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(54) **SEAT ASSEMBLY HAVING A FOLDING SEAT BOTTOM AND HEAD RESTRAINT**

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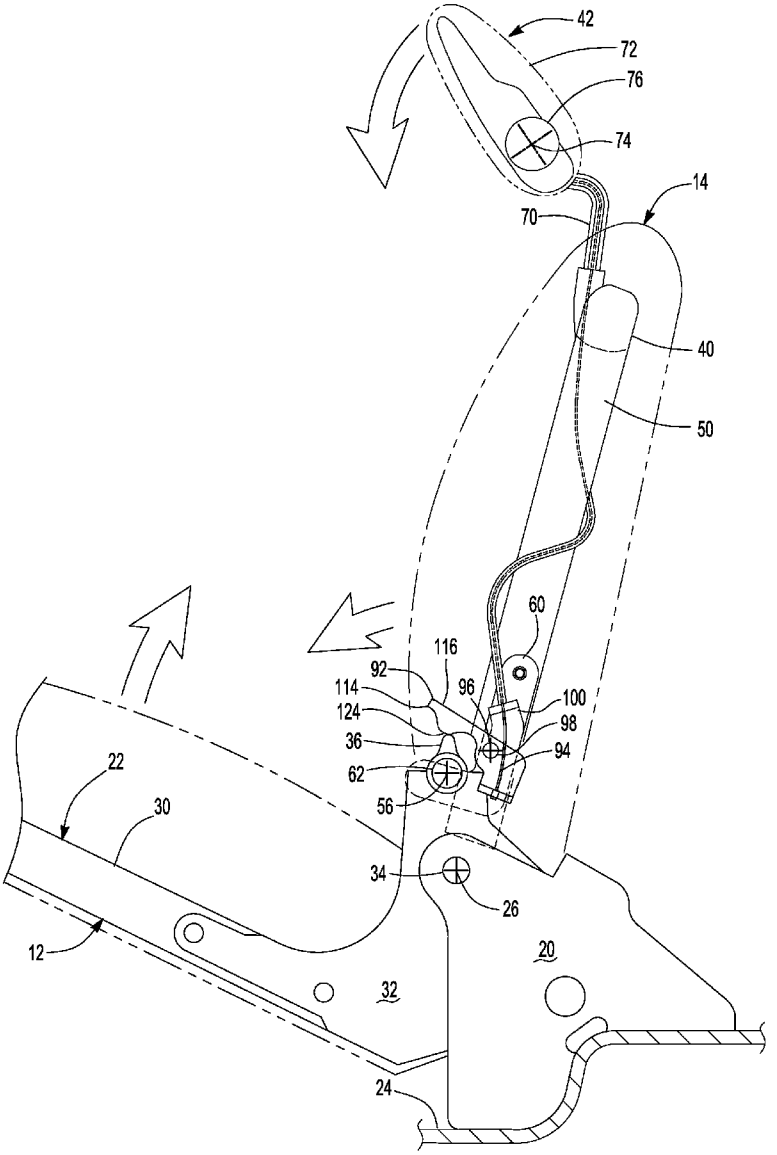
(57) **ABSTRACT**

A seat assembly having a seat bottom, a seat back, and a head restraint assembly. The head restraint assembly may be disposed on the seat back and may move from a first position to a second position when the seat bottom is rotated about a first axis of rotation with respect to the seat back.



