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Dowd et al.

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[54] **MOTOR VEHICLE BODY STRUCTURE FOR RECEIVING SNAP-FIT MODULAR HEADLINER FASTENERS**

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[73] Assignee: **United Technologies Automotive Inc.**, Dearborn, Mich.

[21] Appl. No.: **204,663**

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[51] **Int. Cl.**[4] **B60J 7/08**

[52] **U.S. Cl.** **296/214**; 296/97.11

[58] **Field of Search** 296/210, 205, 203, 194, 296/39.1, 39.2, 97.13, 214, 97.11; 105/354

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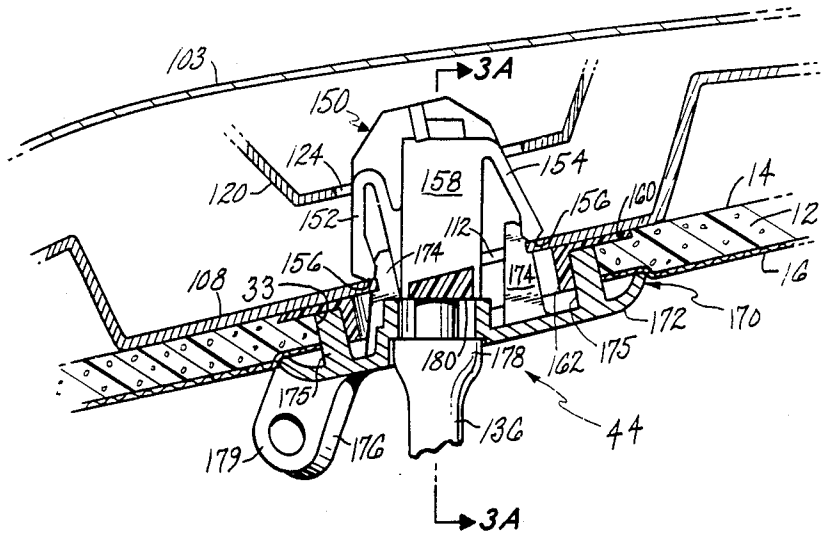
Primary Examiner—Margaret A. Focarino
Assistant Examiner—Gary C. Hoge

[57] **ABSTRACT**

A motor vehicle body support structure for receiving a snap-fit fastener from a modular headliner. The vehicle body structure includes sheet metal members defining slots having longitudinal axes extending in the left to right and front to back directions. The longitudinal axes of the slots which are in alignment extend in mutually perpendicular directions such that a modular headliner may be assembled to multiple sheet metal members while maintaining alignment of the modular headliner within the motor vehicle to which it is being installed.

10 Claims, 5 Drawing Sheets



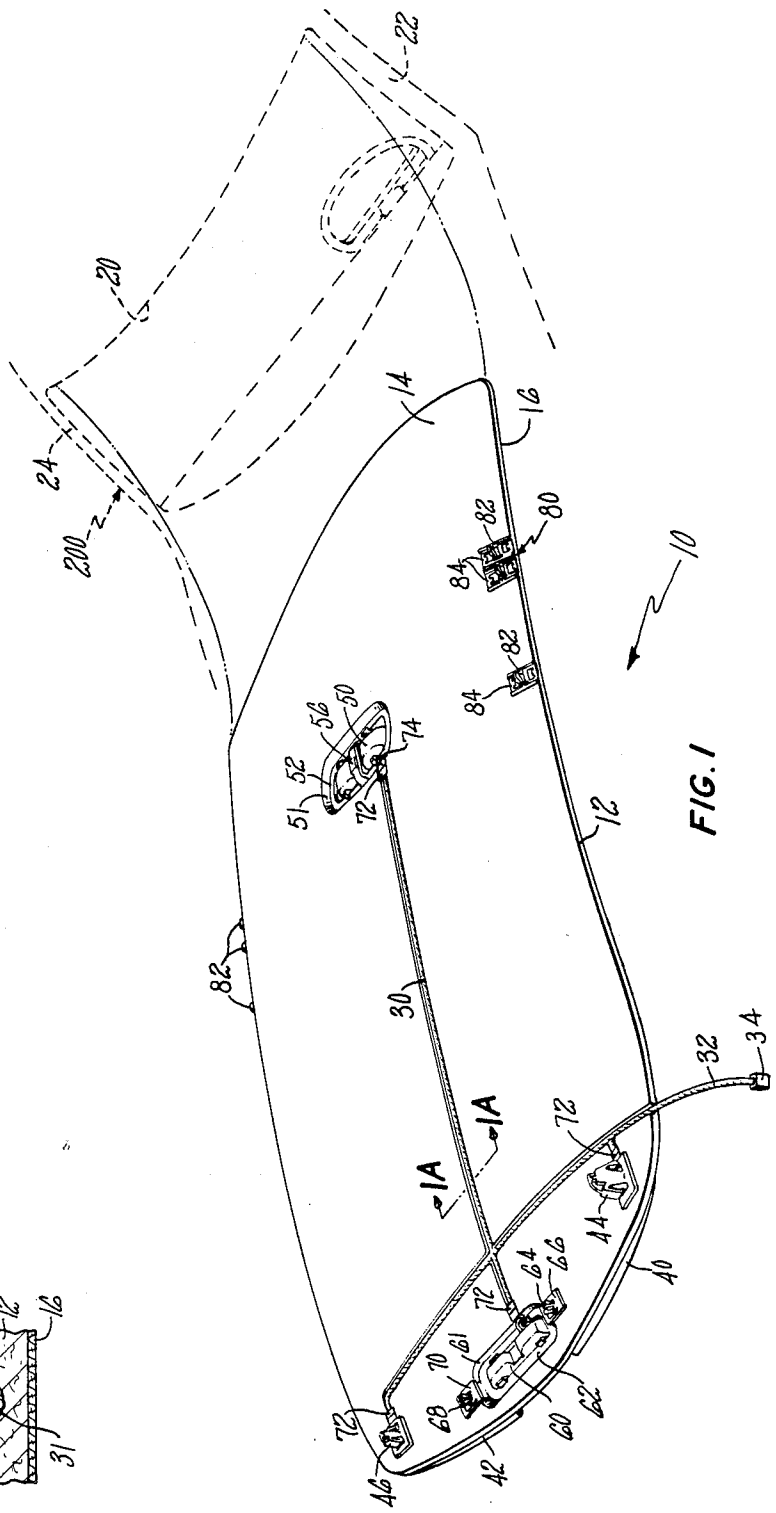

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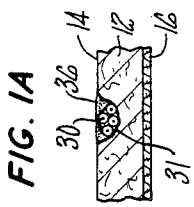
FIG. 1


14
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36
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31

