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INSTRUMENT PANEL BAG FOR SMALL OFFSET AND REDUCED INSTRUMENT PANEL DEPTH

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INSTRUMENT PANEL BAG FOR SMALL OFFSET AND REDUCED INSTRUMENT PANEL DEPTH

Background

It is known to provide an inflatable vehicle occupant protection device, such as an airbag, for helping to protect an occupant of a vehicle. Airbags are inflatable between a portion of the vehicle and a vehicle occupant. One particular type of airbag is a frontal airbag inflatable between an occupant of a front seat of the vehicle and an instrument panel of the vehicle. Such airbags can be driver airbags or passenger airbags. When inflated, the driver and passenger airbags help protect the occupant from impacts with parts of the vehicle such as the instrument panel and/or a steering wheel of the vehicle.

Driver airbags are typically stored in a deflated condition in a housing that is mounted on the vehicle steering wheel. An airbag cover is connectable with the housing and/or steering wheel to help enclose and conceal the airbag in a stored condition. Upon deployment of the driver airbag, the airbag cover opens to permit the airbag to move to an inflated position. The airbag cover opens as a result of forces exerted on the cover by the inflating driver airbag.

Passenger airbags are typically stored in a deflated condition in a housing that is mounted to the vehicle instrument panel. An airbag cover is connectable with the housing and/or instrument panel to help enclose and conceal the airbag in a stored condition. Upon deployment of the passenger airbag, the airbag cover opens to permit the airbag to move to an inflated position. The airbag cover opens as a result of forces exerted on the cover by the inflating airbag.

Known frontal airbags thus rely on the instrument panel and instrument panel-adjacent structures, such as the steering wheel, for providing a storage location and a reaction surface for occupant protection and ejection mitigation in the event of a frontal crash. In certain vehicle configurations, such as in driverless, autonomous, semi-autonomous, automated, and/or semi-automated vehicles, the instrument panel may be designed in a manner that reduces its functionality as an airbag storage location and/or as a reaction surface. For example, in certain vehicle configurations, there may be no instrument panel or the instrument panel may be smaller and narrower than

conventional instrument panels. In such vehicle configurations, it may be desirable to include a large open area or a workstation where at least a portion of the instrument panel would have been located. In these and other similar vehicle configurations, it may be desirable to store at least one of the frontal airbags in a different location within the vehicle.

Present Disclosure

The present disclosure provides an inflatable vehicle occupant protection device in the form of an airbag, such as a passenger frontal airbag, for helping to protect an occupant seated in a front passenger vehicle seat in the event of a vehicle collision. An instrument panel of the vehicle may be smaller and narrower than conventional instrument panels and, thus, the instrument panel may not adequately accommodate an airbag module that includes the passenger frontal airbag. Therefore, the airbag module may be stored in a vehicle center stack between the driver and passenger sides of the vehicle.

As shown in the example configuration of Figs. 1-3, upon the occurrence of an event for which occupant protection is desired, such as a vehicle collision, an airbag controller actuates an inflator to provide inflation fluid to the passenger frontal airbag to inflate and deploy the passenger frontal airbag from a stored condition (Fig. 1) to a deployed condition (Figs. 2-3). The deploying passenger frontal airbag deploys cross-car (i.e., "side-to-side") from the center stack, instead of in a fore-aft direction from the instrument panel.

As shown in the example configuration of Figs. 1 and 3, the instrument panel is reduced in order to accommodate a workstation for the occupant. As shown in Figs. 2-3, the passenger frontal airbag is configured to deploy around the workstation and provide adequate coverage for helping to protect the vehicle occupant. The passenger frontal airbag may include one or more internal tethers that cause a bend in the deploying passenger frontal airbag so that the passenger frontal airbag may deploy around the workstation.

