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(54) **ASSEMBLY FOR ADJUSTING A LUMBAR REGION OF A SEAT**

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(57) **ABSTRACT**

An assembly for adjusting a lumbar region of a seat frame. A support is provided for suspension in the frame and is movable between lumbar positions. An actuator having a chassis and a drive is attached to the support. A wire extends between a first end engaging the drive and a second end for attachment to the frame. First and second spaced guides are mounted to the support and slidably support the wire. An intermediate device supports the wire and has a mount for attachment to the frame. A conduit disposed about the wire has a first end coupled to the actuator and a second end mounted to the intermediate device such that movement of the drive moves the wire relative to the guides and the intermediate device so to move the first guide relative to the second wire end and the second guide relative to the intermediate device.

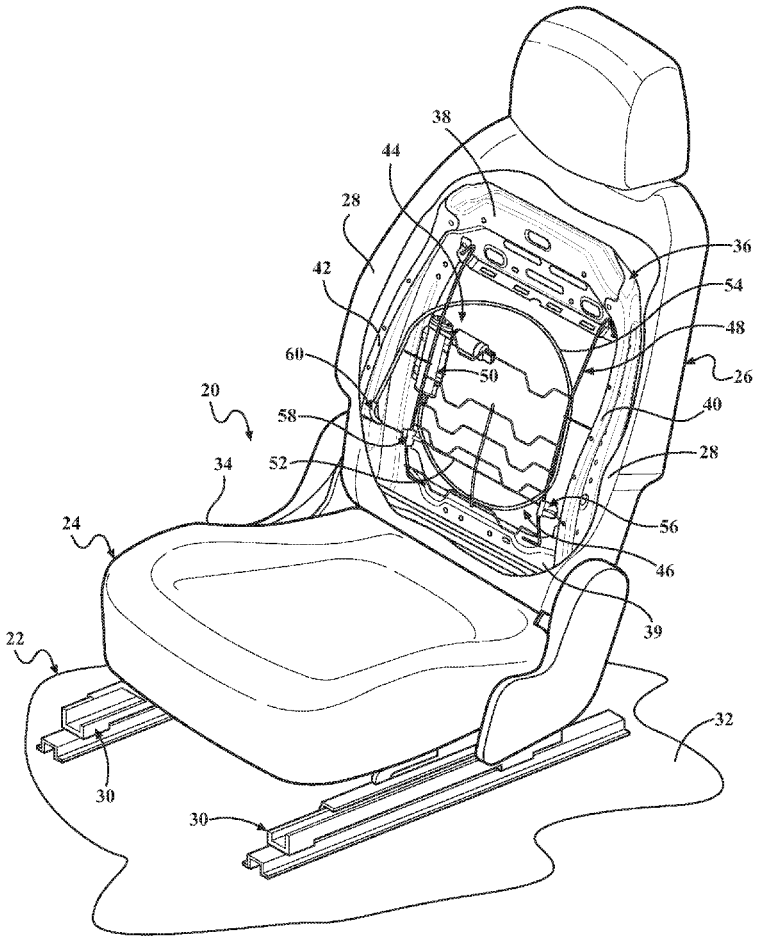
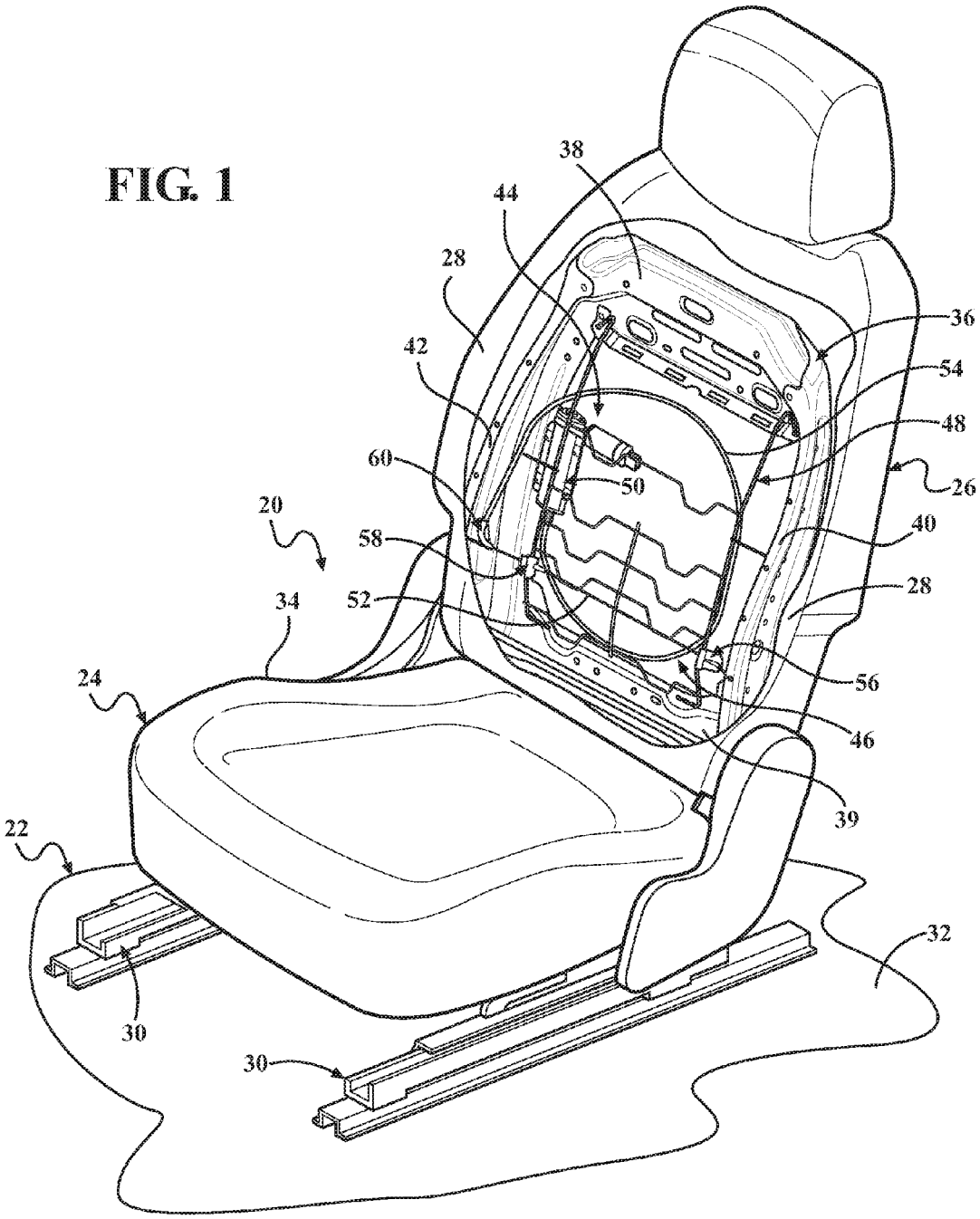


