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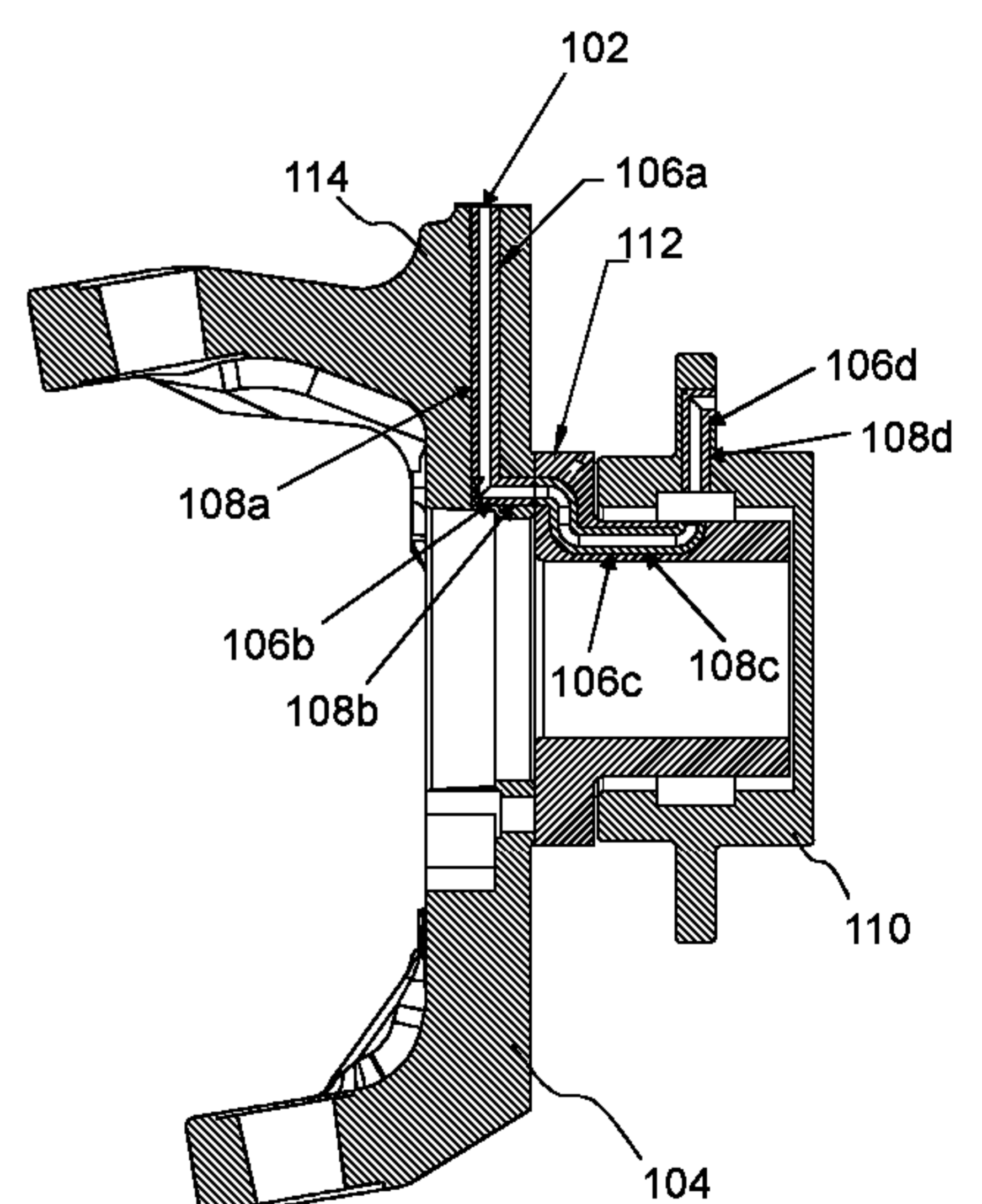
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A CENTRAL TIRE INFLATION SYSTEM (CTIS) CHANNEL AND MANUFACTURING METHODS THEREOF

(57) Tiivistelmä - Sammandrag - Abstract

Esillä oleva keksintö koskee rengaspaineiden säätöjärjestelmä (CTIS) -kanavaa, joka käsittää ainakin yhden kanavaosan ja suojaavan pinnan, suojaavan pinnan peittäen ainakin osan ainakin yhdestä kanavaosasta. Esillä oleva keksintö liittyy vastaaviin menetelmiin.

