. The one or more example embodiments are provided so that this disclosure will be thorough and will fully convey the scope to those who are skilled in the art. Numerous specific details are set forth, such as examples of specific components, devices, and methods, to provide a thorough understanding of embodiments of the present disclosure. It will be apparent to those skilled in the art that specific details need not be employed, and that the example embodiment should not be construed to limit the scope of the present disclosure. Well-known processes, well-known device structures, and well-known technologies are not described herein in detail.

[0030] The phrases "connected to", "coupled to" and "in communication with" refer to any form of interaction between two or more entities, including mechanical, electrical, magnetic, electromagnetic, fluid, and thermal interaction. Two components may be coupled to each other even though they are not in direct contact with each other. The term "adjacent" refers to items that are in close physical proximity with each other, although the items may not necessarily be in direct contact. The phrase "fluid communication" refers to two features that are connected such that a fluid within one feature is able to pass into the other feature. "Exemplary" as used herein

means serving as a typical or representative example or instance and does not necessarily mean special or preferred.

[0031] With general reference to the drawings and with particular reference to the environmental view of Figure 1, a roof airbag arrangement for a vehicle in accordance with the present teachings is illustrated and generally identified at reference character 10. The roof airbag arrangement 10 is shown operatively incorporated into a roof frame 12 defining an opening 14 (shown in Figures 12 and 13) and the opening 14 further shown covered with an airbag 16 of the roof airbag arrangement fully deployed. In the embodiment illustrated, the opening 14 is a panoramic opening 14. In other applications (not shown), the opening may be for a sunroof. It will also be understood that the present teachings may be used with vehicles roofs that do not contain an opening.

[0032] With particular reference to Figure 1 and the simplified cross-sectional view of Figure 14A, the roof airbag arrangement 10 is generally shown to include the airbag 16 and a guide arrangement 100 for guiding the airbag 16 from a stowed position (as shown in Figure 12) to a deployed position (as shown in Figure 1). The guide arrangement 100, as seen in Figures 14A-14C, may generally include at least one guide member 18 and at least one sliding member 20 associated with each of the guide members 18. In the embodiment illustrated, the at least one guide member 18 is shown to include first and second guide rails 18A and 18B. Each guide member or guide rails 18 is associated with one or more sliding members 20.

[0033] In the embodiment illustrated, the first and second guide rails 18A and 18B are on laterally opposite sides of the airbag 16. As will become further understood below, the airbag 16 is deployed in a longitudinal direction along a horizontal trajectory. In other applications, however, the first and second guide rails 18A and 18B may be on longitudinally opposite sides of the airbag 16 and the airbag may be deployed in a lateral direction.

[0034] The first and second guide rails 18A and 18B will be understood to be substantially identical to one another. One of the guide rails is shown in further detail in Figure 2 and identified generically with reference character 18. The first and second guide rails 18A and 18B are on laterally opposite sides of the airbag 16 and define first and second channels 22, respectively. The channel 22 of the first guide rail 18A slidably receives at least one first sliding member 20. Correspondingly, the

channel 22 of the second guide rail 18B slidably receives at least one second sliding member 20.

In the embodiment illustrated, the guide rails 18 are tubular guide members with a circular cross section. Other geometries, however, may be employed within the scope of the present teachings. The guide rails 18 may include a longitudinally extending slot 24 that accommodates tethers 26 connecting the sliding members 20 and the airbag 16. As shown in Figure 1, for example, a first plurality of tethers 26 connects a first lateral side 50 (seen in Figure 9, for example) of the airbag 16 with the at least one first sliding member 20. Similarly, a second plurality of tethers 26 connects a second lateral side 52 of the airbag 16 with the at least one second sliding member 20. The longitudinally extending slot 24 may extend completely along the length of the guide rails 18 or substantially along the length of the guide rails 18. The longitudinally extending slot 24 may extend straight down the guide rails 18. In other embodiments, the slots 24 may be helical slots to further tension the airbag 16 in the lateral direction by shortening a length of the tethers 26 as the airbag 16 deploys.

[0035] The guide rails 18 may be constructed of aluminum or any other suitable material. In the embodiment illustrated, the roof frame 12 may be an aluminum metal extrusion, for example, integrally formed to include the first and second guide rails 18A and 18B. As such, the number of discrete parts may be reduced to expedite assembly, reduce error, and lower associated costs. Alternatively, however, the first and second guide rails 18A and 18B may be welded or otherwise suitably attached to the roof frame 12.

[0036] In the embodiment illustrated, a plurality of first sliding members 20 are carried by the channel 22 of the first guide rail 18A and a plurality of second sliding members 20 are carried by the channel 22 of the second guide rail 18B. In this manner, each of the tethers 26 carried by the airbag 16 are connected to a separate sliding member 20 and the sliding members 20 independently translate along the respective guide rails 18A and 18B as the roof airbag 16 horizontally deploys.

[0037] The sliding members 20 are carried within the first and second guide rails 18A and 18B for translation in a horizontal direction. The sliding members 20 may be complementary in shape to the channel 22 of the guide rails 18. As such, the sliding members 20 shown in Figure 2 are cylindrical. The sliding members 20 may be injection molded of a plastic material or alternatively constructed of any other suitable material. By the nature of the materials or through treatment of the materials,

an interface between the sliding members 20 and the guide rails 18 is provided that has a low coefficient of friction. This interface effectively allows the airbag 16 to reliably and quickly deploy.

[0038] The tethers 26 are attached to the sliding members 20. As shown in Figure 2, the sliding members 20 may include a radially extending opening 28. The opening 28 may include a first side 28A with a first height and a second side 28B with a second, greater height. The tethers 26 of the respective first and second pluralities of tethers 26 enter the sliding member 20 from the first side 28A. A retention member or retention pin 30 may be disposed in the second side 28B of the opening 28. The retention pin 30 may be formed of metal or any other suitable material and has a diameter greater than the first height of the first side 28A and thereby cannot be pulled through the first side 28A. The tethers 26, which may be formed of a synthetic polymer such as nylon, for example, are wrapped around the retention pin 30 and each include first and second ends sewn or otherwise suitably secured to the airbag 16. In some applications, the tethers 26 may be formed or manufactured integrally with airbag 16.

[0039] Turning to Figure 3, an alternative arrangement for slidably connecting the airbag 16 with the guide rails 18 is illustrated. As shown, the sliding members 20 may be connected to each of the tethers 26 indirectly through a bracket 32. The brackets 32 may be right angle brackets having a first leg 34 in a plane of the deployed airbag 16 and a second leg 36 perpendicular to the first leg 34. The tether 26 may pass through a hole in the first leg 34 or otherwise be suitably attached to the first leg 34. The sliding member 20 may be molded over the second leg 36 or otherwise suitably connected to the second leg 36.

[0040] Turning to Figure 4, another alternative arrangement for slidably connecting the airbag 16 with the guide rails 18 is illustrated. As shown, the sliding members 20 may again be connected to each of the tethers 26 indirectly through a bracket 38. The brackets 38 may be U-shaped brackets having a first leg 40 in a plane of the deployed airbag 16, a second leg 42 parallel to the first leg 40, and an intermediate portion or leg 44 connecting the first and second legs 40 and 42. As depicted, the first leg 42 may differ in length, i.e. shorter, than the second leg 44 to aid in the deployment of the airbag 16. As above, the tether 26 may pass through a hole in the first leg 40 or otherwise be suitably attached to the first leg 40. The sliding member 20 may be molded over the second leg 42 or otherwise suitably connected to the second leg 42.

[0041] Turning to Figure 5, another alternative arrangement for slidably connecting the airbag 16 with the guide rails 18 is illustrated. The arrangement of Figure 5 differs from Figure 4 in that the sliding member 20 includes a cylindrical portion 46 with a radially extending portion 48. The radially extending portion 48 is sized to pass through the longitudinally extending slot 24 of the guide rail 18. As such, the radially extending portion 48 prevents rotation of the sliding member 20 within the channel 22 of the guide rail 18.

[0042] Figures 6 through 11 illustrate various particular embodiments of roof airbags in accordance with the present teachings. The features of the various particular roof airbag embodiments will be described with common reference characters to identify similar elements. To the extent not otherwise described, it will be understood that the construction and operation of the various airbags is identical.

[0043] With particular reference to Figure 6, a particular embodiment of a roof airbag in accordance with the present teachings is illustrated and generally identified at reference character 16A. The airbag 16A is generally rectangular and is illustrated to extend along a length L between first and second longitudinal sides 54 and 56 and laterally extending along a width W between the first and second lateral sides 50 and 52. In the application illustrated, the airbag 16A is sized to protect passengers of a vehicle including 3 rows of seats. The length L and width W may be readily adapted, however, for various other applications.

[0044] The airbag 16A may have a one-piece woven (OPW) construction including an upper layer (not particularly shown), a lower layer 60, and a joining edge 62. The airbag 16A further includes an inlet 64 for receiving inflation gases from an inflator 66, the inflator 66 being shown in Figure 1. In the embodiment illustrated, the inlet 64 may be located at the first longitudinal side 54 of the airbag 16A. The inlet 64 is in fluid communication with a plenum 68. The plenum 68 directs inflation gases from the inlet 64 to a plurality of inflatable chambers defined within the airbag by chamber boundaries 70. The chamber boundaries 70 may be defined by seams or welds connecting the upper layer to the lower layer 60.