FIG. 1



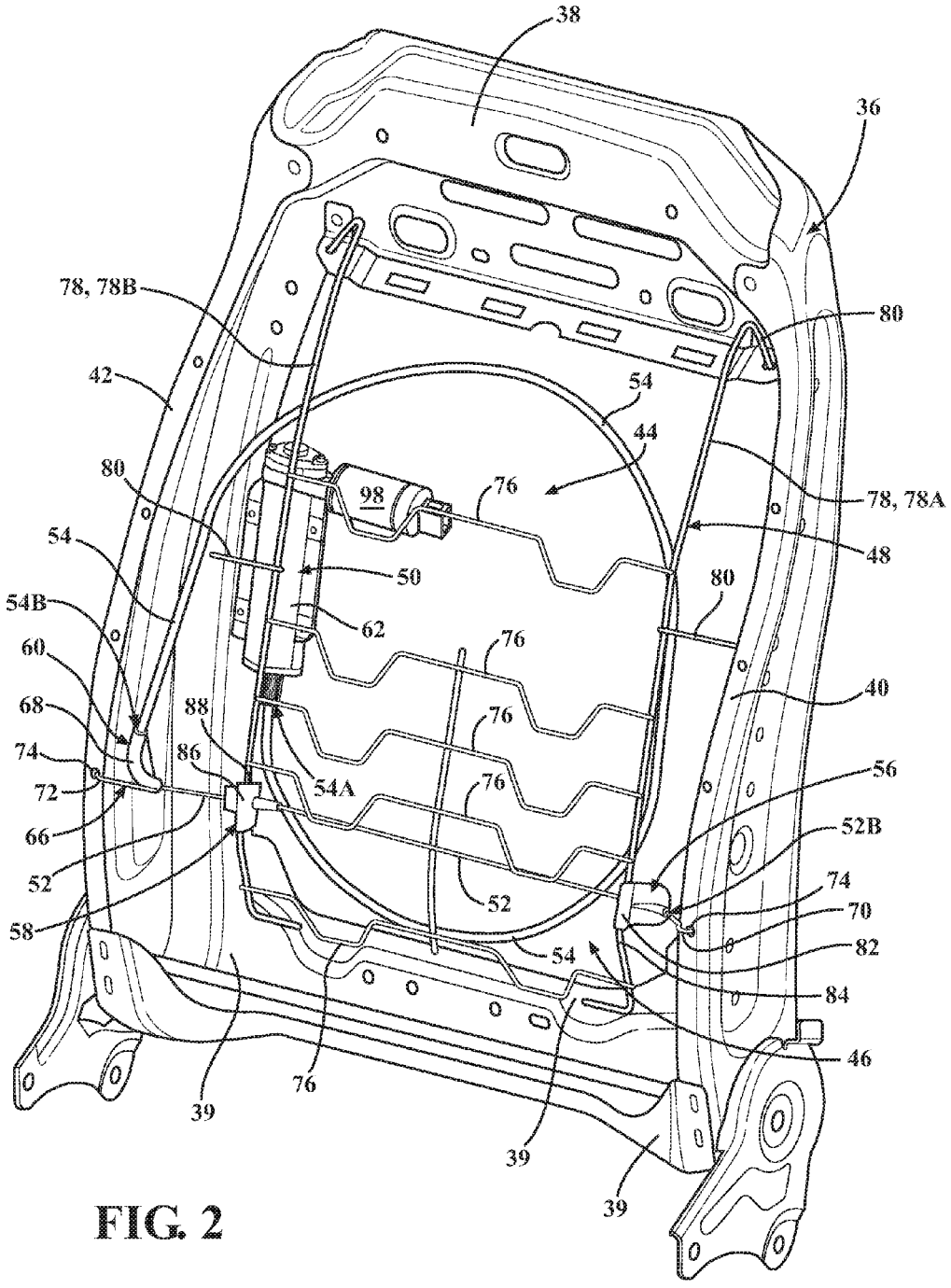

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FIG. 2

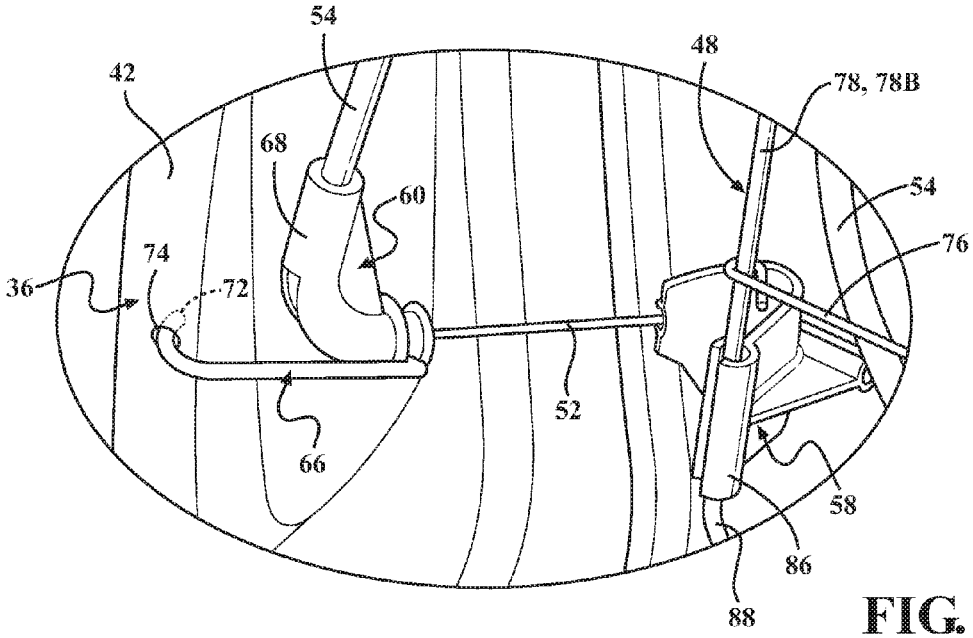
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FIG. 2A

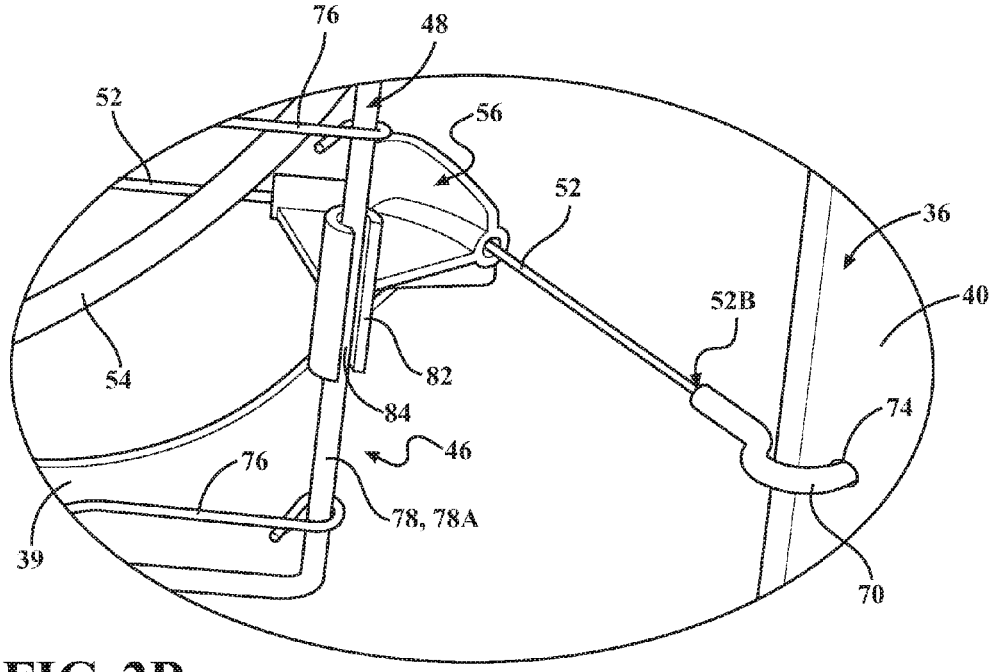
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FIG. 2B

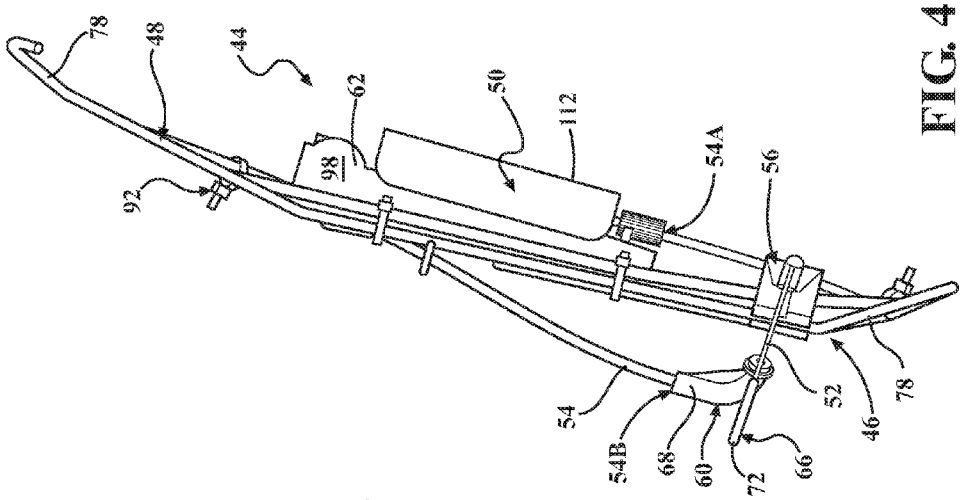
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FIG. 4

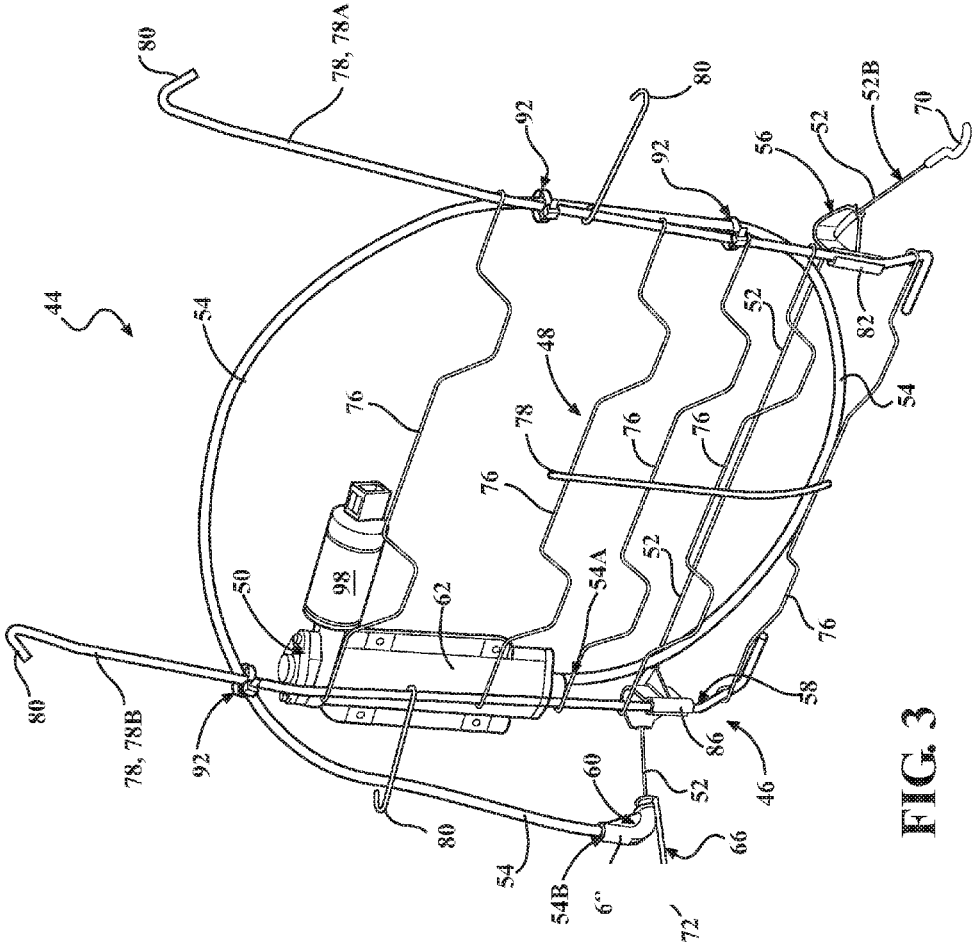
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FIG. 3

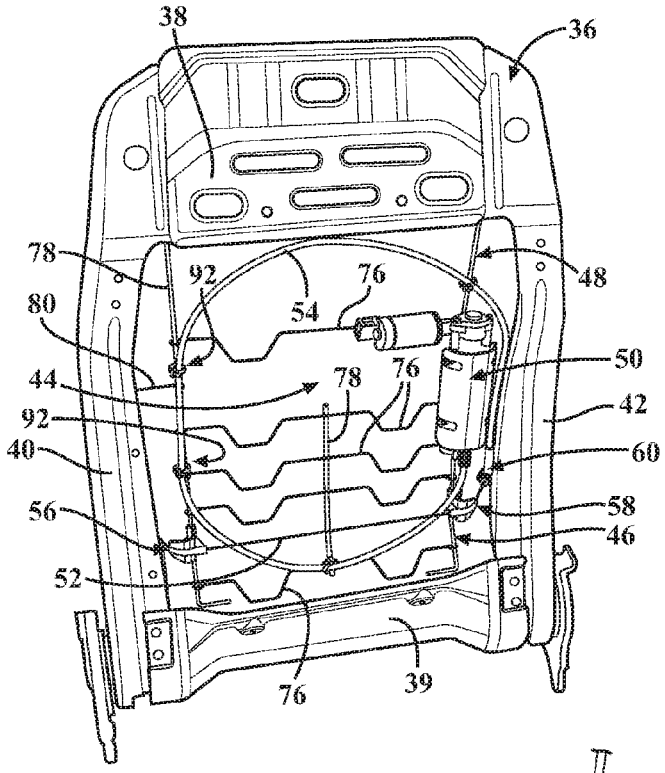
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FIG. 5

