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(54) **HYBRID TRANSMISSION COOLANT FLOW MANAGEMENT SYSTEM**

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*B60W 10/08* (2006.01)
*B60W 20/40* (2016.01)

(52) **U.S. Cl.**

CPC ..... ***F16H 57/0423*** (2013.01); ***F16H 57/0424*** (2013.01); ***F16H 57/0453*** (2013.01); ***F16H 57/0457*** (2013.01); ***F16H 57/0472*** (2013.01); *B60W 10/08* (2013.01); *B60W 20/40* (2013.01)

(58) **Field of Classification Search**

CPC .... B60K 2001/006; B60K 6/405; H02K 9/19; F16H 57/0423; F16H 57/0424; F16H 57/0453; F16H 57/0457; F16H 57/0409

See application file for complete search history.

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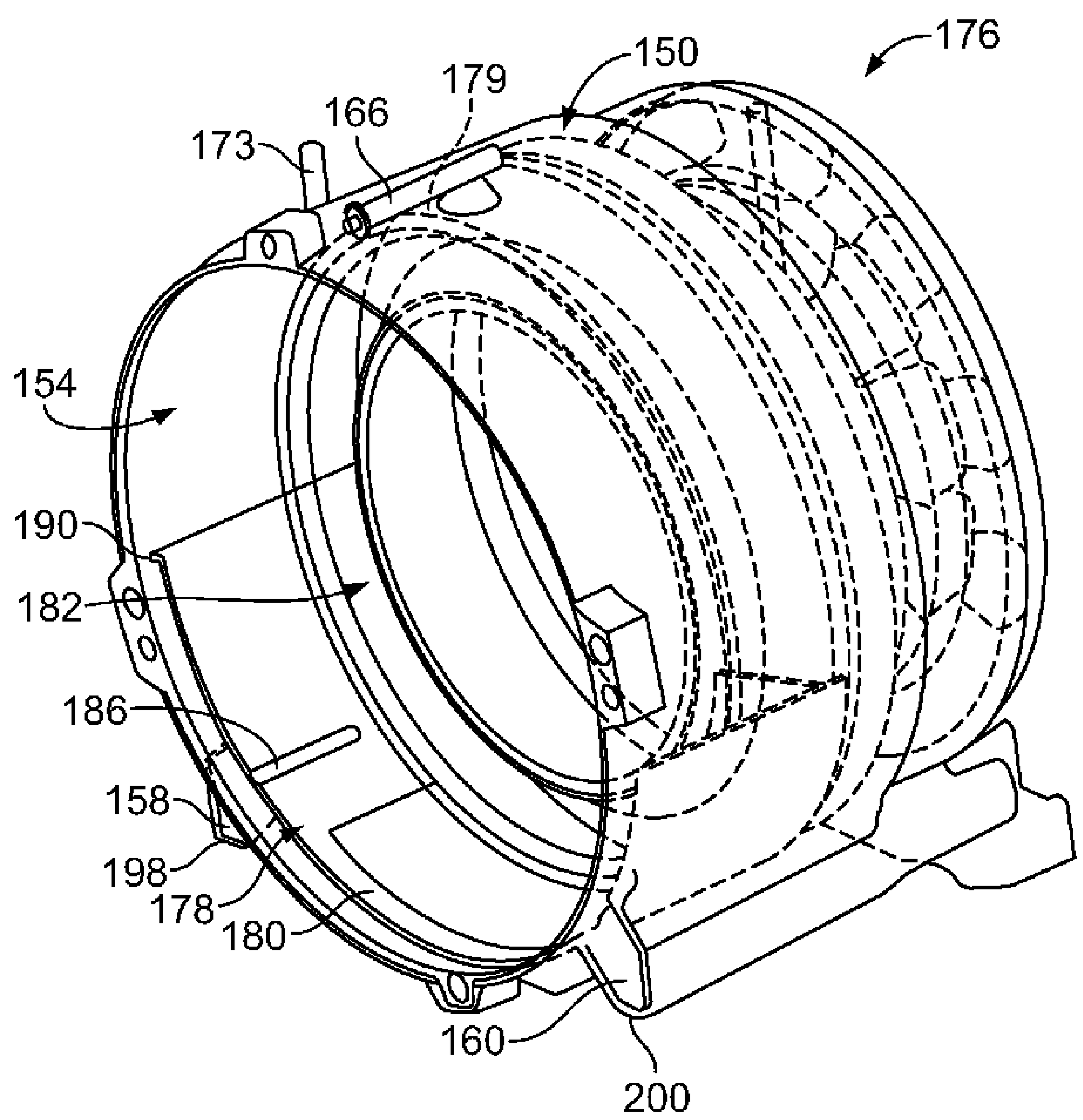
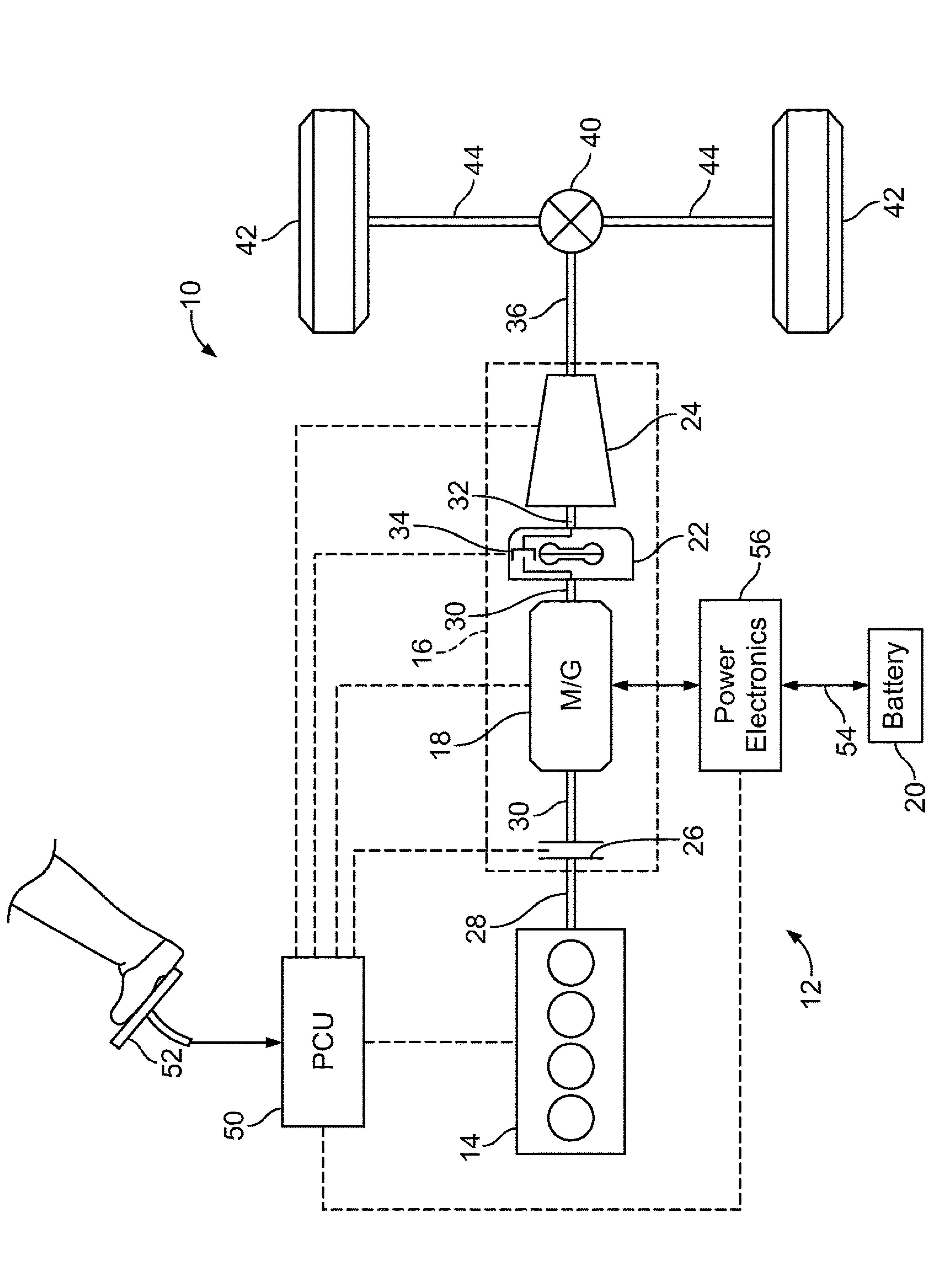
(57) **ABSTRACT**

A transmission assembly including a housing, an electric motor, and a baffle is provided. The housing may include first and second drainage channels. The electric motor may be disposed within the housing adjacent the drainage channels and a torque converter. The baffle may be disposed within the housing upon a housing inner surface, and may define an opening to the first and second drainage channels. The baffle may include a baffle flange sized for positioning adjacent the torque converter to minimize contact of oil within the housing to the torque converter. The housing may define first and second partition walls each partially extending over one of the first and second drainage channels. The baffle may further include first and second seal features each disposed at one of two baffle ends.