The present invention relates to a Central Tire Inflation System (CTIS) channel (102) comprising at least one channel section (106ad), and a protective surface (108a-d), the protective surface covering at least part of the at least one channel section. The present invention relates to related methods.



A CENTRAL TIRE INFLATION SYSTEM (CTIS) CHANNEL AND MANUFACTURING METHODS THEREOF

5 FIELD OF THE INVENTION

The present invention relates to channels and manufacturing methods of such channels. In particular, the present invention relates to a Central Tire Inflation System (CTIS) channel and methods for manufacturing a CTIS channel.

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BACKGROUND

It is well known by off-road car manufacturers and subsystem developers that the Central Tire Inflation System (CTIS) suffers from corrosion problems in the channel that goes through the steering knuckle to the wheel hub and further to the tire.

The steering knuckle is typically manufactured by casted carbon steel or ductile iron, which suffer from severe corrosion when pressurized air containing moisture condensates on the channels surfaces and initiates corrosion. The rust flakes of the corroded channel expand in volume and cause blockages in the channel. The rust flakes will also damage the shaft seals of the CTIS leading to leaks in the system.

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The channels shape and diameter in the steering knuckle are such, that it is not possible with current methods to apply a coating to prevent corrosion from taking place over a 30-year service time.

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SUMMARY OF THE INVENTION

The objective is to at least alleviate the problems described hereinabove not satisfactorily solved by the known arrangements, and to provide a feasible Central Tire Inflation System (CTIS) channel. One objective is to prevent corrosion in the CTIS channel. Another objective is to provide a manufacturing method for a non-corrosive CTIS channel.

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The aforesaid objectives are achieved by the embodiments of a CTIS channel in accordance with the present invention. The aforesaid objectives are achieved by related manufacturing methods for manufacturing a CTIS channel.

- 5 The aforesaid objectives are achieved according to the present invention as claimed in claim 1.

The aforesaid objectives are achieved according to the present invention as claimed in claim 9.

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The aforesaid objectives are achieved according to the present invention as claimed in claim 14.

- 15 Accordingly, in one aspect of the present invention, a Central Tire Inflation System (CTIS) channel comprises

-at least one channel section, and

- 20 -a protective surface, the protective surface covering at least part of the at least one channel section.

In one embodiment the protective surface covers an entire surface of the channel section.

- 25 In one embodiment the protective surface is a corrosion resistant alloy.

In one embodiment the corrosion resistant alloy is a stainless steel.

- 30 In one embodiment the stainless steel is at least one selected from the group of: AISI 316L, AISI 304, AISI 444 and AISI 430.

In one embodiment the CTIS channel comprises at least two channel sections, the at least two channel sections being arranged together.

- 35 In one embodiment the at least two channel sections are arranged together by welding and/or by bending the channel sections from a uniform channel part.

In one embodiment the channel section is arranged inside a casting.

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Accordingly, in another aspect of the present invention a method for manufacturing a Central Tire Inflation System (CTIS) channel comprises

5 -making an insert from at least one pipe section, the at least one pipe section comprising a corrosion resistant alloy,

-placing the insert in a mold, and

10 -casting material in the mold wherein the pipe sections are arranged to withstand heat from the casting material such that the pipe sections form a channel inside the casting.

15 In one embodiment the insert is made by bending at least one pipe section and/or by welding at least two pipe sections together.

In one embodiment connection points are machined to the channel.

20 In one embodiment the pipe sections have a wall thickness of at least 3mm, preventing the pipe sections from melting completely during the casting.

In one embodiment the casting material is iron or steel.

In one embodiment the mold is a sand mold.

25 Accordingly, in a third aspect of the present invention a method for manufacturing a Central Tire Inflation System (CTIS) channel comprises

30 -making an insert from a uniform piece, the insert comprising a corrosion resistant alloy,

-placing the insert in a mold,

-casting material in the mold, and

35 -drilling a channel in the insert.

In one embodiment connection points are machined to the channel.

40 In one embodiment the casting material is iron or steel.

In one embodiment the mold is a sand mold.

The utility of the present invention follows from a plurality of factors depending on each particular embodiment. Some embodiments of the present invention may prevent corrosion in the CTIS channel. Some embodiments of the present invention may provide a feasible manufacturing method for a non-corrosive CTIS channel.

Some embodiments of the present invention may decrease the frequency of maintenance and increase service life. The present invention may enable a cost-effective CTIS channel and manufacturing method for a non-corrosive CTIS channel. In some embodiments of the present invention the non-corrosive material is arranged inside the casting whereas more affordable basic material is provided around the channel.

In this application, the expression “a number of” refers herein to any positive integer starting from one (1), e.g. to one, two, or three.