FIG. 1A

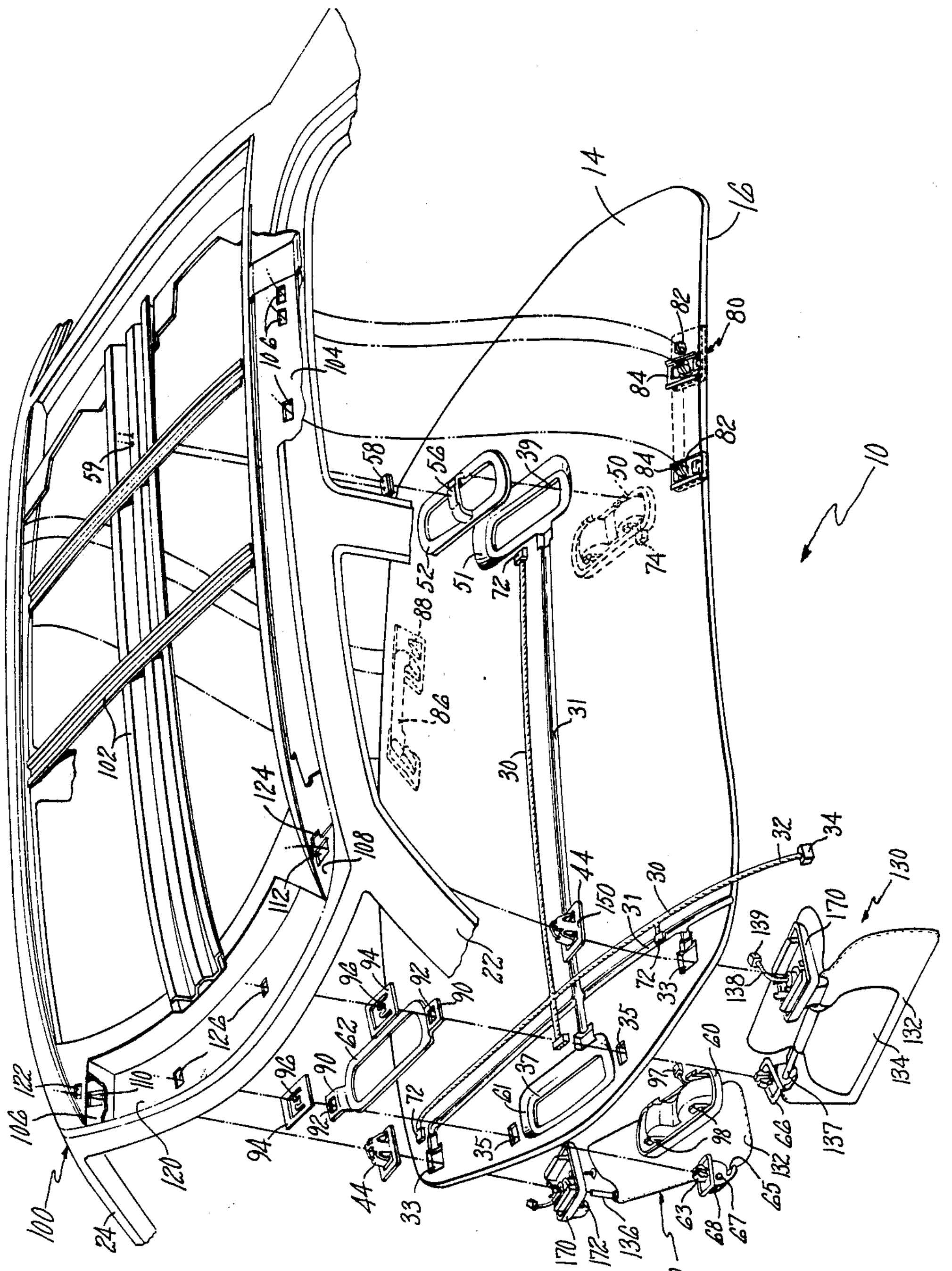
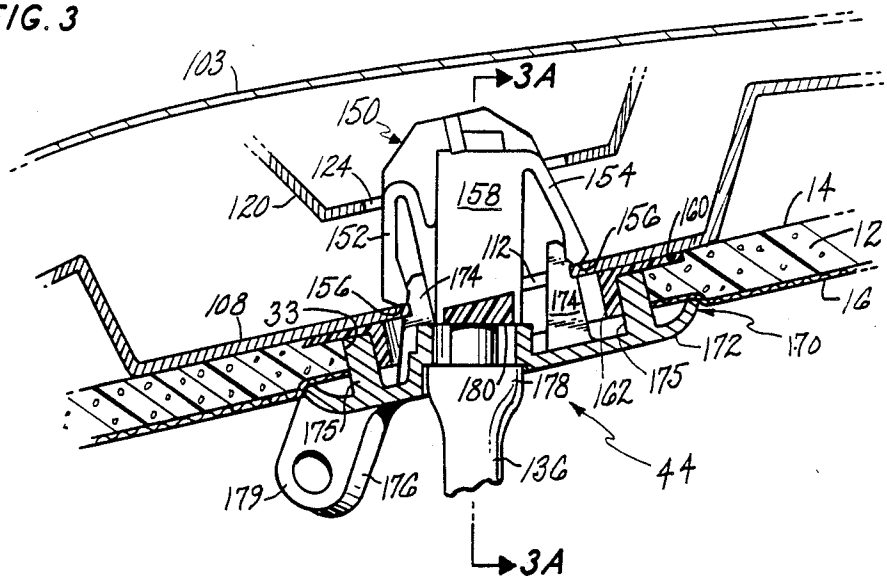


FIG. 2

FIG. 3



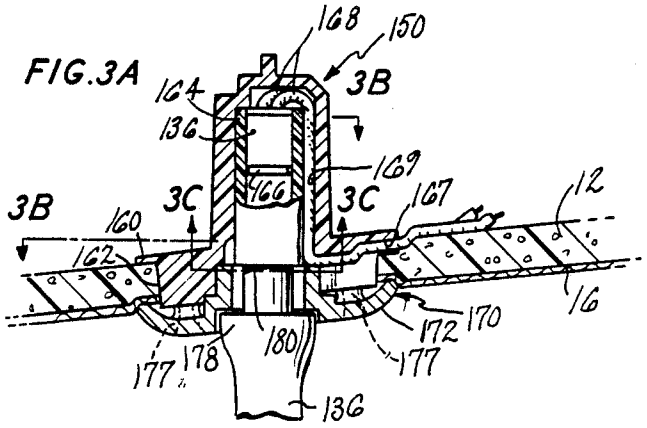
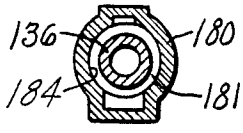