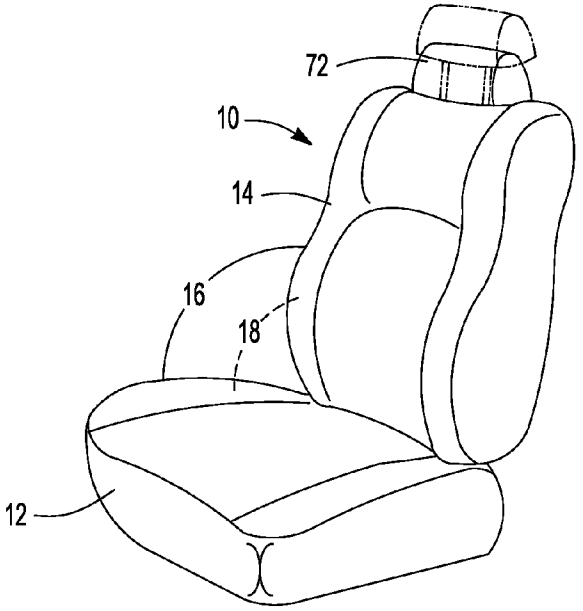

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Fig-1

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Fig-2

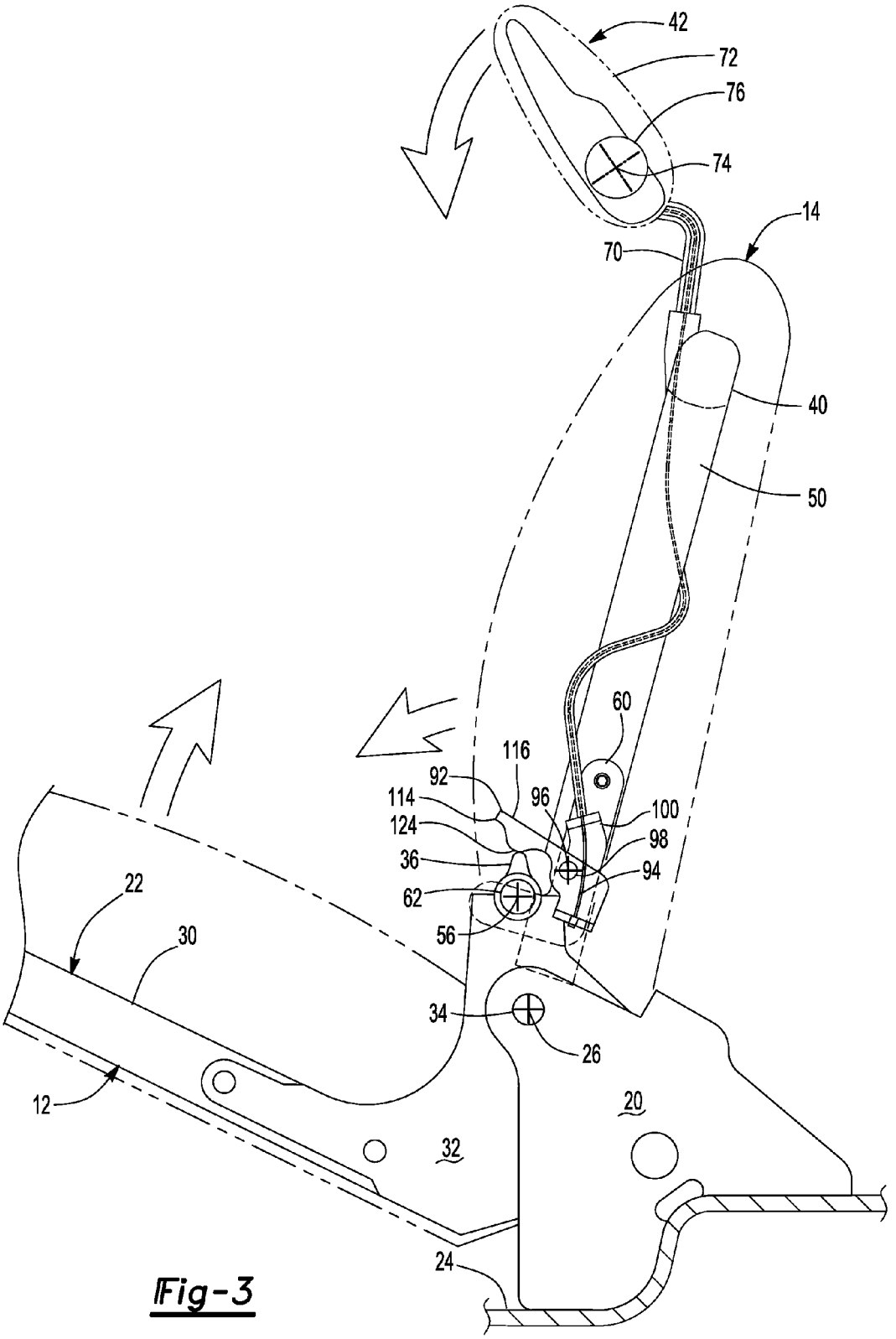
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Fig-3