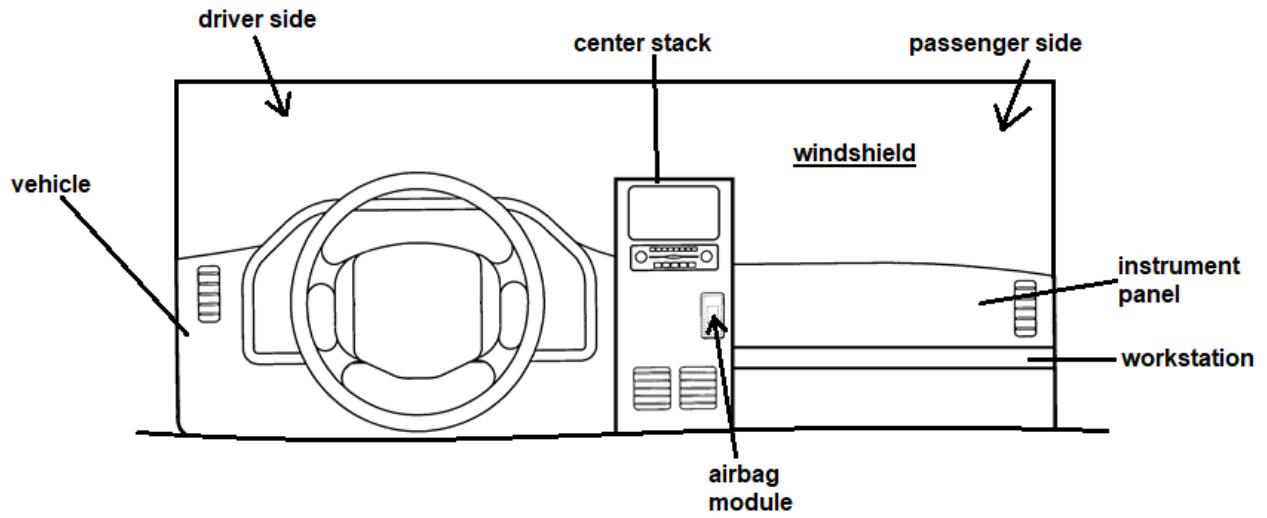


Fig. 1

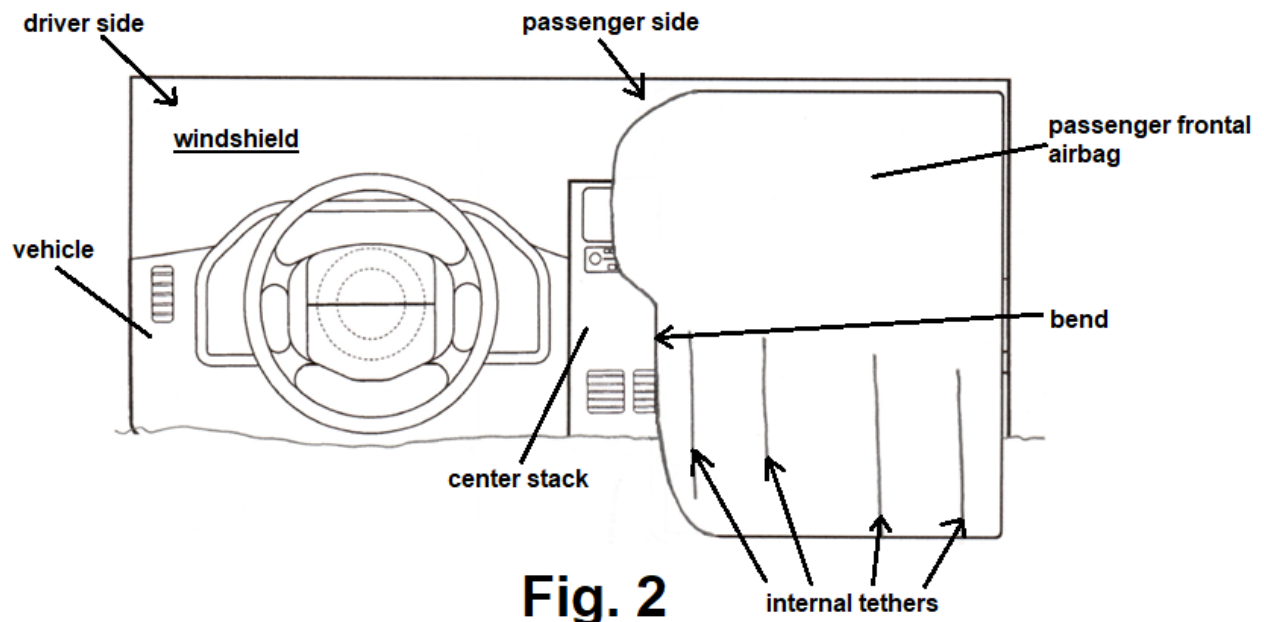


Fig. 2

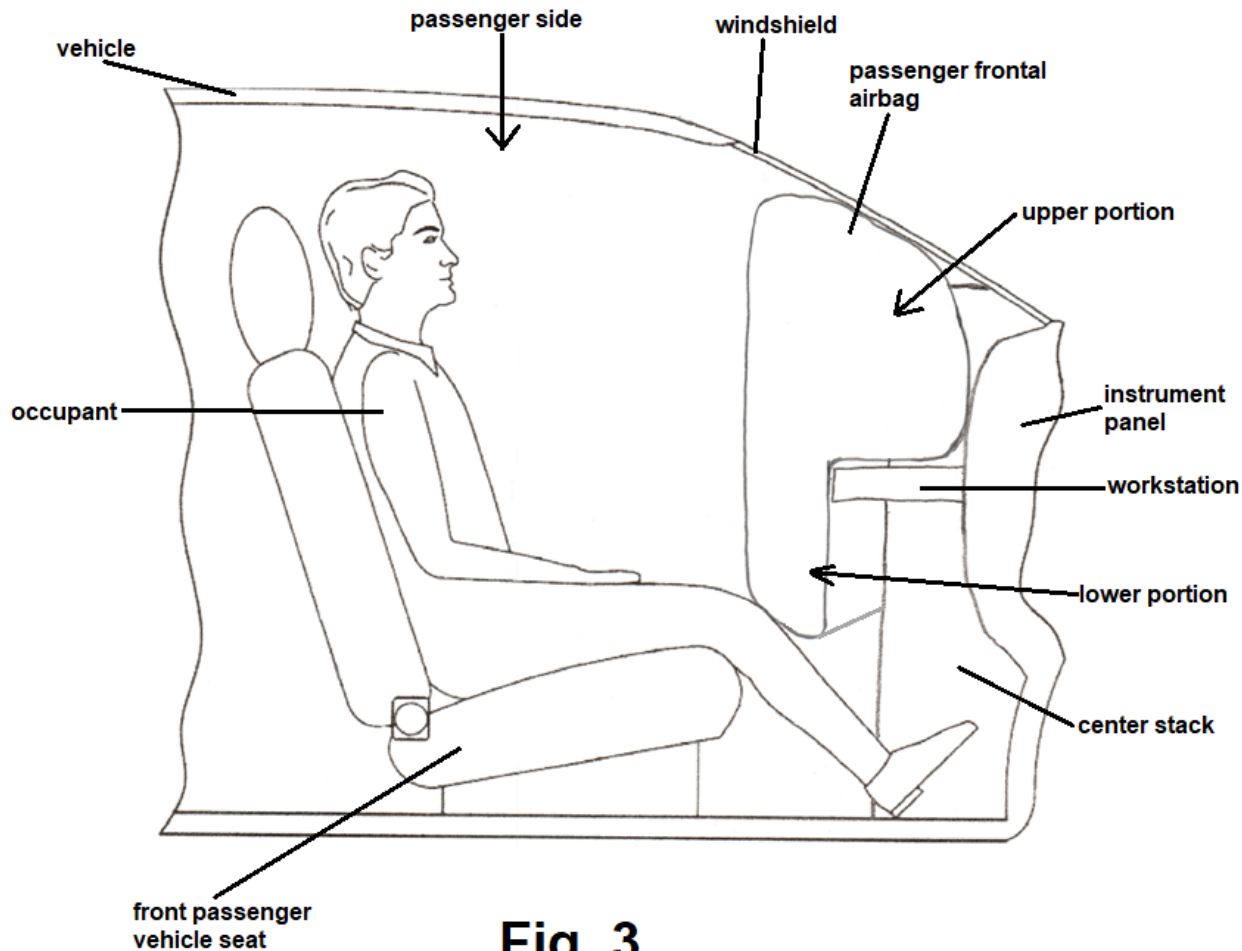


Fig. 3

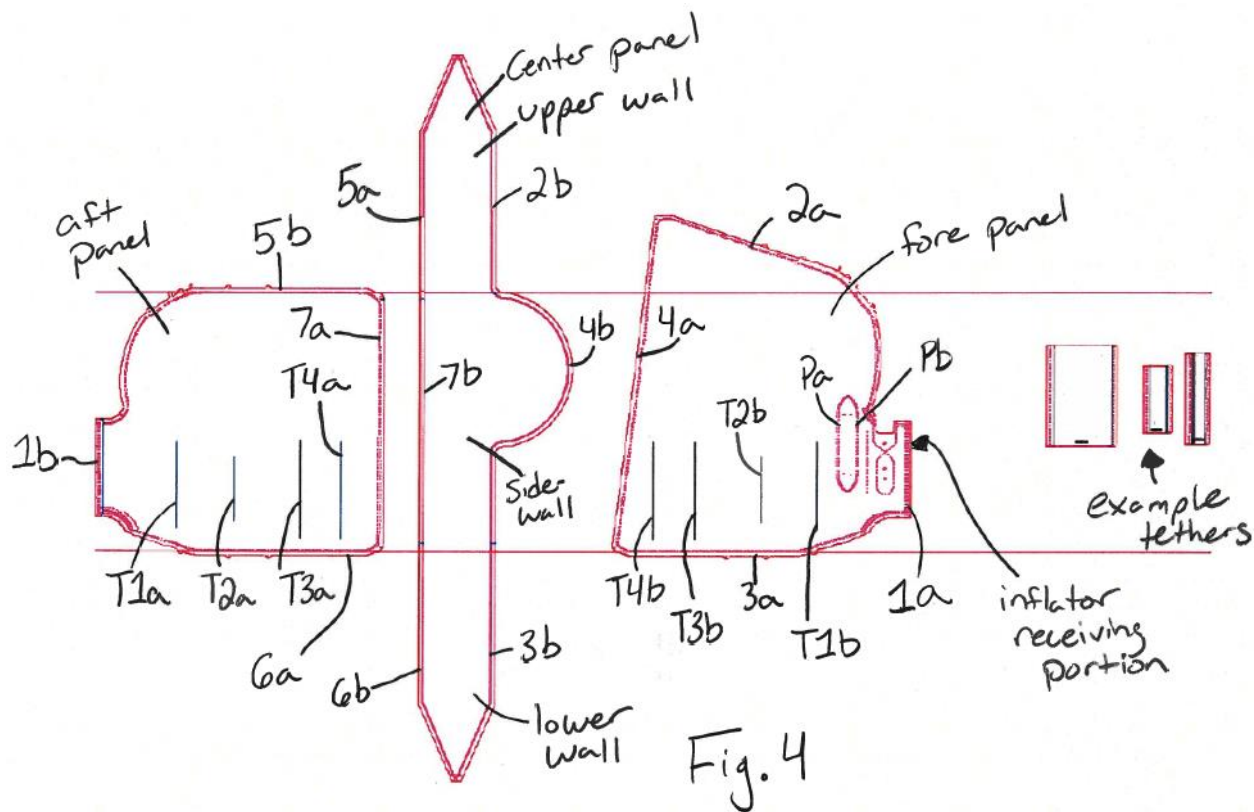
The following descriptions/Figures describe/depict example configurations of the passenger frontal airbag. However, it should be appreciated that configurations other than the ones shown herein may be conceived based on the teachings disclosed herein.

Fig. 4 depicts an example configuration of the passenger frontal airbag in a preassembled state. The passenger frontal airbag of Fig. 4 is constructed from three separate panels (aft panel, center panel, and fore panel) that are sewn, or otherwise connected, together. Edge 1a may be sewn to edge 2b, edge 2a to edge 2b, edge 3a to 3b, and so on.

Figs. 5-7 depict the passenger frontal airbag of Fig. 4 in the inflated and deployed condition. The sidewall of the center panel is configured to produce an upper portion

with a greater airbag depth (i.e., a distance between the fore and aft panels in the inflated condition) than a lower portion. The upper and lower walls of the center panel are configured such that the airbag depth at least partially increases starting from a portion of the airbag that is adjacent to the 1a/1b edge connection to the sidewall.

As shown in Figs. 4 and 8, each end of the internal tethers are connected to a tether point on the aft panel and a tether point on the aft panel. For example a first tether T1 may have a first end connected to a first tether point T1a on the aft panel and a second end connected to a first tether point T1b on the fore panel. As shown in Fig. 8, the tethers T1-T4 help produce the bend in the passenger frontal airbag. The fore panel may also include pinch segments Pa, Pb that are sewn, or otherwise connected, together to form a pinch in the fore panel. The pinch in the fore panel helps produce the bend in the passenger frontal airbag.