[0045] The plurality of chambers is shown to include a plurality of primary inflatable chambers 72 and a plurality of secondary inflatable chambers 74. As used herein, the term “primary” when used to describe the inflatable chambers shall mean that the inflatable chamber is inflated directly by inflation gases received from the plenum 68. The term “secondary” when used to describe the inflatable chambers shall

mean that the inflatable chamber is inflated indirectly by inflation gases received by the plenum 68 through the primary inflatable chambers. Explaining further, the primary inflatable chambers 72, which are in direct fluid communication with the plenum 68, are inflated or at least substantially inflated first (e.g., before the secondary inflatable chambers 74). The primary inflatable chambers 72 function to quickly drive the airbag 16 to horizontally deploy in the longitudinal direction. The secondary inflatable chambers 74, which are in indirect fluid communication with the plenum 68 through the plurality of primary inflatable chambers 72, are inflated after the primary inflatable chambers 72 or at least after the primary inflatable chambers 72 are substantially inflated. The secondary inflatable chambers 74 function to tension the airbag 16A in the lateral direction. The primary and secondary inflatable chambers 72 and 74 cooperate to provide a barrier between the occupants of the vehicle and the roof frame 12.

[0046] As illustrated, the airbag 16A is shown to include first and second primary inflatable chambers 72 adjacent the first and second lateral sides 50 and 52 of the airbag 16A, respectively. In the embodiment illustrated, the first and second primary inflatable chambers 72 extend along at least half of the length L of the airbag 16A and linearly extend from the plenum 68 to the second longitudinal side 56 of the airbag 16A. The primary inflatable chambers 72 may further include a third primary inflatable chamber 72 laterally disposed between and fluidly separated from the first and second primary inflatable chambers 72.

[0047] The secondary inflatable chambers 74 are laterally disposed between the first and second lateral sides 50 and 52 of the airbag 16A and are elongated in the longitudinal direction. In the embodiment illustrated, at least one and preferably two secondary inflatable chambers 74 are laterally disposed between the first primary inflatable chamber 72 adjacent the first lateral side 50 and the third primary inflatable chamber 72. Similarly, at least one and preferably two secondary inflatable chambers 74 are laterally disposed between the second primary inflatable chamber 72 adjacent the second lateral side 52 and the third primary inflatable chamber 72. The secondary inflatable chambers 74 each linearly extend from an open end proximate the second longitudinal side 56 of the airbag 16A to a closed end adjacent the plenum 68.

[0048] The airbag 16A may also include a further inflatable chamber 76 longitudinally disposed between the inlet 64 and the third primary inflatable chamber 72. The plenum 68 effectively wraps around the further inflatable chamber 76 for

directing the delivery of inflation gases to each of the primary inflatable chambers 72. The plenum 68 also directly delivers inflation gases to the further inflatable chamber 76 through an opening 78 adjacent the third primary inflatable chamber 72.

[0049] Turning to Figure 7, another particular embodiment of a roof airbag in accordance with the present teachings is illustrated and generally identified at reference character 16B. As with the roof airbag 16A, the roof airbag 16B includes first and second primary inflatable chambers 72 adjacent the first and second lateral sides 50 and 52 of the airbag 16A, respectively. In the embodiment illustrated, the first and second primary inflatable chambers 72 extend substantially along the length L of the airbag 16B and linearly extend from the plenum 68 to the second longitudinal side 56 of the airbag 16A. The plenum 68 is in fluid communication with the first and second primary inflatable chambers 72 at the first longitudinal side 54 of the airbag 16B.

[0050] The roof airbag 16B also includes a plurality of secondary inflatable chambers 74. As illustrated, the secondary inflatable chambers include a laterally centered secondary inflatable chamber 74 in fluid communication with the primary inflatable chambers 72 at the second longitudinal side 56 of the roof airbag 16B. The secondary inflatable chambers 74 further include first and second U-shaped secondary inflatable chambers 74 that receive inflation gases from the laterally centered secondary inflatable chamber 74. The first U-shaped secondary inflatable chambers 74 are laterally disposed between the laterally centered secondary inflatable chamber 74 and the first primary inflatable chamber 72. The second U-shaped secondary inflatable chambers 74 are laterally disposed between the laterally centered secondary inflatable chamber 74 and the second primary inflatable chamber 72.

[0051] Turning to Figure 8, another particular embodiment of a roof airbag in accordance with the present teachings is illustrated and generally identified at reference character 16C. Similar to the earlier introduced embodiments, the roof airbag 16C includes a plurality of primary inflatable chambers 72 and a plurality of secondary inflatable chambers 74. The roof airbag 16C is further shown to include a protective sleeve or liner 80 lining an interior of the inlet 64 first and a portion of the plenum 68. The protective liner 80 protects the material of the roof airbag 16C from the heat and pressure of the inflation gases. The roof airbag 16C is further shown to include first and second further inflatable chambers 82.

[0052] The plenum 68 includes first and second arms that deliver inflation gases to first and second primary inflatable chambers 72 that are located adjacent the

first and second lateral sides 50 and 52 of the roof airbag 16C. The plenum 68 is also in direct fluid communication with a laterally central primary inflatable chamber 72. As illustrated, the arms of the plenum 68 are skewed relative to both the first and second longitudinal sides 54 and 56 and the first and second lateral sides 50 and 52. The secondary inflatable chambers 74 are shown to include at least one, and preferably at least two secondary chambers 74 laterally located between the first primary inflatable chamber 72 and the laterally centered primary inflatable chamber 72. The secondary inflatable chambers 74 are shown to further include at least one, and preferably at least two secondary chambers 74 laterally located between the second primary inflatable chamber 72 and the laterally centered primary inflatable chamber 72.

[0053] Continuing with this particular embodiment, the first and second further inflatable chambers 82 are C-shaped and laterally disposed between the inlet 64 and the first and second lateral sides 50 and 52 of the roof airbag 16C. Correspondingly, the first further inflatable chamber 82 is in fluid communication with the first primary inflatable chamber 72 through a reduced area opening 84. The second further inflatable chamber 82 is similarly in fluid communication with the second primary inflatable chamber 72 through a reduced area opening 84.

[0054] Turning to Figure 9, another particular embodiment of a roof airbag in accordance with the present teachings is illustrated and generally identified at reference character 16D. The roof airbag 16D differs from the roof airbag 16C by including three secondary chambers 74 laterally located between the first primary inflatable chamber 72 and the laterally centered primary inflatable chamber 72. Additionally, three secondary chambers 74 are laterally located between the second primary inflatable chamber 72 and the laterally centered primary inflatable chamber 72.

[0055] Turning to Figure 10, another particular embodiment of a roof airbag in accordance with the present teachings is illustrated and generally identified at reference character 16E. The roof airbag 16E differs from the roof airbags 16C and 16D in that the roof airbag 16E includes only a single primary inflatable chamber 72 and does not include any secondary inflatable chambers 74. The plenum 68 delivers inflation gases directly to the primary inflatable chamber 72.

[0056] Turning to Figure 11, another particular embodiment of a roof airbag in accordance with the present teachings is illustrated and generally identified at reference character 16F. The roof airbag 16F is similar to the roof airbag 16E in that the roof airbag 16F includes a single primary inflatable chamber 72 and does not

include any secondary inflatable chambers 74. Differing from the roof airbag 16D, the plenum 68 laterally extends across the roof airbag 16F adjacent the first longitudinal side 54. The plenum 68 is in fluid communication with the primary inflatable chamber 72 adjacent the first and second lateral sides 50 and 52 of the roof airbag 16F.

[0057] With particular reference to Figures 1, 12, and 13, a method of deploying a roof airbag 16 of the present teachings will be described. The roof airbag 16 is normally in a stowed position. As shown particularly in Figure 12, in the stowed position, the roof airbag 16 is laterally forward of the panoramic opening 14 (i.e., in a vehicle direction). Alternatively, the roof airbag 16 may be stowed in a position laterally behind the panoramic opening 14. In applications where the roof airbag 16 is adapted to deploy in a lateral direction, the stowed airbag 16 may be laterally offset from the panoramic opening 14. It will be understood that the roof airbag 16 may be located between the roof frame 12 and a headliner (not shown). The roof airbag 16 may be attached to the roof frame 12 with conventional mounting tabs 86. In this manner, the first longitudinal side 54 of the airbag 16 is fixed relative to the roof frame 12.

[0058] Deployment of the roof airbag 16 occurs in response to activation of the inflator 64. The inflator 64 activates in response to a sensed condition indicating a predetermined vehicle collision or event. The inflator 64, its activation, and the sensing of the vehicle collision or event will be understood to be conventional insofar as the present teachings are concerned.

[0059] The inflator 64 delivers inflation gases to the plenum 68. The plenum directly delivers inflation gases to the primary inflatable chambers 72. The primary inflatable chambers 72 function to quickly drive the airbag 16 to horizontally deploy in the longitudinal direction. The secondary inflatable chambers 74 receive inflation gases from the plurality of primary inflatable chambers 72 and are inflated after the primary inflatable chambers 72 or at least after the primary inflatable chambers 72 are substantially inflated. The secondary inflatable chambers 74 tension the airbag 16 in the lateral direction. The primary and secondary inflatable chambers 72 and 74 cooperate to provide a barrier between the occupants of the vehicle and the roof frame 12 to thereby protect the occupants.