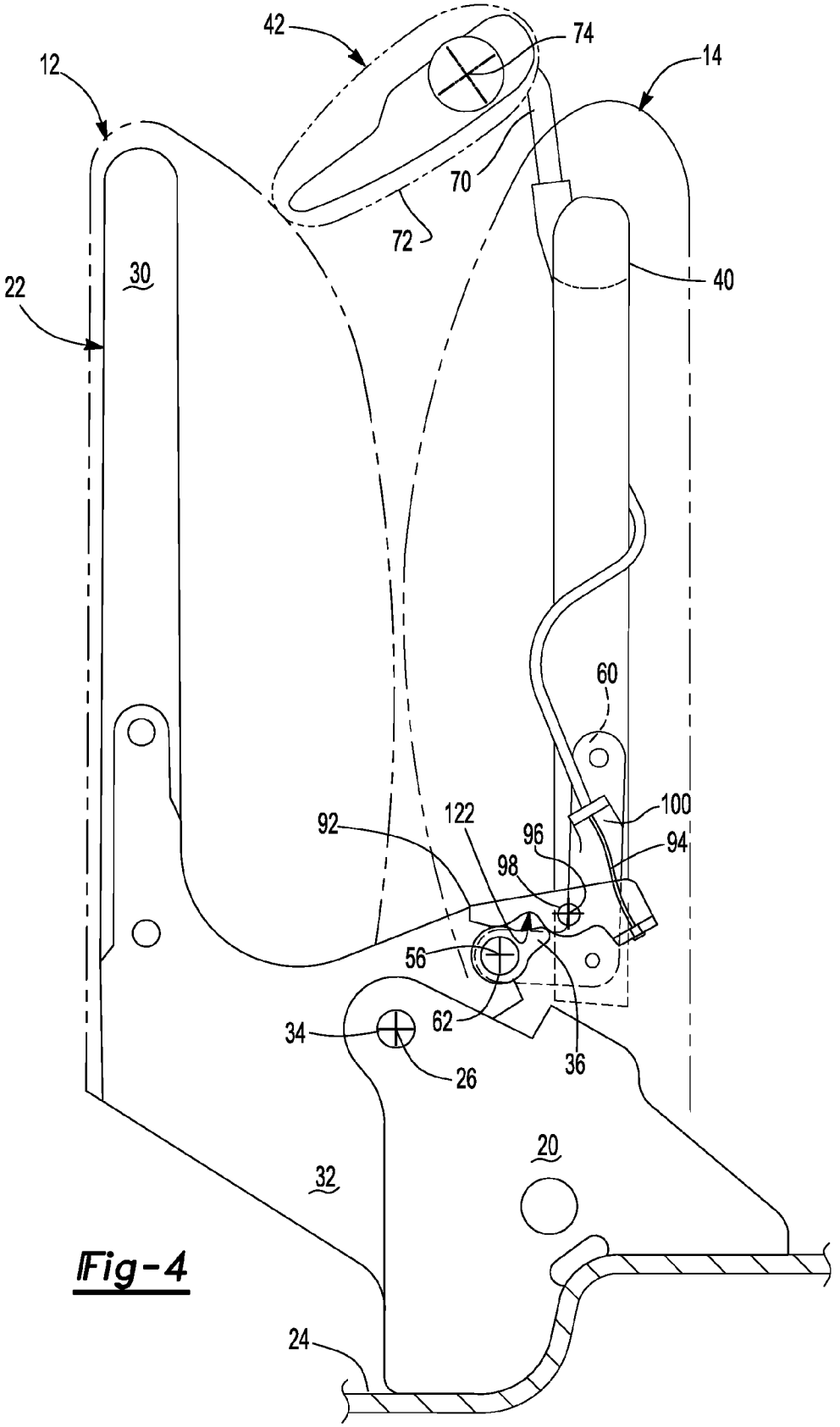
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Fig-4

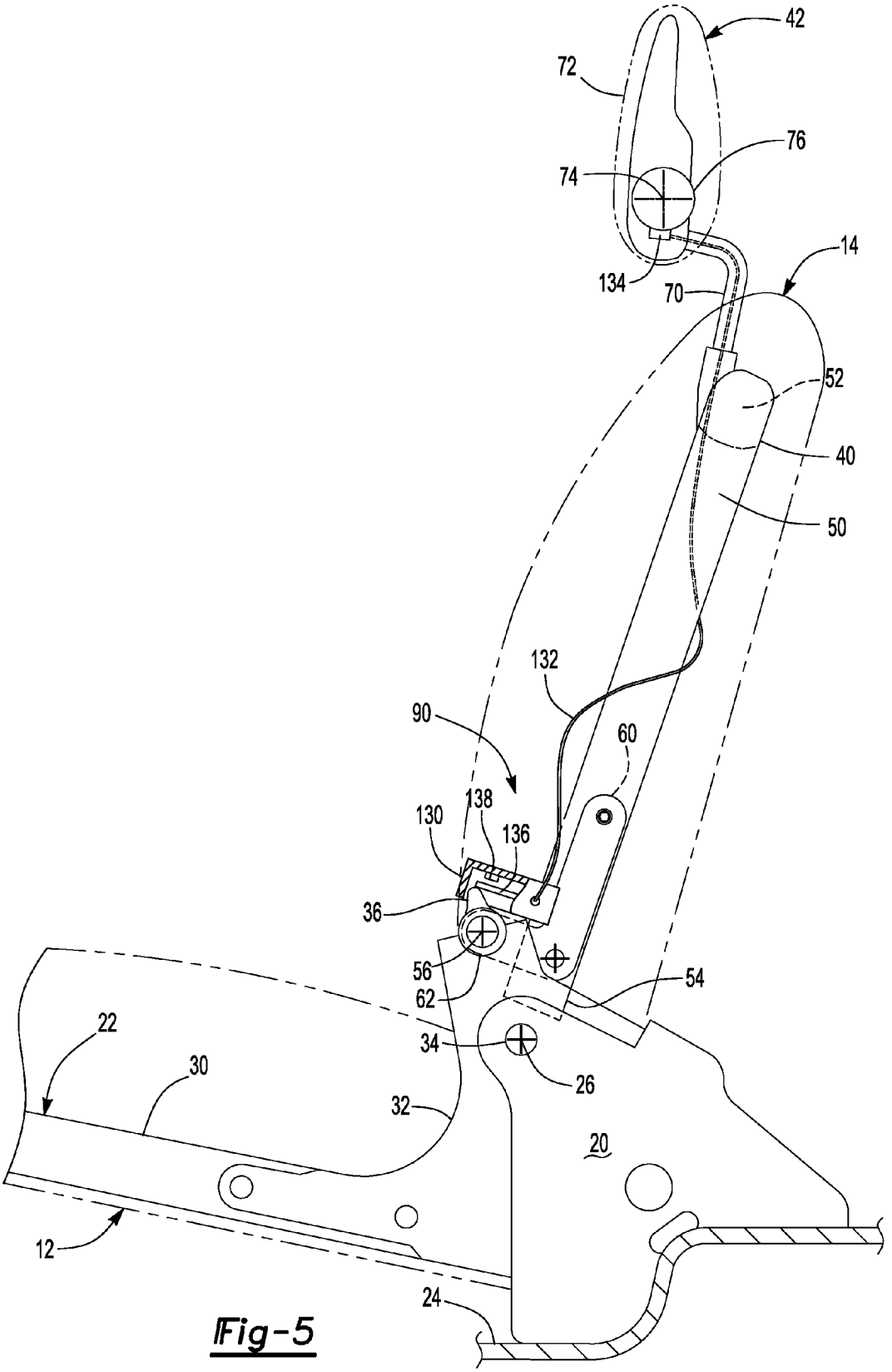
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Fig-5