FIG. 3C



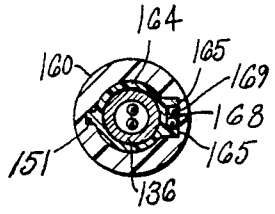


FIG. 3B

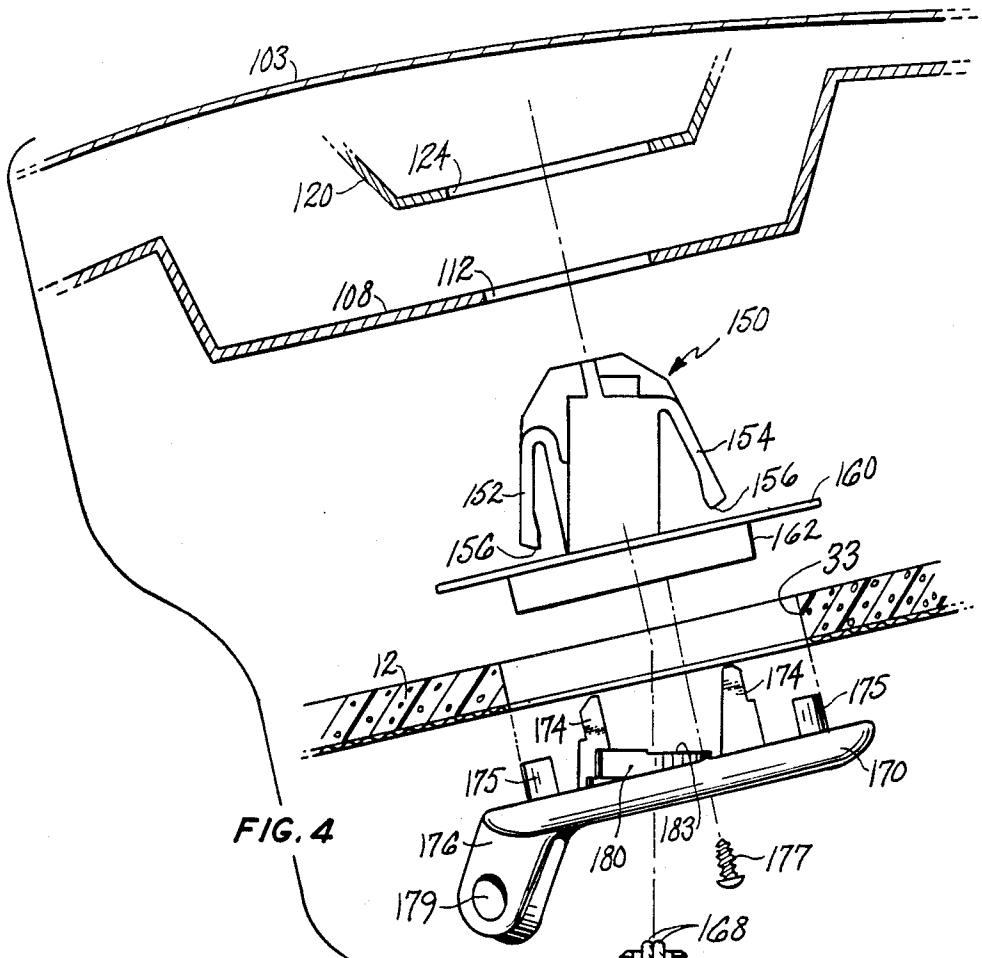

103
124
120
108
112
150
154
152
156
160
162
33
12
174
175
170
176
180
183
177
179
168
165
164
178
136