[0060] Turning to Figures 14A-14C, a series of simplified views are provided to further illustrate the guide assembly 100 of the present teachings for guiding the airbag 16 of the roof airbag arrangement 10 from the stowed position to the deployed position. As discussed above, the guide assembly 100 is shown to generally

include a guide member or guide rail 18 and at least a first sliding member 20. The guide member may be in the form of a slotted tube 18 having a slot 102 for accommodating the tethers 26. In the simplified views of Figures 14A-14C, the guide assembly is shown to include a single sliding member 20 carried by the guide member 18 and translatable relative to the guide member 18 along a translation axis A. It will be understood, however, that the guide member 18 may include a plurality of sliding members 20 with the scope of the present teachings.

[0061] The guide assembly 100 is further illustrated to include a locking member 104 carried by the guide member 18. As will be understood more fully below, the locking member 104 is operable in a first position (shown in dashed lines in Figure 14B to permit the sliding member 20 to translate past the locking member 104 in a first direction D_1 and operable in a second position (shown in Figure 14C, for example) to prevent translation of the sliding member 20 past the locking member 104 in a second direction D_2. The second direction is opposite to the first direction D_1. In the embodiment illustrated, the first direction D_1 is a rearward direction of vehicle travel and the second direction D_2 is a forward direction of vehicle travel.

[0062] In the embodiment illustrated, the locking member 104 is rotatable from the first position to the second position. As shown in the drawings, the locking member 104 rotates in a counterclockwise direction from the first position to the second position. The locking member 104 may be pivotally connected to a mounting flange 106 carried by the guide member 18 by a pivot pin 108. In this manner, the pivot pin 108 defines an axis of rotation for the locking member 104. The axis of rotation is perpendicular to the translation axis A. The locking member 104 may be biased toward the first position with a coil spring 110. In other embodiments within the scope of the present teachings, the present teachings may be adapted to include a locking member that translates between first and second positions.

[0063] In the first position, the locking member 104 extends across and blocks passage of the sliding member 20 along the channel of the guide member 18. The locking member 104 is shown to include a first contact face 104A for interaction with the sliding member 20 when the sliding member 20 moves in the first direction D_1. The locking member 104 may be triangular in shape and the first contact face 104A may extend across the channel of the guide member 18 at an angle to the translation axis A. In one application, the locking member 104 is in the shape of a right triangle and the first contact face is a hypotenuse of the right triangle. When the sliding member

20 translates along the guide member 18 in the first direction D_1, contact of the sliding member 20 with the first contact face 104A rotates the locking member 104 from the second position to the first position against the bias of the coil spring 110, thus loading the coil spring 110.

[0064] The locking member 104 further includes a second contact face 104B. After the sliding member 20 translates in first direction D_1 and passes the locking member 104, the coil spring 110 unloads and the sliding member 20 contacts the second contact face 104B to prevent translation of the sliding member 20 in the second direction D_2. Further rotation of the locking member 104 beyond the second position (e.g. further counterclockwise in the drawings), may be prevented by a stop (not specifically shown) that makes contact with the locking member 104.

[0065] When the general airbag 16 is deployed, the sliding member 20 begins on a first side of the locking member 104 and translates to a second side of the locking member 104. After the sliding member 20 passes the locking member 104 in the first direction D_1, the coil spring 110 rotates the locking member 104 from the first position to the second position. The deployed position of the airbag 16 (shown in Figure 1) is maintained by the locking members 104 which prevent translation of the sliding members 20 in the opposite second direction. In this manner, the airbag 16 is maintained in a desired position for protecting occupants of the vehicle.

[0066] Turning to Figures 15A-15C, a series of simplified views further illustrating another guide assembly in accordance with the present teachings is illustrated and identified at reference character 200. The guide assembly 200 differs from the guide assembly 100 by incorporating a rectangular locking member 202. Given the similarities between the guide assembly 100 and the guide assembly 200, like reference characters are used to identify like elements. It will be understood that the rectangular locking member 202 is just one example of an alternative locking member geometry. In this regard, the locking member may have any shape suitable to allow passage in the first direction D_1 and prevent passage in the second direction D_2.

[0067] While specific embodiments and applications of the present disclosure have been illustrated and described, it is to be understood that the invention is not limited to the precise configuration and components disclosed herein. Various modifications, changes, and variations, which will be apparent to those skilled in the art, may be made in the arrangement, operation, and details of the methods and systems of the present disclosure without departing from the spirit and scope of the disclosure.

CLAIMS

What is claimed is:

1. A guide assembly 100 for a roof airbag arrangement 10 of a vehicle, the guide assembly comprising:

a guide member 18; and

at least a first sliding member 20 carried by the guide member 18 and translatable relative to the guide member 18 along a translation axis;

characterized by a locking member 104 carried by the guide member 18, the locking member 104 operable in a first position to permit the first sliding member 20 to translate past the locking member 104 in a first direction and the locking member 104 operable in a second position to prevent translation of the first sliding member 20 past the locking member 104 in a second direction, the second direction being opposite to the first direction.

2. The guide assembly 100 for a roof airbag arrangement 10 of a vehicle according to claim 1, characterized in that the guide member 18 defines a channel 22 and the first sliding member 20 is disposed in the channel 22 for translation within the channel 22.

3. The guide assembly 100 for a roof airbag arrangement 10 of a vehicle according to one of the preceding claims, characterized in that the locking member 104 is rotatable from the first position to the second position.

4. The guide assembly 100 for a roof airbag arrangement 10 of a vehicle according to claim 3, characterized in that the locking member 104 is rotatable about an axis of rotation, the axis of rotation being perpendicular to the translation axis.

5. The guide assembly 100 for a roof airbag arrangement 10 of a vehicle according to one of the preceding claims, characterized in that, wherein the guide member 18 is a tubular guide member.

6. The guide assembly 100 for a roof airbag arrangement 10 of a vehicle according to claim 5, wherein the tubular guide member 18 is a slotted tubular guide member with a longitudinally extending slot 24.

7. The guide assembly 100 for a roof airbag arrangement 10 of a vehicle according to one of the preceding claims, characterized in combination with a roof airbag 16, the roof airbag 16 connected to the first sliding member 20 with at least a first tether 26.

8. The guide assembly 100 for a roof airbag arrangement 10 in combination with the roof airbag 16 in accordance with claim 8, characterized in that the guide member 18 is a slotted tubular guide member with a longitudinally extending slot 24 and the first tether 26 passes through the longitudinally extending slot 24.

9. The guide assembly 100 for a roof airbag arrangement 10 of a vehicle according to one of the preceding claims, characterized in that the locking member 104 is biased toward the first position such that the locking member 104 returns from the second position to the first position after the first sliding member 20 translates past the locking member 104 in the first direction.

10. The guide assembly 100 for a roof airbag arrangement 10 of a vehicle according to one of the preceding claims, wherein the locking member 104 is biased toward the first position by a coil spring.