**20 Claims, 6 Drawing Sheets**

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M/G
Power Electronics
Battery
PCU

FIG. 1

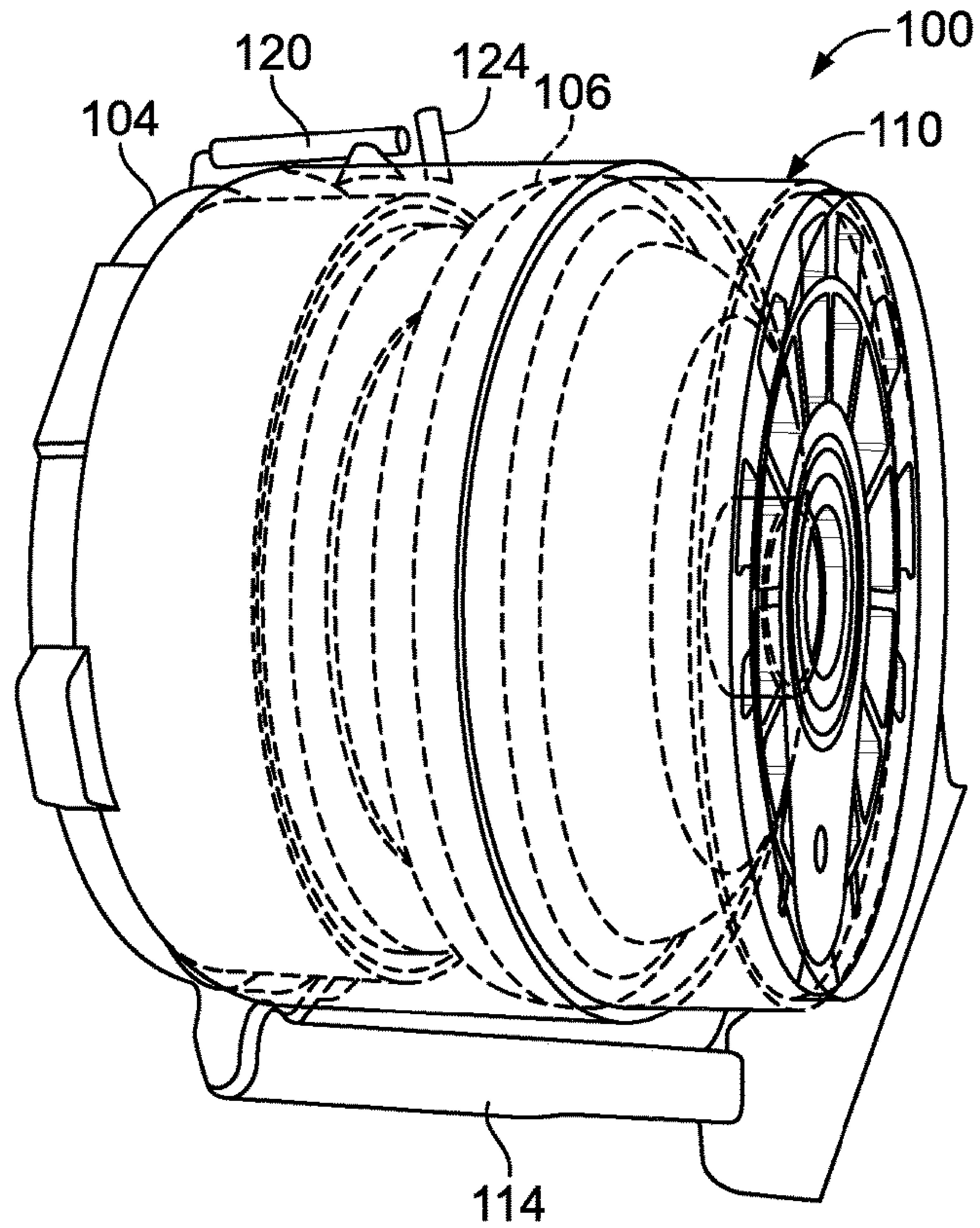



FIG. 2
Prior Art

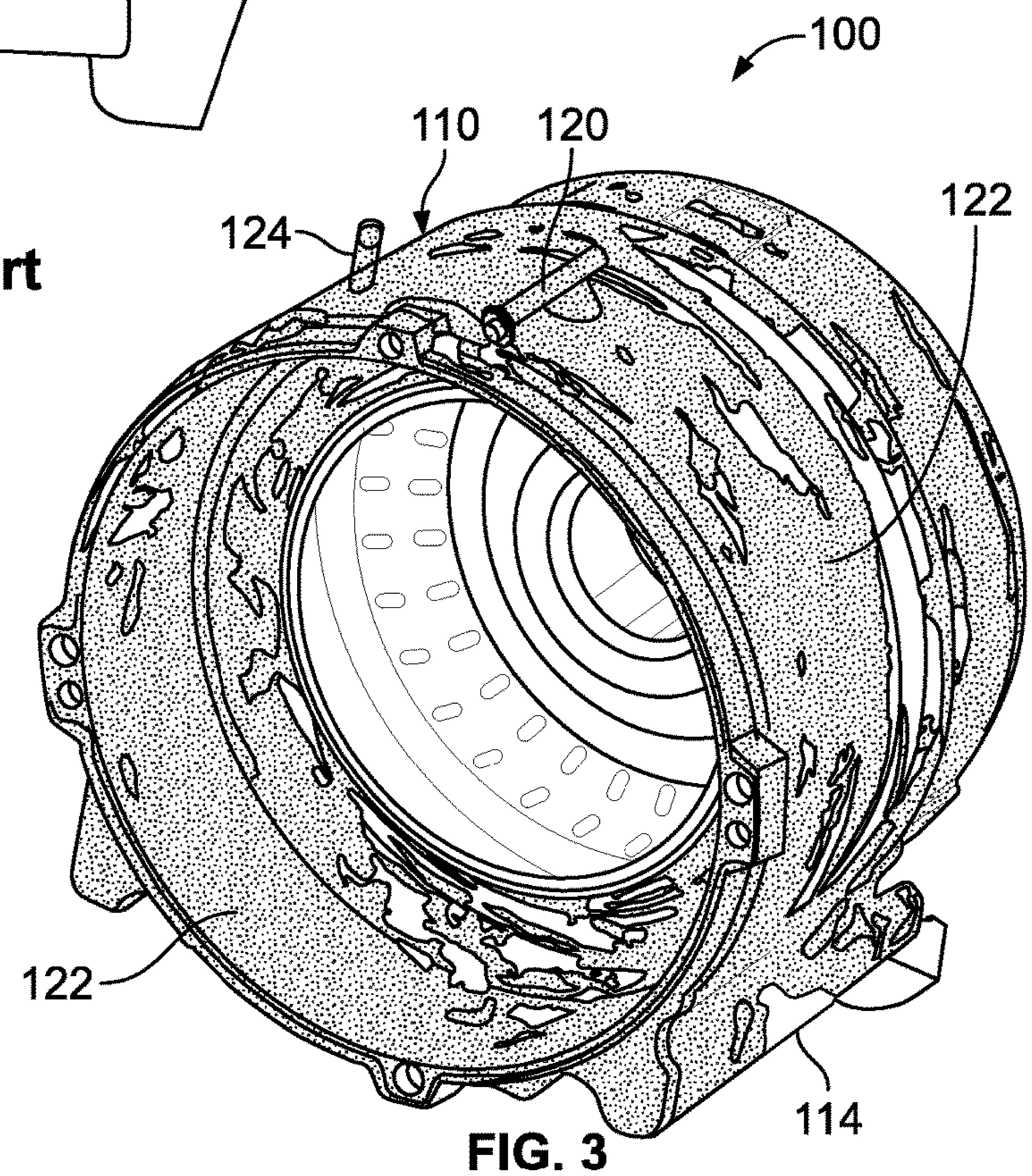
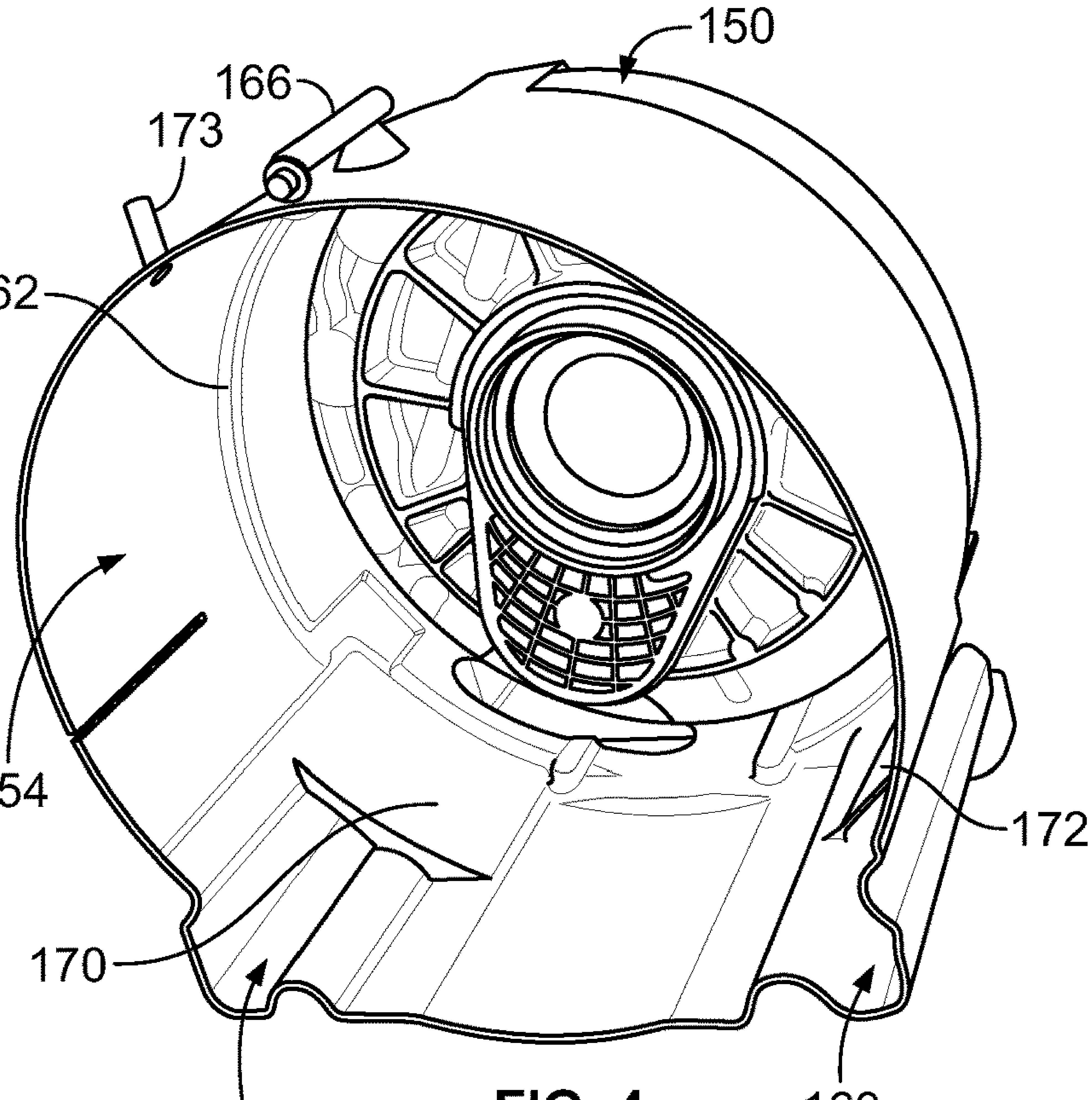