FIG. 4

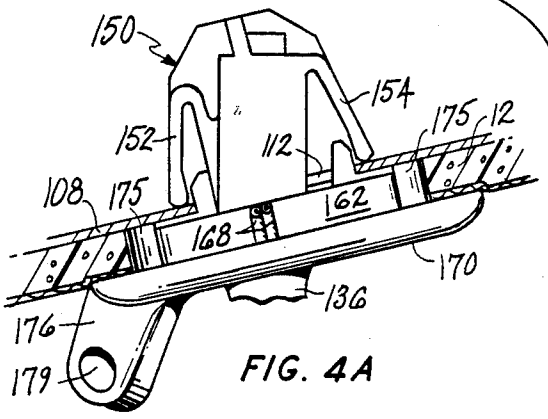

150
154
152
112
175
12
108
162
168
170
136
176
179

FIG. 4A

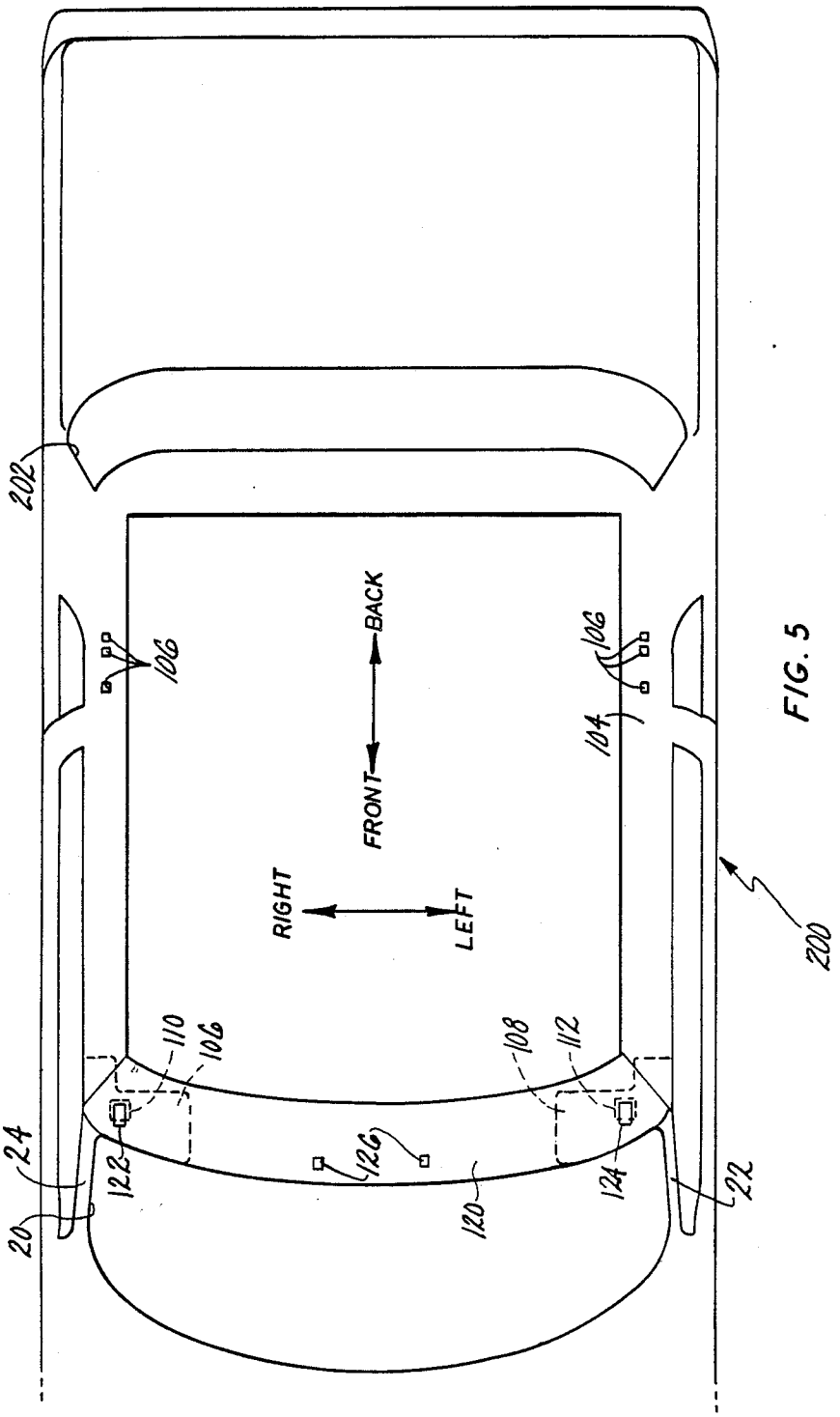

202
106
BACK
FRONT
RIGHT
LEFT
106
104
200
110
106
108
112
24
122
126
124
22
20
120

FIG. 5

MOTOR VEHICLE BODY STRUCTURE FOR RECEIVING SNAP-FIT MODULAR HEADLINER FASTENERS

DESCRIPTION

1. Cross Reference to Related Applications

This application relates to the following simultaneously filed patent applications: U.S. application Ser. No. 204,804, for HEADLINER AND SUNSHADE FASTENER by James D. Dowd, David M. Hilborn, Roy Weilant and Abdolhossein R. Lawassani; U.S. application Ser. No. 204,662, for ASSIST STRAP FOR A MODULAR HEADLINER by James D. Dowd, David H. Hilborn, Matthew J. Brown and Richard P. Bozyk; U.S. application Ser. No. 205,139, for MODULAR HEADLINER ASSEMBLY by James D. Dowd and Darrel Hampton; U.S. application Ser. No. 205,257, for SUNSHADE WITH SNAP-FIT FASTENER by James D. Dowd, David M. Hilborn, Roy Weilant, and Abdolhossein R. Lawassani; U.S. application Ser. No. 204,670, for ASSIST STRAP FOR A MOTOR VEHICLE by James D. Dowd, David M. Hilborn, and Matthew J. Brown; U.S. application Ser. No. 205,150, for SUNSHADE FASTENER MODULE FOR USE WITH MODULAR HEADLINER by James D. Dowd, David M. Hilborn, Roy Weilant, and Abdolhossein R. Lawassani; U.S. application Ser. No. 105,130, for FRONT LAMP MODULE AND SUNSHADE SUPPORTS FOR MODULAR HEADLINER by James D. Dowd, David M. Hilborn, Roy Weilant, and Abdolhossein R. Lawassani; U.S. application Ser. No. 205,265, for CONSOLE MOUNTED TO A HEADLINER by David M. Hilborn and Stephen P. McGarry; U.S. application Ser. No. 205,131, for MODULAR HEADLINER INCLUDING A WIRE HARNESS by James D. Dowd, Darrel Hampton, and Stephen P. McGarry.

2. Technical Field

The present invention relates to the positioning of multiple openings in distinct sheet steel members to provide for the necessary flexibility, alignment and support for a snap-fit modular headliner to be mounted within a motor vehicle.

BACKGROUND OF THE INVENTION

In order to provide a modular headliner which may be snap-fit into the vehicle body structure, it is necessary to provide appropriate openings to allow the modular headliner to be installed while recognizing that part variances and tolerances, welding and other factors affect the vehicle part spacing and alignment during the assembly process. The typical structure to which the sunshades and headliner are mounted is an extending flange from the A-pillar inner (also known as windshield side inner) on either side of the front of the car. These two A-pillar inners are completely distinct sheet steel members. The spacing between openings formed one in each A-pillar is not necessarily consistent nor is the front to back spacing constant. A header (also known as a windshield inner upper) extends across the front of many vehicles above the terminal ends of the A-pillar inners and may be formed such that all the openings therein are stayed simultaneously such that the positioning between the openings therein is maintained constant. The problem is then to determine how to mount a modular headliner using a snap-fit engagement to the sheet metal of the body structure and still provide for finished vehicles having the headliner installed at the right location in alignment and otherwise be a world class product.

The herein described combination of openings, having a long dimension for allowing sliding movement of the fastener within the opening in one direction and having a shorter dimension for preventive sliding motion in the opposite direction has been found particularly useful with the fastener of the type shown. By providing a plurality of openings, it is possible to maintain the desired alignment of the headliner while allowing for a snap-fit arrangement. If a modular headliner was mounted only to A-pillar openings, then based upon the alignment of the openings in the A-pillar, the entire headliner might be skewed due to a minor variation in the relative positions of the openings, such as variations which usually occur during the assembly process.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a sheet metal structure for receiving a snap-fit fastener.

It is another object of the present invention to provide a plurality of openings appropriately arranged such that a modular headliner may be installed on a snap-fit basis thereto while being appropriately aligned with the vehicle.

It is another object of the present invention to provide a sheet metal structure defining openings to allow components to be secured thereto.

A still further object of the present invention is to provide a safe, economical, reliable and easy to utilize configuration of fastening openings.

Other objects will be apparent from the description to follow and from the appended claims.

These and other objects are achieved according to a preferred embodiment of the invention by the provision of a motor vehicle body support structure for receiving a snap-fit modular headliner wherein the motor vehicle has a front and a back, a left side and a right side, including a left side A-pillar sheet metal means extending in the generally horizontal plane adjacent the front left side of the roof and defining a left side A-pillar opening extending in the left to right direction, a right side A-pillar sheet metal means extending in the generally horizontal plane adjacent the front right side of the roof and defining a right side A-pillar opening extending in the left to right direction and a header extending adjacent the roof from the left side A-pillar sheet metal means to the right side A-pillar sheet metal means, said header defining a left side header opening extending in a front to rear direction and a right side header opening extending in a front to rear direction, said header opening being positioned in alignment with A-pillar openings.

Also disclosed is a motor vehicle body structure including sheet metal defining a series of openings sized to allow snap-fit fasteners from a modular headliner to extend therethrough and to engage the sheet metal adjacent to the openings for mounting the modular headliner to the vehicle body structure which includes means for receiving a left side sunshade fastener and including a first sheet metal means defining a slot extending in a first direction and second sheet metal means defining a slot extending in a second direction generally perpendicular to the first direction and means for receiving a right side sunshade fastener including a third sheet metal means defining a slot extending in a third

direction and fourth sheet metal means defining a slot extending in the fourth direction generally perpendicular to the third direction. The second and third sheet metal means may be a unitary sheet metal member such as the header whereas the first and fourth sheet metal means may be the respective A-pillar inners. Additionally, the motor vehicle includes a left side rail inner and a right side rail inner each of which defines openings which is appropriately sized to receive a fastener extending from a modular headliner.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a modular headliner assembly positioned adjacent the vehicle windshield opening for assembly therethrough.

FIG. 1A is a partially sectioned view of FIG. 1 taken at the indicated line.

FIG. 2 is an exploded perspective view of a modular headliner assembly and appropriate portions of the vehicle body structure.

FIG. 3 is a partially sectional end view of a sunshade/headliner fastener shown mounted in the vehicle.

FIG. 3A is a partial sectional view of a portion of the sunshade/headliner fastener.