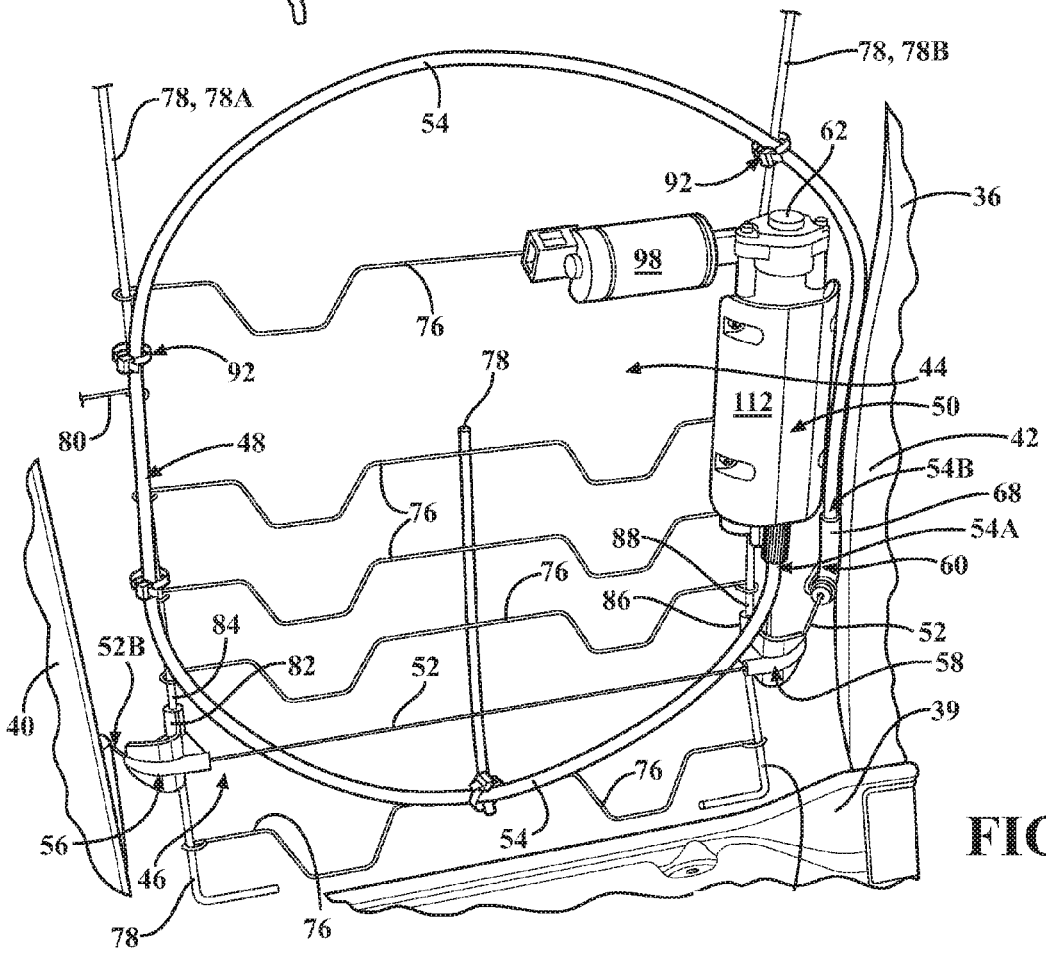
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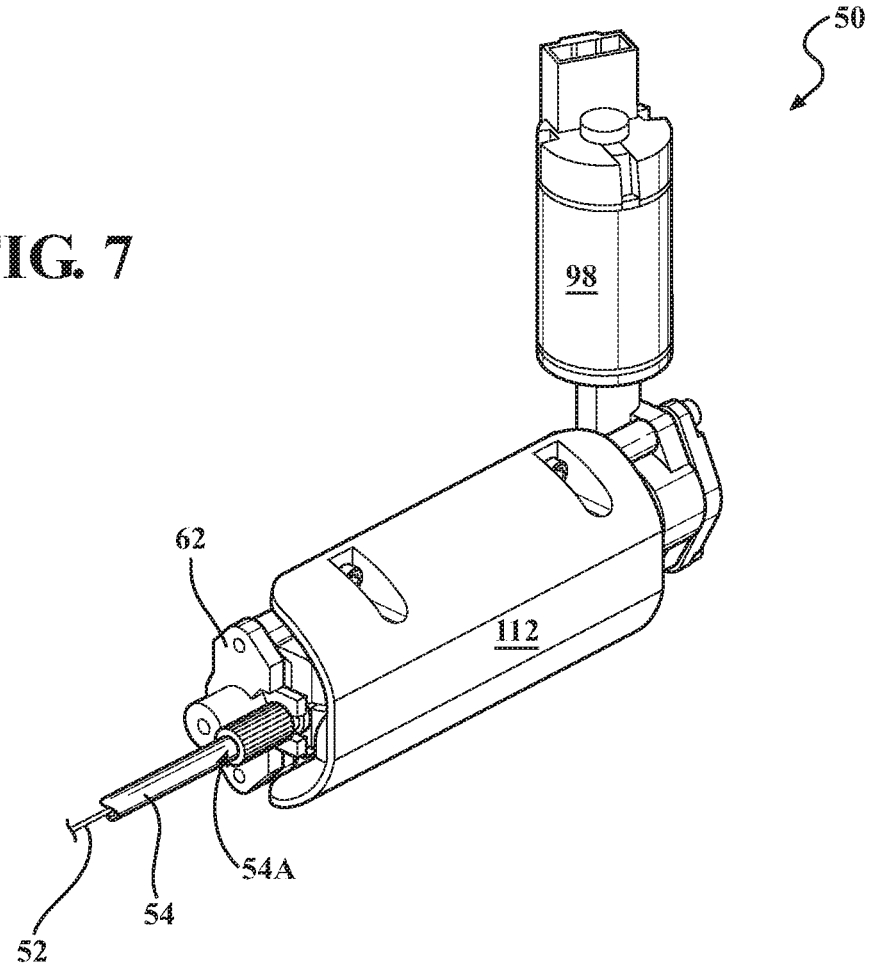
FIG. 6