SEAT ASSEMBLY HAVING A FOLDING SEAT BOTTOM AND HEAD RESTRAINT

TECHNICAL FIELD

[0001] The present application relates to a seat assembly having a folding seat bottom and a head restraint.

BACKGROUND

[0002] A seat assembly having a moveable head restraint is disclosed in U.S. Pat. No. 7,210,734.

SUMMARY

[0003] In at least one embodiment a seat assembly is provided. The seat assembly may include a seat mounting bracket, a seat bottom, a seat back, and a head restraint assembly. The seat bottom may be disposed proximate the seat mounting bracket and may be configured to rotate about a first axis of rotation. The seat back may be disposed proximate the seat bottom. The head restraint assembly may be disposed on the seat back and may be configured to move between a first position and a second position. The head restraint assembly may move from the first position to the second position when the seat bottom is rotated about the first axis of rotation with respect to the seat back.

[0004] In at least one embodiment a seat assembly is provided. The seat assembly may include a seat mounting bracket, a seat bottom, a seat back, a head restraint assembly, and an actuator unit. The seat bottom may have a seat bottom frame that is rotatably disposed on the seat mounting bracket. The seat bottom frame may include a cam. The seat back may have a seat back frame that may be disposed on the seat bottom frame. The head restraint assembly may be disposed on the seat back frame and may be configured to move between a first position and a second position. The actuator unit may be disposed on the seat back frame. The head restraint assembly may move from the first position to the second position when the seat bottom is rotated with respect to the seat back and the cam actuates the actuator unit.

[0005] In at least one embodiment a seat assembly is provided. The seat assembly may include a seat mounting bracket, a seat bottom, a seat back, and a head restraint assembly. The seat bottom may have a seat bottom frame that may be disposed on the seat mounting bracket and may rotate about a first axis of rotation. The seat back may be disposed on the seat bottom frame. The head restraint assembly may be disposed on the seat back and may be configured to move between a first position and a second position. The head restraint assembly may move from the first position to the second position when the seat bottom is rotated about the first axis of rotation toward the seat back.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. **1** is a perspective view of an exemplary seat assembly.

[0007] FIGS. **2-4** are fragmentary side views illustrating movement of the seat assembly.

[0008] FIG. **5** is a fragmentary side view of another embodiment of a seat assembly.

DETAILED DESCRIPTION

[0009] As required, detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention that may be embodied in various and alternative forms. The figures are not necessarily to scale; some features may be exaggerated or minimized to show details of particular components. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a representative basis for teaching one skilled in the art to variously employ the present invention.

[0010] Referring to FIG. **1**, an exemplary seat assembly **10** is shown. The seat assembly **10** may be configured for use in a vehicle, such as a motor vehicle like a car or truck. In at least one embodiment, the seat assembly **10** may be configured as a rear seat, such as a second or third row seat that may be disposed behind a driver seat. Moreover, the seat assembly **10** may have a bench seat configuration that may include seating positions for multiple occupants.

[0011] The seat assembly **10** may include a seat bottom **12** and a seat back **14** that may cooperate to support a seat occupant. The seat bottom **12** and seat back **14** may each include a trim cover **16** that may provide an exterior surface upon which a seat occupant may sit. Each trim cover **16** may at least partially cover or conceal a cushion **18**.

[0012] Referring to FIG. **2**, the seat bottom **12** may include at least one seat mounting bracket **20** and a seat bottom frame **22**.

[0013] The seat mounting bracket **20** may facilitate attachment or mounting of the seat assembly **10** to a mounting surface **24**, such as a floor pan of a vehicle. Two seat mounting brackets **20** may be provided that are disposed along opposing lateral sides of the seat bottom **12**. The seat mounting bracket **20** may be fixedly or removably disposed on the mounting surface **24**.

