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(54) **DAMPER TOP MOUNT**

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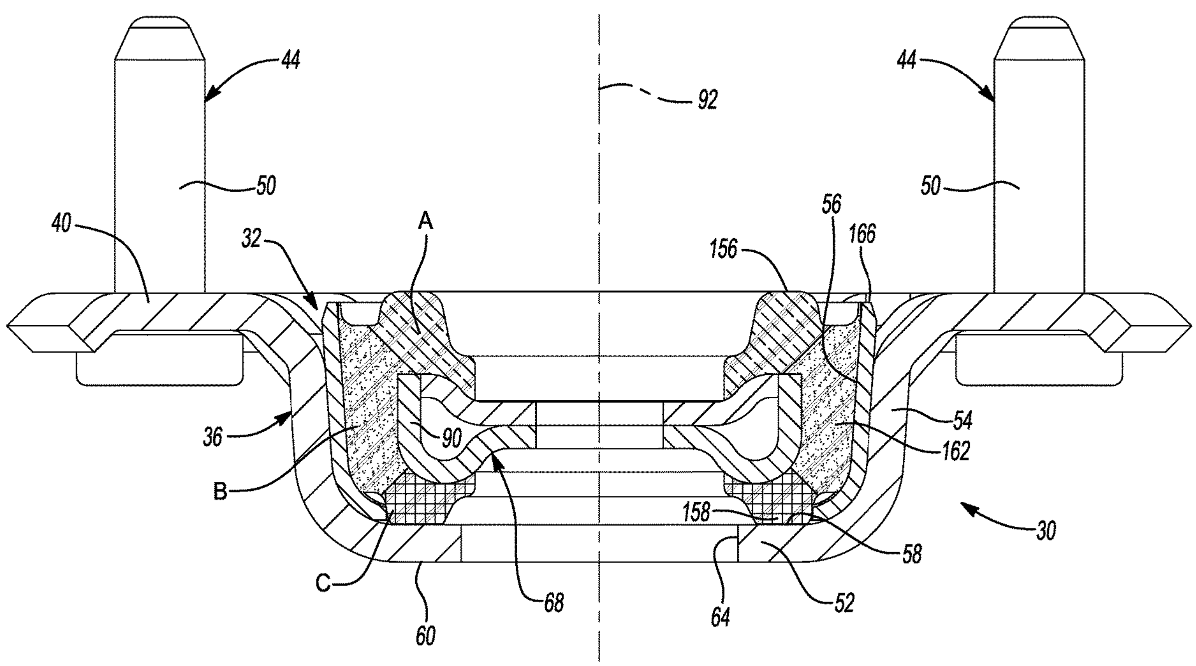
(57) **ABSTRACT**

A damper mount comprises an isolator coupled to a housing. The isolator comprises an inner core, an outer shell, and an elastomeric body positioned therebetween. The inner core includes a first plate coupled to a second plate. The first plate includes a circumferentially extending outer wall. The second plate includes a flange positioned in engagement with the outer wall. The outer shell includes a circumferentially extending wall circumscribing the inner core. The elastomeric body is bonded to the outer shell as well as the first plate and the second plate of the inner core. The circumferentially extending outer wall of the first plate and the circumferentially extending wall of the outer shell extend substantially parallel to one another with a portion of the elastomeric body positioned therebetween.