FIG. 3
Prior Art


150
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173
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FIG. 4

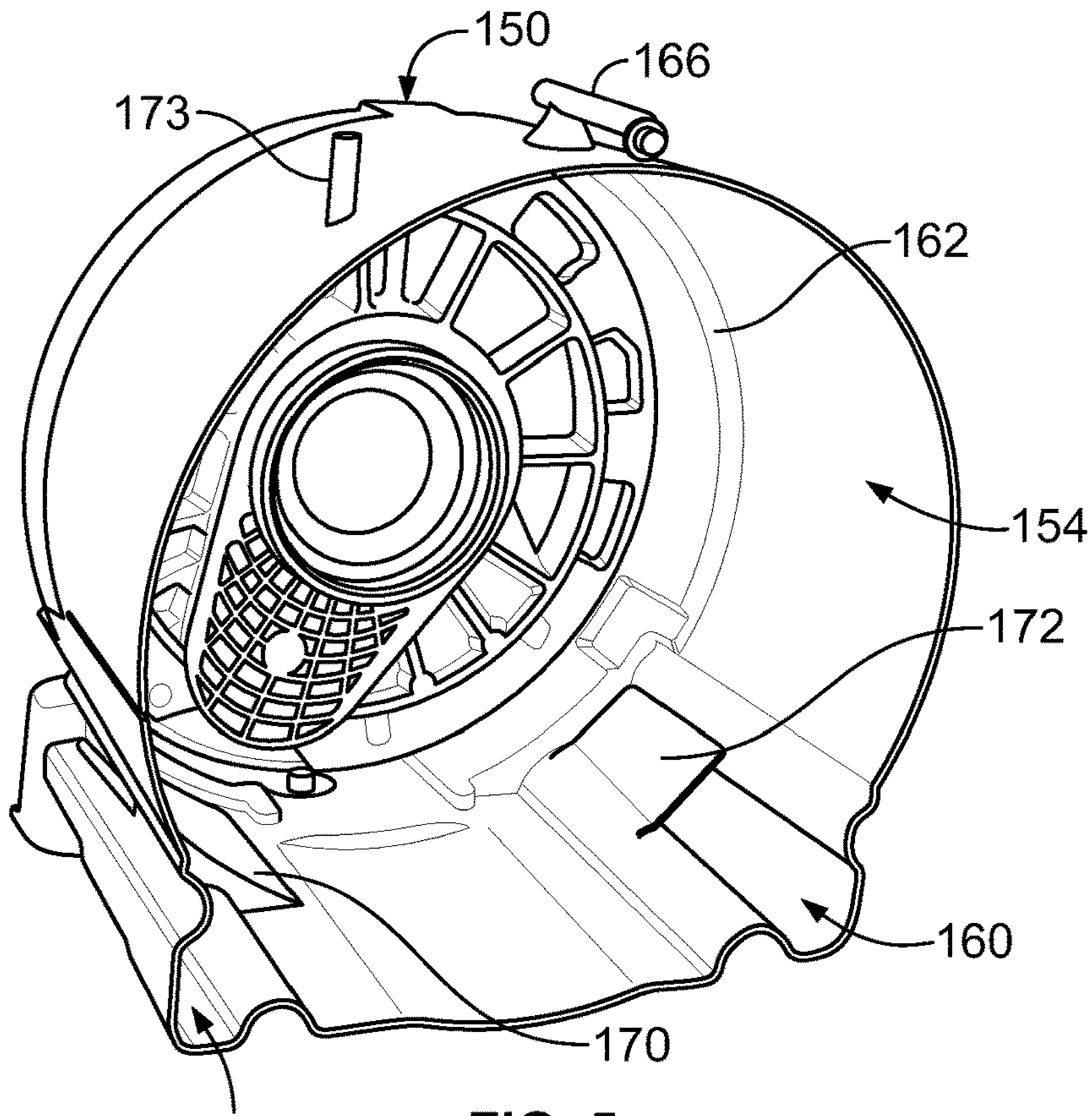
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FIG. 5

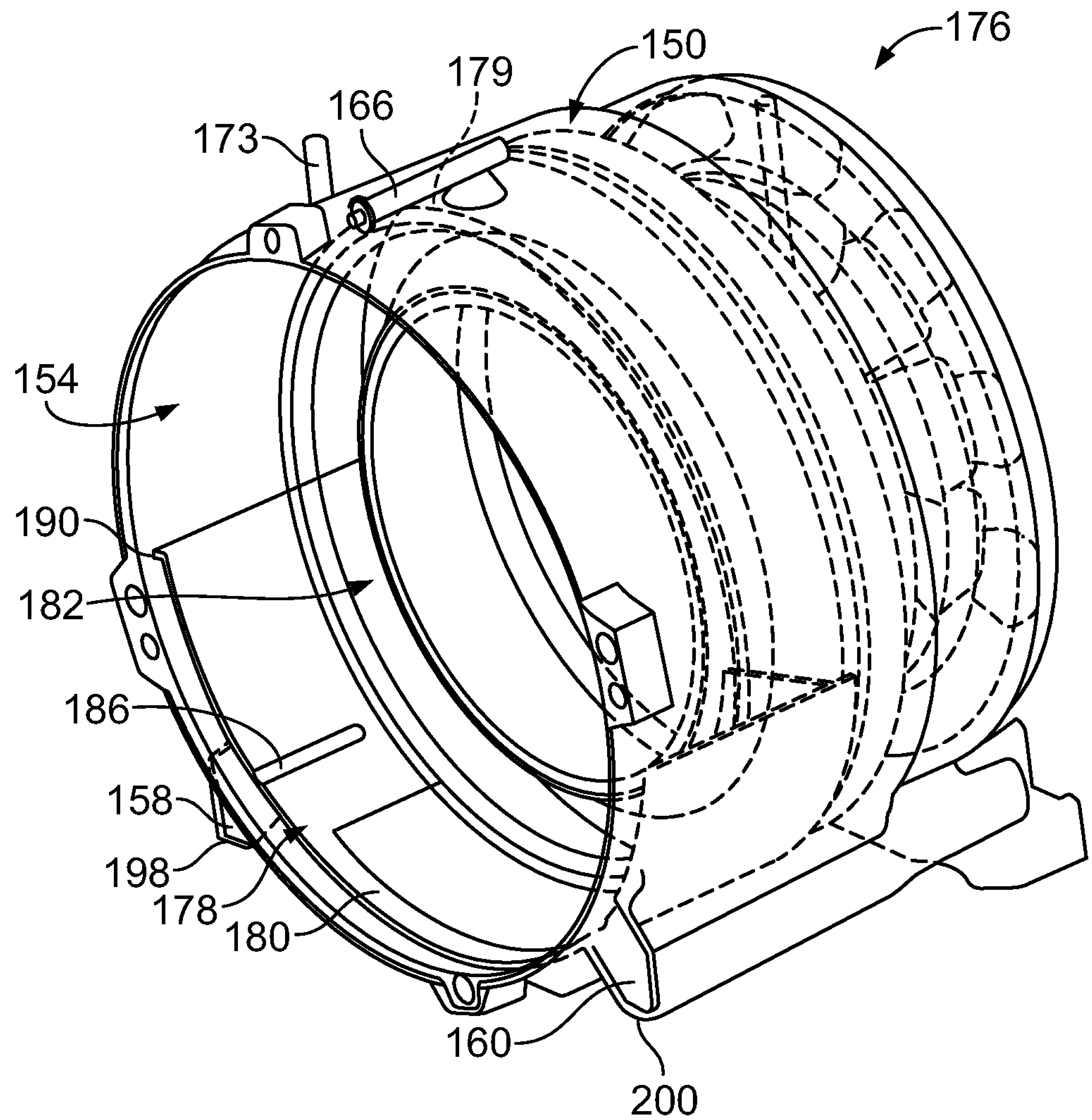
176
150
179
166
173
154
190
182
186
158
198
178
180
160
200