[0014] The seat bottom frame **22** may be rotatably disposed on the seat mounting bracket **20** to facilitate storage or stowing of the seat assembly **10**. More specifically, the seat bottom **12** and seat bottom frame **22** may be configured to rotate or pivot about a first axis of rotation **26** with respect to the seat mounting bracket **20**. The seat bottom frame **22** may have a unitary construction or may be assembled from multiple components. In at least one embodiment, the seat bottom frame **22** may include a first frame member **30** and a second frame member **32**.

[0015] The first frame member **30** may have any suitable configuration. For example, the first frame member **30** may be generally U-shaped and may generally extend along front and lateral sides (e.g., left and right sides) of the seat bottom **12**. The first frame member **30** may be provided with wires or any suitable surface to support the cushion **18** of the seat bottom **12**. In addition, the first frame member **30** may be integrally formed with or fixedly disposed on one or more second frame members **32**. For example, each end of the first frame member **30** may be fixedly disposed on a corresponding second frame member **32** in any suitable manner, such as with one or more fasteners or by welding. In addition, the first frame member **30** may extend from the second frame member **32** such that the first frame member **30** is disposed at an angle with respect to the mounting surface **24** and positioned below the first axis of rotation **26**.

[0016] The second frame member **32** may be configured to rotate about the first axis of rotation **26**. For example, the second frame member **32** may be rotatably disposed on a seat mounting bracket **20** with a mounting feature **34**, such as a pin or bushing. The mounting feature **34** may be fixedly disposed on or integrally formed with the seat mounting bracket **20** or

the second frame member **32** in one or more embodiments. In at least one embodiment, a mounting feature **34** may be provided with each seat mounting bracket **20** such that the mounting features **34** are coaxially disposed along the first axis of rotation **26**.

[0017] A cam **36** may also be provided with the seat bottom frame **22**. The cam **36** may be located above the first axis of rotation **26** and may facilitate actuation of a head restraint assembly as will be discussed in more detail below. In at least one embodiment, the cam **36** may be fixedly disposed on or with respect to the second frame member **32**.

[0018] The seat back **14** may be configured to support the back of a seat occupant. The seat back **14** may include a seat back frame **40** and a head restraint assembly **42**. The seat back **14** may or may not be configured to move when the seat bottom **12** is moved. For instance, the seat back **14** may be fixedly disposed on the seat mounting bracket **20** or another mounting surface in embodiments where the seat back **14** does not move in response to actuation of the seat bottom **12**. In the embodiment shown, the seat back **14** is configured to move when the seat bottom **12** is moved as will be discussed in more detail below.

[0019] The seat back frame **40** may have a unitary construction or may be assembled from multiple components. In at least one embodiment, the seat back frame **40** may include a pair of side members **50**, an upper cross member **52**, and a lower cross member **54**. The upper and lower cross members **52**, **54** may be spaced apart from each other and may interconnect the side members **50**.

[0020] The seat back **14** and seat back frame **40** may be configured to move or pivot with respect to a second axis of rotation **56**. As such, the seat bottom **12** and seat back **14** may pivot about different axes of rotation when the seat bottom **12** is actuated. For example, the seat back frame **40** may be pivotally coupled to the seat bottom **12** with a bracket **60**. In at least one embodiment, the bracket **60** may be generally L-shaped and may include a first arm and a second arm that may extend at an angle from the first arm. The first arm may be fixedly disposed on a side member **50** in any suitable manner, such as with a fastener or by welding. The second arm may be pivotally coupled to a portion of the seat bottom frame **22**, such as the second frame member **32**. For instance, a mounting feature **62**, such as a pin, may be provided to couple the second frame member **32** to the bracket **60**. The mounting feature **62** may be coaxially disposed with or extend along the second axis of rotation **56**. In addition, the second axis of rotation **56** may be disposed above the first axis of rotation **26**.

[0021] The head restraint assembly **42** may be moveably disposed on the seat back frame **40**. The head restraint assembly **42** may move in different manners or directions in various embodiments. For instance, the head restraint assembly **42** may rotate about an axis or retract with respect to the seat back **14**. The head restraint assembly **42** may include a support post **70** and a headrest **72** that may be disposed on the support post **70**. In at least one embodiment, the support post **70** may be fixedly disposed on a portion of the seat back frame **40**, such as the upper cross member **52**, and the headrest **72** may move with respect to the support post **70**. Alternatively, the support post **70** may be moveably disposed on a portion of the seat back frame **40**, which may allow the head restraint assembly **42** to be extended away from or retracted toward the top of the seat back **14**. An example of and extendable/retractable head restraint assembly is shown in FIG. **1**, which shows a headrest **72** in an exemplary retracted position in solid lines and in an exemplary extended position in phantom. In addition, the head restraint assembly may be provided with a thinner profile or "shingle" configuration than is shown in FIG. **1** in one or more embodiments.

[0022] In at least one embodiment, the headrest **72** may be configured to rotate about a third axis of rotation **74**. In one or more embodiments, the third axis of rotation **74** may extend substantially parallel to the first and/or second axes of rotation **26**, **56**. In addition, the third axis of rotation **74** may be coaxially disposed with or may extend substantially parallel to a cross member portion of the support post **70** that may be at least partially disposed in the headrest **72**.