The expression “a plurality of” refers herein to any positive integer starting from two (2), e.g. to two, three, or four.

Different embodiments of the present invention are disclosed in the dependent claims.

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BRIEF DESCRIPTION OF THE RELATED DRAWINGS

In the following, the invention is described in more detail with reference to the appended drawings in which

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Fig. 1 illustrates a cross-section of an embodiment of a Central Tire Inflation (CTIS) channel in accordance with the present invention.

Fig. 2 illustrates an embodiment of a casting wherein the CTIS channel is arranged.

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Fig. 3 illustrates a front view of the casting.

Fig. 4 is a flow chart of an embodiment of a method in accordance with the present invention.

Fig. 5 is a flow chart of another embodiment of a method in accordance with the present invention.

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DETAILED DESCRIPTION OF THE EMBODIMENTS

Referring to figures 1-3, the Central Tire Inflation System (CTIS) channel 102 is arranged inside a casting 104. The CTIS channel 102 comprises four channel sections 106a-d. The channel sections 106a-d comprise a protective surface 108a-d. The protective surface 108a-d covers at least part of the channel sections 106a-d. Preferably, the protective surface 108a-d covers the entire surface of the channel sections 106a-d.

The protective surface 108a-d is a corrosion resistant alloy. The corrosion resistant alloy may be a stainless steel such as AISI 316L, AISI304, AISI 444 or AISI 430. Alternatively, the corrosion resistant alloy may be copper if it is water cooled during the casting process, or a nickel based superalloy such as Inconel 625.

The channel sections 106a-d may be arranged together by welding or by bending the channel sections from a uniform channel part.

The casting 104 comprises a wheel hub 110, a bearing housing 112 and a steering knuckle 114. The bearing housing 112 connects the wheel hub 110 and the steering knuckle 114. The casting 104 may be casted from iron (e.g. ductile iron) or steel (e.g. carbon steel), for example. The CTIS channel 102 is arranged from the steering knuckle 114 to the wheel hub 110.

There may be different castings, in which a CTIS channel according to the present invention is arranged. The CTIS channels in different castings may be connected with tubes, for example.

The CTIS channel 102 is part of a Central Tire Inflation System.

Referring to figure 4, the flow chart illustrates a method 200 for manufacturing a CTIS channel.

In a method start-up 202, all of the preparatory measures of the method are carried out.

At 204, an insert is made from at least one pipe section. The at least one pipe section comprises a corrosion resistant alloy. The step may include bending at least one pipe section and/or welding at least two pipe sections together.

At 206, the insert is placed in a mold. The mold may be a sand mold, for example.

At 208, material is casted in the mold. The pipe sections are arranged to withstand heat from the casting material such that the pipe sections form a channel inside the casting. The pipe sections may have a wall thickness of at least 3mm, preventing the pipe sections from melting completely during the casting and forming the channel inside the casting. The casting material may be iron or steel, for example. Water cooling may be used during casting. In some embodiments, a pipe section with a wall thickness below 3mm may be used if water cooling is applied. Without water cooling, a pipe section with a wall thickness of approximately 4-7mm may be used.

At 210, connection points are machined to the channel. This may include machining at least a first and a second end of the channel.

Step 212, illustrates the end of the present method.

Referring to figure 5, the flow chart illustrates a method 300 for manufacturing a CTIS channel.

At the method start-up 302, all of the preparatory measures of the method are carried out.

At 304, an insert is made from a uniform piece. The insert comprises a corrosion resistant alloy.

At 306, the insert is placed in a mold. The mold may be a sand mold, for example. Alternatively, the mold may be a metal mold.

At 308, material is casted in the mold. The casting material may be iron or steel, for example.

At 310, a channel is drilled in the insert.

At 312, connection points are machined to the channel. This may include machining at least a first and a second end of the channel.

Step 314 illustrates the end of the present method.

Consequently, a skilled person may on the basis of this disclosure and general knowledge apply the provided teachings in order to implement the scope of the present invention as defined by the appended claims in each particular use case with necessary modifications, deletions, and additions.