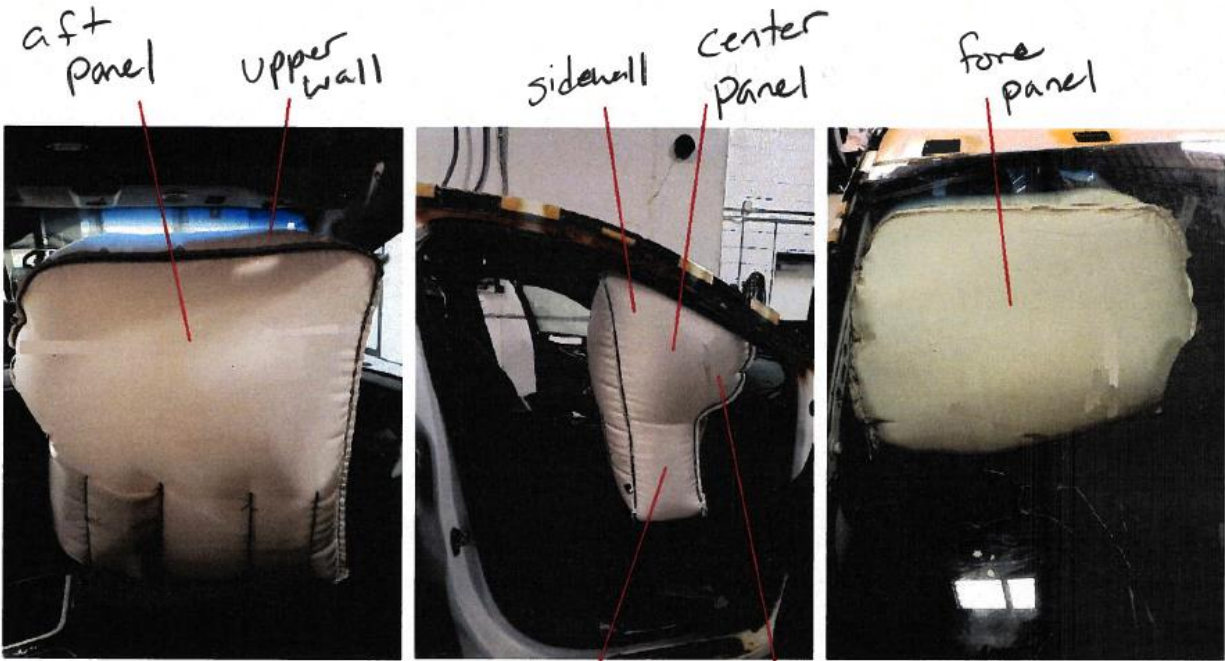


Fig. 5

lower portion upper portion

Fig. 6

Fig. 7

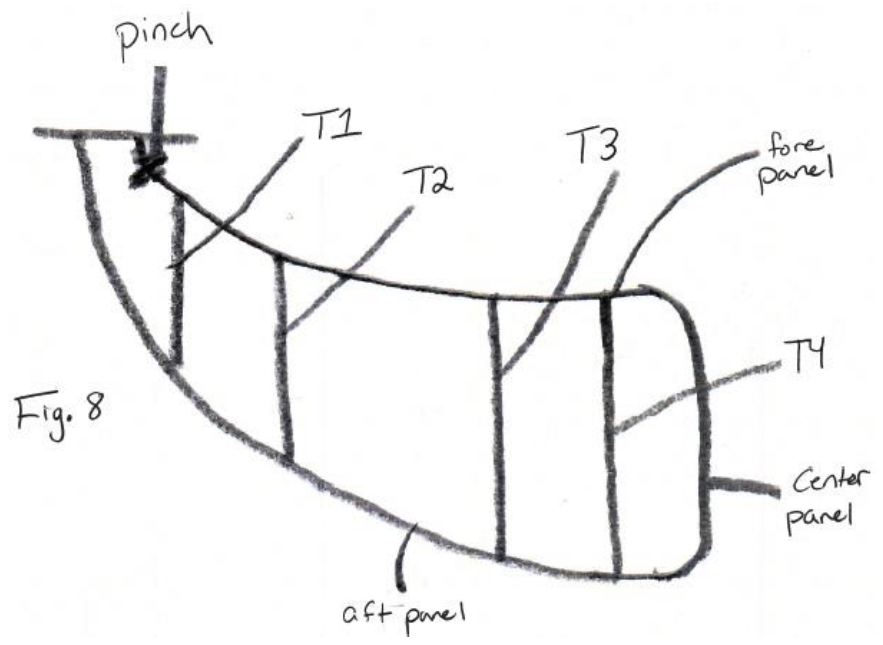


Fig. 8

Fig. 9 depicts an example configuration of the passenger frontal airbag in a preassembled state. The passenger frontal airbag of Fig. 9 is constructed from three separate panels (aft panel, center panel, and fore panel) that are sewn, or otherwise connected, together. Edge 1a may be sewn to edge 2b, edge 2a to edge 2b, edge 3a to 3b, and so on.

The sidewall of the center panel is configured such that the upper and lower portions of the passenger frontal airbag have substantially the same airbag depth. The upper and lower walls of the center panel are configured such that the airbag depth at least partially increases starting from a portion of the airbag that is adjacent to the 1a/1b edge connection to the sidewall.

As shown in Figs. 9-10, each end of the internal tethers are connected to a tether point on the aft panel and a tether point on the aft panel. For example a first tether T1 may have a first end connected to a first tether point T1a on the aft panel and a second end connected to a first tether point T1b on the fore panel. Unlike the tethers T1-T4 of the passenger frontal airbag of Figs. 4-8, the ends of each tether T1-T4 of the passenger frontal airbag of Figs. 9-10 are offset from one another. The offset tether ends help produce the bend in the passenger frontal airbag.

The fore panel may also include pinch segments Pa, Pb that are sewn, or otherwise connected, together to form a pinch in the fore panel. The pinch in the fore panel helps produce the bend in the passenger frontal airbag.