[0023] The headrest **72** may include a latching mechanism **76** that may be configured to control movement of the headrest **72**. Examples of exemplary latching mechanisms are disclosed in U.S. Patent Publication No. 2010/0283305 which is assigned to the assignee of the present application and is incorporated by reference. In at least one embodiment, the latching mechanism **76** may be disposed in the headrest **72** and may include a biasing member and a moveable latch.

[0024] The biasing member, which may be a torsion spring, may be disposed in the headrest **72** and may be disposed about the cross member of the support post **70**. The biasing member may exert a biasing force that may urge the headrest **72** to rotate about the third axis of rotation **74** and toward the seat bottom **12**, or in a counterclockwise direction from the perspective shown.

[0025] The latch may also be disposed in the headrest **72** and may move between a latched position and an unlatched position. Rotation of the headrest **72** about the third axis of rotation **74** in at least one direction may be inhibited when the latch in the latched position. Rotation of the headrest **72** about the third axis of rotation **74** may be permitted when the latch is in the unlatched position. For example, the latch may retain the headrest **72** in a predetermined initial position when in the latched position. Movement of the latch to the unlatched position may release the headrest **72** and allow the headrest **72** to pivot toward the seat bottom **12** in response to the biasing force exerted by the biasing member. In addition, the latching mechanism **76** may be configured to permit manual repositioning of the headrest **72**. For instance, the headrest **72** may be manually pivoted back to the initial position where the latch may reset to the latched position to inhibit pivotal movement of the headrest **72** until the latch is unlatched.

[0026] An actuator unit **90** may be provided to selectively control movement of the head restraint assembly **42** when the seat bottom **12** is moved with respect to the seat back **14**. Various actuator unit embodiments are contemplated. In FIG. **2**, the actuator unit **90** may include a lever **92** and a linkage **94**.

[0027] The lever **92** may be configured to pivot about a lever axis or a fourth axis of rotation **96** and with respect to the seat back frame **42**. For example, the lever **92** may be pivotally disposed on a mounting feature such as a pin **98** that may extend along the fourth axis of rotation **96**. The pin **98** may be disposed on or engage the bracket **60** or a linkage mounting bracket **100** that may be fixedly positioned with respect to the seat back frame **42**.

[0028] In at least one embodiment, the lever **92** may include a first end **110**, a second end **112**, a first surface **114**, and a second surface **116**. The first and second ends **110**, **112** may be disposed opposite each other and may be disposed on opposite sides of the fourth axis of rotation **96**. The first surface **114** may be disposed opposite the second surface **116**

and may extend from the first end **110** to or toward the second end **112**. The first surface **114** may face toward and may be configured to engage the cam **36**. The first surface **114** may include a convex portion **120** that may extend from the first end **110** and a concave portion **122** that may extend from the convex portion **120**. The convex portion **120** may have an apex **124**, or point along the convex portion **120** that may be disposed at the greatest distance from the second surface **116**.

[0029] The linkage **94** may be configured to transmit force from the lever **92** to the latching mechanism **76** to facilitate movement of the head restraint assembly **42**. In at least one embodiment, the linkage **94** may be a cable such as a Bowden cable. A first end of the linkage **94** may be disposed proximate the second end **112** of the lever **92**. For instance, the second end **112** of the lever **92** may include a tab having an opening that receives and retains the first end of the linkage **94**. A second end of the linkage **94** may be coupled to the latching mechanism **76**. For example, the linkage **94** may extend through the seat back **14** and the support post **70** and into the headrest **72** such that a second end is coupled to the latch of the latching mechanism **76**. As such, rotation of the lever **92** may actuate the linkage **94** to release the latching mechanism **76** as will be discussed in more detail below.

[0030] Referring to FIGS. **2-4**, operation of at least one embodiment of the seat assembly will now be described in more detail. In these figures an outline of seat assembly is shown in phantom. This embodiment is described primarily with respect to an embodiment in which the headrest may move when the seat bottom is folded toward the seat back, but may also be applied to embodiments in which movement occurs when the seat bottom is unfolded away from the seat back, either alone or in combination with movement when the seat bottom is folded toward the seat back.

[0031] In FIG. **2**, the seat assembly **10** is shown in an initial configuration in which the seat bottom **12** is in an unfolded position. The seat bottom **12** may be positioned at a maximum distance from the seat back **14** when in the unfolded position. In addition, the head restraint assembly **42** is shown in an exemplary first position or initial position in which the head restraint assembly **42** is positioned to support the head of a seat occupant. As such, the headrest **72** may generally extend upward or away from the seat bottom **12** when in the first position. Moreover, the latching mechanism **76** may be in a latched position to inhibit movement of the head restraint assembly **42**. As such, the latching mechanism **76** may inhibit rotation of the headrest **72** about the third axis of rotation **74**. The cam **36** may be positioned near the first end **110** of the lever **92**. As such, the cam **36** may generally rest against a portion of the first surface **114** located between the first end **110** and the apex **124**.