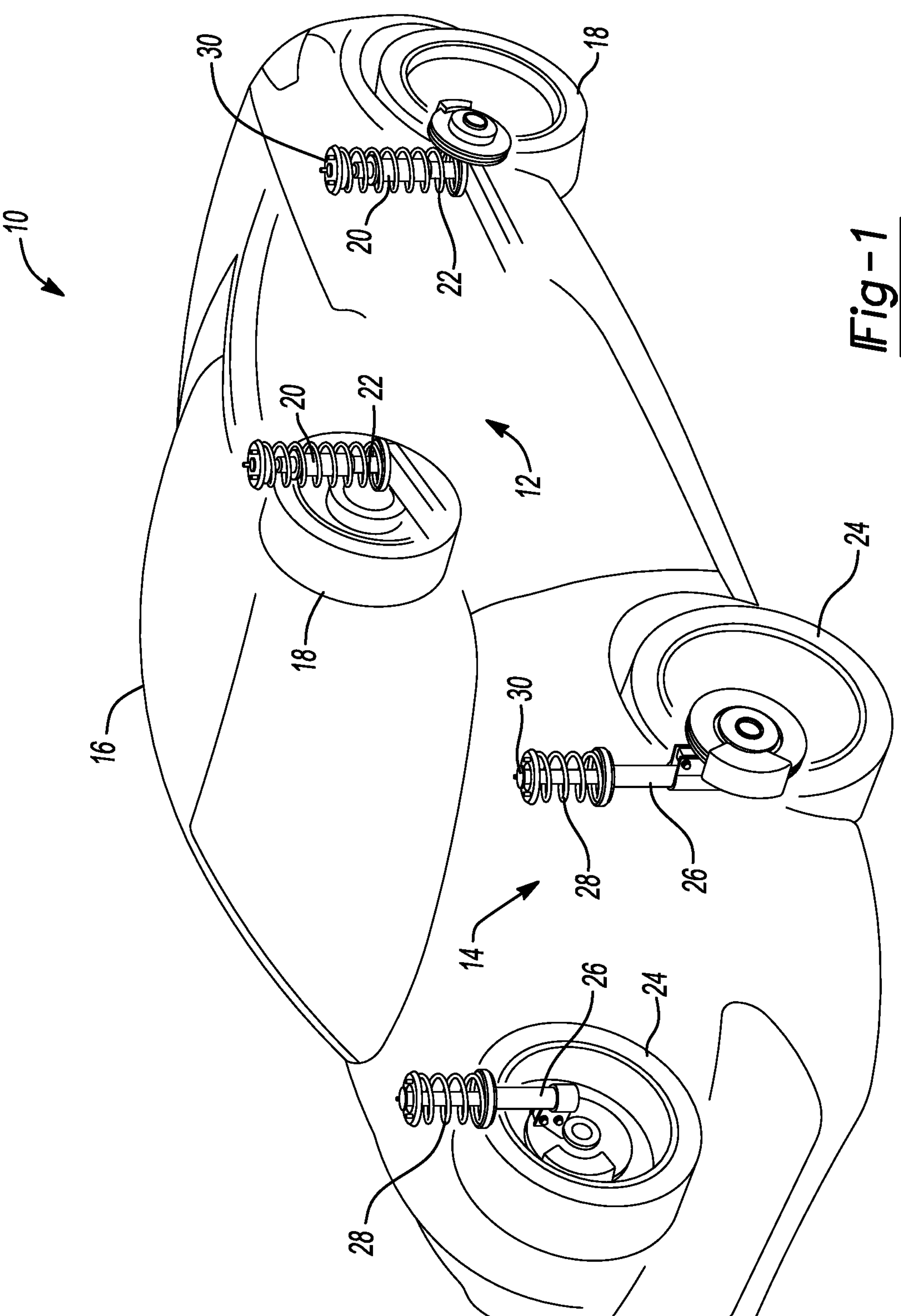



Fig-1