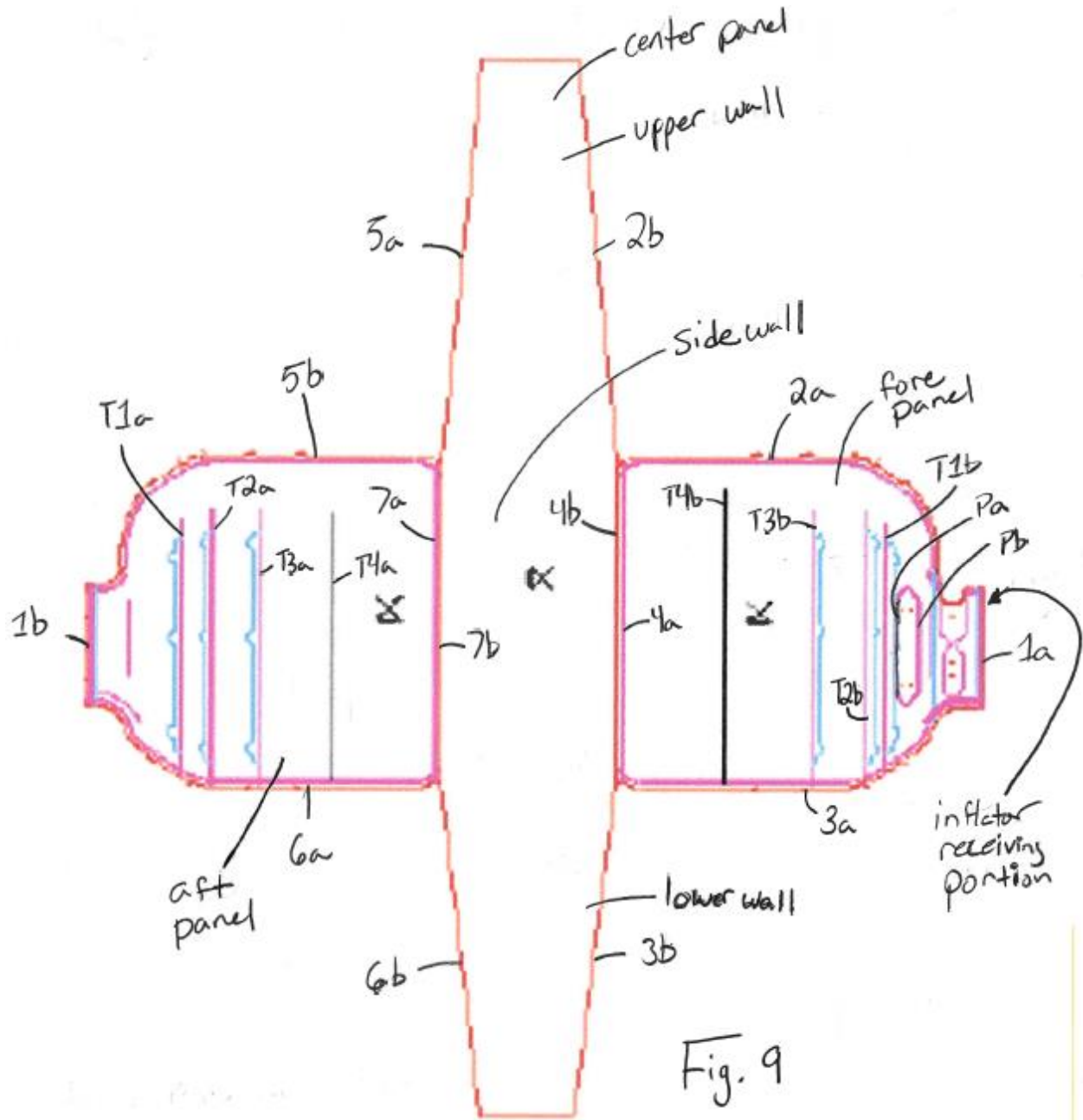


Fig. 9

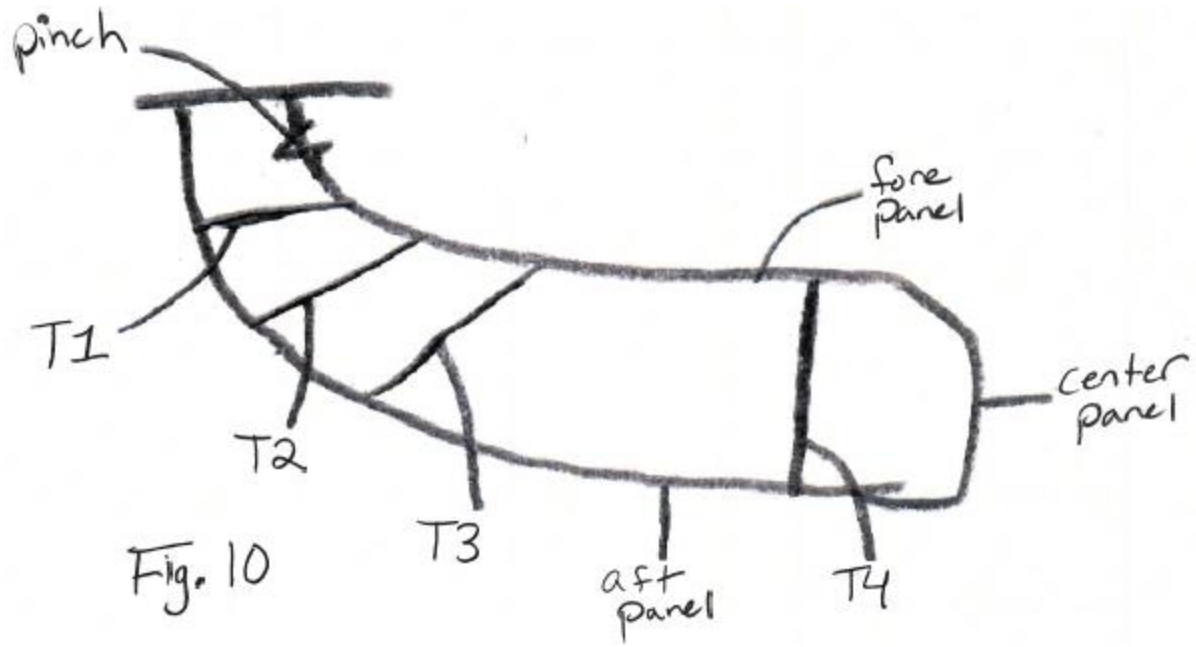


Fig. 11 depicts an example configuration of the passenger frontal airbag in a preassembled state. The passenger frontal airbag of Fig. 11 is substantially the same as the passenger frontal airbag of Fig. 9, except that the passenger frontal airbag of Fig. 11 has a one-piece construction. The aft, center, and fore panels thus are all integrated in one piece of airbag material.