[0032] In FIG. **3**, the seat bottom **12** is shown partially folded toward the seat back **14**. As the seat bottom **12** is folded, the seat bottom frame **22** rotates about the first axis of rotation **26**. Movement of the seat bottom frame **22** moves the cam **36** along the first surface **114** of the lever **92** toward the apex **124**. Movement of the cam **36** toward the apex **124** rotates the lever **92** about the fourth axis of rotation **96** in a clockwise direction from the perspective shown. Rotation of the lever **92** actuates the linkage **94**, which moves the latching mechanism **76** from the latched position to the unlatched position, thereby allowing the headrest **72** to rotate about the third axis of rotation **74** and toward the seat bottom **12**, or in a counterclockwise direction from the perspective shown. In at least one embodiment, the latching mechanism **76** may be unlatched when the lever **92** is sufficiently rotated about the fourth axis of rotation **96**, such as when the cam **36** engages or is disposed proximate the apex **124**. In addition, the seat back **14** and seat back frame **40** may begin to pivot about the second axis of rotation **56** when the seat bottom **12** is folded toward the seat back **14** due to the interconnection between the seat back frame **40** and the second frame member **32**. The seat back **14** may pivot or rotate toward the seat bottom **12** before the head restraint assembly **42** moves with respect to the seat back **14** in one or more embodiments.

[0033] In FIG. **4**, the seat bottom **12** is shown fully folded toward the seat back **14** or in a folded position. As such, the seat bottom **12** and seat bottom frame **22** may be rotated about the first axis of rotation **26** such that the seating surfaces of the seat bottom **12** and seat back **14** face toward and are positioned in close proximity to each other to reduce the package space of the seat assembly **10**. In addition, movement of the seat bottom frame **22** moves the cam **36** past the apex **124** such that the cam **36** may be positioned proximate the concave portion **122** of the lever **92**. As such, the lever **92** may rotate about the fourth axis of rotation **96** in a counterclockwise direction with respect to FIG. **3** from the perspective shown. The headrest **72** rotates about the third axis of rotation **74** toward the seat bottom **12** and to a second position. The headrest **72** may extend toward and may engage or be positioned in close proximity to the seat bottom **12** when in the second position to reduce the package space of the seat assembly **10**. In addition, the seat back **14** and seat back frame **40** are pivoted further about the second axis of rotation **56** and move closer to the seat bottom **12**. In one or more embodiments, the seat back **14** and/or seat back frame **40** may be disposed in a substantially vertical position when the seat bottom **12** is fully folded. In addition, the seat bottom **12** and the first frame member **30** may be disposed in a substantially vertical position when the seat bottom **12** is fully folded.

[0034] The head restraint assembly may be returned to the initial configuration by generally reversing the sequence depicted in FIGS. **2-4**. For instance, the seat bottom **12** may be manually rotated about the first axis of rotation **26** in a counterclockwise direction from the perspective shown to return the seat bottom **12** and the seat back **14** to the initial positions shown in FIG. **2**. Movement of the seat bottom **12** may or may not actuate the headrest **72** from the second position to the first position depending on the configuration of the seat assembly **10**. In at least one embodiment, the headrest **72** may not move from the second position to the first position when the seat bottom **12** is unfolded. Rather, the headrest **72** may be manually moved back to the first position where the latching mechanism **76** may reengage the headrest **72** and be in the latched position to inhibit movement of the headrest **72**. In at least one other embodiment, the actuator unit **90** may be configured to move the head restraint assembly **42** and/or headrest **72** back to the first position. For example, a second cable may be provided with the actuator unit **90** to pull the headrest **72** back to the first position when the seat bottom is 12 returned to the unfolded position.

[0035] Referring to FIG. **5**, a second embodiment of a seat assembly is shown. In this embodiment, the actuator unit **90** includes a switch **130**, a wire **132**, and an actuator **134**. The switch **130** may be mounted on the seat back frame **42** and/or the bracket **60**. The switch **130** may be normally open and may include a lever arm **136** and a contact **138**. The switch **130** may be configured to close when the cam **36** engages and actuates the lever arm **136** against the contact **138** when the

seat bottom **12** is moved from the unfolded position toward the folded position. An electrical signal or current may then be provided via the wire **132** to the actuator **134**. The actuator **134** may be disposed in the head restraint assembly **42** and may be configured as an electrical machine, such as a solenoid or motor. The actuator **134** may actuate the latching mechanism **76** to the unlatched position when the switch **130** is closed to permit the headrest **72** to move as previously described. Moreover, in embodiments in which the actuator **134** is a motor, the electrical signal may be used to move the headrest **72** from the unfolded position to the folded position or vice versa.

[0036] In at least one other embodiment, the head restraint assembly may be configured such that the headrest **72** moves toward or away from the seat back **14** rather than rotating. As such, the headrest **72** may move between a first position or extended position in which the headrest **72** is spaced apart from the top of the seat back **14** and a second position or retracted position in which the headrest **72** is moved toward and may be disposed against the top of the seat back **14**. Such movement may be realized by actuating the support post **70** with respect to the seat back frame **40**. Such actuation may be accomplished using an actuator unit having one or more cables. An example of such a mechanism is disclosed in U.S. Pat. No. 7,210,734, which is assigned to the assignee of the present application and is incorporated by reference. For example, one or more cables may be used to couple the seat bottom **12** and the support post **70**. Folding of the seat bottom **12** may actuate a cable which in turn may pull on the support post **70** and hence retract the headrest **72** toward the top of the seat back **14**.