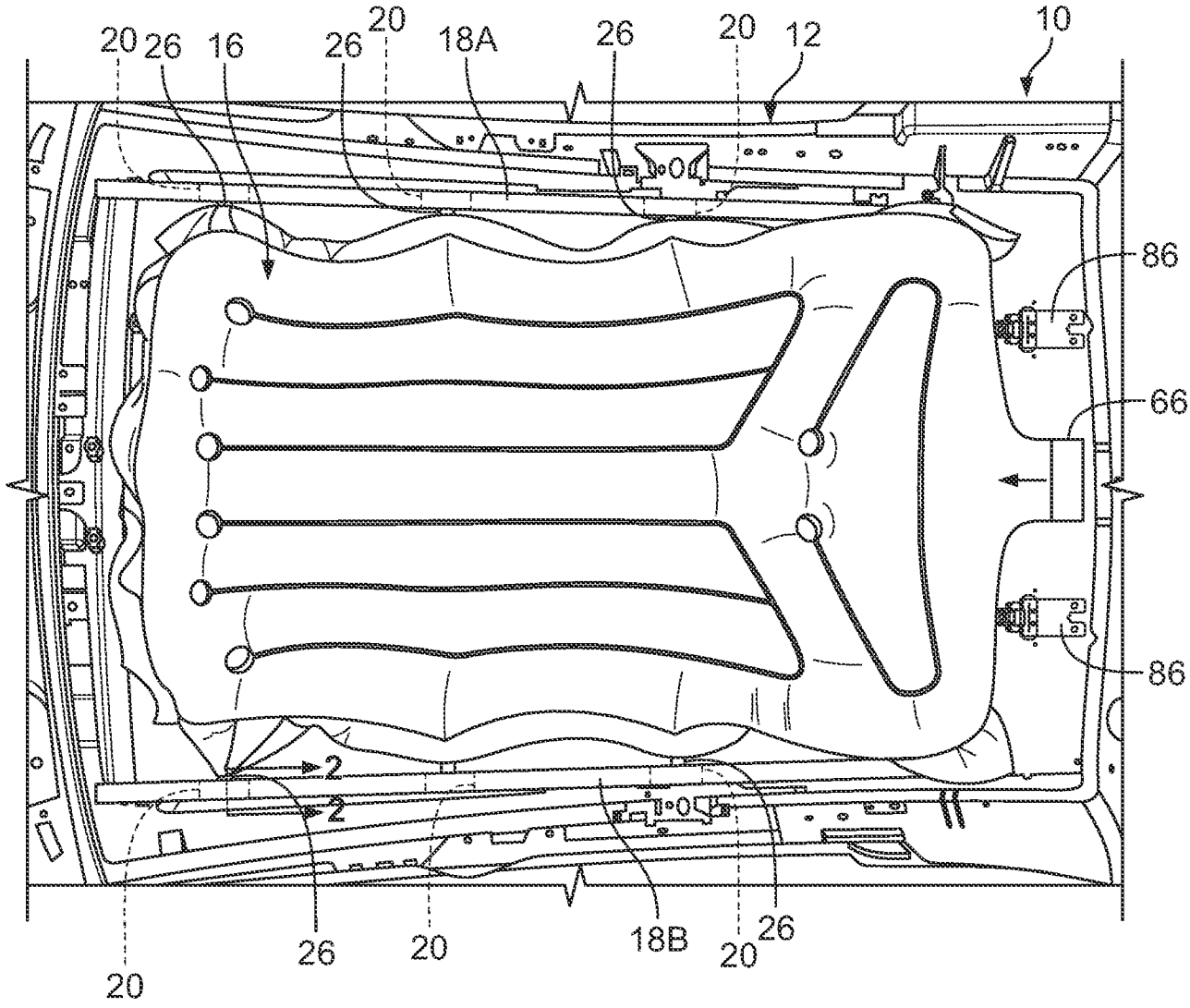


FIG. 1

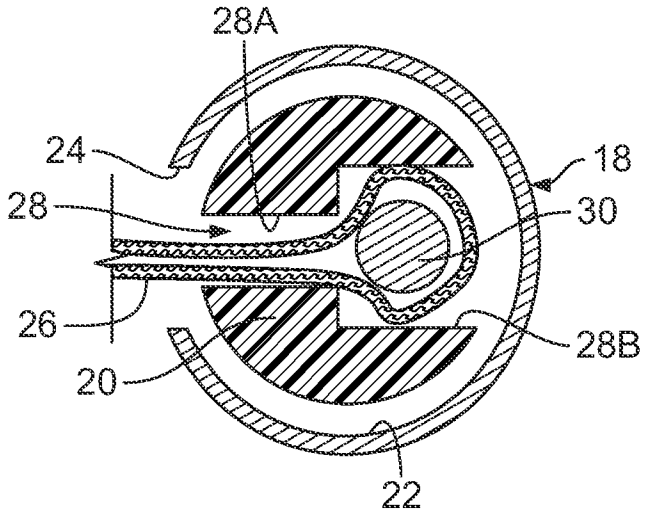


FIG. 2

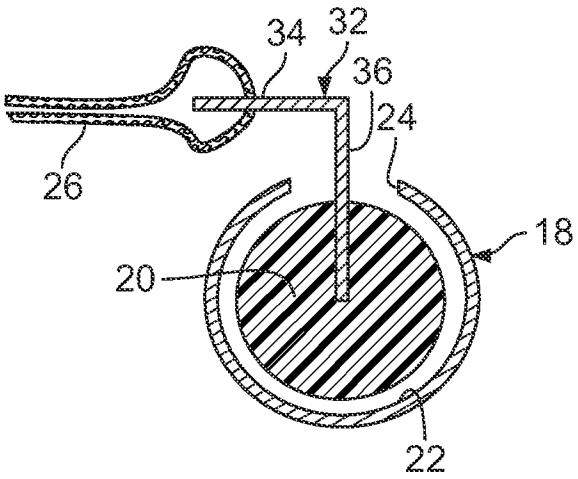


FIG. 3

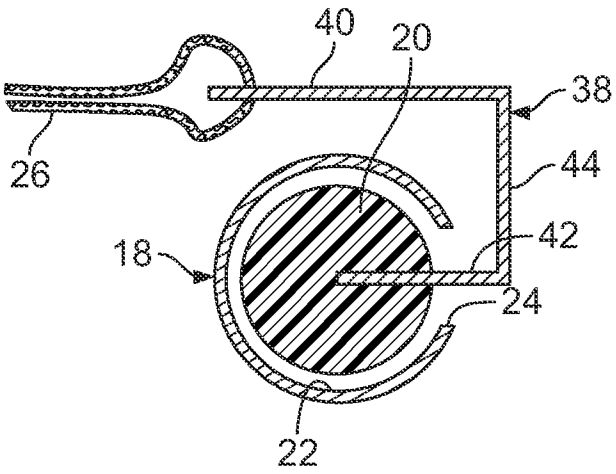


FIG. 4

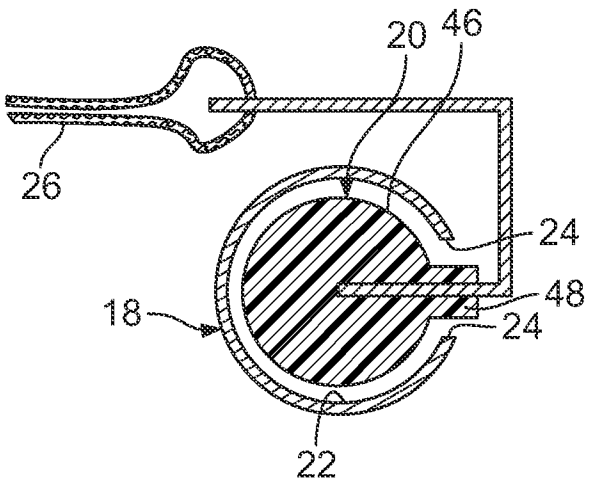
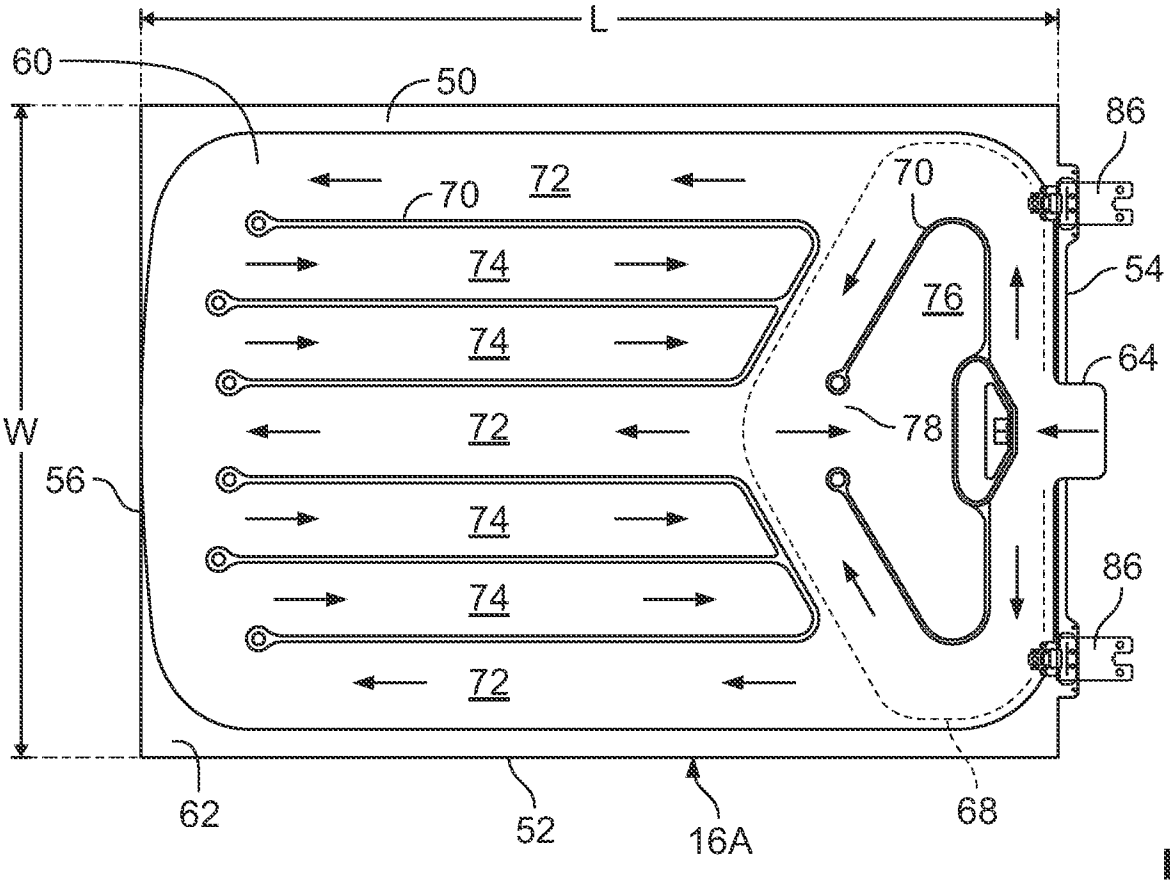