FIG. 6

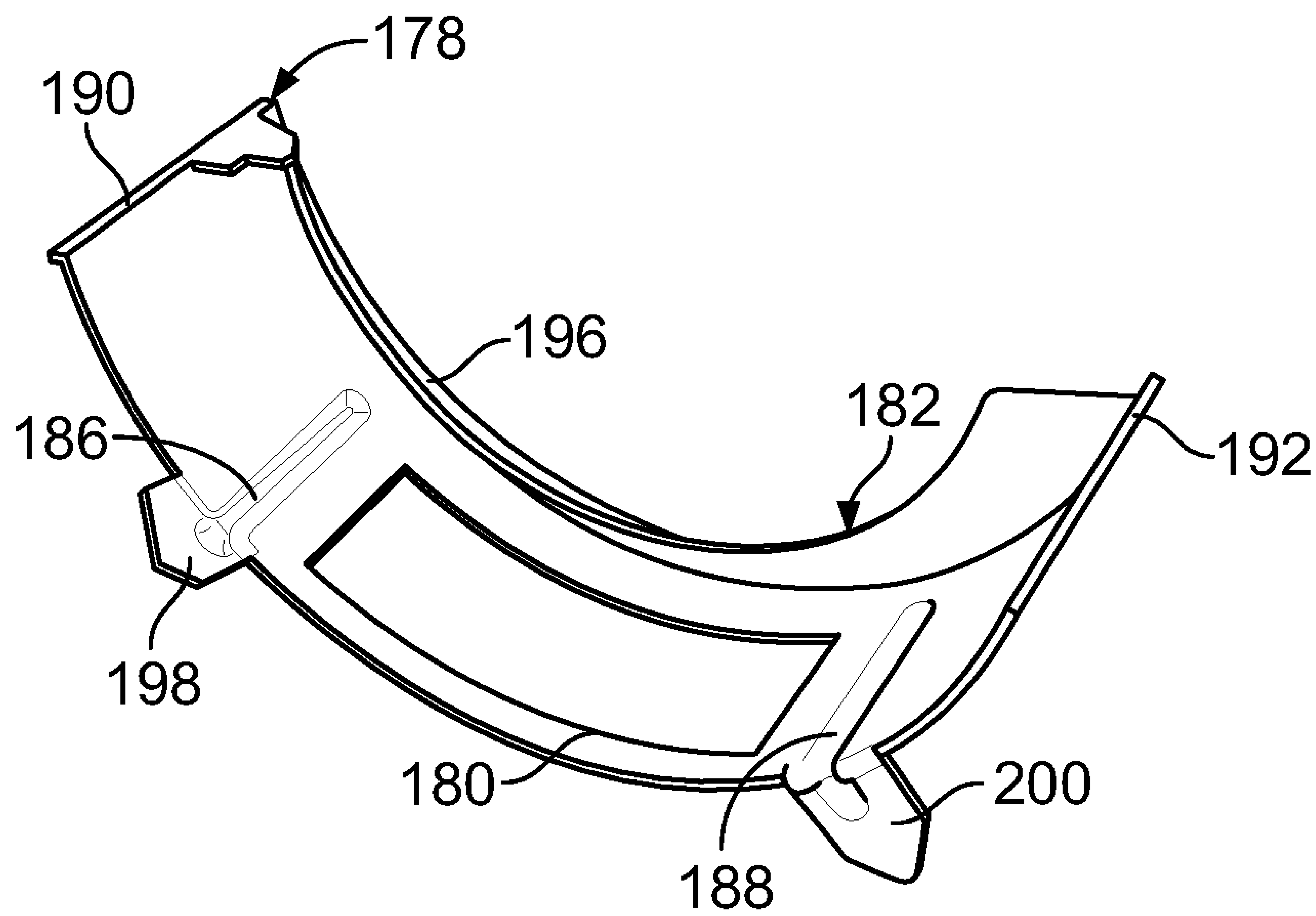
178
190
196
182
192
186
198
180
188
200

FIG. 7

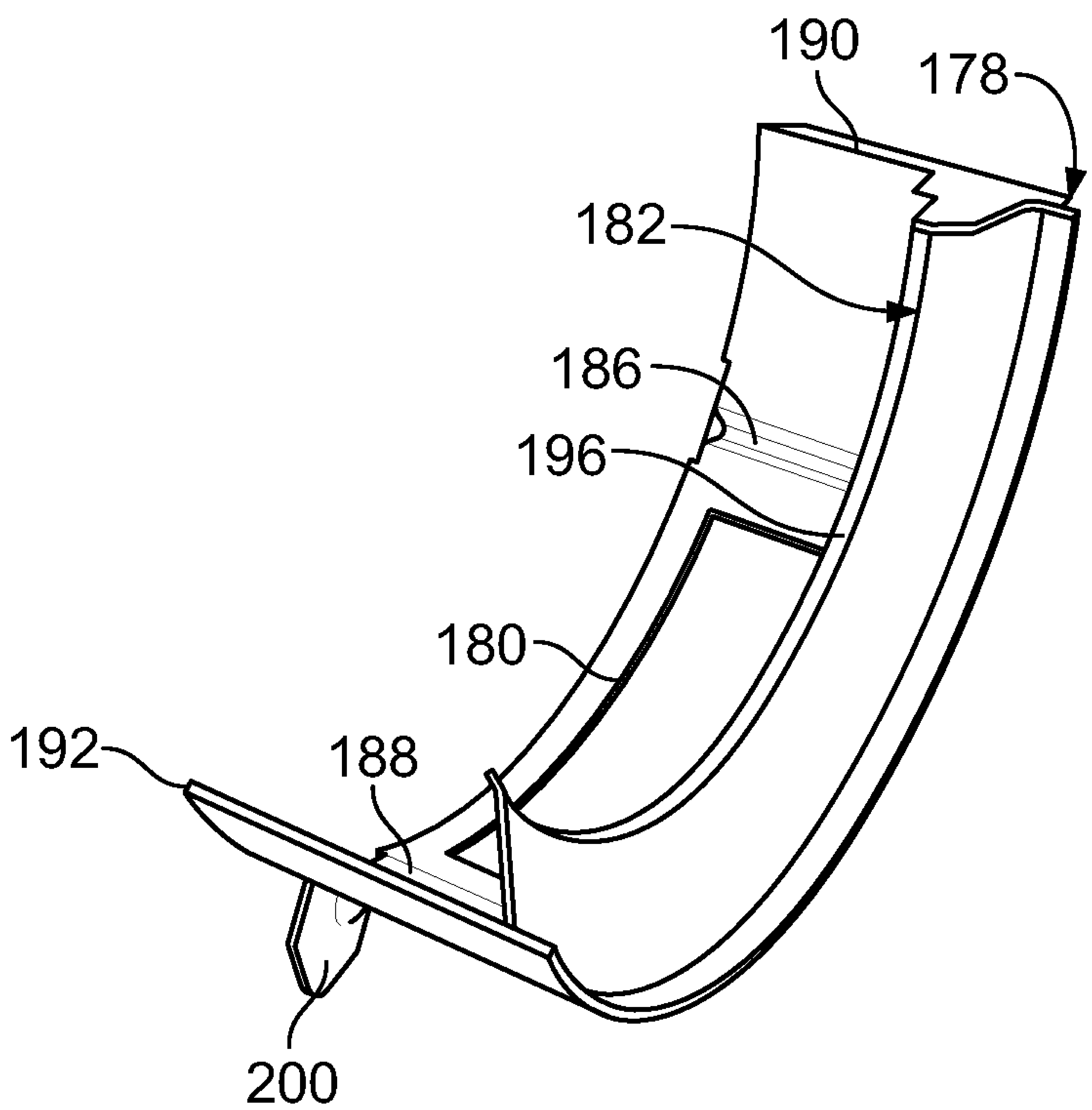
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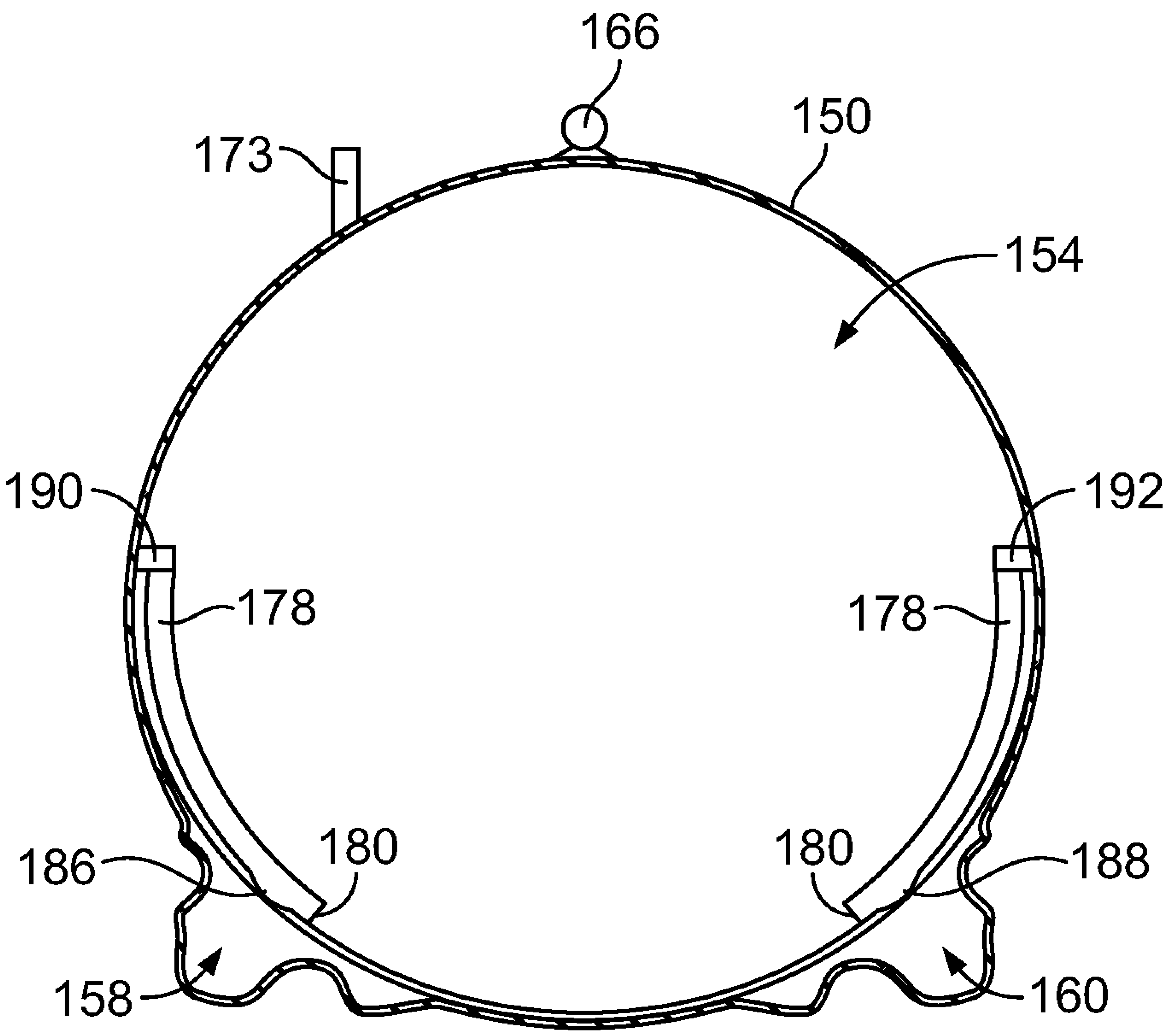
FIG. 8