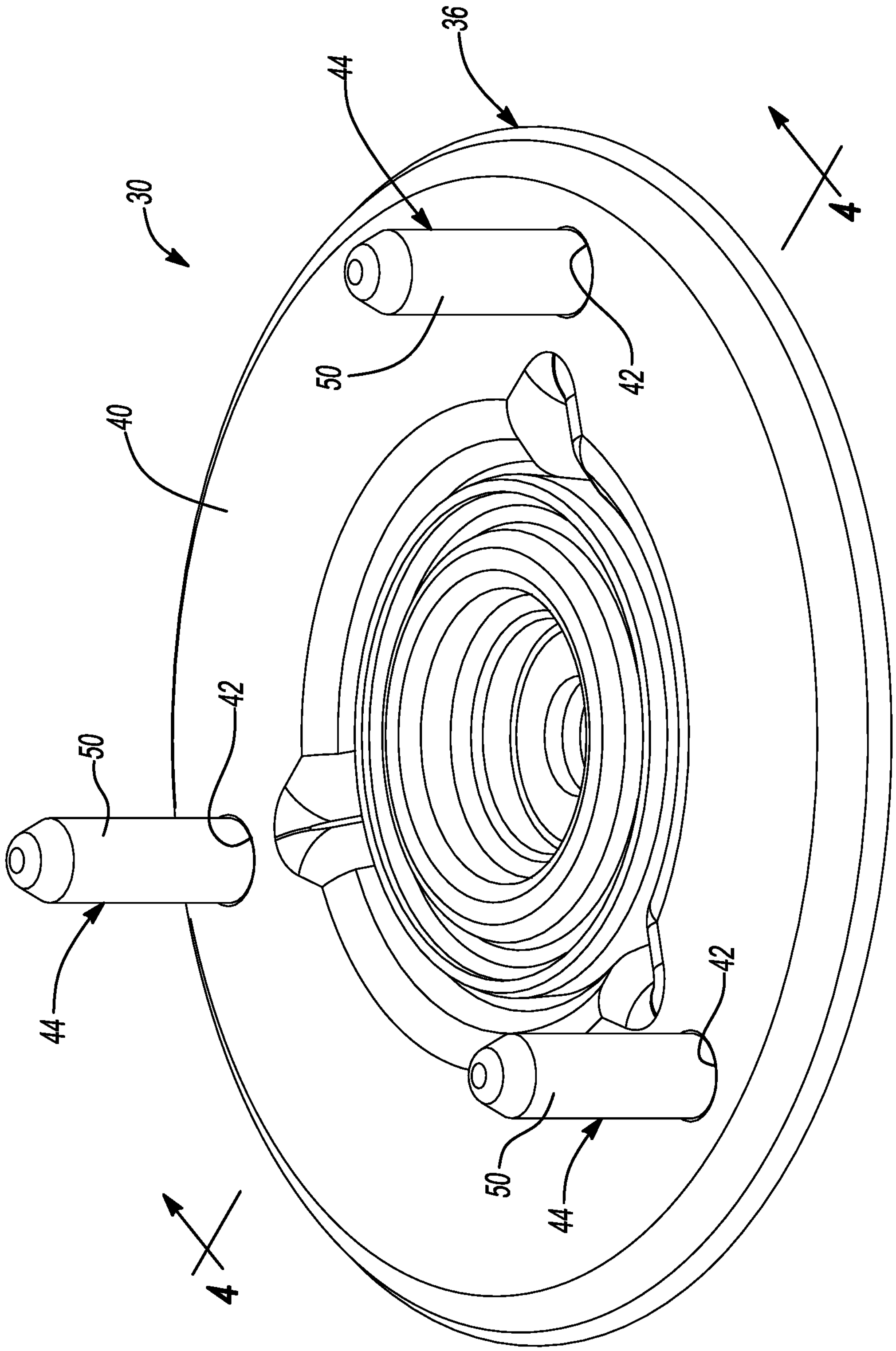
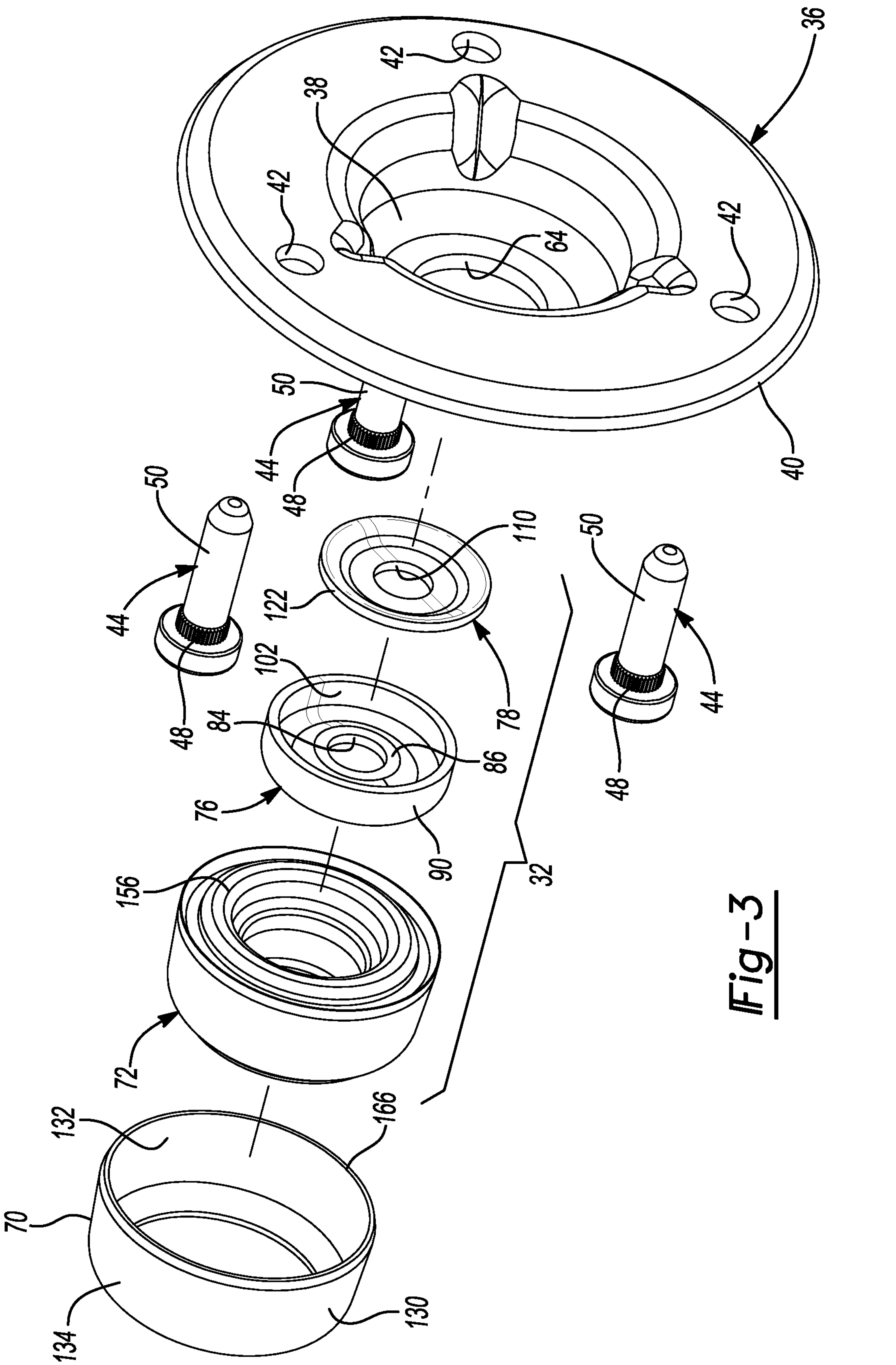