Claims

1. A Central Tire Inflation System (CTIS) channel comprising
 - 5 -at least one channel section, and
 - a protective surface, the protective surface covering at least part of the at least one channel section.
- 10 2. The CTIS channel according to claim 1, wherein the protective surface covers an entire surface of the at least one channel section.
3. The CTIS channel according to any preceding claim, wherein the protective surface is a corrosion resistant alloy.
- 15 4. The CTIS channel according to claim 3, wherein the corrosion resistant alloy is a stainless steel.
5. The CTIS channel according to claim 4, wherein the stainless steel is at least one selected from the group of: AISI 316L, AISI 304, AISI 444 and AISI 430.
- 20 6. The CTIS channel according to any preceding claim, wherein the CTIS channel comprises at least two channel sections, the at least two channel sections being arranged together.
- 25 7. The CTIS channel according to claim 6, wherein the at least two channel sections are arranged together by welding and/or by bending the channel sections from a uniform channel part.
- 30 8. The CTIS channel according to any preceding claim, wherein the channel section is arranged inside a casting.
9. A method for manufacturing a Central Tire Inflation System (CTIS) channel comprises
 - 35 -making an insert from at least one pipe section, the at least one pipe section comprising a corrosion resistant alloy,
 - 40 -placing the insert in a mold, and

-casting material in the mold wherein the pipe sections are arranged to withstand heat from the casting material such that the pipe sections form a channel inside the casting.

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10. The method according to claim 9, wherein the insert is made by bending at least one pipe section and/or by welding at least two pipe sections together.

11. The method according to any of claims 9 or 10, wherein connection points
10 are machined to the channel.

12. The method according to any of claims 9-11, wherein the pipe sections have a wall thickness of at least 3mm, preventing the pipe sections from melting completely during the casting.

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13. The method according to any of claims 9-12, wherein the casting material is iron or steel.

14. A method for manufacturing a Central Tire Inflation System (CTIS) chan-
20 nel comprises

-making an insert from a uniform piece, the insert comprising a corrosion resistant alloy,

25 -placing the insert in a mold,

-casting material in the mold, and

-drilling a channel in the insert.

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15. The method according to claim 14, wherein connection points are machined to the channel.