166
173
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186
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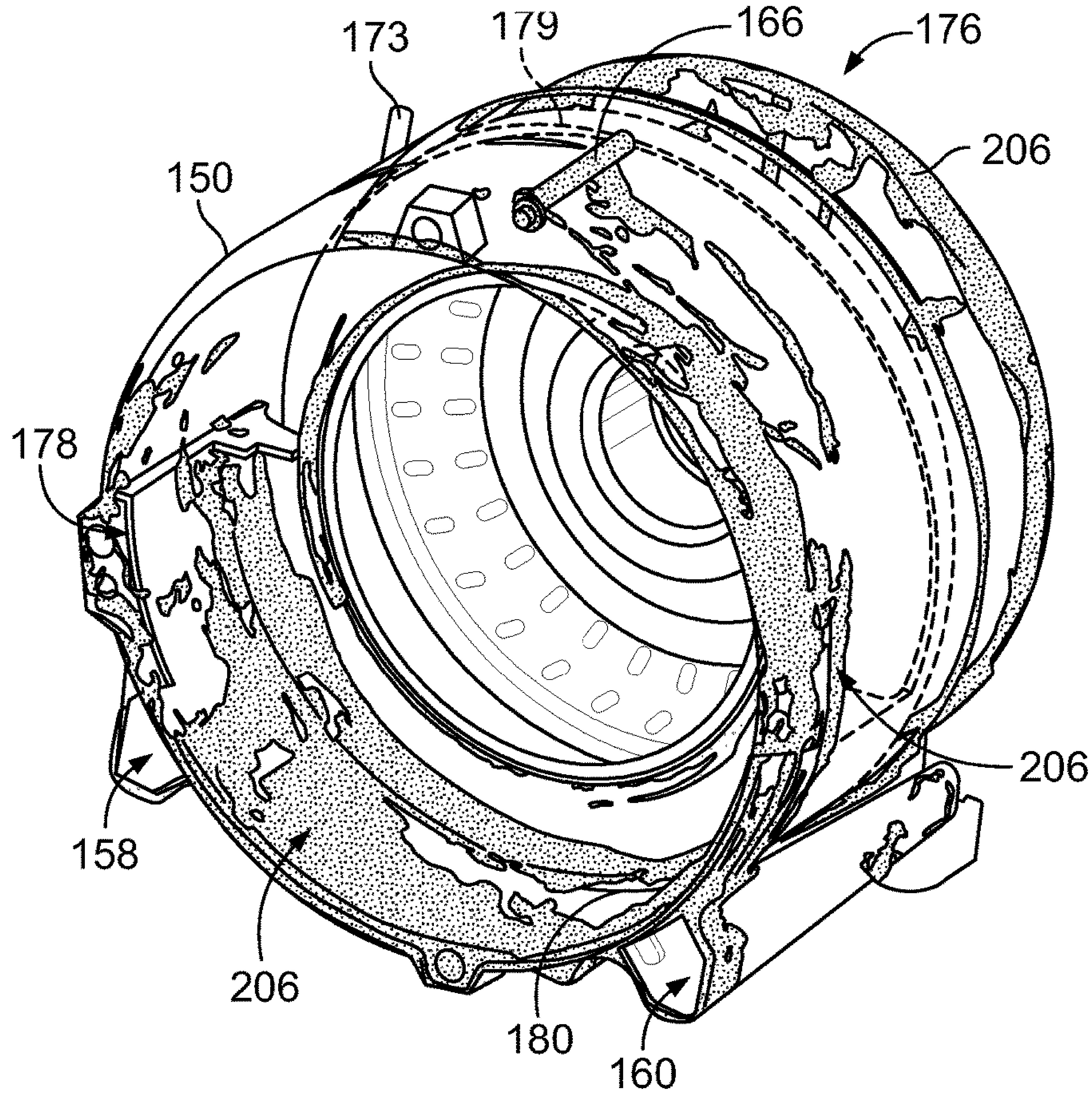
188
158
160

FIG. 9


173
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176
206
150
178
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180
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FIG. 10

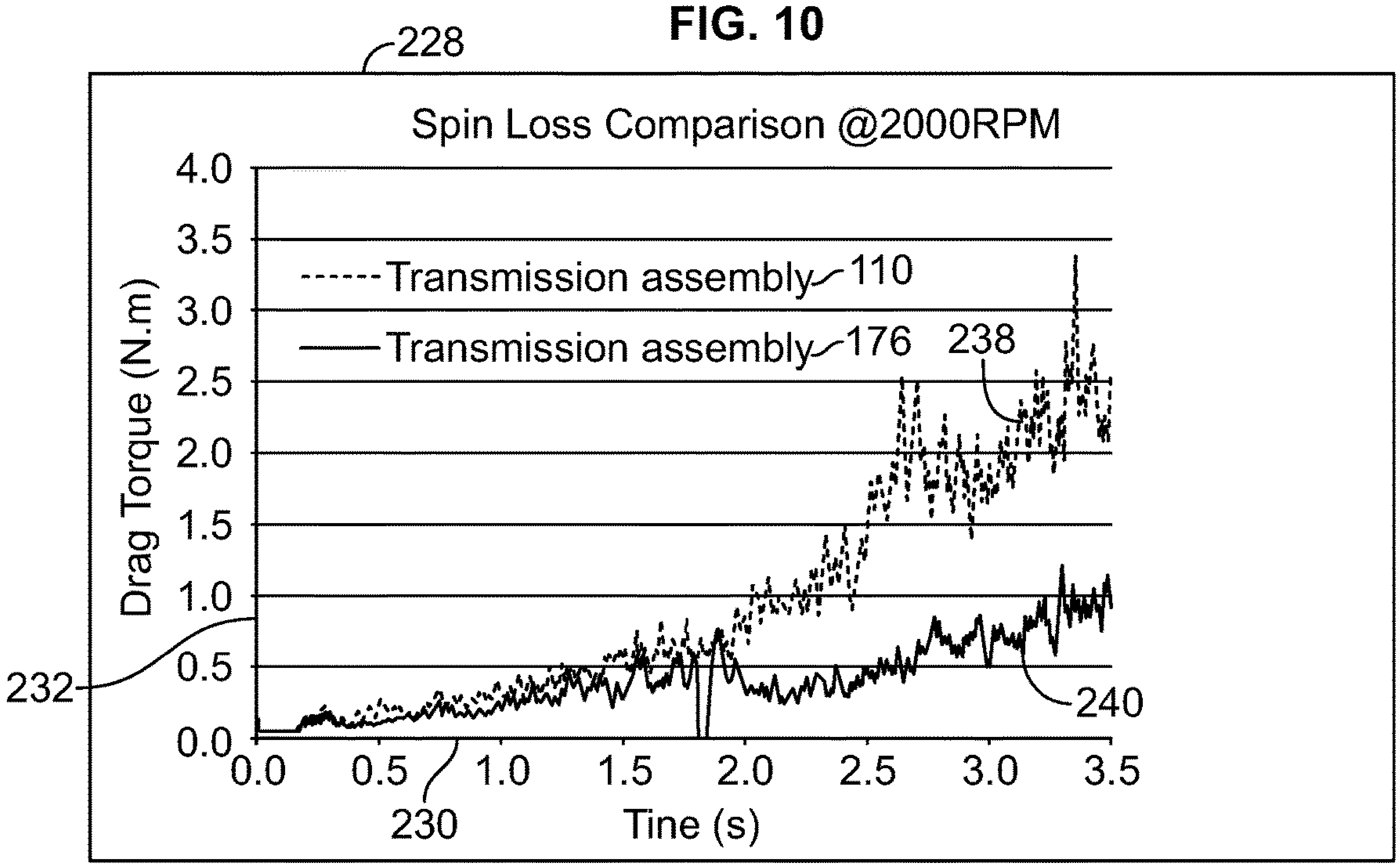
228
Spin Loss Comparison @2000RPM
Transmission assembly 110
Transmission assembly 176
238
Drag Torque (N.m)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
232
240
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
230
Tine (s)

FIG. 11

# HYBRID TRANSMISSION COOLANT FLOW MANAGEMENT SYSTEM

## TECHNICAL FIELD

This disclosure relates to a coolant flow management system for a vehicle hybrid transmission.