FIG. 7



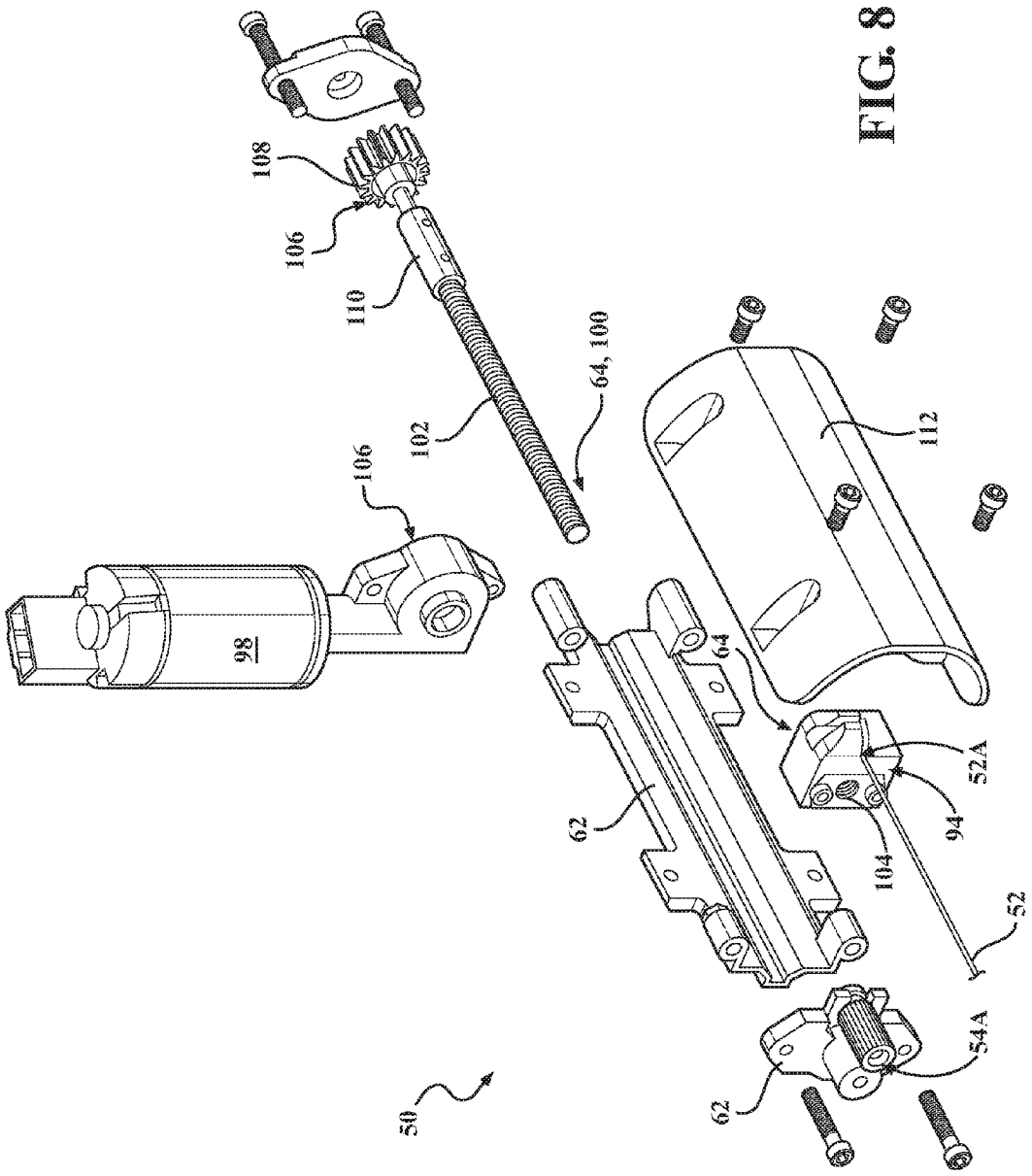


FIG. 8

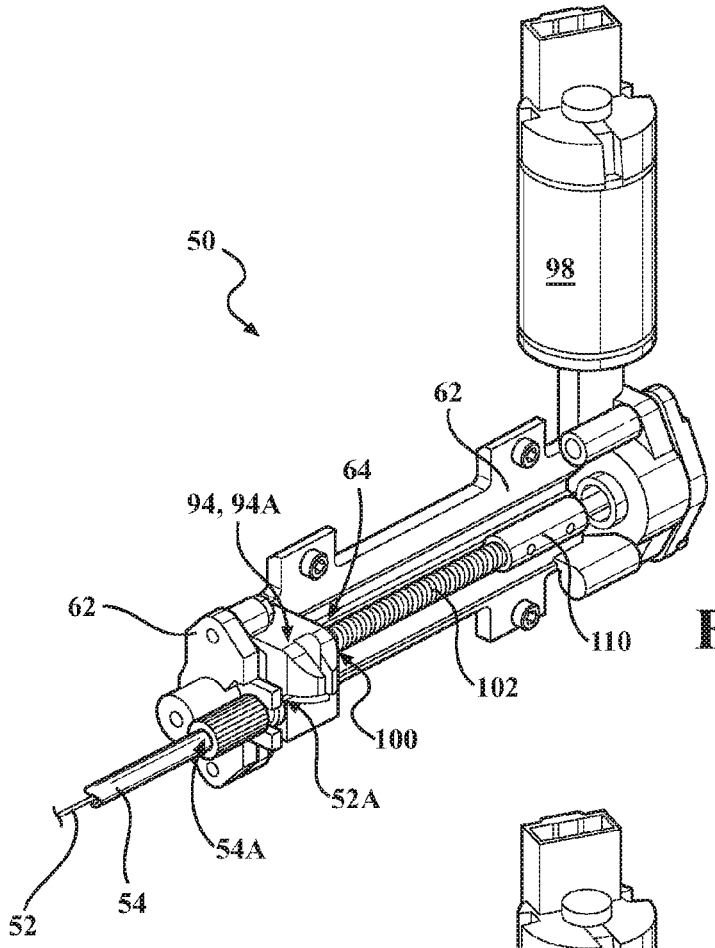

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FIG. 9A

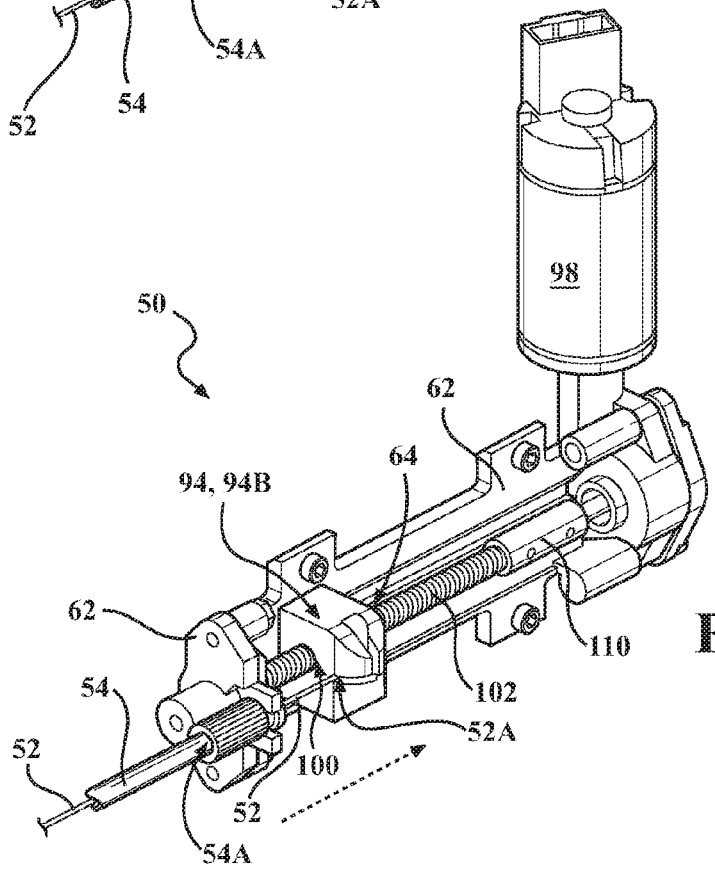
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FIG. 9B

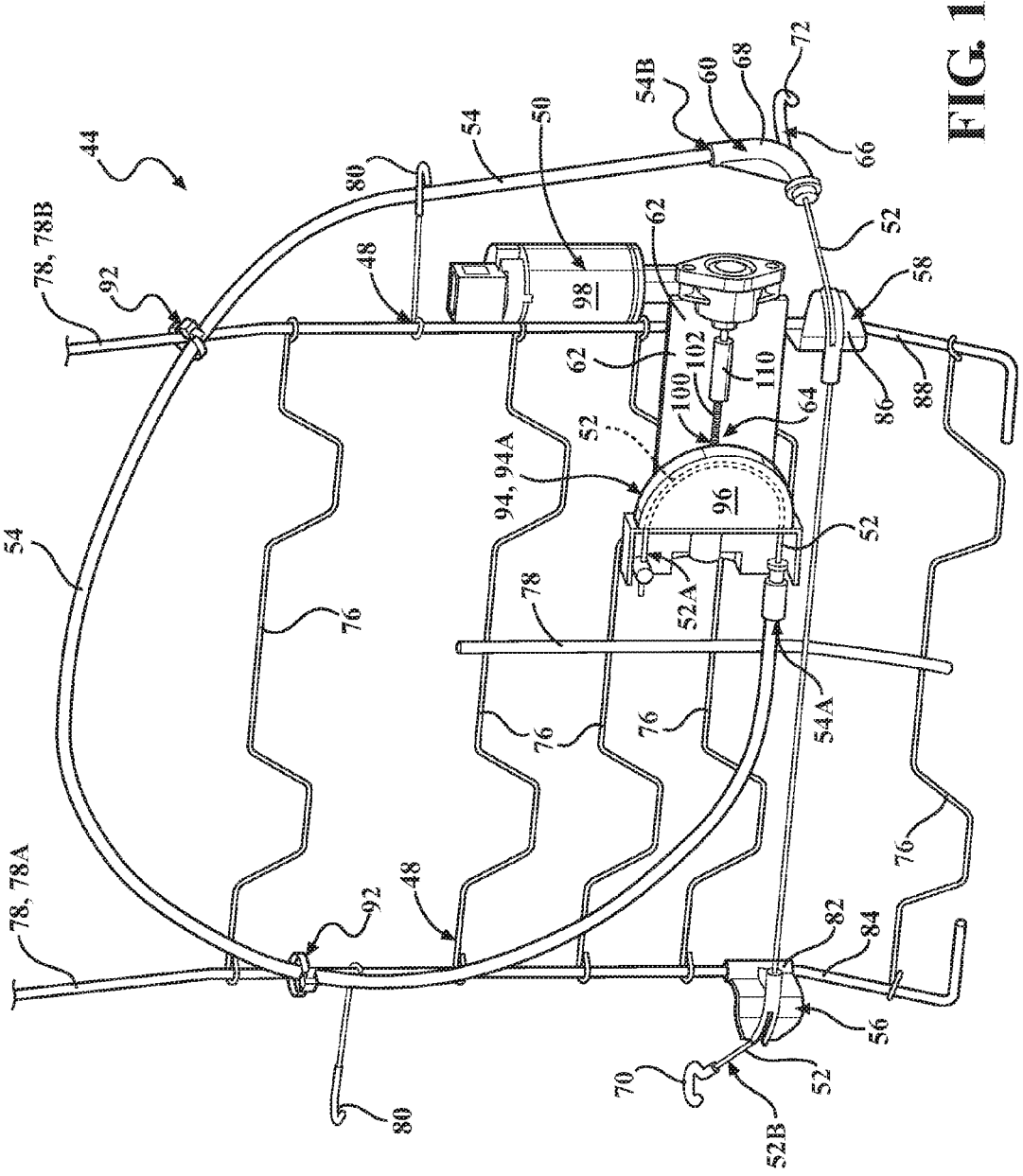
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FIG. 10A

FIG. 10B

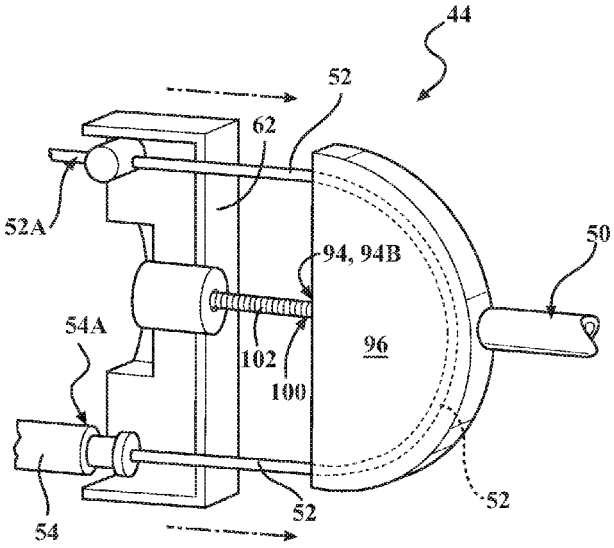
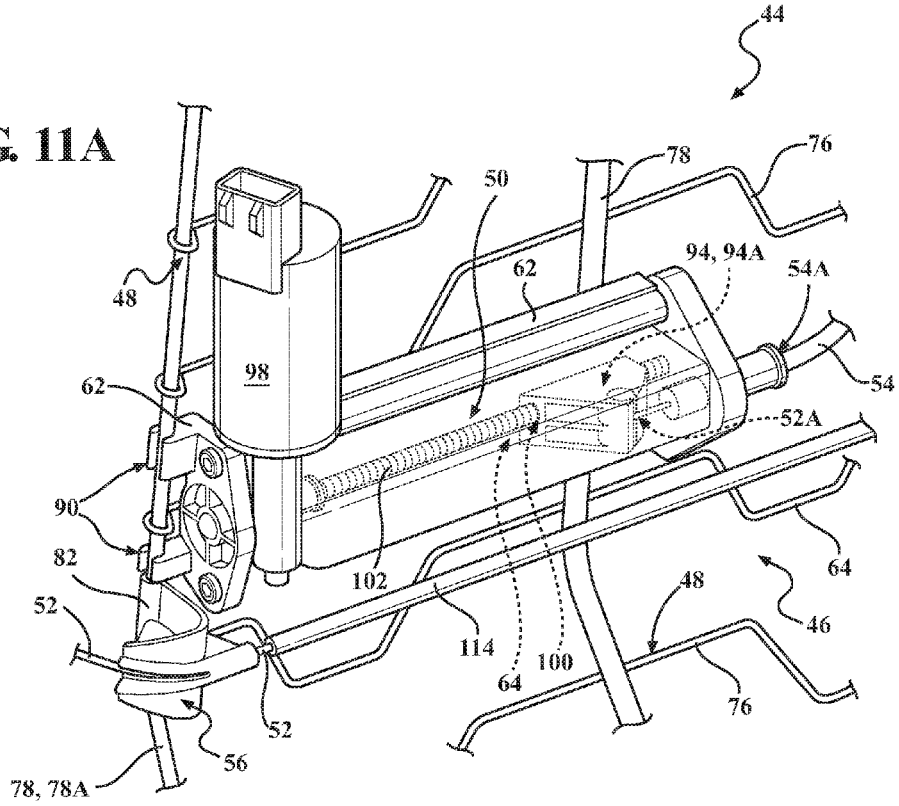