FIG. 5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16A
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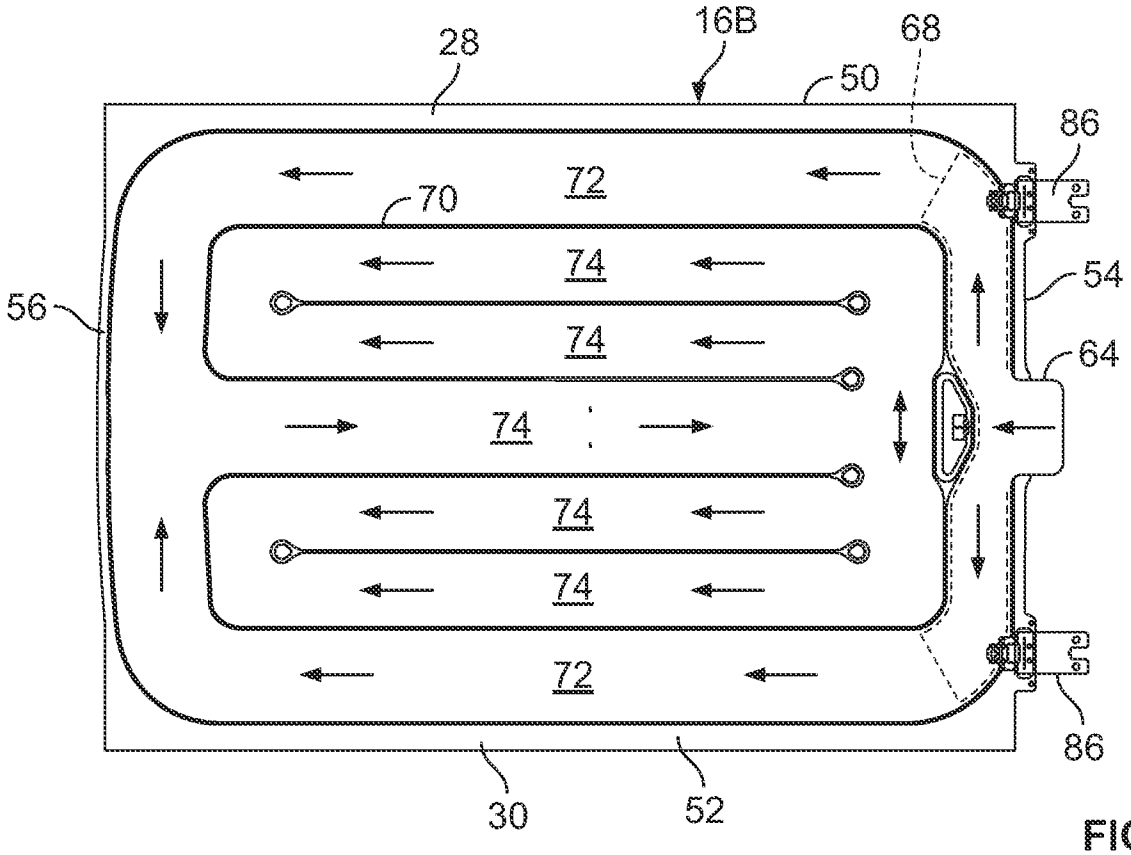
FIG. 6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16B
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86
30
52