## BACKGROUND

Vehicle torque converters often operate in a dry environment. Torque converters of hybrid transmissions often operate in a wet environment. Packaging constraints between the torque converter and transmission may limit cooling oil drainage. For example, oil may accumulate around an electric motor and the torque converter. This oil accumulation may induce spin loss from the torque converter.

## SUMMARY

A transmission assembly includes a housing, an electric motor, and a baffle. The housing includes first and second drainage channels. The electric motor is disposed within the housing adjacent the drainage channels and a torque converter. The baffle is disposed within the housing upon a housing inner surface, defines an opening to the first and second drainage channels, and includes a baffle flange sized for positioning adjacent the torque converter to minimize contact of oil within the housing to the torque converter. The housing may define first and second partition walls each partially extending over one of the first and second drainage channels. The baffle may further include first and second seal features each disposed at one of two baffle ends. Each of the first and second seal features may be secured to the housing inner surface to prevent oil from accumulating between the baffle and the housing inner surface. The housing may further include first and second trenches. The baffle may define third and fourth trenches with the opening disposed therebetween and each sized for resting within one of the first and second trenches. The trenches may be arranged with one another to orient the opening to facilitate fluid communication between a housing cavity and the first and second drainage channels. The baffle may further include first and second caps each sized for securing to an end of one of the first and second drainage channels. The baffle may further include a baffle flap extending from the baffle flange at an angle based on a shape of the torque converter to influence oil to flow toward the opening and away from the torque converter. The assembly may further include a housing vent open to a cavity and defined by the housing to assist in maintaining pressure conditions of the cavity within a predetermined threshold.

A hybrid vehicle transmission assembly includes a housing and a baffle. The housing is for receiving a torque converter and an adjacent electric machine. The housing defines an inner surface having first and second partition walls each partially extending above one of two oil drainage channels. The baffle is disposed upon the inner surface beneath the electric machine and includes a drainage opening open to each of the two oil drainage channels. The baffle is arranged with the torque converter to direct oil introduced within the housing to the two oil drainage channels via the opening. The baffle may further include first and second seals each disposed at one of two baffle ends. The first and second seals may be sized for securing to the inner surface to prevent oil from accumulating between the baffle and the inner surface. The housing may define a substantially circular profile. The first and second seals may be radially spaced from one another at approximately 180 degrees relative to the profile. An oil distributor may be mounted to the housing for delivering oil within the housing. The baffle may further include a baffle flange extending from a baffle body at approximately ninety degrees and a baffle flap extending from the baffle flange. The baffle flange and the baffle flap may be oriented relative to the torque converter to prevent oil within the housing from contacting the torque converter. The baffle may be further arranged with the torque converter so the baffle flange and flap are located adjacent the torque converter to influence oil to travel toward the drainage opening. A housing vent may be located adjacent an oil distributor and open to a cavity defined by the inner surface of the housing to assist in maintaining pressure conditions of the cavity within a predetermined threshold.

A hybrid vehicle transmission assembly includes a housing and a baffle. The housing includes first and second drainage channels extending below a mount location for an electric motor and a torque converter. The baffle is disposed upon the mount location, defines an opening to the drainage channels, and includes a first seal located at one of two opposing baffle ends for securing to a housing inner surface to prevent oil from accumulating between the baffle and the housing inner surface. The housing may further include first and second trenches. The baffle defines third and fourth trenches with the opening disposed therebetween and each of the third and fourth trenches may be sized for resting within one of the first and second trenches. The trenches may be arranged with one another to orient the opening to facilitate fluid communication between a housing cavity and the first and second drainage channels. One of the first and second trenches may be arranged with the first seal to prevent oil from accumulating upon an inner surface of the housing therebetween. An oil distributor may be open to a cavity and adjacent a housing vent. The baffle may further include a second seal. The first seal and the second seal may each be located at one of the two opposing baffle ends. The housing may define a substantially circular profile. Each of the first seal and the second seal may be radially spaced from one another at approximately 180 degrees relative to the substantially circular profile.



## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic diagram illustrating an example of a vehicle.

FIG. **2** is a perspective view of an example of a portion of a transmission assembly for a vehicle.

FIG. **3** is a perspective view of the transmission assembly of FIG. **2** illustrating an example of operational oil distribution.

FIG. **4** is a perspective view of an example of a portion of a transmission housing of a transmission assembly.

FIG. **5** is another perspective view of the portion of the transmission housing of FIG. **4**.

FIG. **6** is a perspective view of the portion of the transmission housing of FIG. **4** illustrating an example of a baffle component.

FIG. **7** is a perspective view of the baffle component of FIG. **6**.

FIG. **8** is another perspective view of the baffle component of FIG. **6**.

FIG. **9** is a front view, in cross-section, of a portion of the transmission assembly of FIG. **2**.

FIG. **10** is a perspective view of an example of a transmission assembly including the transmission housing of FIG. **4** illustrating an example of operational oil distribution.

FIG. **11** is a graph comparing spin losses due to oil accumulation within the transmission assembly of FIGS. **2** and **3** and the transmission assembly of FIGS. **4** through **10**.

## DETAILED DESCRIPTION

Embodiments of the present disclosure are described herein. It is to be understood, however, that the disclosed embodiments are merely examples and other embodiments can take various and alternative forms. The figures are not necessarily to scale; some features could 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 embodiments. As those of ordinary skill in the art will understand, various features illustrated and described with reference to any one of the figures can be combined with features illustrated in one or more other figures to produce embodiments that are not explicitly illustrated or described. The combinations of features illustrated provide representative embodiments for typical applications. Various combinations and modifications of the features consistent with the teachings of this disclosure, however, could be desired for particular applications or implementations.

FIG. **1** is a schematic diagram illustrating an example of a hybrid electric vehicle (HEV) referred to as a vehicle **10**. FIG. **1** illustrates representative relationships among the components. Physical placement and orientation of the components within the vehicle may vary. The vehicle **10** includes a powertrain **12**. The powertrain **12** includes an engine **14** that drives a transmission **16**, which may be referred to as a hybrid transmission. As will be described in further detail below, transmission **16** includes an electric machine such as an electric motor/generator (M/G) **18**, an associated traction battery **20**, a torque converter **22**, and a multiple step-ratio automatic transmission, or gearbox **24**.

The engine **14** and the M/G **18** are both drive sources for the vehicle **10**. The engine **14** generally represents a power source that may include an internal combustion engine such as a gasoline, diesel, or natural gas powered engine, or a fuel cell. The engine **14** generates an engine power and corresponding engine torque that is supplied to the M/G **18** when a disconnect clutch **26** between the engine **14** and the M/G **18** is at least partially engaged. The M/G **18** may be implemented by any one of a plurality of types of electric machines. For example, M/G **18** may be a permanent magnet synchronous motor. Power electronics condition direct current (DC) power provided by the traction battery **20** to the requirements of the M/G **18**, as will be described below. For example, power electronics may provide three phase alternating current (AC) to the M/G **18**.

When the disconnect clutch **26** is at least partially engaged, power flow from the engine **14** to the M/G **18** or from the M/G **18** to the engine **14** is possible. For example, the disconnect clutch **26** may be engaged and M/G **18** may operate as a generator to convert rotational energy provided by a crankshaft **28** and M/G shaft **30** into electrical energy to be stored in the traction battery **20**. The disconnect clutch **26** can also be disengaged to isolate the engine **14** from the remainder of the powertrain **12** such that the M/G **18** can act as the sole drive source for the vehicle **10**. Shaft **30** extends through the M/G **18**. The M/G **18** is continuously drivably connected to the shaft **30**, whereas the engine **14** is drivably connected to the shaft **30** only when the disconnect clutch **26** is at least partially engaged.

The M/G **18** is connected to the torque converter **22** via shaft **30**. The torque converter **22** is therefore connected to the engine **14** when the disconnect clutch **26** is at least partially engaged. The torque converter **22** includes an impeller fixed to M/G shaft **30** and a turbine fixed to a transmission input shaft **32**. The torque converter **22** thus provides a hydraulic coupling between shaft **30** and transmission input shaft **32**. The torque converter **22** transmits power from the impeller to the turbine when the impeller rotates faster than the turbine. The magnitude of the turbine torque and impeller torque generally depend upon the relative speeds. When the ratio of impeller speed to turbine speed is sufficiently high, the turbine torque is a multiple of the impeller torque. During operation, oil is introduced assist in managing thermal conditions of the M/G **18**.

A torque converter bypass clutch **34** may also be provided that, when engaged, frictionally or mechanically couples the impeller and the turbine of the torque converter **22**, permitting more efficient power transfer. The torque converter bypass clutch **34** may be operated as a launch clutch to provide smooth vehicle launch. Alternatively, or in combination, a launch clutch similar to disconnect clutch **26** may be provided between the M/G **18** and gearbox **24** for applications that do not include a torque converter **22** or a torque converter bypass clutch **34**. In some applications, disconnect clutch **26** is generally referred to as an upstream clutch and launch clutch **34** (which may be a torque converter bypass clutch) is generally referred to as a downstream clutch.