FIG. 3B is a sectional view of FIG. 3A taken at the indicated line.

FIG. 3C is a sectional view of FIG. 3A taken at the indicated line.

FIG. 4 is an exploded view of a headliner/sunshade fastener and vehicle parts to which it is assembled.

FIG. 4A is a side view of a sunshade fastener.

FIG. 5 is a top view of the vehicle body structure showing the mounting locations for a modular headliner.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention will be described with reference to a specific embodiment or embodiments hereof. It is understood that this invention has applicability with minor modifications to many vehicle lines, body styles, trim levels and structures, and it is to be anticipated that various changes can be made to the disclosed embodiments within the spirit and scope of the invention.

FIG. **1** is a perspective view of a modular headliner assembly **10** about to be installed into motor vehicle **200**. The motor vehicle is shown having windshield opening **20**, left A-pillar **22** and right A-pillar **24**. The modular headliner is mounted into the partially assembled vehicle through the windshield or other large window opening which could also be the rear window opening. In this manner, the body structure of the vehicle may be assembled prior to the modular headliner assembly being mounted thereto.

Modular headliner assembly **10** consists of all those components between the decorative interior surface of the headliner and the body structure of the vehicle. The modular headliner **10** must be appropriately configured such that when assembled, the modular headliner may be shipped, handled and installed in the vehicle and potentially mistreated during a portion of this process without having the interior surface damaged, without distortion or bending due to uneven stresses and without impacting the function of the various components thereof.

As may be specifically seen in FIGS. **1** and **1A**, the headliner includes substrate **12** is made from a material such as molded fiberglass, styrene, cardboard, a polymeric material, or as is otherwise known in the art. Substrate **12** has mounted on the surface thereof a decorative covering or surface **16** which is the surface visible to an occupant of the finished vehicle. The opposite side of substrate **12** from that on which decorative surface **16** is mounted is the non-show surface, surface **14**.

Left sunshade **40** and right sunshade **42** are mounted to the substrate by the use of left sunshade fastener **4** and right sunshade fastener **46**.

Additionally shown as part of the modular headliner are assist straps **80** which are retained to the modular headliner by retainers **84** interacting with assist strap legs **82**.

Also shown as a portion of modular headliner **10** is center console **50** which is shown secured within depressed portion **51** formed in the substrate to retainer **52**. A mesh fastener **56** is shown located to extend upwardly from retainer **52**.

Likewise, forward console **60** is shown mounted within depressed portion **61** formed in the headliner in combination with forward retainer **62**. Forward retainer **62** includes an outwardly projecting area through which left inboard sunshade support **64** and right inboard sunshade support **68** extend. Appropriate retainers **66** and **70** are shown for securing the legs of the inboard sunshade supports to hold the inboard sunshade supports in position.

Further shown as part of the modular headliner is wire harness **30** having a wire bundle **32**, including a vehicle electrical connector **34** and a series of accessory connectors **72** located adjacent each accessory requiring electrical connections. Complementary connectors **74** extend from each accessory and mate with accessory connectors **72** to form a completed wire harness. Vehicle electrical connector **34** is typically connected to a mating connection extending from the vehicle body electrical system in an easy to access area such as one of the A-pillars.

Additionally it may be seen that the modular headliner wire harness is secured within substrate channels **31** such that the wire is maintained therein. Additionally, adhesive **36** may be placed over the wire bundle to secure the wire bundle within the channel. In this manner, the wires are protected from inadvertent contact with roof bows or other roof structure and the potential for damage to the wires is avoided.

As may be seen in FIG. **1**, the modular headliner assembly is about to be inserted into the vehicle for assembly thereto. The left and right sunshade fasteners, **44** and **46**, extend upwardly and include legs for engaging with the metal structure of the vehicle to mount the same thereto. Likewise, assist straps **80** have upwardly extending legs **82** which engage appropriate openings in the body structure to also secure the modular headliner to the vehicle. Furthermore, mesh fastener **56** may appropriately interact with a corresponding mesh fastener to likewise secure the headliner to the body structure. Hence, the left and right sunshade fasteners and at least one of the two assist strap handles are used for securing the modular headliner assembly to the motor vehicle. Furthermore, the mesh fastener of retainer **52** may likewise serve such a function. Also not to be ignored are the right inboard sunshade support and the left inboard sunshade support which also includes legs for engaging the sheet metal structure of the vehicle.

In order to assemble the modular headliner to the vehicle, the headliner is slid through a large window opening such as a windshield and placed in general

position to which it is to be mounted. An operator then positions one of the sunshade fasteners to feel when the fastener mates with an appropriate opening. The sunshade fastener is then snap-fit into the opening to mount that portion of the modular headliner. The same process is then followed with the other sunshade fastener, the assist straps and the inboard sunshade supports. In this manner, the entire modular headliner may be snap-fit to the motor vehicle. Thereafter, an appropriate electrical connection is made at vehicle electrical connector **34** and the assembly process for the headliner is complete.

In FIG. **2** an exploded view of a modular headliner about to be mounted to a vehicle body structure is shown. In this view it may be seen that modular headliner **10** incorporates many various subassemblies such that all the appropriate subassemblies are mounted to the modular headliner and such that may be readily fastened to the vehicle body structure.

The wire harness **30** of the modular headliner assembly includes a series of accessory connectors **72** adapted to be connected to the appropriate electrical accessory mounted to the headliner. The wire harness assembly is further shown slightly exploded from channels **31** formed in the substrate for securing the headliner wire harness therein. This wire harness assembly is shown somewhat schematically and may, in fact, be located at different positions about the headliner, such positions being chosen for having optimum room for securing wires therein and for providing optimum space between the headliner and the vehicle body structure to prevent any accidental contact therebetween.

The center console **50** is shown having a complementary connector **74** extending therefrom for connection to accessory connector **72**. Front console **60** has a complementary connector **97** and sunshade module **130** has a complementary connector **139**, designed to be connected to accessory connectors **72** to form the integrated wire harness of the modular headliner assembly.

Center console **50** and forward console **60** are shown somewhat in schematic format. It is to be understood that these consoles may include features such as overhead lights, reading lights, displays, vanity mirrors, garage door opener compartments, switches, and other control features such that a modular headliner wire harness may include a significant number of conductors. Additionally, the sunshade modules as shown are anticipated to be sunshade modules incorporating illuminated vanity mirrors which likewise require a power supply.

Center console **50** is mounted through a substrate center module opening **39** formed in depressed portion of the substrate **51** to retainer **52** mounted on the opposite side of the substrate. Retainer **52** may have extending wings which act to distribute the load of the console over a wide area of the substrate such that uneven loading or distortion during the shipping or handling process is avoided. The substrate about the console is depressed and defines an opening therein. The console covers the end of the depression including the opening to form a neat, highly attractive module.