FIG. 7

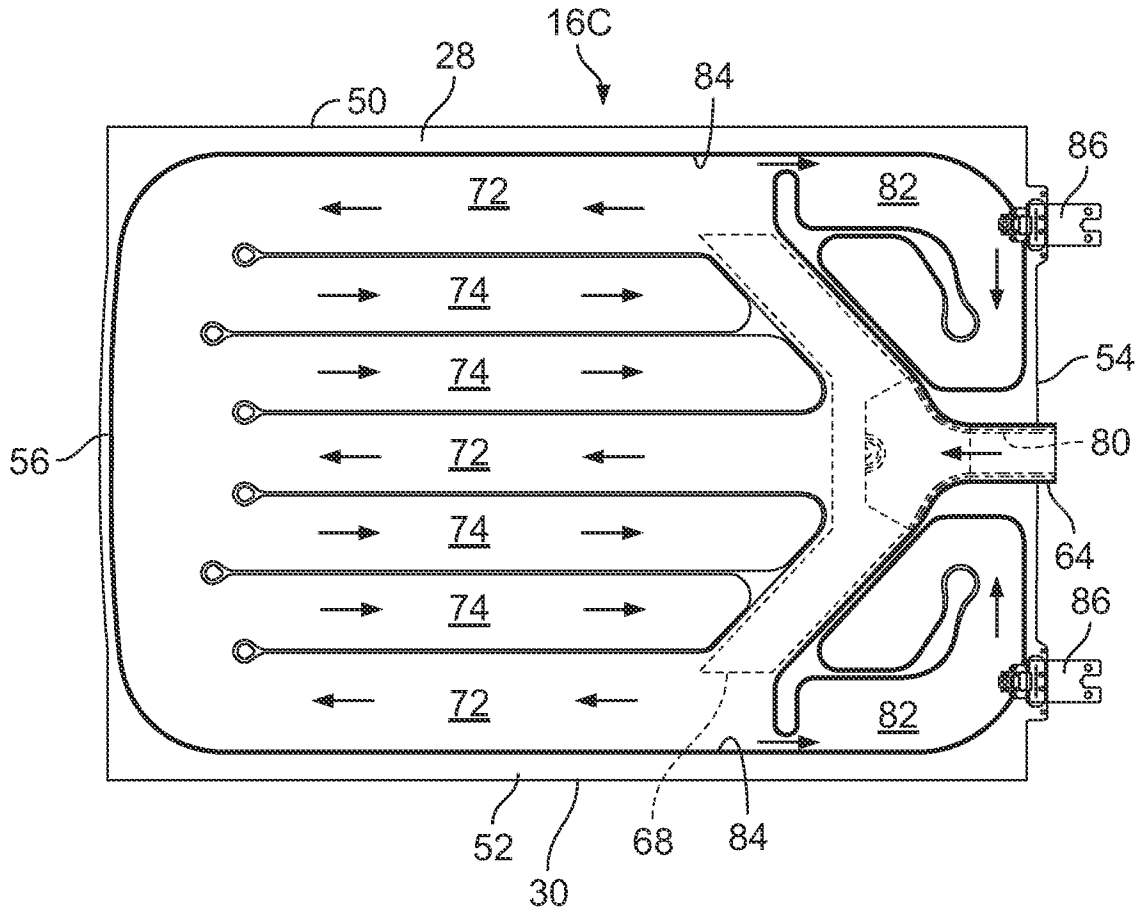

FIG. 8

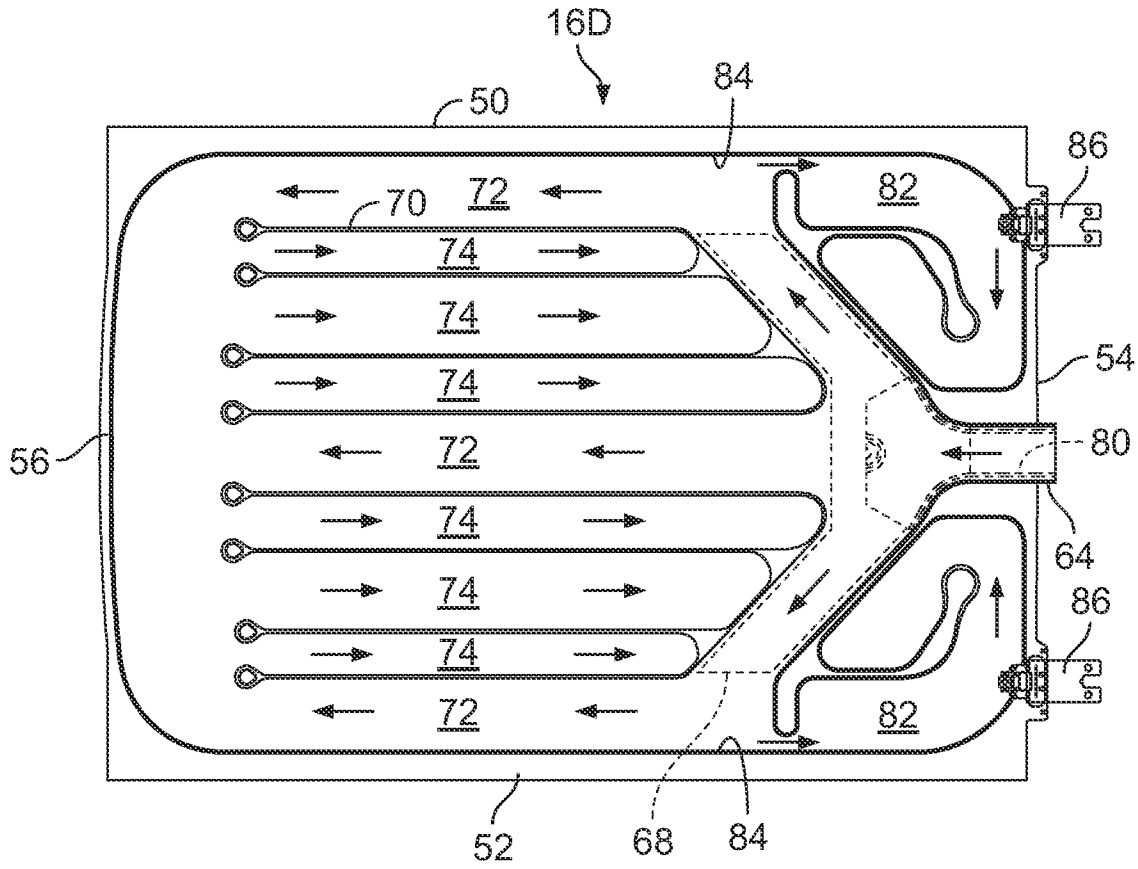

FIG. 9

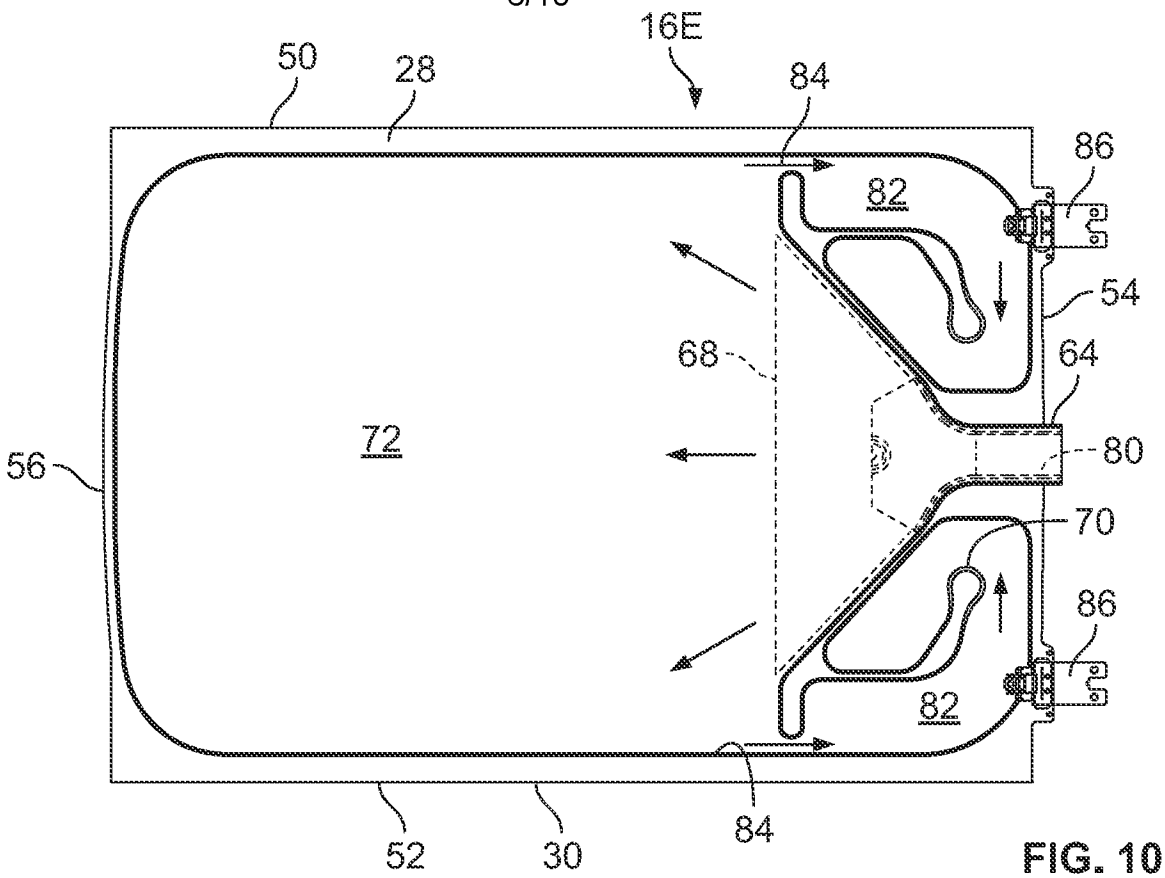
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FIG. 10

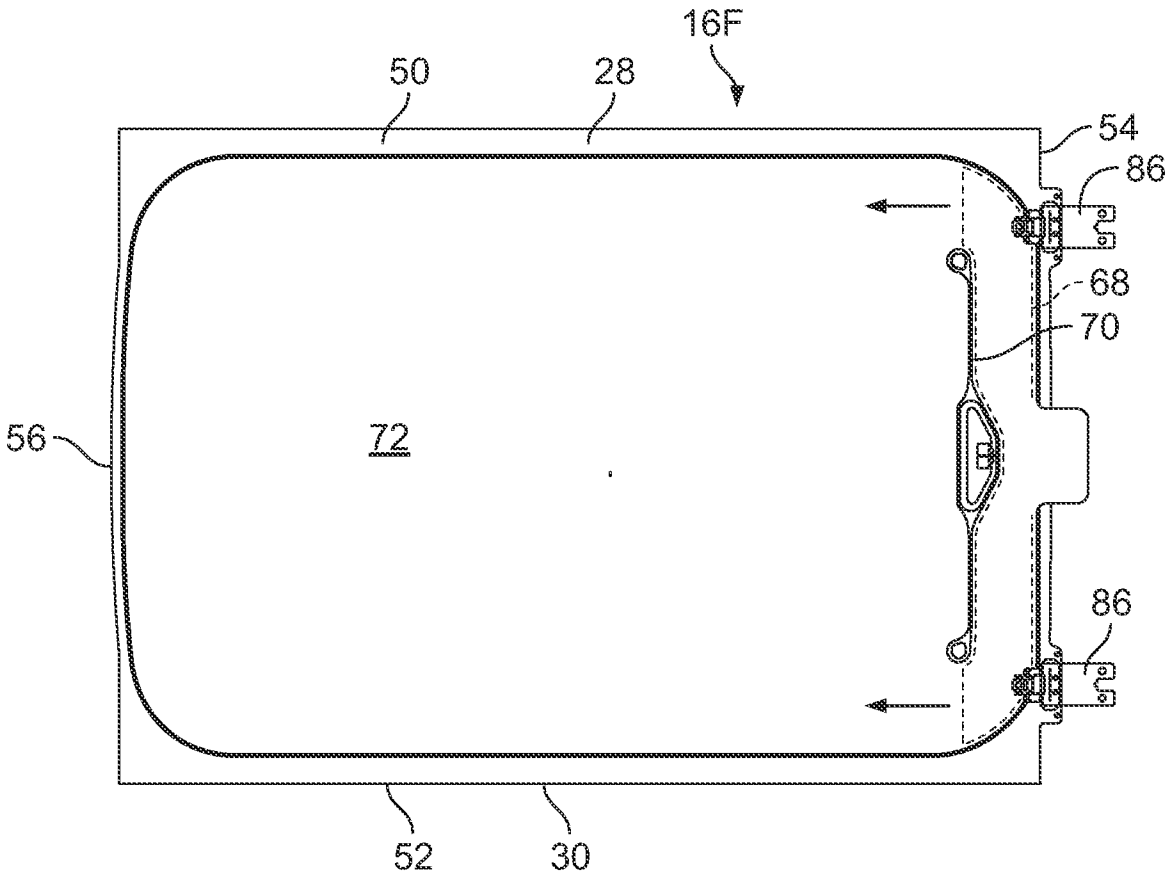
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FIG. 11