FIG. 11A



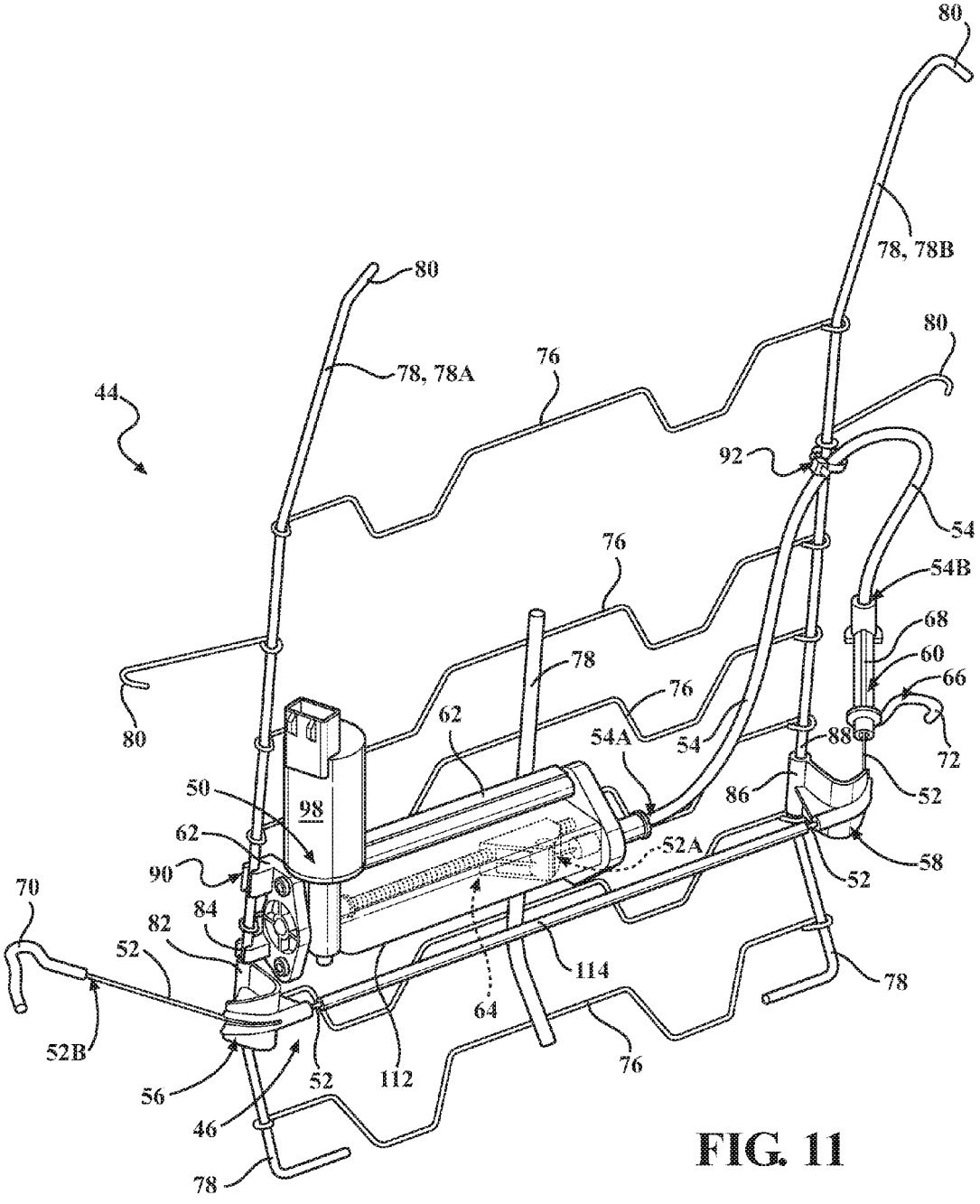

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FIG. 11

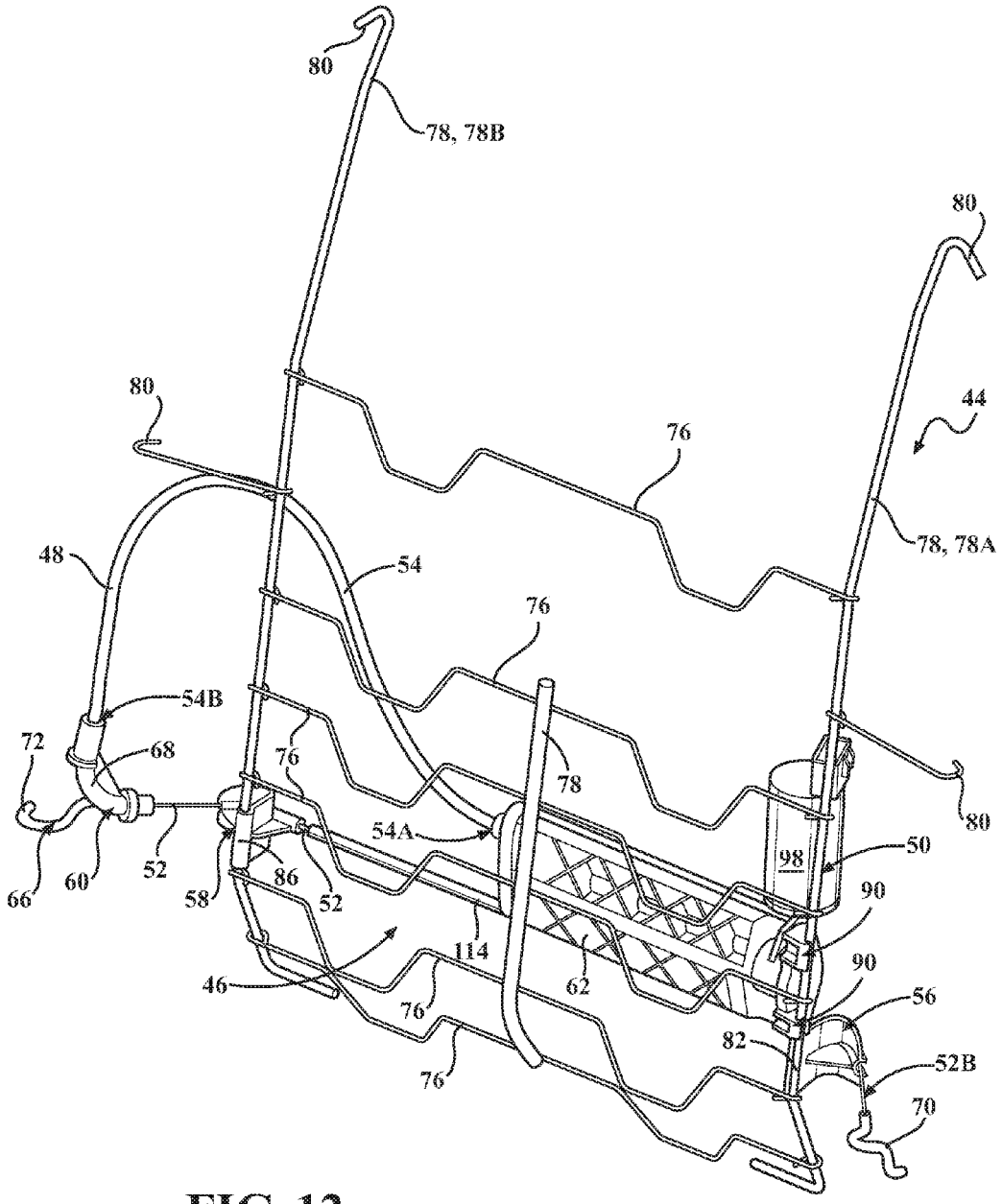
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FIG. 12