Mesh fastener **56** attached to a back portion of the retainer or alternatively to the console is designed to interact with mesh fastener **58** secured at location **59** to the roof bows of the vehicle body structure. This mesh retainer is preferably a Dual Lock ® retainer. By the selection of Dual Lock material, it is possible that the headliner may slide into position with one portion of the Dual Lock fastener sliding relative to the other. The Dual Lock fastener has the property that it does not grab and lock until the two fasteners are forced one into the other such as when the substrate is displaced upwardly locking it into its final position. Prior to such time, the headliner and the two mesh portions may be slid relative to one another to allow positioning and alignment of the headliner. This is quite different than other mesh fasteners which grab upon contact and may not thereafter be readily displaced.

Front console **60** is shown having snap legs **98** which extend upwardly through substrate front console opening **37** formed in depressed portion **61** to engage retainer **62**. Retainer **62** has wings **90** which define wing openings **92**. Inboard sunshade supports **66** and **68** extend with fastening legs **63** projecting upwardly through substrate openings **35**, through retainer openings **92** and are secured in position by retainers **94** including spring legs **96** and, upon final assembly, extend through header openings **126** in the vehicle body structure. Each of the inboard sunshade supports **66** and **68** includes a receptacle for secondary visor **67** and a slot for receiving primary visor **65**. As is seen in reference to sunshade module **130**, the module includes a primary visor **132** and a secondary visor **134**. The primary visor is mounted on the pivot rod **136** and the secondary visor is mounted on the pivot rod **137**. The sunshade module further includes fastener **44** having a base **170**, cover **150** and wires **138** extending therebetween. The primary visor is mounted for pivoted movement with pivot rod **136** and for rotation about the pivot rod **136** between a stored position against the headliner and a downward position to shield an occupant's eyes from sunlight entering through the windshield. When the primary visor is pivoted to block the sunlight coming through the side window, then the secondary visor may be rotated downwardly to block sunlight entering in through the windshield.

Assist straps **80** include projecting legs **84** projecting through the headliner substrate. Retainers **82** are shown in engagement with legs **84** to secure the assist straps to the headliner. An assist strap may include handle **86** and a coat hook **88**, and is mounted in an appropriate position to provide a grab handle for an occupant entering or leaving the vehicle. Assist strap openings **106** are shown defined by inside rail **104** of the vehicle body structure **100**. It is to these assist strap openings **106** that legs **82** engage to hold the assist strap and consequently the modular headliner in position. Fastener **44** engages the vehicle body structure through left A-pillar opening **112** formed in left A-pillar inner **108**, a portion of A-pillar **22**. In the same manner, right fastener **44** is inserted through the right A-pillar opening **110** of right A-pillar inner **106**, a portion of right A-pillar **24**. Both fasteners are likewise mounted through header left sunshade fastener **124** and header right sunshade fastener **122** openings, both being openings in header **120**.

Vehicle body structure **100** as shown includes a series of roof bows **102** and the header and A-pillars as previously mentioned. Additionally, vehicle body structure **100** includes side rail **104** defining openings **106** to which the various assist strap legs may be engaged.

Hence, it may be seen from FIG. **2** that the entire modular headliner assembly may be secured to the vehicle body structure with the vehicle body structure merely providing appropriately sized and positioned openings. No other structure need be added to the vehicle body structure to allow the modular headliner to be secured thereto. All the fasteners for securing the modular headliner are affixed to the modular headliner such

that the vehicle assembler need only mount the modular headliner to the vehicle body structure and need not add any intermediate fastener or receptacle portions to do such.

FIG. 3 shows a partially sectional view of fastener **44** secured to a vehicle. As may be seen therein, the fastener is positioned below roof **103** and fits in opening **124** of header **120** and through left A-pillar opening **112** of A-pillar inner **108**. Additionally, substrate **12** having a non-show surface **14** and decorative surface **16** are shown.

Fastener **44** has a cover **150** and base **170** which includes projection for receiving secondary visor **176** which defines an opening therein. Pivot rod flange **178** is shown encompassing pivot rod **136** although it might be considered to be a portion of the pivot rod as opposed to a portion of the base. Additionally, the base includes a torque fitting support **180** through which the pivot rod will extend. The torque fitting will engage the top of the torque fitting support such that the pivot rod is maintained to the base by the torque fitting engaging the torque fitting support. The torque fitting support may include a torque fitting opening **184** which allows the torque fitting to be inserted through the base, said torque fitting including a keyway and a wire guide area. Once the torque fitting is inserted through the torque fitting support, the torque fitting is then rotated to prevent its removal through the torque fitting support and is retained from rotation therein by torque fitting **183** indent. The cover then secures the torque fitting in the position to which it has been rotated.

Bezel **172** is shown extending generally parallel with substrate **12** and of sufficient area to engage substrate **12** such that substrate 12 will be pushed upwardly by bezel **172** as the fastener is mounted. Centering arms **174** and bezel ribs **175** are also shown extending upwardly from bezel **172**.

Cover **150** defines a pair of flanges **152** and **154** extending outwardly therefrom. These flanges are flexible and may be compressed to allow the cover to fit through the left A-pillar opening **112**. Each flange has a curved end **156**, and when inserted through the opening, the flange is compressed and as the cover approaches the fully inserted position, the flange bows outwardly with only the downward most end being received by the edges of the opening. The end of the flange is curved and the combination of the bowing of the flange and the curve provides a camming action which, once the flange is released, will cause the flange to snap behind A-pillar inner **108** as shown such that the flanges act to prevent the fastener from being moved downwardly. The center of cover **150** is defined as torque fitting receiving area **158** into which the torque fitting connected to the rod will be maintained. Cover **150** further includes platform portion **160** which engages the top surface of substrate **12** and the opposite surface of A-pillar inner **108** from the surface that the flanges engage. Cover **150** additionally includes a platform rib !62 extending downwardly from platform portion which acts to engage bezel **172** and bezel ribs **175** such that spacing is provided therebetween, said spacing being appropriately sized to receive substrate **12**. The engagement of platform rib **162** and bezel rib **175** act to align the cover to the fastener and prevent any applied torque from rotating the base without transmitting the rotation to the cover and consequently the vehicle body structure.

Referring now to FIG. 3A, there may be seen a partial sectional view of the fastener. Therein, cover **150** is shown with torque fitting **164** contained therewithin. Torque fitting **164** is typically molded to the pivot rod. Annular indent **166** is provided on the pivot rod to engage the torque fitting to prevent linear displacement of the torque fitting along the pivot rod. Torque fitting **164** is maintained by cover **150** in the desired position, and will not rotate relative thereto. The rod, however, will rotate relative the torque fitting and it is this torque relationship that provides the resistance necessary as the sunshade is pivoted between the position covering the windshield and the position covering the side window. Platform **160** and rib **162** are shown extending above the substrate, the rib acting to space the cover from the base.

Wires **168** are shown extending from rod **136** and are those wires used to supply power to the illuminated vanity mirror portions of the sunshade. Wires **168** exit upwardly from the pivot rod and then traverse downwardly within wire guide area **169**. The wires then make a right angle turn and exit through wire opening area **167**. The wires are then positioned at the top of the substrate and may have a connector located at the end thereof for connecting to the modular headliner wire harness.