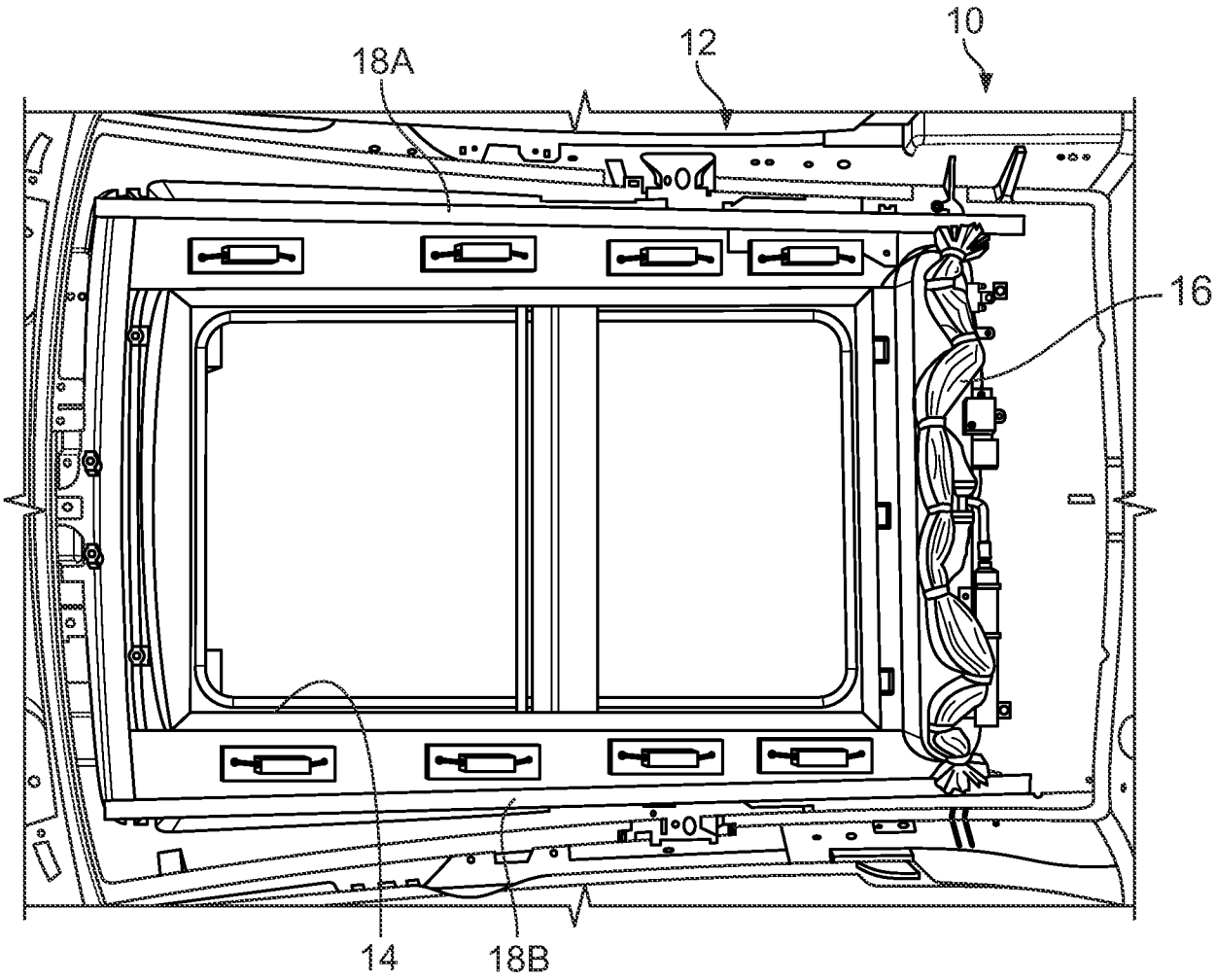

FIG. 12

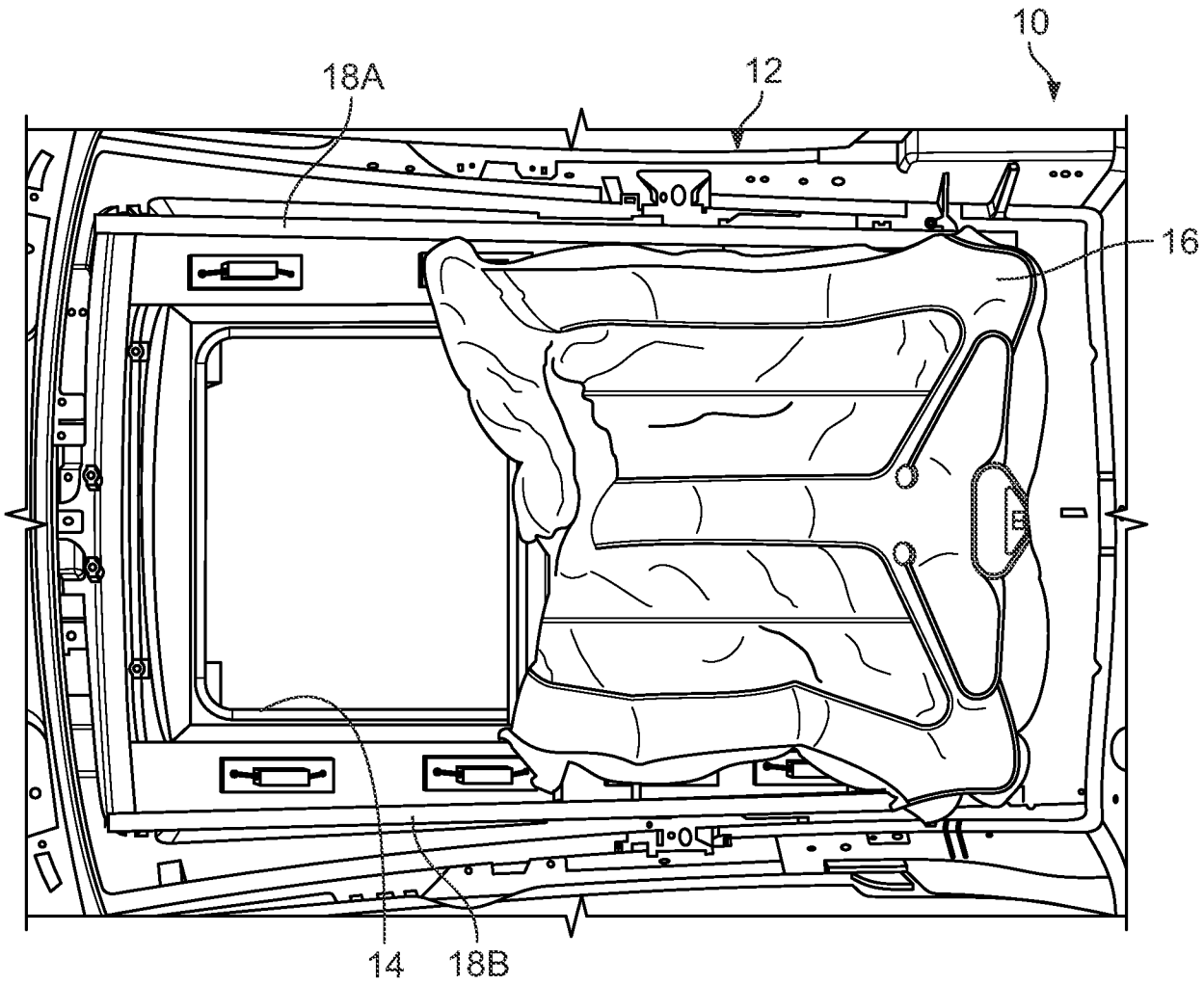

FIG. 13

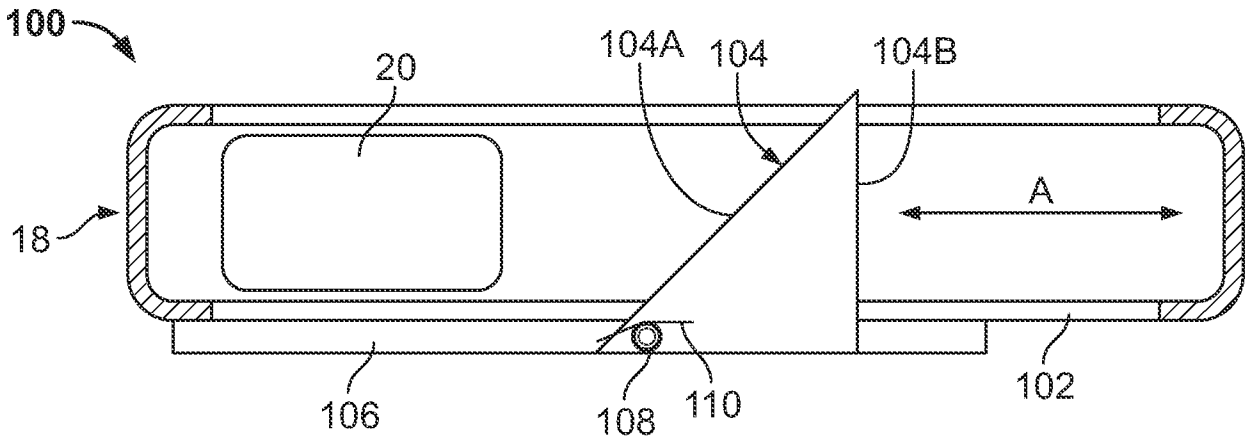

FIG. 14A

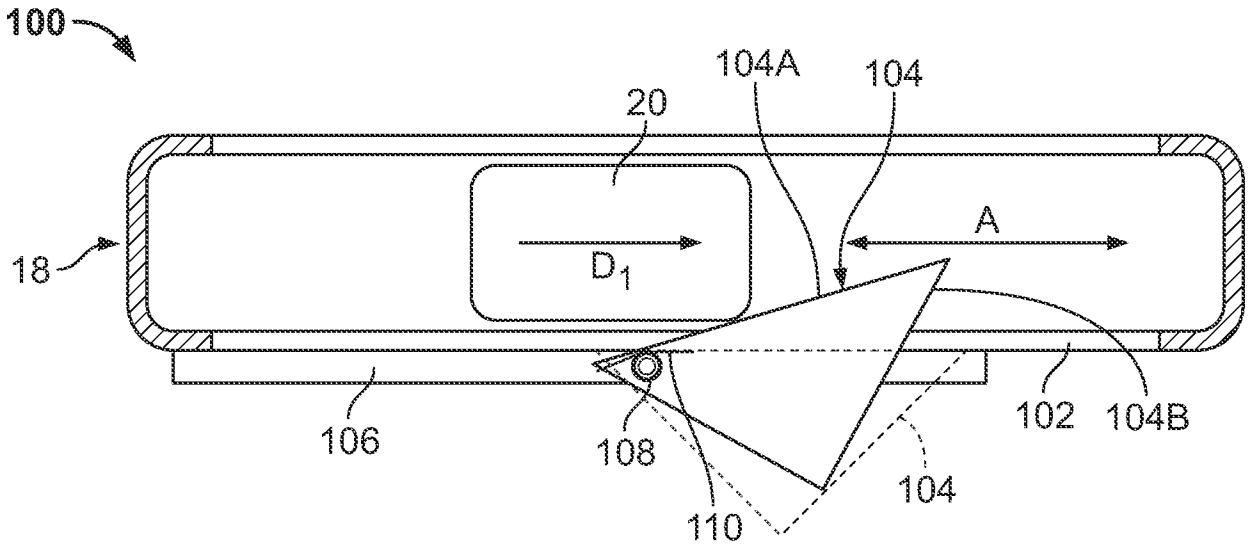

FIG. 14B

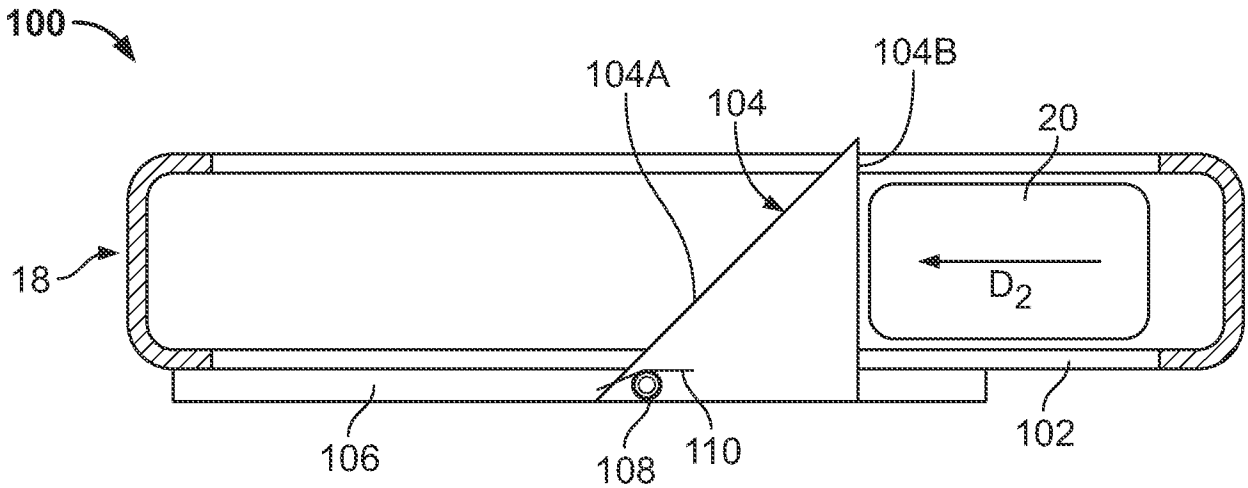

FIG. 14C

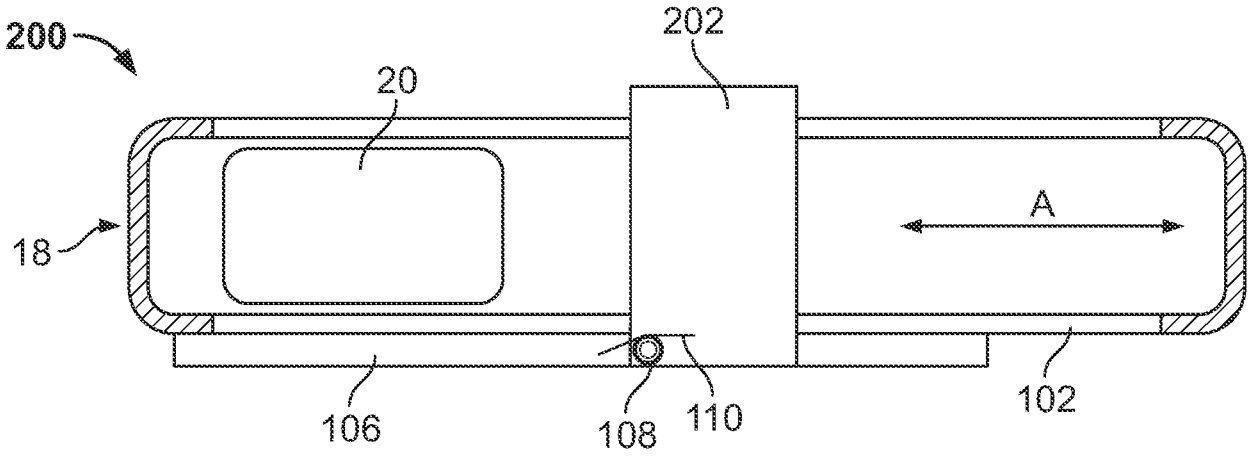

FIG. 15A

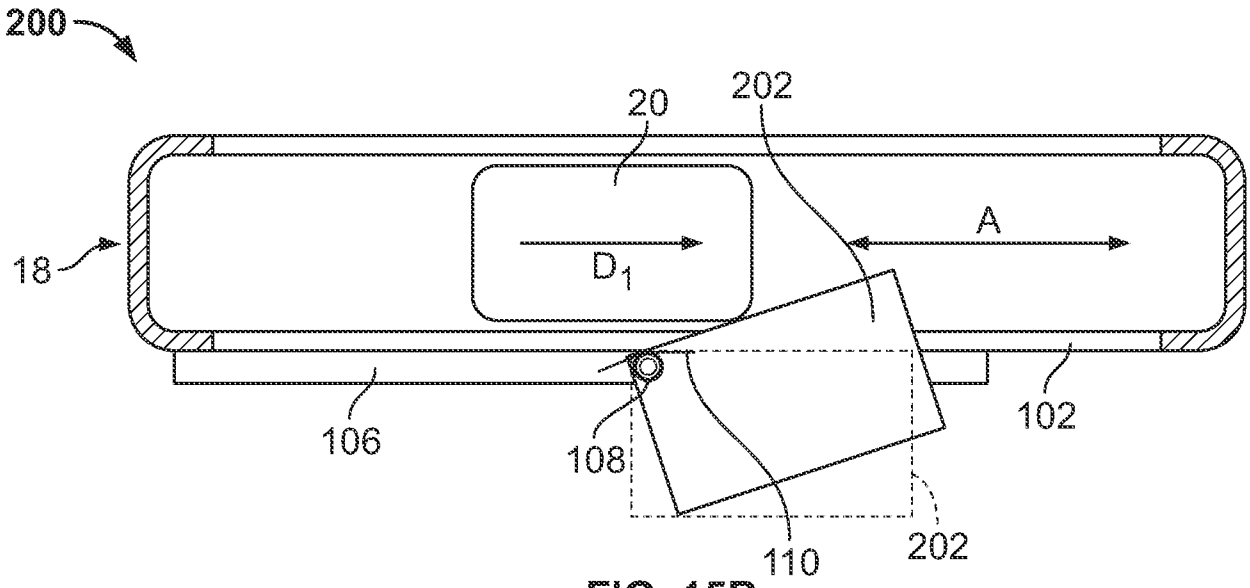

FIG. 15B

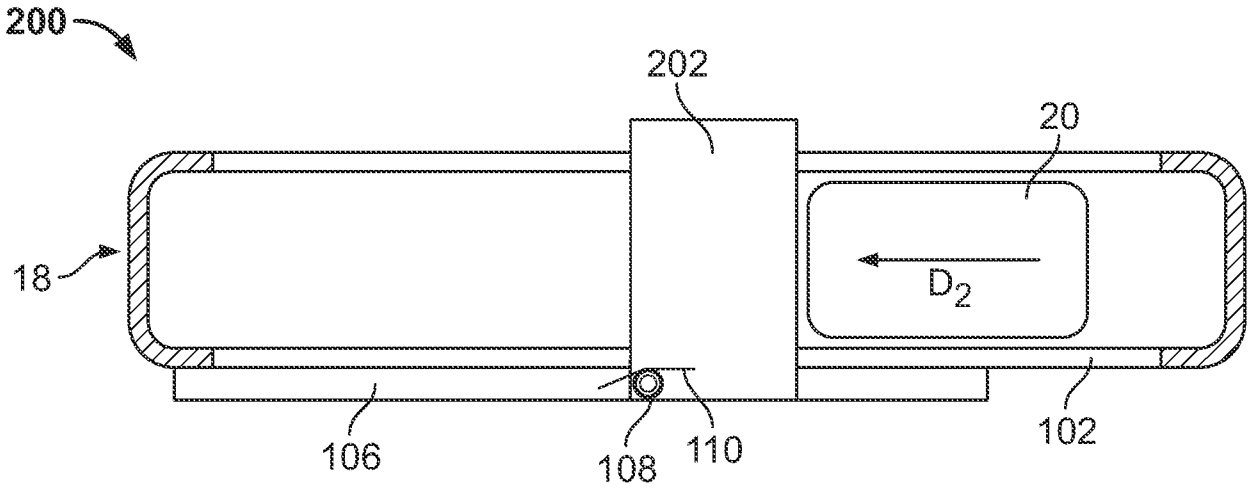

FIG. 15C

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2022/035644

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60R21/231 B60R21/2334 B60R21/13 B60R21/214
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 9 994 182 B1 (JARADI DEAN M [US] ET AL) 12 June 2018 (2018-06-12) column 2, line 63 - column 7, line 26; figures 1-5	1-10
X	US 2017/267199 A1 (SCHÜTT THOMAS [DE] ET AL) 21 September 2017 (2017-09-21)	1,2,5-10
A	paragraph [0058] - paragraph [0074]; figures 1A-9	3,4
A	US 2021/101556 A1 (JARADI DEAN M [US] ET AL) 8 April 2021 (2021-04-08) paragraph [0041] - paragraph [0049]; figures 1, 3, 11 paragraph [0059]	1-10

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[x] Further documents are listed in the continuation of Box C.

[x] See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 November 2022	14/11/2022

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Ekblom, Henrik

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2022/035644

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2022/035644

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