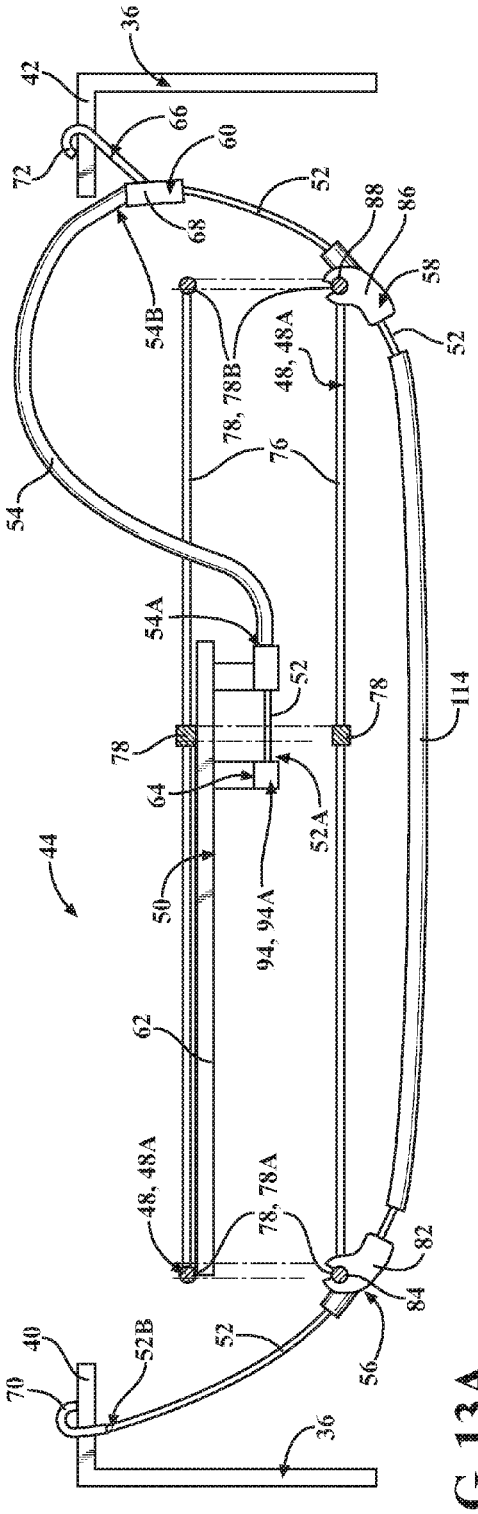

FIG. 13A

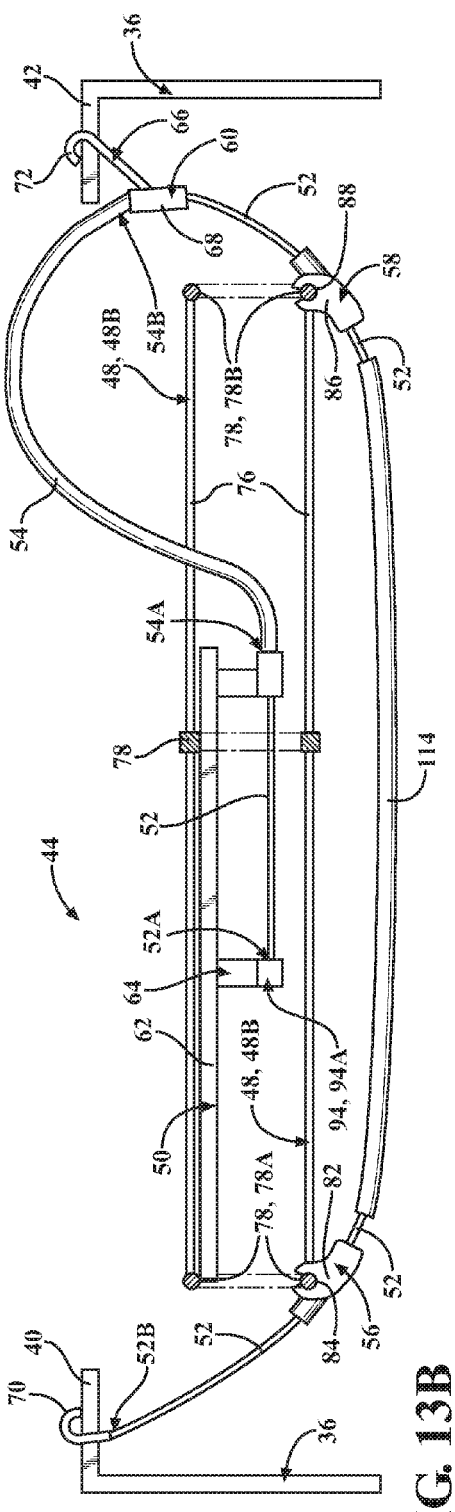

FIG. 13B

ASSEMBLY FOR ADJUSTING A LUMBAR REGION OF A SEAT

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates, generally, to vehicle seats and, more specifically, to an assembly for adjusting a lumbar region of a seat.

2. Description of the Related Art

[0002] Conventional seats known in the art include a base and a back configured to accommodate, support, and secure an occupant of a vehicle. The base is operatively attached to the vehicle, such as to a passenger compartment floorboard, and may be adapted to selectively move along the floorboard so as to effect selective legroom adjustment to accommodate differently-sized occupants. The back is pivotally attached to the base such that the occupant can selectively adjust the angular position of the back with respect to the base.

[0003] In addition to legroom adjustment and back/base angular position adjustment, seats known in the related art employ various mechanisms to facilitate adjustable support to the occupant at specific seat locations corresponding to anatomical regions of the body. By way of non-limiting example, the seat may include one or mechanisms to facilitate adjustment of lumbar support against the occupant's back, and/or bolster support against the occupant's hips, waist, or shoulders. Such selective adjustment is particularly advantageous when the occupant has been seated for an extended period of time.

[0004] There are a number of different types of mechanisms known in the related art for providing selectively adjustable support within a seat, including both manually-adjusted and power-adjusted mechanisms.

[0005] While seats and adjustment mechanisms known in the prior art have generally performed well for their intended purpose, there remains a need in the art for a seat adjustment mechanism assembly which strikes a substantial balance between packaging size, component cost, manufacturability, functionality, usability, and ergonomics.

SUMMARY OF THE INVENTION

[0006] The present invention overcomes the disadvantages in the related art in an assembly for adjusting a lumbar region of a seat having a back frame. The assembly includes a seat support adapted for suspension in the back frame of the seat. The seat support is movable between a first lumbar position and a second lumbar position. An actuator is operatively attached to the seat support to concurrently move with the seat support between the lumbar positions. The actuator includes a chassis and a drive mechanism. A wire extends between first and second longitudinal ends. The first end of the wire operatively engages the drive mechanism of the actuator, and the second end of the wire is adapted for attachment to the back frame of the seat. A conduit is disposed about at least a portion of the wire and has first and second ends. The first end of the conduit is coupled to the actuator. A first guide is mounted to the seat support with a portion of the wire adjacent the second end of the wire being slideably supported by the first guide. A second guide is mounted to the seat support spaced from the first guide with a portion of the wire being slideably supported by the second guide. An intermediate mounting device is provided having a mount adapted for attachment to the back frame of the seat. A portion of the wire is supported by the intermediate mounting device. The second end of the conduit is mounted to the intermediate mounting device such that movement of the drive mechanism moves the wire relative to the guides and the intermediate mounting device to facilitate movement of the first guide relative to the second end of the wire and movement of the second guide relative to the intermediate mounting device.

[0007] In this way, the adjustment mechanism of the present invention provides improved functionality and usability in connection with automotive seating systems and, at the same time, reduces the cost and complexity of manufacturing and assembling seating systems with improved improved features, such as increased comfort, adjustability, and ergonomics.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings.

[0009] FIG. **1** is a perspective view of a vehicle seat having a back frame in which an assembly according to one embodiment of the present invention is suspended for adjusting a lumbar region of the seat.

[0010] FIG. **2** is a perspective view of the back frame and the assembly of FIG. **1** showing a seat support, an actuator, a wire, a conduit, a first guide, a second guide, and an intermediate mounting device.

[0011] FIG. **2**A is an enlarged view of the back frame and assembly of FIG. **2**, showing additional detail of the conduit, wire, intermediate mounting device, and the second guide.

[0012] FIG. **2**B is an another enlarged view of the back frame and assembly of FIG. **2**, showing additional detail of the wire and the first guide.

[0013] FIG. **3** is a rotated perspective view of the assembly of FIG. **2**.

[0014] FIG. **4** is a side view of the assembly of FIG. **3**.

[0015] FIG. **5** is a rotated perspective view of the back frame and the assembly of FIG. **2**.

[0016] FIG. **6** is an enlarged partial perspective view of the back frame and the assembly of FIG. **5**.

[0017] FIG. **7** is a perspective view of the actuator of FIGS. **2-6**.

[0018] FIG. **8** is a partially exploded perspective view of the actuator of FIG. **7**, showing a chassis, a drive mechanism, and a cover.

[0019] FIG. **9**A is a perspective view of the chassis and the drive mechanism of the actuator of FIGS. **7** and **8** with the drive mechanism shown in a first position.

[0020] FIG. **9**B is an another perspective view of the actuator of FIG. **9**A with the drive mechanism shown in a second position.

[0021] FIG. **10**A is a perspective view of an assembly for adjusting the lumbar region of the seat of FIG. **1** according to another embodiment of the present invention, showing an actuator with a drive mechanism employing a cam and shown in a first position.

[0022] FIG. **10**B is an enlarged partial perspective view of the actuator of the assembly of FIG. **10**B with the drive mechanism and cam shown in a second position.

[0023] FIG. **11** is a perspective view of an assembly for adjusting the lumbar region of the seat of FIG. **1** according to yet another embodiment of the present invention having an actuator with a drive mechanism shown in phantom.

[0024] FIG. **11**A is an enlarged view of the assembly of FIG. **11**, showing additional detail of the actuator.

[0025] FIG. **12** is rotated perspective view of the assembly of FIG. **11**.

[0026] FIG. **13**A is a partial schematic top-side sectional view of the back frame and a portion of the assembly according to one embodiment of the invention shown with the seat support in the first lumbar position and with the actuator in a first position.

[0027] FIG. **13**B is an another partial schematic top-side sectional view of the back frame and the assembly of FIG. **13**A shown with the seat support in the second lumbar position and with the actuator in a second position.

DETAILED DESCRIPTION OF THE INVENTION

[0028] With reference now to the Figures, wherein like numerals indicate like parts throughout the several views, a seat is shown at **20** in FIG. **1**. The seat **20** is configured to be mounted in a passenger compartment of a vehicle, generally indicated at **22**, and is used to accommodate, secure, and support an occupant of the vehicle **22**. To that end, the seat **20** includes a base, generally indicated at **24**, and a back, generally indicated at **26**. The base **24** accommodates and provides support to the occupant's buttocks and thighs. Similarly, the back **26** accommodates and provides support to the occupant's shoulders, back, waist, and/or hips. The base **24** and/or the back **26** may include bolsters **28** configured to provide lateral support to the occupant so as to urge or otherwise hold the occupant in a seated position on the seat **20**. For example, the bolsters **28** may be sized, shaped, and/or oriented so as to prevent the occupant from moving laterally relative to the base **24** and/or the back **26**.

[0029] The back **26** is pivotally attached to the base **24** such that the occupant can selectively adjust the angular position of the back **26** with respect to the base **24** (not shown in detail, but generally known in the related art). In the representative embodiment illustrated herein, the base **24** is operatively attached to the vehicle **22** via one or more slider assemblies, generally indicated at **30** which, in turn, are secured to a floorboard **32** of the vehicle **22**. The slider assemblies **30** are configured to facilitate selective movement of the seat **20** with respect to the vehicle **22** floorboard **32** so as to effect selective legroom adjustment to accommodate differently-size occupants. By way of non-limiting example, where the seat **20** is used to accommodate an operator of the vehicle **22**, the slider assemblies **30** allow the operator to move the seat **20** closer-to or further-away-from the vehicle **22** controls, such as the accelerator, brakes, and/or steering wheel (not shown, but generally known in the art), and may be manually-adjusted or power-adjusted. However, those having ordinary skill in the art will appreciate that the seat **20** could accommodate any occupant of the vehicle **22** and, thus, could be positioned in any suitable location (i.e., driver seat, front passenger seat, rear seat, etc.) secured to any suitable portion of the vehicle **22** in any suitable way, with or without the use of slider assemblies **30**, without departing from the scope of the present invention. Moreover, while the vehicle **22** described herein is an automobile, those having ordinary skill in the art will appreciate that the vehicle **22** could be of any suitable type without departing from the scope of the present invention. By way of non-limiting example, the vehicle **22** could be adapted for civilian, commercial, industrial, military, or law enforcement use on land, water, or in the air.

[0030] The base **24** and back **26** of the seat **20** each include frames that provide structural rigidity and support to the seat **20** and facilitate connection between various components of the seat **20** as well as connection to the vehicle **22**, and may extend within the bolsters **28** so as to support foam and/or cushions supported in the base **24** and/or the back **26** (not shown in detail, but generally known in the related art) underneath one or more outer upholstery covers of the seat **20**, generally indicated at **34**. Typically, frames are formed of metal, but could be formed or otherwise manufactured from any suitable material sufficient to provide proper support for the occupant. The base **24** of the seat **20** includes a base frame (not shown) supported therein adapted to connect the base **24** to the slider assemblies **30**, and the back **26** of the seat **20** includes a back frame **36** supported therein (see FIG. **1**). The back frame **36** includes a top cross support **38** and a bottom cross support **39** spaced from and aligned substantially parallel to the top cross support **38**. The back frame **36** further includes first and second side supports **40**, **42** extending between the top cross support **38** and bottom cross support **39** to define a periphery of the back frame **36**.