The gearbox **24** may include gear sets (not shown) that are selectively placed in different gear ratios by selective engagement of friction elements such as clutches and brakes (not shown) to establish the desired multiple discrete or step drive ratios. The friction elements are controllable through a shift schedule that connects and disconnects certain elements of the gear sets to control the ratio between a transmission output shaft **36** and the transmission input shaft **32**. The gearbox **24** is automatically shifted from one ratio to another based on various vehicle and ambient operating conditions by an associated controller. The gearbox **24** then provides powertrain output torque to output shaft **36**.

It should be understood that the hydraulically controlled gearbox **24** used with a torque converter **22** is but one example of a gearbox or transmission arrangement; any multiple ratio gearbox that accepts input torque(s) from an engine and/or a motor and then provides torque to an output shaft at the different ratios is acceptable for use with embodiments of the present disclosure. For example, gearbox **24** may be implemented by an automated mechanical (or manual) transmission (AMT) that includes one or more servo motors to translate/rotate shift forks along a shift rail to select a desired gear ratio.

As shown in the representative embodiment of FIG. **1**, the output shaft **36** is connected to a differential **40**. The differential **40** drives a pair of wheels **42** via respective axles **44** connected to the differential **40**. The differential transmits approximately equal torque to each wheel **42** while permitting slight speed differences such as when the vehicle turns a corner. Different types of differentials or similar devices may be used to distribute torque from the powertrain to one or more wheels. In some applications, torque distribution may vary depending on the particular operating mode or condition.

The powertrain **12** further includes an associated controller **50** such as a powertrain control unit (PCU). While illustrated as one controller, the controller **50** may be part of a larger control system and may be controlled by various other controllers throughout the vehicle **10**, such as a vehicle system controller (VSC). It should therefore be understood that the controller **50** and one or more other controllers can collectively be referred to as a "controller" that controls various actuators in response to signals from various sensors to control functions such as starting/stopping engine **14**, operating M/G **18** to provide wheel torque or charge the traction battery **20**, select or schedule transmission shifts, etc. Controller **50** may include a microprocessor or central processing unit (CPU) in communication with various types of computer readable storage devices or media.

The controller communicates with various engine/vehicle sensors and actuators via an input/output (I/O) interface that may be implemented as a single integrated interface that provides various raw data or signal conditioning, processing, and/or conversion, short-circuit protection, and the like. Alternatively, one or more dedicated hardware or firmware chips may be used to condition and process particular signals before being supplied to the CPU. Controller **50** may communicate signals to and/or from engine **14**, disconnect clutch **26**, M/G **18**, launch clutch **34**, transmission gearbox **24**, and power electronics **56**. Representative examples of parameters, systems, and/or components that may be directly or indirectly actuated using control logic executed by the controller include fuel injection timing, rate, and duration, throttle valve position, spark plug ignition timing (for spark-ignition engines), intake/exhaust valve timing and duration, front-end accessory drive (FEAD) components such as an alternator, air conditioning compressor, battery charging, regenerative braking, M/G operation, clutch pressures for disconnect clutch **26**, launch clutch **34**, and transmission gearbox **24**, and the like.

The control logic may be implemented in software executed by a microprocessor-based vehicle, engine, and/or powertrain controller, such as the controller **50**. When implemented in software, the control logic may be provided in one or more computer-readable storage devices or media having stored data representing code or instructions executed by a computer to control the vehicle or its subsystems.

An accelerator pedal **52** is used by the driver of the vehicle to provide a demanded torque, power, or drive command to propel the vehicle. In general, depressing and releasing the pedal **52** generates an accelerator pedal position signal that may be interpreted by the controller **50** as a demand for increased power or decreased power, respectively. Based at least upon input from the pedal, the controller **50** commands torque from the engine **14** and/or the M/G **18**. The controller **50** also controls the timing of gear shifts within the gearbox **24**, as well as engagement or disengagement of the disconnect clutch **26** and the torque converter bypass clutch **34**. Like the disconnect clutch **26**, the torque converter bypass clutch **34** can be modulated across a range between the engaged and disengaged positions. This produces a variable slip in the torque converter **22** in addition to the variable slip produced by the hydrodynamic coupling between the impeller and the turbine. Alternatively, the torque converter bypass clutch **34** may be operated as locked or open without using a modulated operating mode depending on the particular application.

To drive the vehicle **10** with the engine **14**, the disconnect clutch **26** is at least partially engaged to transfer at least a portion of the engine torque through the disconnect clutch **26** to the M/G **18**, and then from the M/G **18** through the torque converter **22** and gearbox **24**. When the engine **14** alone provides the torque necessary to propel the vehicle, this operation mode may be referred to as the "engine mode," "engine-only mode," or "mechanical mode."

The M/G **18** may assist the engine **14** by providing additional power to turn the shaft **30**. This operation mode may be referred to as a "hybrid mode," an "engine-motor mode," or an "electric-assist mode."

To drive the vehicle with the M/G **18** as the sole power source, the power flow remains the same except the disconnect clutch **26** isolates the engine **14** from the remainder of the powertrain **12**. Combustion in the engine **14** may be disabled or otherwise OFF during this time to conserve fuel. The traction battery **20** transmits stored electrical energy through wiring **54** to power electronics **56** that may include an inverter, for example. The power electronics **56** convert DC voltage from the traction battery **20** into AC voltage to be used by the M/G **18**. The controller **50** commands the power electronics **56** to convert voltage from the traction battery **20** to an AC voltage provided to the M/G **18** to provide positive or negative torque to the shaft **30**. This operation mode may be referred to as an "electric-only mode," "electric vehicle mode," or "motor mode."

In any mode of operation, the M/G **18** may act as a motor and provide a driving force for the powertrain **12**. Alternatively, the M/G **18** may act as a generator and convert kinetic energy from the powertrain **12** into electric energy to be stored in the traction battery **20**. The M/G **18** may act as a generator while the engine **14** is providing propulsion power for the vehicle **10**, for example. The M/G **18** may additionally act as a generator during times of regenerative braking in which rotational energy from spinning wheels **42** is transferred back through the gearbox **24** and is converted into electrical energy for storage in the traction battery **20**.

FIG. **2** is a perspective view of a previously known example of a portion of a vehicle transmission assembly, referred to as a transmission assembly **100** herein. The transmission assembly **100** includes an electric motor **104** and a torque converter **106**. The electric motor **104** and the torque converter **106** are each disposed within a cavity of a transmission housing **110**. The electric motor **104** operates as a motor to power the vehicle and vehicle components. The torque converter **106** operates as a fluid coupler to allow an engine to spin somewhat independently of a transmission. The transmission housing **110** defines a drainage channel **114** in fluid communication with the cavity of the transmission housing **110**. An oil distributor **120** distributes coolant into the cavity of the transmission housing to cool the electric motor **104** during operation.

FIG. **3** is a perspective view illustrating an example of oil accumulation within the transmission housing **110** after approximately five seconds with the torque converter **106** rotating at approximately 2000 rpm. During operation, oil is pumped into the transmission housing **110** to assist in managing thermal conditions of components therein. This oil accumulates in locations that hinder performance of components of the transmission assembly **100**. The electric motor **104** is removed in FIG. **3** to more clearly show oil accumulation throughout the cavity of the transmission housing **110**. Oil accumulation is represented by coating **122**. As shown, oil accumulates throughout the cavity, upon an inner surface of the transmission housing **110**, and upon the torque converter **106** instead of exiting via the drainage channel **114** in a desirable fashion. Further, oil may accumulate in a housing vent **124**. This oil accumulation negatively influences performance of the torque converter **106** and may cause spin losses, for example, of approximately 3.1 Nm at 2000 rpm. An improvement to an oil drainage system may assist in minimizing or eliminating the oil accumulation issue within the transmission housing **110**.

FIGS. **4** and **5** are perspective views of an example of a portion of a transmission housing, generally referred to as a transmission housing **150**. The transmission housing **150** operates with other components to provide an improved oil drainage system in comparison to the transmission housing **110** shown in FIGS. **2** and **3**. For example, the transmission housing **150** defines a cavity **154**, a first drainage channel **158**, a second drainage channel **160**, and a lip **162**. An oil distributor **166** is mounted to the housing to deliver oil to the cavity **154**. A first partition wall **170** may extend over a portion of the first drainage channel **158** and a second partition wall **172** may extend over a portion of the second drainage channel **160**. It is contemplated that alternative embodiments having different packaging constraints may or may not include one or more partition walls. A housing vent **173** may assist in maintaining pressure conditions of the cavity **154** within a predetermined threshold. The transmission housing **150** is sized to receive the electric motor and a torque converter (not shown in FIGS. **4** and **5**). Oil distributed to the cavity **154** assists in cooling the electric motor during operation as further described herein.

FIG. **6** is a perspective view of a portion of a transmission assembly **176** including the transmission housing **150** of FIGS. **4** and **5** shown with additional components mounted therein. A baffle **178** is mounted within the cavity **154** to an inner surface of the transmission housing **150**. In one example the baffle **178** may be of a thermoplastic material. A torque converter **179** is shown mounted adjacent the baffle **178**. An electric motor (not shown) may be mounted above the baffle **178** and adjacent the torque converter **179**. The baffle **178** includes a drainage opening **180** and a baffle flange **182**. The drainage opening **180** is oriented for fluid communication with the first drainage channel **158** and the second drainage channel **160**. For example, oil that enters the transmission housing **110** via the oil distributor **166** may be influenced to travel to the drainage opening **180** and then the first drainage channel **158** and the second drainage channel **160**.

FIGS. **7** and **8** show further detail of the baffle **178**. The baffle **178** may include a first trench **186** and a second trench **188** each located on opposing sides of the drainage opening **180**. Each of the first trench **186** and the second trench **188** may be sized to sit within a similarly sized trench defined by the transmission housing **150** to assist in orienting the baffle **178** within the transmission housing **150**.