Fig-2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130

Fig-3

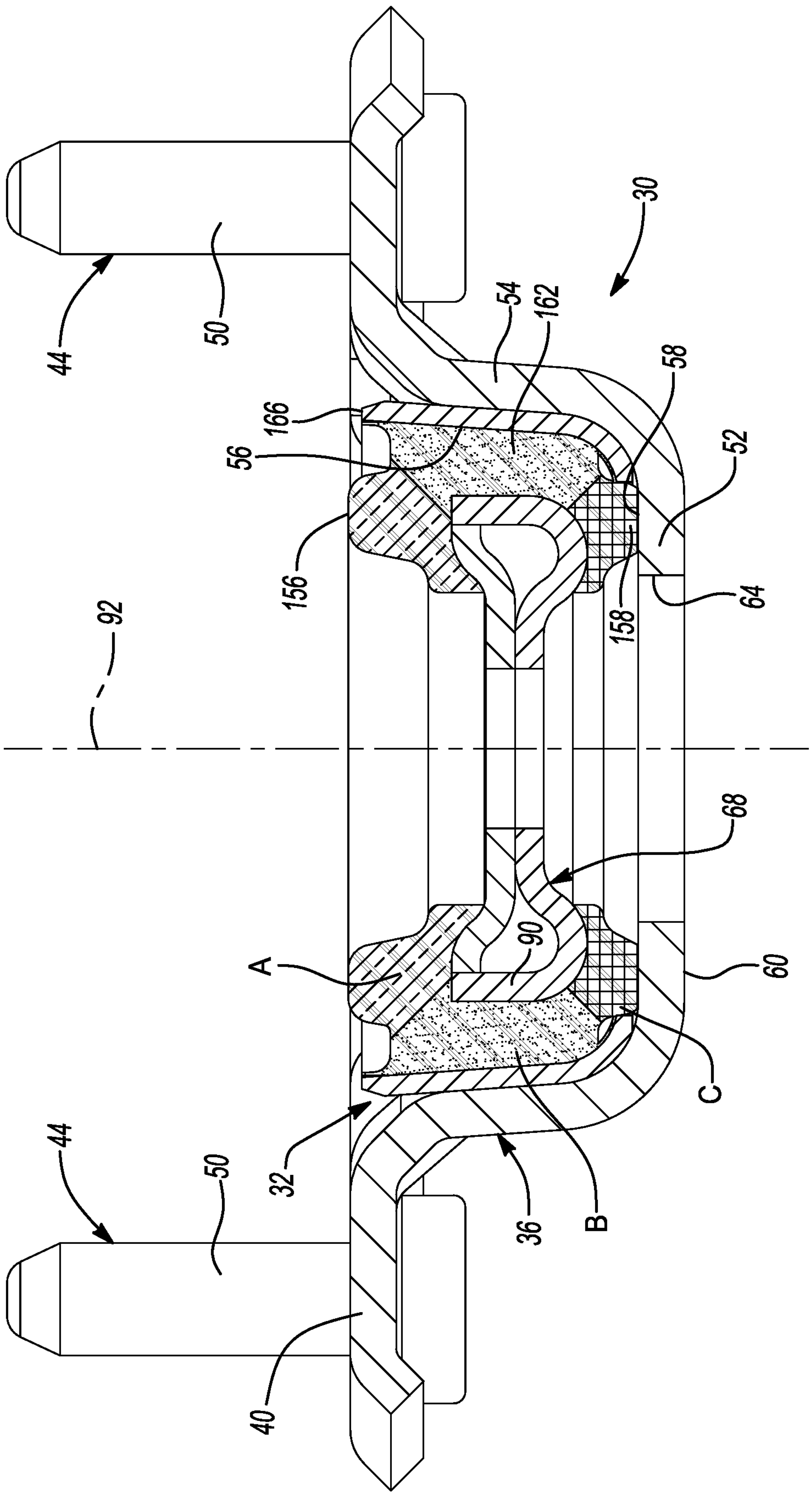


Fig-4

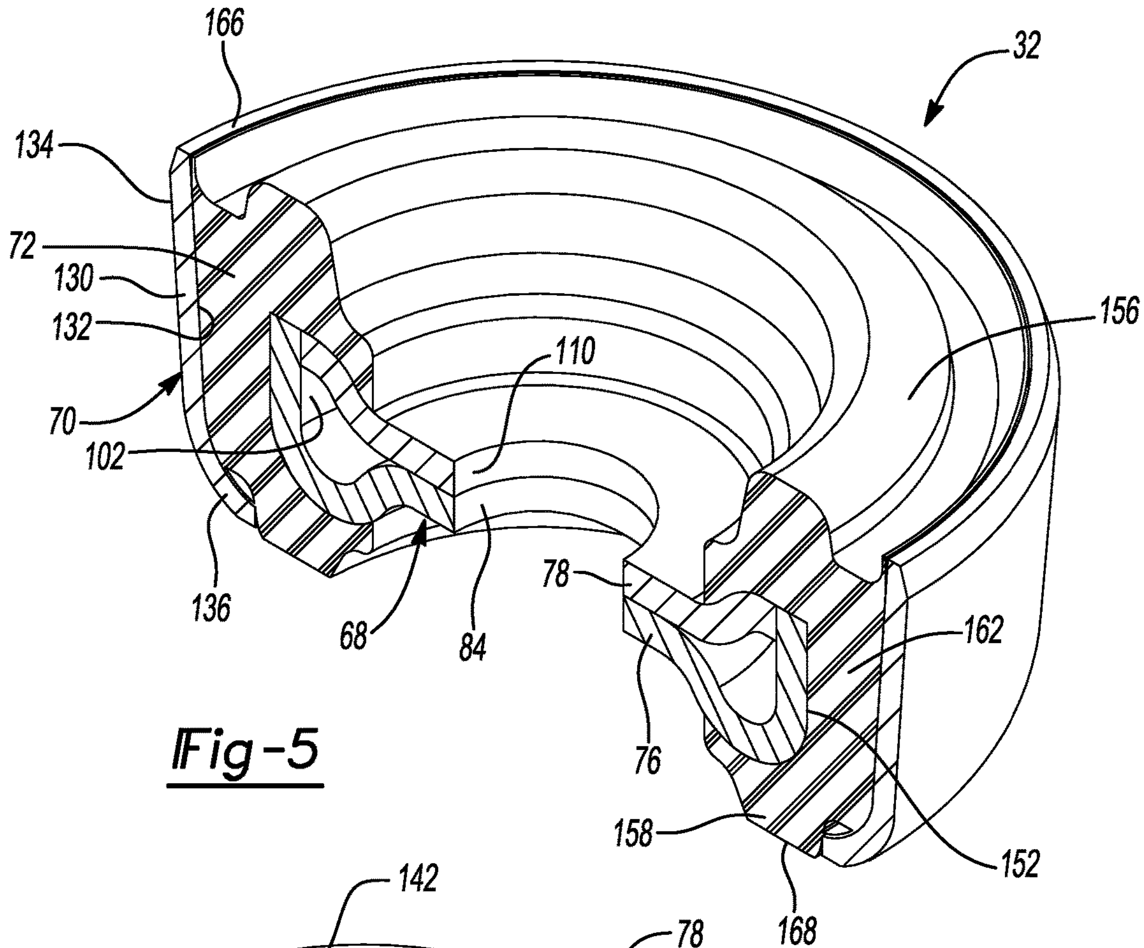
166
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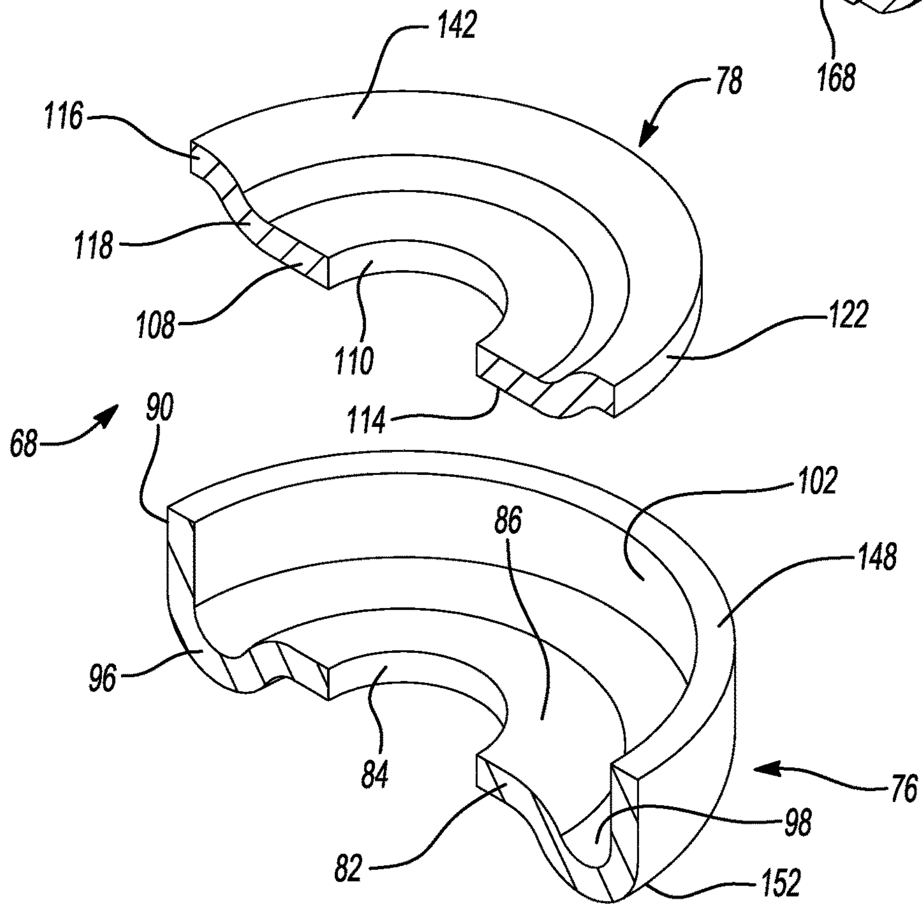
Fig-5


142
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152

Fig-6

# DAMPER TOP MOUNT

## FIELD

**[0001]** Top mount assemblies are used with dampers including shocks and struts within suspension systems of motor vehicles. A top mount assembly including a multi-piece inner component providing a light weight and cost-effective solution is discussed.