Base **170** is shown having a bezel engaged to the substrate and is additionally shown having screws **177** which may secure the base to the cover to form an integral fastener. Torque fitting support **180** is shown positioned to have torque fitting **164** resting thereon such that as the base is secured to the cover, the base through the torque fitting support will maintain the torque fitting in the desired position to secure the sunshade thereto. Pivot rod flange **178** and pivot rod **136** are also shown such that a decorative connection may be made between the pivot rod and the base. Pivot rod flange **178** may extend down the pivot rod and around a right angle bend therein.

FIG. 3B is a sectional view taken in FIG. 3A at the indicated location showing the various relationships between pivot rod **136** and the wires passing therethrough. Torque fitting **164** is shown encircling pivot rod **166** and includes key **151** extending outwardly to be engaged by the cover to prevent the torque fitting from rotating. Additionally shown are wire guide projections **165** defining a wire guide are **169** to which wires **168** may be enclosed and also serving to prevent the torque fitting from rotating.

FIG. 3C is a sectional view taken in FIG. 3A at the indicated location showing torque fitting opening **181** is sized to allow the rod with the torque fitting mounted thereto to pass through the torque fitting support. The rod and fitting are thereafter rotated such that the wire guide projections and the keyway of the torque fitting engage the torque fitting support to secure the torque fitting to the fastener. Torque fitting indent **183** helps retain the torque fitting in the rotated position prior to the assembly of the cover to the base.

FIG. 4 is an exploded view of the fastener showing how the various parts go together. Starting at the bottom, it may be seen that pivot rod **136** has pivot rod flange **178** and torque fitting **164** secured thereto. Wire guide projections **165** are shown with wires **168** secured therebetween. The orientation of the torque fitting is shown in the as assembled configuration and not in the orientation necessary to pass through the base.

Base **170** is shown having projection for receiving secondary visor **176** and an opening for the receipt of the secondary visor rod **137**. The torque fitting support **180** is shown for the receipt of the torque fitting on the rod. Centering arms **174** are shown extending upwardly from base **170**. Substrate **12** is shown defining a substrate opening **33** through which the fastener may pass. Cover **150** is shown having flanges **152** and **154**, a platform portion **160** and platform rib **162**. An A-pillar inner **108** defining an opening **112** and header **120** defining header opening **124** are shown both positioned below roof **103**.

Upon assembly of the fastener, a number of interactions happen to help secure the entire assembly in the desired position. The pivot rod is first mounted to the base by the torque fitting including the pivot rod being inserted through the base and then rotate to its assembled position. The pivot rod is thereby secured relative to the base by the fit of the torque fitting against the torque fitting support. The base of the pivot rod is then placed against the substrate with the centering arms extending outwardly therethrough and the base ribs extending upwardly. Cover **150** is then secured to the substrate with platform portion **160** engaging the top of the substrate and platform ribs **162** extending downwardly therethrough within the substrate opening **33** said ribs acting to form a spacer between the base and the cover such that the substrate is maintained within the space defined by the spacer and said ribs engaging the cover ribs to align the cover to the base and to transmit torque between the cover and the base. Centering arms **174** also includes notches therein for engaging the A-pillar inner to additionally provide spacing. Furthermore, the coacting ribs extend upwardly from the base to coact with the platform ribs to both align the fastener, center the fastener, and to additionally provide means for spacing the cover from the support.

The fastener is assembled by screws being inserted to secure the base portion to the cover portion. Thereafter, the entire assembly may be snap-fit to the vehicle. As may be seen in FIG. **3**, the unassembled position, the cover is forced through a A-pillar opening **112** thereby compressing legs **152** and **154**. In this position, the legs or flanges readily fit through the opening. Once the legs or flanges have passed through the opening, they are released since they are no longer in contact of the opening, and the legs spring outwardly to engage the vehicle body structure on the opposite side of the A-pillar inner such that the sunshade and headliner are mounted to the A-pillar inner. In this manner, the entire modular assembly or simply a sunshade or a sunshade/headliner combination are maintained in the desired position. The curvilinear ends of the flanges act to assure that the flanges will snap outwardly. The incline or the generally pointed nature of the top of the fastener assures that the fastener will enter the opening correctly to facilitate the displacement of the fastener relative to the opening, said displacement acting to compress the flanges until they snap outwardly.

Opening **112** is sized to allow the cover to pass therethrough and then to allow the fastener to slide in the left/right direction as viewed from FIG. **4**. However, centering arms **174** extend upwardly and engage the edges of A-pillar inner **108** which define opening **112** and prevent the fastener from sliding in the left/right direction as seen therein.

Header opening **124** defined by header **120** as can be seen in FIG. **4** is larger than the cover as inserted therein. However, in a plane perpendicular to the paper in FIG. **4**, the header opening is sized to just receive cover **150**, and hence movement of the fastener is limited, in the direction in and out of the paper, by the fit of the cover within the header opening.

Referring now to FIG. **4A**, there can be seen a slightly different embodiment of the herein invention. In this embodiment, the fastener cover does not include a platform **160**. Herein, the cover engages the A-pillar inner on one side and the base engages substrate **12** on the opposite side. This embodiment is specifically designed for subassembly as a fastener and sunshade combination to a vehicle or further in combination to also secure an already positioned headliner to the motor vehicle. It is contemplated that this fastener would be used with a subcombination of simply a sunshade and a fastener which may be used to both align an existing headliner and to provide support for the headliner and the fastener. This combination does not provide for the substrate to be sandwiched between the cover and the base. As may be seen in FIG. **4A**, the components are essentially the same as those of the fastener of FIG. **4** and use the same reference numerals to refer thereto. Cover **150** includes flanges **154** and **152** which engage the upward side of A-pillar inner **108**. Base **170** includes an outwardly extending bezel which engages substrate **12** as the fastener is assembled. Pivot rod **136**, projection receiving secondary visor **176**, and opening **179** are also shown.

Further as may be seen in the various Figures, wires **168** exit the fastener through wire opening area **167**. Hence, it may be seen in combination with FIG. **4A** and FIG. **3A** the various manners in which the wires transverse the fastener such that they may be connected to the modular headliner wire assembly.

As further can be seen in FIG. **4A**, the entire fastener may be assembled including the sunshade assembled thereto, and then the fastener inserted through an opening in the substrate and then inserted through an opening in the sheet metal structure such that the substrate and sunshade to which the fastener is attached are both secured to the sheet metal structure.

Although not specifically apparent in FIGS. **3** or **4A**, centering arms **174** extend upwardly within A-pillar opening **112** or a similar opening, however, they are not in alignment with flanges **154** and **152**. Hence, flanges **154** and **152** act independently of the centering arms to snap into position regardless of location of the centering arms. In this manner, the free compression and expansion of the flanges as the fastener is displaced through the opening are not impacted by the centering arms.