The baffle **178** may include a first seal **190** and a second seal **192** each located on opposing side of the drainage opening **180**. The first seal **190** may be arranged with the first trench **186** to prevent oil from accumulating upon the inner surface of the transmission housing **150** therebetween and the second seal **192** may be arranged with the second trench **188** to prevent oil from accumulating upon the inner surface of the transmission housing **150** therebetween. Each of the first seal **190** and the second seal **192** may be located at opposing ends of the baffle **178** and each may be sized for securing to the inner surface of the transmission housing **150** to prevent oil from accumulating between the baffle **178** and the inner surface. Each of the first seal **190** and the second seal **192** assist in preventing oil from traveling between the baffle **178** and the transmission housing **150** and assist in influencing oil to travel to the drainage opening **180**. In one example, the first seal **190** and the second seal **192** may be radially spaced from one another at approximately 180 degrees relative to a circular profile defined by the transmission housing **150**. In another embodiment, the baffle **178** may include only one of the first seal **190** and the second seal **192**.

The baffle flange **182** is sized for being located adjacent the torque converter **179** such that oil entering the cavity **154** via the oil distributor **166** is prevented or minimized from contacting the torque converter **179**. It is contemplated that the baffle flange **182** may extend about the cavity **154** three-hundred-sixty degrees or less. A flap **196** may extend from the baffle flange **182** at an angle based on a shape of the torque converter **179** to promote a seal relationship therebetween. The baffle flange **182** and the flap **196** may be sized to rest upon or adjacent the torque converter **179** to prevent oil introduced within the transmission housing **150** from contacting the torque converter **179**. The baffle **178** may include a first cap **198** and a second cap **200**. Each of the first cap **198** and the second cap **200** may provide a surface for securing to the transmission housing **150** via a fastener. The first cap **198** may provide a cap to seal the first drainage channel **158** and the second cap **200** may provide a cap to seal the second drainage channel **160**.

FIG. **9** is a front view, in cross-section, illustrating a fluid path for oil from the oil distributor **166** to the first drainage channel **158** and the second drainage channel **160**. For example, oil may enter the cavity **154** of the transmission housing **150** via the oil distributor **166**. The oil may then be influenced toward the drainage opening **180** by the baffle **178**. The oil may then enter the first drainage channel **158** or the second drainage channel **160**. Inclusion of two separate drainage channels provides oil drainage benefits of the transmission assembly **176** in comparison to a single drainage channel **114** used in the transmission assembly **100**. Additionally, inclusion of the baffle flange **182**, the first seal **190**, and the second seal **192** influences oil to travel toward the drainage opening **180** instead of toward the torque converter **179** to improve oil drainage characteristics of the transmission assembly **176**.

FIG. **10** is a perspective view of a portion of the transmission assembly **176** illustrating an example of oil accumulation within the transmission housing **150** after approximately five seconds with the torque converter **179** rotating at approximately 2000 rpm. The electric motor is not shown in FIG. **10** to more clearly show oil accumulation. Oil accumulation is represented by coating **206**. As shown in FIG. **10**, an addition of the baffle **178** provides for more efficient oil drainage and less oil accumulation within the transmission housing **150** in comparison to a system of the transmission housing **110**. For example, FIG. **10** shows almost zero oil accumulation upon the torque converter **179** and within the housing vent **173**. FIG. **10** also shows oil accumulation upon the inner surface of the transmission **150** as significantly less than oil accumulation upon an inner surface of the transmission housing **110**.

FIG. **11** is a graph **228** illustrating an example of a comparison of torque converter spin loss between the transmission assembly **100** and the transmission assembly **176** due to oil accumulation within the respective transmission housing. X-axis **230** represents time and Y-axis **232** represents drag torque in Nm. Line **238** represents spin loss of the torque converter **106** of the transmission assembly **100** at a torque converter operating condition of 2000 rpm. Line **240** represents spin loss of the torque converter **179** of the transmission assembly **176** at a torque converter operating condition of 2000 rpm.

As shown in the graph **228**, the transmission assembly **176** operates with less drag torque at 2000 rpm in comparison to the transmission assembly **100**. This improvement in drag torque is due to inclusion of the baffle **178** to improve oil flow within the transmission housing **150** and due to inclusion of the first drainage channel **158** and the second drainage channel **160**.

While various embodiments are described above, it is not intended that these embodiments describe all possible forms encompassed by the claims. The words used in the specification are words of description rather than limitation, and it is understood that various changes can be made without departing from the spirit and scope of the disclosure. As previously described, the features of various embodiments can be combined to form further embodiments of the disclosure that may not be explicitly described or illustrated. While various embodiments could have been described as providing advantages or being preferred over other embodiments or prior art implementations with respect to one or more desired characteristics, those of ordinary skill in the art recognize that one or more features or characteristics can be compromised to achieve desired overall system attributes, which depend on the specific application and implementation. These attributes can include, but are not limited to marketability, appearance, consistency, robustness, customer acceptability, reliability, accuracy, etc. As such, embodiments described as less desirable than other embodiments or prior art implementations with respect to one or more characteristics are not outside the scope of the disclosure and can be desirable for particular applications.

What is claimed is:

**1**. A transmission assembly comprising:

a housing including first and second drainage channels;

an electric motor disposed within the housing adjacent the drainage channels and a torque converter; and

a baffle disposed within the housing upon a housing inner surface, defining an opening to the first and second drainage channels, and including a baffle flange sized for positioning adjacent the torque converter to minimize contact of oil within the housing to the torque converter.

**2**. The assembly of claim **1**, wherein the housing defines first and second partition walls each partially extending over one of the first and second drainage channels.

**3**. The assembly of claim **1**, wherein the baffle further includes first and second seal features each disposed at one of two baffle ends, and wherein each of the first and second seal features are secured to the housing inner surface to prevent oil from accumulating between the baffle and the housing inner surface.

**4**. The assembly of claim **1**, wherein the housing further includes first and second trenches, wherein the baffle defines third and fourth trenches with the opening disposed therebetween and each sized for resting within one of the first and second trenches, and wherein the trenches are arranged with one another to orient the opening to facilitate fluid communication between a housing cavity and the first and second drainage channels.

**5**. The assembly of claim **1**, wherein the baffle further includes first and second caps each sized for securing to an end of one of the first and second drainage channels.

**6**. The assembly of claim **1**, wherein the baffle further includes a baffle flap extending from the baffle flange at an angle based on a shape of the torque converter to influence oil to flow toward the opening and away from the torque converter.

**7**. The assembly of claim **1** further comprising a housing vent open to a cavity defined by the housing to assist in maintaining pressure conditions of the cavity within a predetermined threshold.

**8**. A hybrid vehicle transmission assembly comprising:

a housing for receiving a torque converter and an adjacent electric machine and defining an inner surface having first and second partition walls each partially extending above one of two oil drainage channels, and

a baffle disposed upon the inner surface beneath the electric machine and including a drainage opening open to each of the two oil drainage channels,

wherein the baffle is arranged with the torque converter to direct oil introduced within the housing to the two oil drainage channels via the opening.

**9**. The assembly of claim **8**, wherein the baffle further includes first and second seals each disposed at one of two baffle ends, and wherein the first and second seals are sized for securing to the inner surface to prevent oil from accumulating between the baffle and the inner surface.

**10**. The assembly of claim **9**, wherein the housing defines a substantially circular profile, and wherein the first and second seals are radially spaced from one another at approximately 180 degrees relative to the profile.

**11**. The assembly of claim **8** further comprising an oil distributor mounted to the housing for delivering oil within the housing.

**12**. The assembly of claim **8**, wherein the baffle further includes a baffle flange extending from a baffle body at approximately ninety degrees and a baffle flap extending from the baffle flange, and wherein the baffle flange and the baffle flap are oriented relative to the torque converter to prevent oil within the housing from contacting the torque converter.

**13**. The assembly of claim **12**, wherein the baffle is further arranged with the torque converter so the baffle flange and flap are located adjacent the torque converter to influence oil to travel toward the drainage opening.

**14**. The assembly of claim **8** further comprising a housing vent located adjacent an oil distributor and open to a cavity defined by the inner surface of the housing to assist in maintaining pressure conditions of the cavity within a predetermined threshold.

**15**. A hybrid vehicle transmission assembly comprising:

a housing including first and second drainage channels extending below a mount location for an electric motor and a torque converter; and

a baffle disposed upon the mount location, defining an opening to the drainage channels, and including a first seal located at one of two opposing baffle ends for securing to a housing inner surface to prevent oil from accumulating between the baffle and the housing inner surface.

**16**. The assembly of claim **15**, wherein the housing further includes first and second trenches, wherein the baffle defines third and fourth trenches with the opening disposed therebetween and each of the third and fourth trenches sized for resting within one of the first and second trenches, and wherein the trenches are arranged with one another to orient the opening to facilitate fluid communication between a housing cavity and the first and second drainage channels.

**17**. The assembly of claim **16**, wherein one of the first and second trenches is arranged with the first seal to prevent oil from accumulating upon an inner surface of the housing therebetween.

**18**. The assembly of claim **15** further comprising an oil distributor open to a cavity and adjacent a housing vent.

**19**. The assembly of claim **15** further comprising a second seal, wherein the first seal and the second seal are each located at one of the two opposing baffle ends.

**20**. The assembly of claim **19**, wherein the housing defines a substantially circular profile, and wherein each of the first seal and the second seal are radially spaced from one another at approximately 180 degrees relative to the substantially circular profile.

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