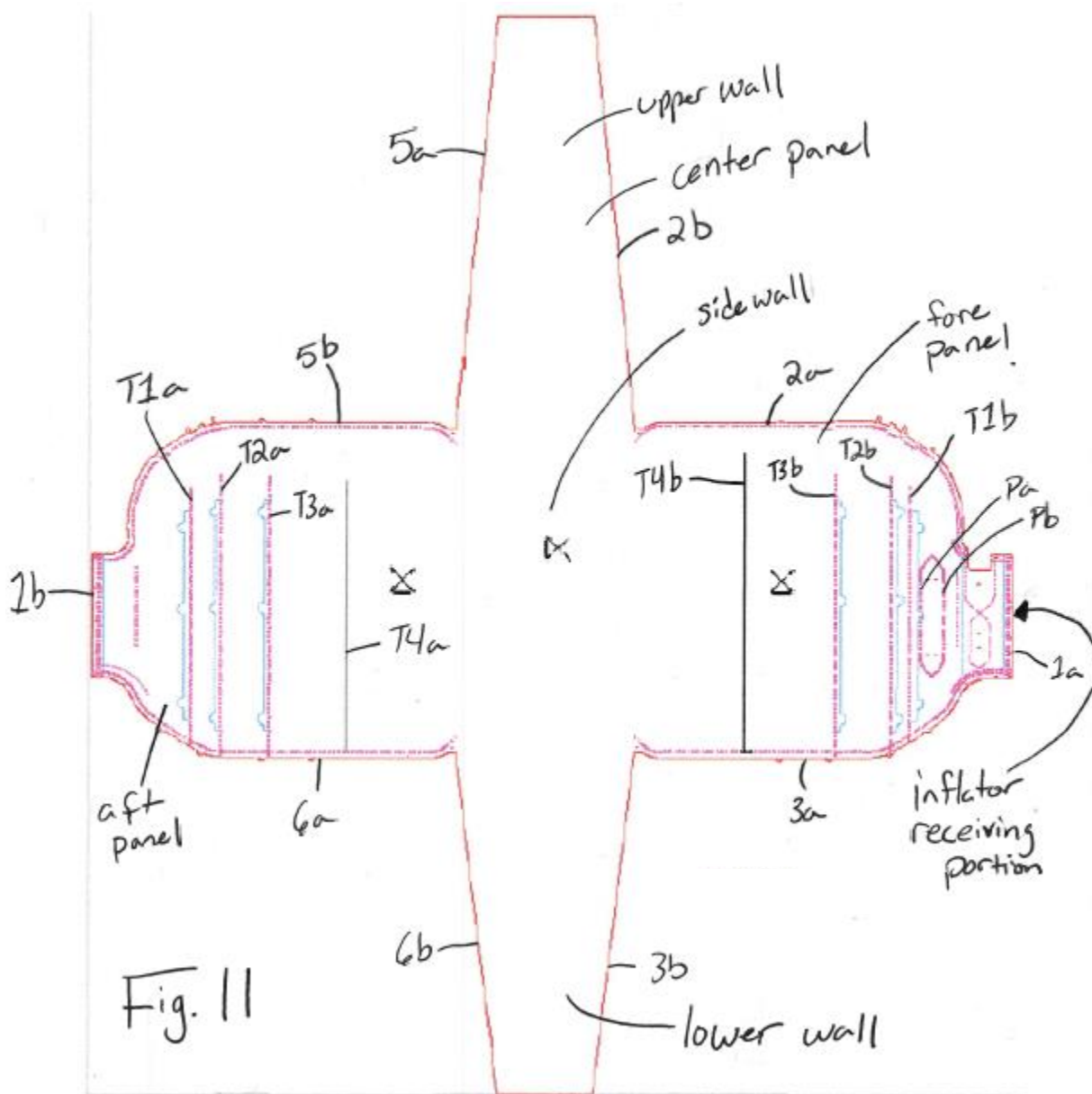


Fig. 12 depicts an example configuration of the passenger frontal airbag in a preassembled state. The passenger frontal airbag of Fig. 12 is substantially the same as the passenger frontal airbag of Fig. 11, except that the airbag depth is substantially the same starting from a portion of the airbag that is adjacent to the 1a/1b edge connection to the sidewall.