## BACKGROUND

**[0002]** The statements in this section merely provide background information related to the present disclosure and may not constitute prior art.

**[0003]** Known top mount assemblies typically include an outer metal cap fixed to a body of a vehicle. The mount assembly often includes a central inner component that is at least partially encapsulated with an elastomeric or plastic material. A piston rod of the damper is fixed to the inner component. The inner component and the elastomeric material are positioned within and at least partially covered by the cap. Encapsulation of the inner component may be costly and time consuming. A need exists for a lower cost solution.

## SUMMARY

**[0004]** A damper mount comprises an isolator coupled to a housing. The isolator comprises an inner core, an outer shell, and an elastomeric body positioned therebetween. The inner core includes a first plate coupled to a second plate. The first plate includes a circumferentially extending outer wall. The second plate includes a flange positioned in engagement with the outer wall. The outer shell includes a circumferentially extending wall circumscribing the inner core. The elastomeric body is bonded to the outer shell as well as the first plate and the second plate of the inner core. The circumferentially extending outer wall of the first plate and the circumferentially extending wall of the outer shell extend substantially parallel to one another with a portion of the elastomeric body positioned therebetween.

**[0005]** In another arrangement, a damper mount includes an isolator coupled to a housing. The isolator comprises an inner core including a first plate coupled to a second plate. The first plate includes a circumferentially extending outer wall. The second plate includes a flange including an annular outer surface. The annular outer surface is positioned in engagement with an inner surface of the outer wall. The damper mount includes an outer shell having a circumferentially extending wall circumscribing the inner core. An elastomeric body is bonded to the circumferentially extending wall of the outer shell and the first plate. The elastomeric body includes a central portion positioned between the circumferentially extending outer wall and the outer shell. The central portion is loaded in shear in response to a load attempting to move the inner core relative to the outer shell in an axial direction.

## BRIEF DESCRIPTION OF DRAWINGS

**[0006]** The drawings described herein are for illustration purposes only and are not intended to limit the scope of the present disclosure in any way.

**[0007]** FIG. **1** is an illustration of an automobile using top mount assemblies in accordance with the present disclosure;

**[0008]** FIG. **2** is a perspective view of an exemplary top mount in accordance with the present disclosure;

**[0009]** FIG. **3** is an exploded perspective view of the top mount depicted in FIG. **2**;

**[0010]** FIG. **4** is a cross-sectional side view taken along line **4-4** as shown in FIG. **2**;

**[0011]** FIG. **5** is a fragmentary perspective view of an isolator of the top mount depicted in FIG. **2**; and

**[0012]** FIG. **6** is a fragmentary exploded perspective view of an inner core of the isolator shown in FIG. **5**.

## DESCRIPTION

**[0013]** The following description is merely exemplary in nature and is not intended to limit the present disclosure, application, or uses. It should be understood that throughout the drawings, corresponding reference numerals indicate like or corresponding parts and features.

**[0014]** FIG. **1** depicts an exemplary vehicle **10** incorporating a suspension system including top mount assemblies in accordance with the teachings of present disclosure. A top mount assembly may more generally be identified as a suspension mount. Vehicle **10** includes a rear suspension **12**, a front suspension **14** and a body **16**. Rear suspension **12** is adapted to operatively support the vehicle's rear wheels **18**. Rear suspension **12** is operatively connected to body **16** by means of a pair of dampers **20** and a pair of helical coil springs **22**. Front suspension **14** operatively supports the vehicle's front wheels **24**. Front suspension **14** is operatively connected to body **16** by means of a second pair of dampers **26** and by a pair of helical coil springs **28**. Dampers **20** and **26** serve to dampen the relative motion of the unsprung portion (i.e. front and rear suspensions **12** and **14**, respectively) and the sprung portion (i.e. body **16**) of vehicle **10**. The term "damper" as used herein is intended to include at least shocks and struts. The spring and shock arrangements relating to dampers **20** and springs **22** may be separate spaced apart components or coil-over arrangements in an independent rear suspension, as shown.

**[0015]** Referring now to FIGS. **2-6**, a suspension mount or top mount assembly **30** for a damper is depicted in accordance with an embodiment of the present disclosure. Top mount assembly **30** generally includes an elastomeric isolator **32** disposed within a housing **36**. Housing **36** is typically constructed as a steel stamping. Alternatively, housing **36** may be formed from cast aluminum. Housing **36** includes a cup portion **38** integrally formed with a flange portion **40**. Flange portion **40** radially outwardly extends from cup portion **38** and includes a plurality of apertures **42** extending therethrough. Fasteners **44** extend through apertures **42** and may be fixed to housing **36** via splines **48**. Shanks **50** of fasteners **44** may be threaded for engagement with nuts, not shown, when coupling top mount assembly **30** to vehicle **10**.

**[0016]** Cup portion **38** includes an end wall **52** and a circumferentially extending side wall **54** integrally formed together as one piece. Side wall **54** includes an inner surface **56**. End wall **52** includes an inner surface **58** and an opposite outer surface **60**. An aperture **64** extends through end wall **52** for receipt of a portion of the damper such as a piston rod (not shown).