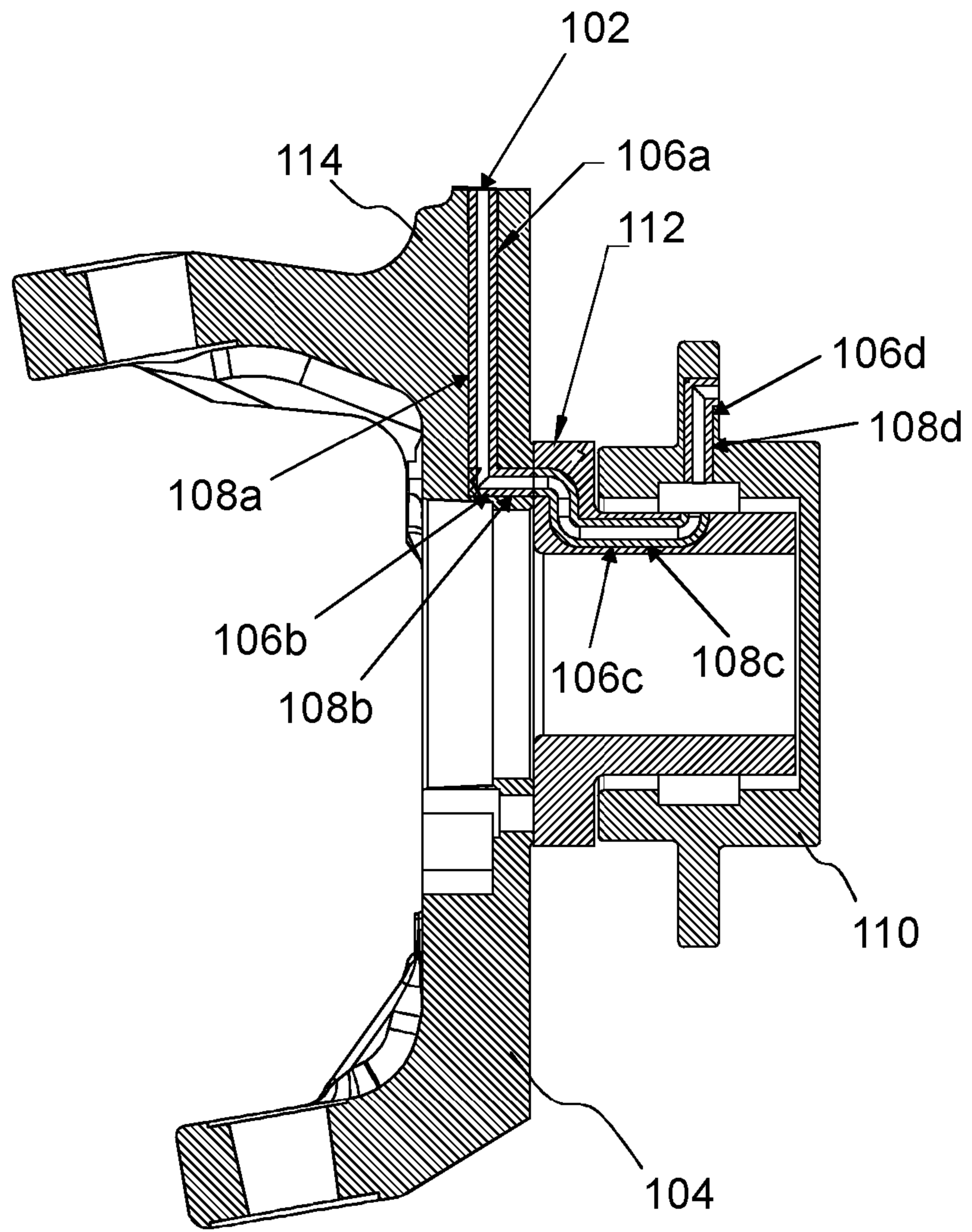


FIG. 1

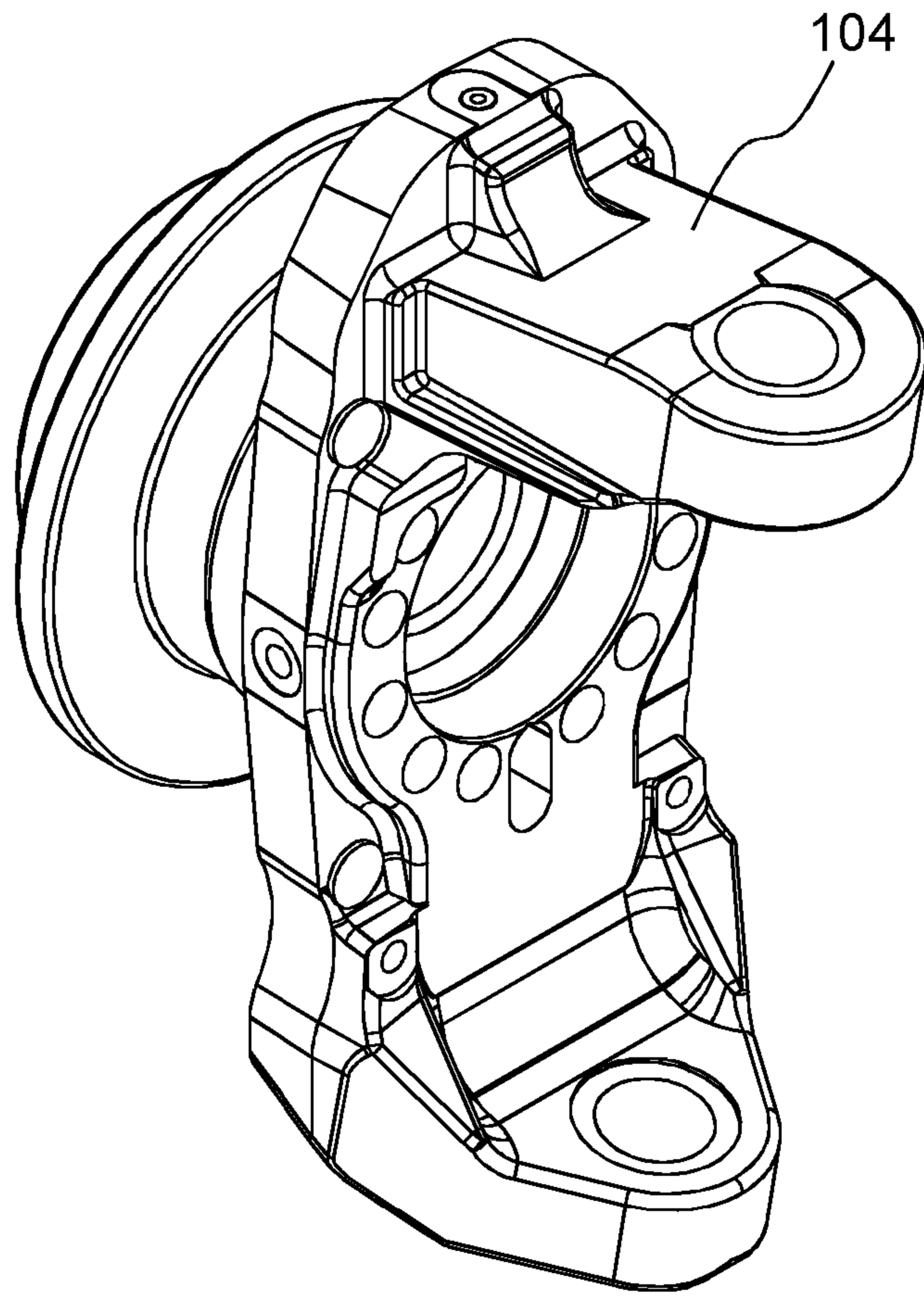


FIG. 2

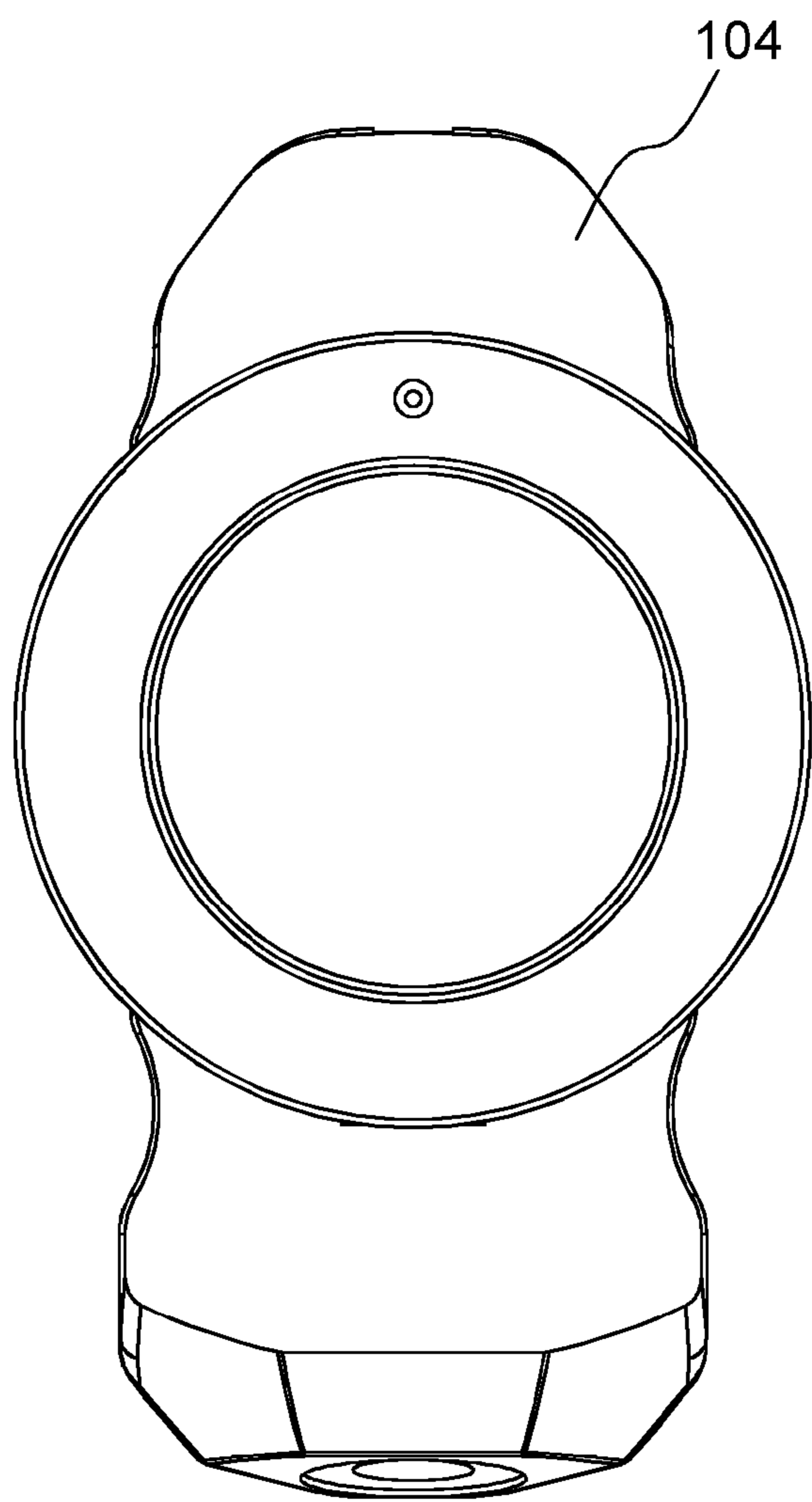


FIG. 3

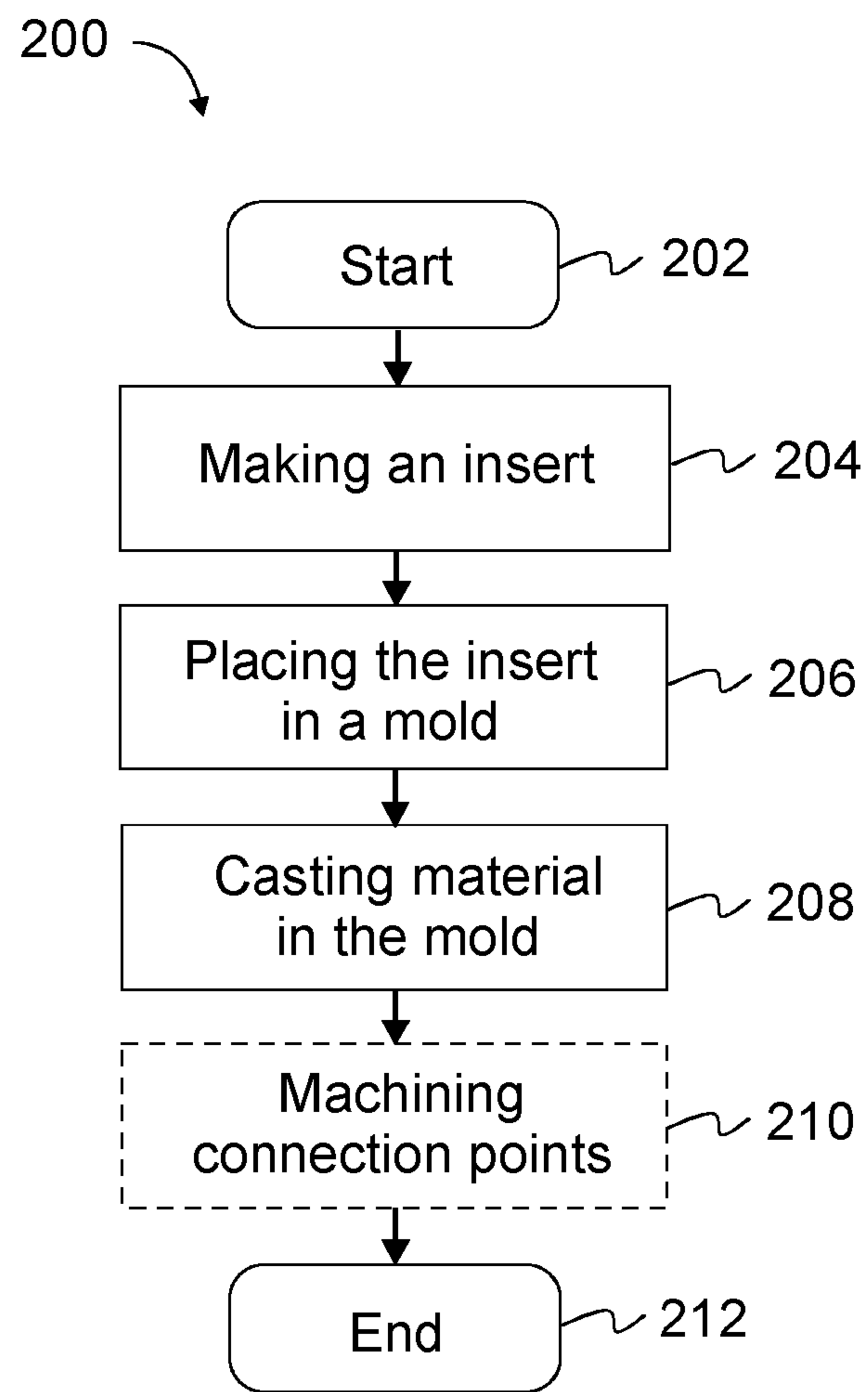


FIG. 4

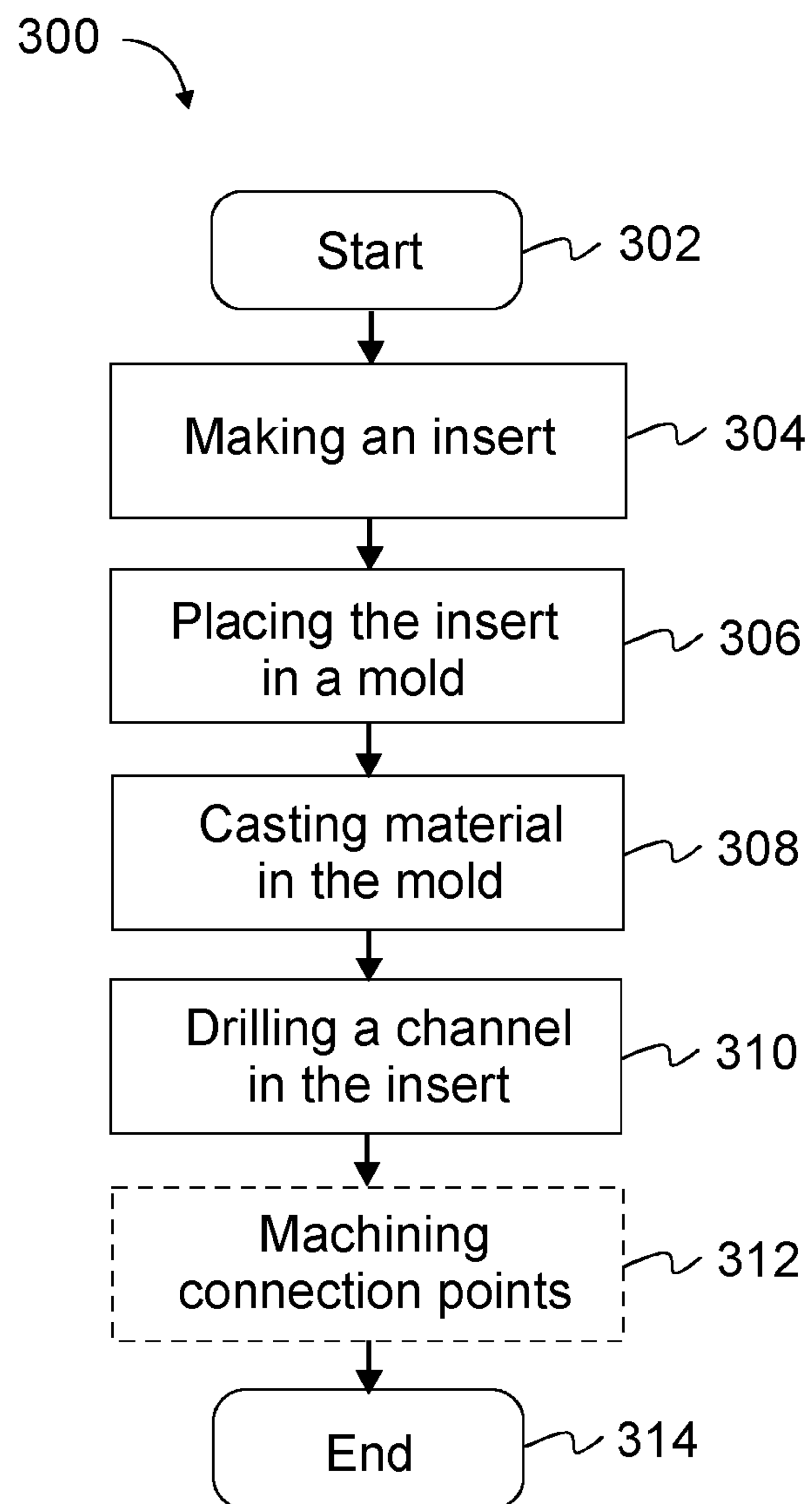


FIG. 5

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SEARCH REPORT

PATENT APPLICATION No.		CLASSIFICATION	