[0031] Referring now to FIGS. **1**-**9**B, an assembly **44** according to the present invention is mounted within the back frame **36** of the back **26** of the seat **20** for adjusting a lumbar region of the seat **20**, generally indicated at **46**. To that end, the assembly **44** includes a seat support **48**, an actuator **50**, a wire **52**, a conduit **54**, a first guide **56**, a second guide **58**, and an intermediate mounting device **60** which cooperate to facilitate selective adjustment of the lumbar region **36** of the seat **20**. Each of these components will be described in greater detail below.

[0032] The seat support **48** is adapted for suspension in the back frame **36** of the seat **20** and is selectively movable between a first lumbar position **48**A and a second lumbar position **48**B (see FIGS. **13**A-**13**B). The actuator **50** is operatively attached to the seat support **48** and concurrently moves with the seat support **48** between the lumbar positions **48**A, **48**B. To that end, the actuator **50** has a chassis **62** and a drive mechanism **64** for selectively moving the wire **52** with respect to the chassis **62**. The wire **52** extends between first and second longitudinal ends **52**A, **52**B. The first longitudinal end **52**A of the wire **52** operatively engages the drive mechanism **64** of the actuator **50**. The second longitudinal end **52**B of the wire **52** is adapted for attachment to the back frame **36** of the seat **20**. The conduit **54** is disposed about at least a portion of the wire **52** and has first and second conduit ends **54**A, **54**B. The first conduit end **54**A of the conduit **54** is coupled to the actuator **50** (see FIG. **2**). The first guide **56** is mounted to the seat support **48** adjacent to the second end **52**B of the wire **52** with a portion of the wire **52** slidably supported by the first guide **56**. Similarly, the second guide **58** is mounted to the seat support **48** spaced from the first guide **56** with a portion of the wire **52** slidably supported by the second guide **58**. The intermediate mounting device **60** has a mount **62** adapted for attachment to the back frame **36** of the seat **20**. A portion of the wire **52** is supported by the intermediate mounting device **60**, and the second conduit end **54**B of the conduit **54** is mounted to the intermediate mounting device **60** such that predetermined

movement of the drive mechanism **64** of the actuator **50** moves the wire **52** relative to the guides **56**, **58** and the intermediate mounting device **60** so as to facilitate movement of the first guide **56** relative to the second end **52**B of the wire **52** and movement of the second guide **58** relative to the intermediate mounting device **60**, thereby effecting corresponding movement of the seat support **48** between the lumbar positions **48**A, **48**B (see FIGS. **13**A-**13**B).

[0033] As shown best in FIGS. **2**-**2**A, the intermediate mounting device **60** is spaced from the seat support **48**. Specifically, the intermediate mounting device **60** guides the wire **52** from the conduit **54** towards the guides **56**, **58**, but does not move with respect to the back frame **36** of the seat **20** as the drive mechanism **64** of the actuator **50** moves the wire **52** to effect corresponding movement of the seat support **48** between the lumbar positions **48**A, **48**B, as noted above. Moreover, the intermediate mounting device **60** remains spaced from the guides **56**, **58** along the wire **52** as the seat support **48** moves between the lumbar positions **48**A, **48**B.

[0034] As shown throughout the drawings, the wire **52** is continuous between the longitudinal ends **52**A, **52**B and extends slidably through the conduit **54**, the guides **56**, **58**, and the intermediate mounting device **60**. Thus, the wire **52** at least partially passes through the conduit **54**, the guides **56**, **58**, and the intermediate mounting device **60**. In one embodiment, the intermediate mounting device **60** includes a device body, generally indicated at **68**, which encloses at least a portion of the wire **52**. As shown best in FIG. **2**A, the device body **68** has a substantially curved profile shaped to direct the wire **52** at least partially towards the guides **56**, **58**. The mount **66** of the intermediate mounting device **60** extends from and merges with the device body **68**.

[0035] In one embodiment, the wire **52** includes a first hook **70** coupled to the second end **52**B of the wire **52**, and the mount **66** of the intermediate mounting device **60** includes a second hook **72** (see FIG. **3**). The hooks **70**, **72** are spaced from each other and are adapted for attachment to the back frame **36** of the seat **20**, such as disposed in holes **74** defined in respective side supports **40**, **42** of the back frame **36** (see FIG. **2**). However, those having ordinary skill in the art will appreciate that second end **52**B of the wire **52** and the mount **66** of the intermediate mounting device **60** could be configured differently and could attach to the back frame **36** of the seat **20** in a number of different ways, with or without the use of hooks **70**, **72** without departing from the scope of the present invention. Further, as will be appreciated from the subsequent description of the actuator **50** below, the wire **52** could be of any suitable type, manufactured from any suitable material, sufficient to move through the conduit **54**, the guides **56**, **58**, and the intermediate mounting device **60**, without departing from the scope of the present invention. By way of non-limiting example, the wire **52** could be realized as a solid wire, as a braided wire, or as a stranded wire.

[0036] As noted above, the seat support **48** is adapted for suspension in the back frame **36** of the seat **20**. In the representative embodiment illustrated herein, the seat support **48** is mounted within the back frame **36** of the back **26** of the seat **20** and provides adjustable lumbar support to the occupant in the lumbar region **36**. More specifically, as noted above, the seat support **48** and the actuator **50** move together between the lumbar positions **48**A, **48**B, adjacent to the lumbar region **36** of the seat **20**, in response to movement of the drive mechanism **64** of the actuator **50**, as described in greater detail below. As shown best in FIGS. **1** and **2**, the seat support **48** is a mat-type wire mesh configured to resiliently support the back **26** of the seat **20** so as to provide support to the vehicle **22** occupant. To that end, the seat support **48** includes a plurality of horizontal rods **76** and a plurality of vertical rods **78** supporting the horizontal rods **76**. The seat support **48** also includes a plurality of rod hooks **80** formed with the horizontal rods **76** and extending from the vertical rods **78** to the side supports **40**, **42** of the back frame **36** so as to suspend the seat support **48** therein. The horizontal rod hooks **80** extend at a constant length beyond the vertical rods **78**, thereby maintaining proper separation between the back frame **36** and the seat support **48** above the lumbar region **36** of the seat **20**. However, as shown in FIG. **2**, rod hooks **80** may also be integrally formed with the vertical rods **78**, and may extend to the cross supports **38**, **39** of the back frame **36** so as to suspend the seat support **48** therein. As shown in FIG. **2**, the rod hooks **80** attach to the back frame **36** within the back **26** of the seat **20** and are spaced from the upholstery cover **34** so as to provide space for the foam or cushion between the seat support **48** and upholstery cover **34**, as noted above.

[0037] In one embodiment, the seat support **48** of the assembly **44** includes a first vertical rod **78**A and second vertical rod **78**B spaced longitudinally from the first vertical rod **78**A. Here, the first guide **56** is coupled to the first vertical rod **78**A, and the second guide **58** is coupled to the second vertical rod **78**B. More specifically, in one embodiment, the first guide **56** includes a first guide mount **82** coupled to the seat support **48** at a first location **84** defined by the first vertical rod **78**A, and the second guide **58** includes a second guide mount **86** coupled to the seat support **48** at a second location **88** defined by the second vertical rod **78**B. The first location **86** is spaced from the second location **88**. As shown best in FIGS. **2**A-**2**B, the guide mounts **82**, **86** have a substantially c-shaped profile configured for snap attachment to the vertical rods **78** of the seat support **48**. Similarly, as shown in the embodiment of the assembly **44** illustrated in FIGS. **11**-**11**A, the chassis **62** of the actuator **50** may include at least one securing feature, generally indicated at **90**, configured for attaching the actuator **50** to the vertical rods **78** of the seat support **48**, such as via snap attachment. Moreover, while the representative embodiment of the securing feature **90** illustrated in FIG. **11** is realized as a protrusion integrally formed with and extending from the chassis **62** that is clipped onto one of the vertical rods **78** of the seat support **48**, it will be appreciated that the securing feature **90** could be formed, configured, oriented, or otherwise realized in any suitable way by any suitable structural feature or component sufficient to secure the actuator **50** to the seat support **48** as described above, without departing from the scope of the present invention. Further, those having ordinary skill in the art will appreciate that the actuator **50** of the assembly **44** can be arranged, oriented, or otherwise supported in any suitable way sufficient to move concurrently with the seat support **48** between the lumbar positions **48**A, **48**B. Similarly, one or more additional securing mechanisms, generally indicated at **92**, could be utilized to secure or otherwise position other portions of the assembly **44**, such as one or more "zip ties" **92** employed to secure the conduit **54** to the seat support **48** spaced from the actuator **50** (see FIG. **3**).

[0038] As noted above, movement of the wire **52** via the drive mechanism **64** of the actuator **50** effects movement of the seat support **48** between the lumbar positions **48**A, **48**B as the wire **52** moves though the conduit **54**, the guides **56**, **58**, and the intermediate mounting device **60** (see FIGS. **13**A-**13**B). As described in greater detail below, the assembly **44** of the present invention can be implemented, oriented, or configured in a number of different ways depending on the specific configuration of the seat. Moreover, the drive mechanism **64** of the actuator **50** of the assembly **44** can be configured in a number of different ways sufficient to move the wire **52** to effect movement of the seat support **48** between the lumbar positions **48**A, **48**B, as noted above.

[0039] In one embodiment, the drive mechanism **64** of the actuator **50** includes a drive block, generally indicated at **94**, which is selectively movable with respect to the chassis **62** of the actuator **50** between a first position **94**A corresponding to the first lumbar position **48**A (see FIG. **13**A), and a second position **94**B corresponding to the second lumbar position **48**B (see FIG. **13**B). Here, as the drive block **94** moves from the first position **94**A (see FIG. **9**A) to the second position **94**B (see FIG. **9**B), the wire **52** correspondingly moves through the conduit **54**, the guides **56**, **58**, and the intermediate mounting device **60** so as to effect movement of the seat support **48** between the lumbar positions **48**A, **48**B (see FIGS. **13**A-**13**B). To that end, in one embodiment, the intermediate mounting device **60** is arranged along the wire **42** adjacent to the second guide **58** such that movement of the drive block **94** from the first position **94**A towards the second position **94**B urges the second guide **58** towards the intermediate mounting device **60** as the seat support **48** moves from the first lumbar position **48**A towards the second lumbar position **48**B. Similarly, in one embodiment, the first guide **56** is arranged along the wire **52** such that movement of the drive block **94** of the drive mechanism **64** from the first position **94**A towards the second position **94**B urges the first guide **56** towards the second end **52**B of the wire **52** as the seat support **48** moves from the first lumbar position **48**A towards the second lumbar position **48**B.