**[0017]** Elastomeric isolator **32** includes an inner core **68**, an outer shell **70**, and an elastomeric body **72** positioned therebetween. Inner core **68** is an assembly of a first plate **76** and a second plate **78**. Each of first plate **76** and second plate **78** are constructed from low-cost steel stampings that may be readily manufactured in high volume from steel sheets.

First plate **76** includes a central portion **82** having a substantially flat disk shape with a central aperture **84** extending therethrough. Central portion **82** includes a substantially planar surface **86**. First plate **76** also includes a substantially cylindrically shaped outer wall **90**. Both central aperture **84** and outer wall **90** share a common axis of alignment with a longitudinal axis **92** of top mount assembly **30**. A circumferentially extending curved wall portion **96** connects central portion **82** with outer wall **90**. The shape of curved wall portion **96** defines a recess **98** of first plate **76**. Outer wall **90** includes a circumferentially extending inner surface **102**.

**[0018]** Second plate **78** includes a substantially disk-shaped central portion **108** including a central aperture **110** extending therethrough. Central portion **108** includes a substantially planar surface **114**. Second plate **78** also includes a radially outwardly extending flange portion **116** fixed to central portion **108** by a circumferentially extending curved wall portion **118**. Flange portion **116** includes an annular outer surface **122**.

**[0019]** Annular outer surface **122** defines an outer diameter slightly greater than an inner diameter defined by circumferentially extending inner surface **102**. To assemble inner core **68**, first plate **76** and second plate **78** are moved toward one another to engage annular surface **122** with inner circumferentially extending inner surface **102** in a press-fit arrangement. First plate **76** and second plate **78** are moved toward one another until planar surface **86** and planar surface **114** are in contact with one another. Central portion **82** is positioned adjacent to central portion **108** after assembly. Central aperture **84** is coaxially aligned with central aperture **110**. In the embodiment depicted in the figures, both first plate **76** and second plate **78** have the same cross-sectional thickness. This configuration is merely exemplary and provides a nonlimiting example. First plate **76** and second plate **78** may be constructed from sheets of similar material or dissimilar materials without departing from the scope of the present disclosure.

**[0020]** Outer shell **70** includes a circumferentially extending wall **130** including an inner surface **132** and an outer surface **134**. Outer shell **70** includes a curled end **136** radially inwardly extending from wall **130**. Outer wall **90** extends substantially parallel to axis **92**. In similar fashion, circumferentially extending wall **130** of outer shell **70** also extends substantially parallel to longitudinal axis **92**.

**[0021]** Once inner core **68** has been assembled as previously discussed, both inner core **68** and outer shell **70** are positioned within an injection mold. Molten elastomer is injected within the mold such that elastomeric body **72** bonds to inner surface **102** as well as an inner surface of curved wall portion **96**. Elastomeric body **72** is also overmolded on an adhesion surface **142** of second plate **78**, an end face **148** of outer wall **90** and an adhesion surface **152** of first plate **76**. On the opposite side, elastomeric body **72** is molded to inner surface **132** of outer shell **70**.

**[0022]** Elastomeric body **72** includes a first snubber **156**, a second snubber **158** and a hollow cylindrically shaped central portion **162** positioned therebetween.

**[0023]** An axial length of outer wall **90** extends a magnitude sufficient to trap central portion **162** of elastomeric body **72** between outer wall **90** and circumferentially extending wall **130**. Relative movement between inner core **68** and outer shell **70** is restricted based on the mechanical properties of elastomeric body **72** as will described in further detail. It should be appreciated that the axial length of outer wall **90** is preferably 50-90% the axial extent of circumferentially extending wall **130**. This geometric association places a desirable predetermined amount of central portion **162** in shear loading when inner core **68** and outer shell **70** are urged to move axially relative to one another.

**[0024]** First snubber **156** is shaped as annular ring axially extending from central portion **162**. At least a portion of first snubber **156** axially extends beyond an end face **166** of outer shell **70**. Based on this geometry, first snubber **156** is compressed against a portion of vehicle **10** (not shown) when housing **36** is fixed to vehicle **10**.

**[0025]** Second snubber **158** is initially molded to include an annular land **168**. Prior to positioning elastomeric isolator **32** within housing **36**. Annual land **168** axially extends beyond the axial extent of outer shell **70**. As best shown in FIG. **4**, second snubber **158** is placed in compression as annular surface **168** engages inner surface **58** of end wall **52**. Outer shell **70** is positioned in a press fit assembly condition with housing **36** in such a manner to place second snubber **158** in compression. Similarly, first snubber **156** is placed in compression when top mount assembly **30** is fixed to the vehicle.