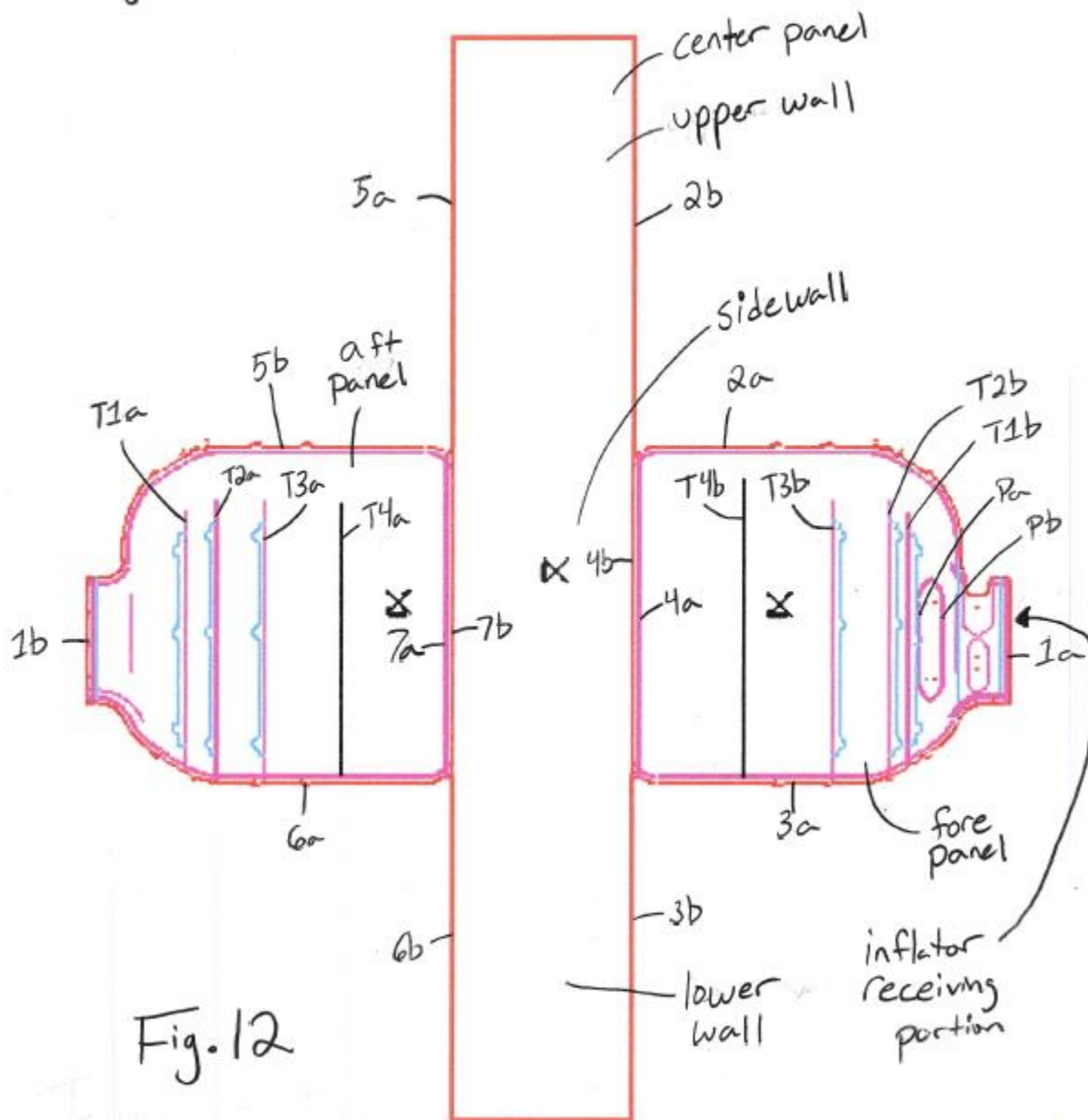


Fig. 13 depicts an example configuration of the passenger frontal airbag in a preassembled state. The passenger frontal airbag of Fig. 13 is substantially the same as the passenger frontal airbag of Fig. 11, except that the passenger front airbag of Fig. 13 does not include a center panel. The airbag depth of the passenger frontal airbag of Fig. 13 thus is substantially the same starting from a portion of the airbag that is adjacent to the 1a/1b edge connection to the sidewall.