FIG. **5** is a top view of a motor vehicle body structure. Specifically, there may be seen windshield opening **20**, and rear window opening **202** of motor vehicle **200**. Left A-pillar inner **108** is shown defining left A-pillar opening **112** having a longitudinal axis extending in a first (left to right) direction. Right A-pillar **106** is shown defining right A-pillar opening **110** whose longitudinal axis is similarly oriented. Header **120** is shown having header openings **122** and **124** whose longitudinal axes extend in a second direction (front to back) generally perpendicular to the first direction) and header inboard sunshade support openings **126**. Additionally, side rails **104** are shown having openings **106**. Additionally, various arrows are shown to indicate the left/right direction and the front/back directions relative to the vehicle.

When the modular headliner is assembled, fasteners **44** are displaced upwardly through various openings. A fastener will be displaced upwardly until the cover first engages the A-pillar inner **108**. The operator will then through displacement of the angled end of cover **150** be able to feel when cover **150** enters into inner opening **112**. The operator then displaces the modular headliner upwardly until the flanges pass through opening **112** and snap outwardly to engage the modular headliner to the vehicle body structure.

However, since the left A-pillar inner and the right A-pillar inner are two entirely separately distinct pieces of sheet metal which are assembled to the vehicle and are subject to manufacturing tolerances and variations, the relative positioning between the two is not always maintained constant. On the other hand, header **120** is a single stamping and contains a plurality of openings which are all fixed relative to one another. However, the header itself may not be necessarily secured to the A-pillar inners and the rest of the vehicle body structure always in the same position. Hence, the combination of openings overlapping one another, (being dimensioned such that each slot extends in its respective longitudinal direction, beyond the vertically adjacent slot) A-pillar opening **112** and header opening **124** and A-pillar opening **110** and header opening **122** are shown. In this manner, each opening acts to secure the displacement of the modular headliner in a single direction, but not the other direction whereby flexibility may be obtained in the manner in which the modular headliner is mounted. This flexibility is necessary to compensate for the various tolerance and variances during the assembly of the vehicle. In this manner, a single fastener may first be mounted to the vehicle structure and the modular headliner thereafter be pivoted to mate with the other openings while the entire modular headliner is aligned relative to the vehicle. By providing these sliding arrangements, a snap-fit fastening arrangement may be utilized to assemble the entire modular headliner. If no provision for relative displacement were provided, the vehicle build would have to have precise tolerances on the openings, presently unattainable, or some other method of adjusting the positioning of the modular headliner relative to the vehicle body structure would be necessary. However, with the provision of overlapping holes for allowing for sliding fits between the fastener and the combination of the headliner and the header of the A-pillar inner and the header, a snap-fit relationship is possible.

As may be specifically seen from FIGS. **2**, **5** and **4**, this various combination acts to allow a fastener to be inserted with the centering arms **174** securing the fastener relative to A-pillar opening **112**, such that the fastener may be displaced in the left to right direction as shown in FIG. **5**, but not the front to back direction. However, the cover is appropriately sized such that the cover is not retained in the front to back direction by the header opening such that relative to the header, the assembly may be slid in the front to back direction. However, the cover is sized in the left to right direction relative to the header opening such that the cover may not be slid in the left to right direction. Consequently, one opening for each fastener acts to maintain the modular headliner in the desired position at that location. Consequently, variations between the A-pillar inner and the header are accommodated without skewing the entire headliner module.

The invention has been described with reference to a particular embodiment. It is to be understood by those skilled in the art that variations and modifications can be made within the spirit and scope of the invention.

We claim:

1. A motor vehicle body support structure for receiving a snap-fit modular headliner wherein the motor vehicle has a front and back, a roof, a left side and a right side, which comprises:

left side A-pillar sheet metal means extending in a generally horizontal plan adjacent the front left side of the roof and defining a left side A-pillar opening having a longitudinal axis extending in a first direction; and

right side A-pillar sheet metal means extending in a generally horizontal plane adjacent the front right side of the roof and defining a right side A-pillar opening having a longitudinal axis extending in said first direction; and

a header extending adjacent the roof from the left side A-pillar sheet metal means to the right side A-pillar sheet metal means, said header defining a left side header opening having a longitudinal axis extending in a second direction generally perpendicular to said first direction and a right side header opening extending in said second direction, said header openings being positioned in alignment with the A-pillar openings.

2. The apparatus as set forth in claim **1** wherein the longitudinal axes of the A-pillar openings extend in a front to back direction and the longitudinal axes of the header openings extend in the left to right direction.

3. The apparatus as set forth in claims **1** or **2** and wherein the header further defines a pair of inboard sunshade support openings, each inboard sunshade support opening being positioned a specific distance from a respective header opening.

4. The apparatus as set forth in claims **1** or **2** wherein the header is secured to both the left side A-pillar and the right side A-pillar.

5. The apparatus as set forth in claims **1** or **2** wherein the motor vehicle includes a left side rail inner and a right side rail inner, each side rail inner extending from the vehicle roof to the vehicle side and each including side rail inner openings sized to receive a fastener extending from a modular headliner.

6. The apparatus as set forth in claims **1** or **2** wherein the modular headliner further comprises a sunshade socket which may be mounted to extend through the A-pillar opening and the header opening and sized to engage the A-pillar opening to prevent movement of the socket in said second direction and to engage the header opening to prevent movement of the socket in said first direction.

7. A motor vehicle body structure including sheet metal defining a series of openings sized to allow snap-fit fasteners from a shoulder headliner to extend there through and to engage the sheet metal adjacent to the openings for mounting the modular headliner to the vehicle body structure comprising:

means for receiving a left side sunshade fastener including first sheet metal means defining a first slot extending in a first direction anD a second sheet metal means defining a second slot generally vertically aligned with said first slot and extending in a second direction generally perpendicular to the first direction; and

means for receiving a right side sunshade fastener including third sheet metal means defining a third slot extending in a third direction and fourth sheet metal means defining a fourth slot generally vertically aligned with said third slot and extending in a fourth direction generally perpendicular to the third direction;

said slots being dimensioned and overlapped such that said first slot extends beyond said second slot in said first direction and said second slot extends beyond said first slot in said second direction while said third slot extends beyond said fourth slot in said third direction and said fourth slot extends beyond said third slot in said fourth direction.

8. The apparatus as set forth in claim **7** wherein the second sheet metal means and the third sheet metal means are a unitary sheet metal member and wherein said member defines at least two inboard sunshade support openings positioned to be engaged by inboard sunshade supports.

9. The apparatus as set forth in claim **7** and further comprising side rail members extending along the side of the vehicle and defining assist strap openings positioned to receive assist strap fasteners.

10. The apparatus as set forth in claim **7** wherein the first sheet metal means and the fourth sheet metal means are A-pillar inners.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,893,866

DATED : January 16, 1990

INVENTOR(S) : James D. Dowd, David M. Hilborn

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 8, line 48,"are" should be --area--.

Column 12, claim 7, line 58, "shoulder" should be --modular--.

Signed and Sealed this

Twenty-eighth Day of May, 1991

Attest:

HARRY F. MANBECK, JR.

Attesting Officer

Commissioner of Patents and Trademarks