[0040] In the representative embodiments illustrated in FIGS. **2**-**11**B and **13**A-**13**B, the first end **52**A of the wire **52** is fixed to the drive block **94** of the drive mechanism **64** of the actuator **50** for concurrent movement therewith, and the first conduit end **54**A of the conduit **54** is fixed to the chassis **62** of the actuator **50** at a location spaced from the drive block **94** of the drive mechanism **64**. Here, movement of the drive block **94** directly moves the wire **52** through the conduit **54**, the intermediate mounting device **60**, and the guides **56**, **58** so as to effect movement of the seat support **48** between the lumbar positions **48**A, **48**B, as noted above. In the embodiment illustrated in FIGS. **10**A-**10**B, however, the drive mechanism **64** of the actuator **50** further includes a cam, generally indicated at **96**, which is fixed to the drive block **94** for concurrent movement, and the cam **96** engages a portion of the wire **52** spaced from and adjacent to the first end **52**A of the wire **52**. Here, the first end **52**A of the wire **52** does not move concurrently with the drive block **94** and is fixed to the drive mechanism **64** at a location spaced from the drive block **94**, whereby movement of the wire **52** through the conduit **54**, guides **56**, **58**, and intermediate mounting device **60** is effected as the cam **96** moves into engagement with the portion of the wire **52** adjacent the first end **52**A, which slides within or otherwise along the cam **96** as the drive block **94** moves between the positions **94**A, **94**B. Those having ordinary skill in the art will appreciate that the specific configuration of the cam **96** and drive block **94** can be adjusted for specific application requirements, such as to optimize mechanical advantage based on the geometry of the cam **96** and the movement of the drive block **94**. It will be appreciated that the drive block **94** can be configured, supported, and/or shaped in any suitable way sufficient to effect movement of the wire **52** as described above, without departing from the scope of the present invention.

[0041] Referring now to FIGS. **7**-**9**B, in one embodiment, the actuator **50** further includes a driver, generally indicated at **98**, and a screw drive **100**. The driver **98** provides a source of rotational torque in opposing first and second rotational directions **98**A, **98**B. In one embodiment, the driver **98** is realized as an electric motor. However, it will be appreciated that the driver **98** could be realized by any suitable type of automated prime mover without departing from the scope of the present invention.

[0042] The screw drive **100** is supported on the chassis **62** and is disposed in torque-translating relationship with the driver **98**. Here, the drive block **94** is supported in threaded engagement with the screw drive **100** such that rotation of the driver **98** in the first rotational direction **98**A urges the drive block **94** so as to move the drive mechanism **64** from the first position **94**A toward the second position **94**B, and rotation of the driver **98** in the second rotational direction **62**B urges the drive block **94** so as to move the drive mechanism **64** from the second position **94**B toward the first position **94**A. To that end, the screw drive **100** includes an externally-threaded rod **102** extending along a portion of the chassis **62** which engages a corresponding internally-threaded portion **104** of the drive block **68** so as to linearly move the drive block **94** and the drive mechanism **64** between the positions **94**A, **94**B in response to predetermined rotation of the driver **98**. It will be appreciated that the specific configuration of the threaded engagement of the screw drive **100** between the threaded rod **102** and the threaded portion **104**, such as the pitch, thread count, etc., may be configured to correspond to force output of the actuator **50** necessary to facilitate movement between the lumbar positions **48**A, **48**B, based on available torque output of the driver **98** and structural characteristics of the seat support **48** and/or the back frame **36** of the seat **20**

[0043] In one embodiment, the actuator **50** further includes a geartrain, generally indicated at **106**, interposed in torque-translating relationship between the driver **98** and the screw drive **100**. In the representative embodiment illustrated herein, the geartrain **106** includes worm gear **108** coupled to the threaded rod **102** of the screw drive **100** via a coupling, generally indicated at **110**, which engages a worm shaft of the driver **98** (worm shaft not shown, but generally known in the art). As shown in FIGS. **7** and **8**, the actuator **50** may also include a cover **112** encapsulating the drive mechanism **64**, the drive block **94**, the screw drive **100**, and/or the geartrain **106**.

[0044] With reference now to FIGS. **11**-**13**B, in one embodiment, the assembly **44** further includes a sheath **114** slidably supported along the wire **52** and disposed between the guides **56**, **58**. As shown best in FIG. **11**A, the sheath **114** is spaced from the guides **56**, **58**. The sheath **114** provides support to the wire **52** and helps guide the wire **52** between the guides **56**, **58** across the seat support **58**.

[0045] In this way, the assembly **44** of the present invention provides for selective adjustment of the lumbar region **46** of the seat **20** while affording significantly optimized and space-efficient component packaging and, at the same time, reduces the cost and complexity of manufacturing and assembling lumbar adjustment mechanisms for seats **20**.

[0046] The invention has been described in an illustrative manner, and it is to be understood that the terminology which has been used is intended to be in the nature of words of description rather than of limitation. Many modifications and variations of the present invention are possible in light of the above teachings, and the invention may be practiced otherwise than as specifically described.

1. An assembly for adjusting a lumbar region of a seat having a back frame, said assembly comprising:

a seat support adapted for suspension in the back frame of the seat, with said seat support movable between a first lumbar position and a second lumbar position;

an actuator operatively attached to said seat support to concurrently move with said seat support between said lumbar positions, and said actuator having a chassis and a drive mechanism;

a wire extending between first and second longitudinal ends with said first end of said wire operatively engaging said drive mechanism of said actuator and said second end of said wire adapted for attachment to the back frame of the seat;

a conduit disposed about at least a portion of said wire and having first and second ends with said first end of said conduit coupled to said actuator;

a first guide mounted to said seat support adjacent said second end of said wire with a portion of said wire slideably supported by said first guide;

a second guide mounted to said seat support spaced from said first guide with a portion of said wire slideably supported by said second guide; and

an intermediate mounting device having a mount adapted for attachment to the back frame of the seat, with a portion of said wire supported by said intermediate mounting device, and said second end of said conduit mounted to said intermediate mounting device such that movement of said drive mechanism moves said wire relative to said guides and said intermediate mounting device to facilitate movement of said first guide relative to said second end of said wire and movement of said second guide relative to said intermediate mounting device.

2. The assembly as set forth in claim **1**, wherein said intermediate mounting device is spaced from said seat support.

3. The assembly as set forth in claim **1**, wherein said intermediate mounting device includes a device body enclosing at least a portion of said wire with said mount of said intermediate mounting device extending from and merging with said device body.

4. The assembly as set forth in claim **3**, wherein said device body has a substantially curved profile shaped to direct said wire at least partially towards said guides.

5. The assembly as set forth in claim **1**, wherein

said intermediate mounting device remains spaced from said guides along said wire as said seat support moves between said lumbar positions.

6. The assembly as set forth in claim **1**, wherein said wire further includes a first hook coupled to said second end of said wire, and wherein said mount of said intermediate mounting device includes a second hook, with said hooks adapted for attachment to the back frame of the seat.

7. The assembly as set forth in claim **1**, wherein said wire is continuous between said ends through said guides and said intermediate mounting device.

8. The assembly as set forth in claim **1**, wherein said wire is disposed in tension through said guides and said intermediate mounting device and remains in tension as said seat support moves between said lumbar positions.

9. The assembly as set forth in claim **1**, wherein said seat support includes a first vertical rod and a second vertical rod spaced longitudinally from said first vertical rod.

10. The assembly as set forth in claim **9**, wherein said first guide is coupled to said first vertical rod and said second guide is coupled to said second vertical rod.

11. The assembly as set forth in claim **1**, wherein said first guide includes a first guide mount coupled to said seat support at a first location; and wherein said second guide includes a second guide mount coupled to said seat support at a second location spaced from said first location.

12. The assembly as set forth in claim **11**, wherein said guide mounts have a substantially c-shaped profile configured for snap attachment to said vertical rods of said seat support.

13. The assembly as set forth in claim **1**, wherein said chassis of said actuator includes at least one securing feature for attaching said actuator to said seat support.

14. The assembly as set forth in claim **1**, wherein said drive mechanism of said actuator includes a drive block selectively movable with respect to said chassis of said actuator between first and second positions corresponding to said first and second lumbar positions of said seat support.

15. The assembly as set forth in claim **14**, wherein said first end of said wire is fixed to said drive block of said drive mechanism for concurrent movement therewith.

16. The assembly as set forth in claim **14**, wherein said first end of said conduit is fixed to said chassis of said actuator spaced from said drive block of said drive mechanism.

17. The assembly as set forth in claim **14**, wherein said drive mechanism of said actuator further includes a cam fixed to said drive block for concurrent movement therewith, said cam engaging a portion of said wire spaced from and adjacent to said first end of said wire.

18. The assembly as set forth in claim **14**, wherein said drive mechanism of said actuator further includes a driver for providing a source of rotational torque in opposing first and second rotational directions, and a screw drive disposed in torque translating relationship with said driver, said drive block being supported in threaded engagement with said screw drive such that rotation of said driver in said first rotational direction urges said drive block from said first position toward said second position and rotation of said driver in said second rotational direction urges said drive block from said second position toward said first position.

19. The assembly as set forth in claim **14**, wherein said intermediate mounting device is arranged along said wire adjacent to said second guide such that movement of said drive block of said drive mechanism from said first position towards said second position urges said second guide towards said intermediate mounting device as said seat support moves from said first lumbar position towards said second lumbar position.

20. The assembly as set forth in claim **14**, wherein said first guide is arranged along said wire such that movement of said drive block of said drive mechanism from said first position towards said second position urges said first guide towards said second end of said wire as said seat support moves from said first lumbar position towards said second lumbar position.

21. The assembly as set forth in claim **18**, wherein said driver of said drive mechanism of said actuator is an electric motor.

22. The assembly as set forth in claim **18**, wherein said drive mechanism of said actuator includes a geartrain interposed in torque translating relationship between said driver and said screw drive.

23. The assembly as set forth in claim **1**, further including a sheath slidably supported along said wire disposed between said guides and spaced from said guides.

24. The assembly as set forth in claim **1**, wherein said wire is either a solid wire, a braided wire, or a stranded wire.

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