**[0026]** Once installed on the vehicle, elastomeric body **72** includes three zones of loading as shown in FIG. **4**. First snubber **156** is associated with a first loading zone A that is placed in compression once top mount assembly **30** is fixed to vehicle **10**. First loading zone A is also placed in compression when axial loading occurs generally along longitudinal axis **92**. Central portion **162** also includes a generally trapezoid shaped cross-section identified as zone B. A majority of the material within zone B is positioned between outer wall **90** of inner core **68** and wall **130** of outer shell **70**. Based on elastomeric body **72** being bonded to inner surface **132** and adhesion surface **152**, central portion **162** of elastomeric body **70** is placed in shear when inner core **68** is loaded relative to housing **36** in the longitudinal direction along longitudinal axis **92**. Second snubber **158** is associated with the third loading zone C. Zone C is substantially trapezoidally-shaped and placed in compression when elastomeric isolator **32** is pressed into housing **36**. Zone C may also be loaded in compression during vehicle operation when axial loads are applied attempting to move inner core **68** relative to outer shell **70** and housing **36**. During transverse or radial loading relative to longitudinal axis **92**, the load conditions in the three zones previously described are reversed. Namely, a radial load places zone A and zone C in shear while zone B is placed in compression.

**[0027]** While various embodiments have been described, those skilled in the art will recognize modifications or variations which might be made without departing from the present disclosure. The examples illustrate the various embodiments and are not intended to limit the present disclosure. Therefore, the description and claims should be interpreted liberally with only such limitation as is necessary in view of the pertinent prior art.

What is claimed is:

**1**. A damper mount, comprising:

a housing; and

an isolator coupled to the housing, the isolator comprising:

an inner core including a first plate coupled to a second plate, the first plate including a circumferentially extending outer wall, the second plate including a flange positioned in engagement with the outer wall, an outer shell including a circumferentially extending wall, the inner core being circumscribed by the wall of the outer shell, and

an elastomeric body bonded to the outer shell as well as the first plate and the second plate of the inner core, wherein the circumferentially extending outer wall of the first plate and the circumferentially extending wall of the outer shell extend substantially parallel to one another with a portion of the elastomeric body positioned therebetween.

**2**. The damper mount of claim **1**, wherein the first plate includes a central portion and the second plate includes a central portion positioned adjacent to and in contact with the central portion of the first plate.

**3**. The damper mount of claim **1**, wherein the first plate is coupled to the second plate in a press fit.

**4**. The damper mount of claim **1**, wherein the outer shell includes a curled end and the inner core includes a curved surface, wherein a portion of the elastomeric body is trapped between the curled end and the curved surface to restrict relative axial movement between the inner core and the outer shell.

**5**. The damper mount of claim **1**, wherein the elastomeric body includes a first snubber axially extending beyond a first end of the outer sleeve and a diametrically opposed second snubber axially extending beyond a second opposite end of the outer shell when in an unloaded condition.

**6**. The damper mount of claim **5**, wherein the second snubber is compressed between the inner core and the housing when the isolator is assembled to the housing.

**7**. The damper mount of claim **1**, wherein the inner core includes a central aperture extending therethrough.

**8**. The damper mount of claim **1**, wherein the elastomeric body includes a first zone loaded in compression, a second zone loaded in shear and a third zone loaded in compression when viewed in cross-section.

**9**. The damper mount of claim **1**, wherein the first plate and the second plate include shaped flat steel sheets.

**10**. The damper mount of claim **1**, wherein the housing includes a cup portion and a radially outwardly extending flange portion, the cup portion being in receipt of the outer shell.

**11**. The damper mount of claim **10**, wherein the outer shell is press fit to the housing.

**12**. The damper mount of claim **10**, wherein the flange portion includes an aperture in receipt of a fastener extending therethrough.

**13**. The damper mount of claim **1**, wherein the circumferentially extending outer wall of the first plate includes an axial length 50-90% of an axial length of the circumferentially extending wall of the outer shell.

**14**. A damper mount, comprising:

a housing; and

an isolator coupled to the housing, the isolator comprising:

an inner core including a first plate coupled to a second plate, the first plate including a circumferentially extending outer wall, the second plate including a flange including an annular outer surface, the annular outer surface being positioned in engagement with an inner surface of the outer wall,

an outer shell including a circumferentially extending wall circumscribing the inner core, and

an elastomeric body bonded to the circumferentially extending wall of the outer shell and the first plate, the elastomeric body including a central portion positioned between the circumferentially extending outer wall and the outer shell wall being loaded in shear in response to a load attempting to move the inner core relative to the outer shell in an axial direction.

**15**. The damper mount of claim **14**, wherein the elastomeric body includes a first snubber axially extending beyond a first end of the outer sleeve and a diametrically opposed second snubber axially extending beyond a second opposite end of the outer shell when in an unloaded condition.

**16**. The damper mount of claim **15**, wherein the second snubber is compressed between the inner core and the housing when the isolator is assembled to the housing.

**17**. The damper mount of claim **14**, wherein the first plate includes a central portion and the second plate includes a central portion positioned adjacent to and in contact with the central portion of the first plate.

**18**. The damper mount of claim **14**, wherein the outer shell includes a curled end and the inner core includes a curved surface, wherein a portion of the elastomeric body is trapped between the curled end and the curved surface to restrict relative axial movement between the inner core and the outer shell.

**19**. The damper mount of claim **14**, wherein the housing includes a cup portion and a radially outwardly extending flange portion, the cup portion being in receipt of the outer shell.

**20**. The damper mount of claim **19**, wherein the outer shell is press fit to the housing.

* * * * *