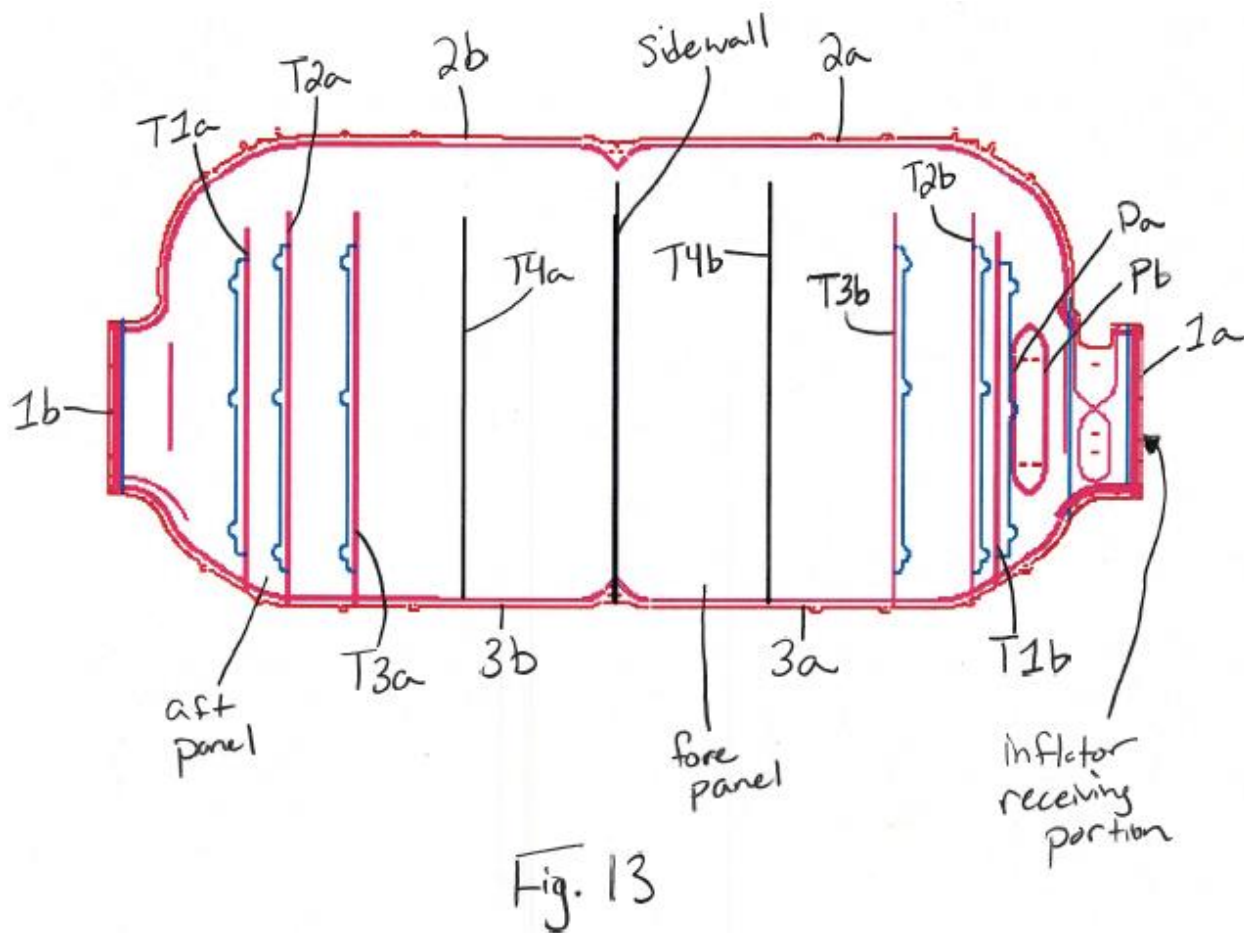
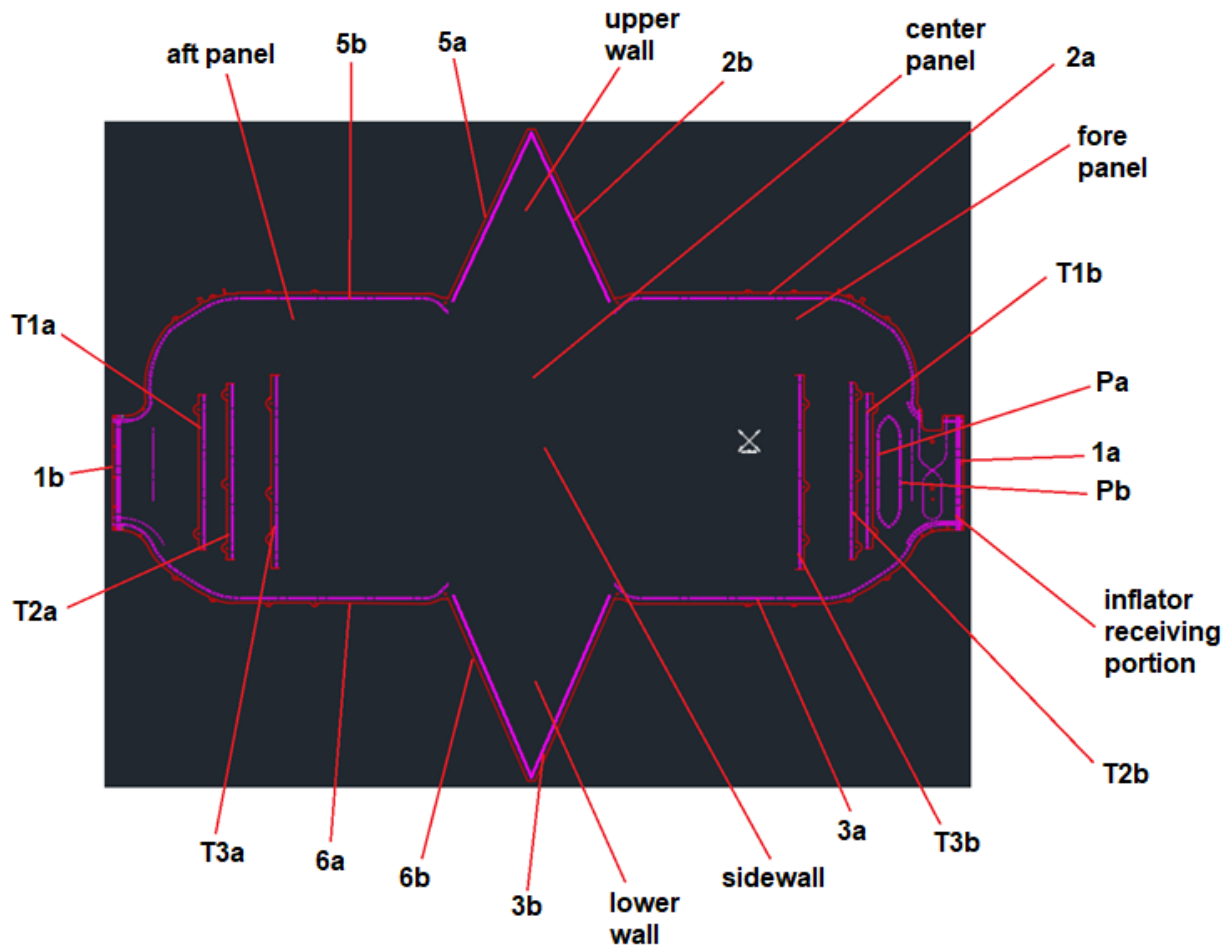


Fig. 14 depicts an example configuration of the passenger frontal airbag in a preassembled state. The passenger frontal airbag of Fig. 14 is substantially the same as the passenger frontal airbag of Fig. 11, except that the upper and lower walls of the passenger frontal airbag of Fig. 14 are more triangular-shaped than the upper and lower walls of the passenger frontal airbag of Fig. 11.



It is contemplated that any of the passenger frontal airbags described herein may be constructed from a plurality of pieces of airbag material or from a single piece of airbag material.

Although the airbag module has been described as being stored in the vehicle center stack, the airbag module can be stored in any centrally positioned structure in the vehicle.

Although only a passenger frontal airbag is shown in the drawings, the those skilled in the art will appreciate that the airbag/airbag module disclosed herein could be adapted to help protect a driver side vehicle occupant or occupants of rearward rows of the vehicle, such as a 2nd row, 3rd row, etc., of the vehicle (not shown). When adapted for protecting driver side vehicle occupants, the frontal airbag disclosed herein can be configured to bend and deploy around the steering wheel when the steering wheel is present.

Although the passenger frontal airbag has been described as deploying around a workstation in a vehicle having an instrument panel that is smaller and narrower than conventional instrument panels, the passenger frontal airbag may be configured to for use in a vehicle having a conventional instrument panel. In such case, the bend in the passenger frontal airbag causes the passenger frontal airbag to deploy along/around the conventional instrument panel (see Figs. 5-7, for example).

Those having ordinary skill in the art will appreciate that the airbag/airbag module of the present disclosure can be used to help protect occupants of occupant-driven, driverless, autonomous, semi-autonomous, automated, and/or semi-automated vehicles.