[0037] While exemplary embodiments are described above, it is not intended that these embodiments describe all possible forms of the invention. Rather, the words used in the specification are words of description rather than limitation, and it is understood that various changes may be made without departing from the spirit and scope of the invention. Additionally, the features of various implementing embodiments may be combined to form further embodiments of the invention.

What is claimed is:

1. A seat assembly comprising:

a seat mounting bracket;

a seat bottom disposed proximate the seat mounting bracket and configured to rotate about a first axis of rotation;

a seat back disposed proximate the seat bottom;

a head restraint assembly disposed on the seat back and configured to move between a first position and a second position;

wherein the head restraint assembly moves from the first position to the second position when the seat bottom is rotated about the first axis of rotation with respect to the seat back.

2. The seat assembly of claim **1** wherein the seat back rotates toward the seat bottom when the seat bottom is rotated toward the seat back.

3. The seat assembly of claim **2** wherein the seat back is configured to rotate about a second axis of rotation.

4. The seat assembly of claim **3** wherein the first axis of rotation is spaced apart from and disposed below the second axis of rotation.

5. The seat assembly of claim **3** wherein the second axis of rotation moves with respect to the first axis of rotation when the seat bottom is folded toward the seat back.

6. The seat assembly of claim **3** further comprising an L-shaped bracket that is disposed on the seat back, wherein the L-shaped bracket is coupled to the mounting bracket with a mounting feature that is disposed along the second axis of rotation.

7. The seat assembly of claim **1** wherein the head restraint assembly rotates about a third axis of rotation toward the seat bottom when the head restraint assembly moves from the first position to the second position.

8. The seat assembly of claim **1** wherein the head restraint assembly includes a headrest, wherein the headrest is spaced apart from a top of the seat back when in the first position and wherein the headrest engages the top of the seat back in the second position.

9. A seat assembly comprising:

a seat mounting bracket;

a seat bottom having a seat bottom frame that is rotatably disposed on the seat mounting bracket and that includes a cam;

a seat back having a seat back frame that is disposed on the seat bottom frame;

a head restraint assembly disposed on the seat back frame that is configured to move between a first position and a second position; and

an actuator unit disposed on the seat back frame;

wherein the head restraint assembly moves from the first position to the second position when the seat bottom is rotated with respect to the seat back and the cam actuates the actuator unit.

10. The seat assembly of claim **9** wherein the seat bottom frame is configured to rotate about a first axis of rotation and the seat back frame is configured to rotate about a second axis of rotation.

11. The seat assembly of claim **10** wherein the cam is fixedly disposed along the second axis of rotation.

12. The seat assembly of claim **9** wherein the actuator unit includes a lever and a linkage that has a first end disposed on the lever and a second end that engages the head restraint assembly, wherein the lever is coupled to the seat back frame and configured to rotate about a lever axis of rotation and wherein the cam rotates the lever when the seat bottom is folded toward the seat back.

13. The seat assembly of claim **12** wherein the lever includes a convex portion having an apex, wherein the head restraint assembly moves from the first position toward the second position when the cam is disposed proximate the apex.

14. The seat assembly of claim **13** wherein the lever includes a concave portion disposed adjacent to the convex portion, wherein the lever is disposed proximate the concave portion after the head restraint assembly moves from the first position toward the second position.

15. The seat assembly of claim **9** wherein the actuator unit includes a switch coupled to the seat back frame and an electrical machine disposed in a headrest of the head restraint assembly, wherein the electrical machine permits the head restraint assembly to move from the first position to the second position when the seat bottom is rotated toward the seat back such that the cam closes the switch.

16. A seat assembly comprising:
a seat mounting bracket;
a seat bottom having a seat bottom frame disposed on the seat mounting bracket and configured to rotate about a first axis of rotation;
a seat back disposed on the seat bottom frame; and
a head restraint assembly disposed on the seat back and configured to move between a first position and a second position;
wherein the head restraint assembly moves from the first position to the second position when the seat bottom is rotated about the first axis of rotation toward the seat back.

17. The seat assembly of claim **16** wherein the head restraint assembly does not move from the second position to the first position when the seat bottom is rotated about the first axis of rotation away from the seat back.

18. The seat assembly of claim **16** wherein the seat is configured to rotate about a second axis of rotation, wherein the seat back rotates about the second axis of rotation toward the seat bottom when the seat bottom is rotated about the first axis of rotation toward the seat back.

19. The seat assembly of claim **18** wherein the seat back rotates about the second axis of rotation away from the seat bottom when the seat bottom is rotated about the first axis of rotation away from the seat back.

20. The seat assembly of claim **18** wherein the second axis of rotation moves with respect to the first axis of rotation when the seat bottom is rotated with respect to the seat mounting bracket.

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