20195953		IPC B60C 23/00 (2006.01) B60C 23/10 (2006.01)	CPC B60C 23/001 B60C 23/10 Y10T 137/36
PATENT CLASSES SEARCHED (classification systems and classes)			
IPC: B60C			
DATABASES CONSULTED DURING THE SEARCH			
EPODOC, EPO-Internal full-text databases, Full-text translation databases from Asian languages, WPIAP			

DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*)	Bibliographic data on the document and relevant passages	Relevant to claims
X	US 2016200151 A1 (HOELDRICH BERNHARD [DE] et al.) 14 July 2016 (14.07.2016) whole document; see in particular paragraphs [0001], [0002], [0037], [0039], [0040]; figures 1-3	1-15
X	JP 2006088809 A (NSK LTD) 06 April 2006 (06.04.2006) figures 1-6 & machine translation into English by EPO & Google [online], whole document: paragraphs [0003], [0024]	1, 3-15
A	WO 2014051677 A1 (ACCURIDE CORP [US]) 03 April 2014 (03.04.2014) whole document; see in particular paragraphs [0004], [0026]; figures 1-17	1-15
A	US 4431043 A (GOODELL FRED L [US] et al.) 14 February 1984 (14.02.1984) whole document; figure 2	1-15

Continued on the next sheet ☐

*) X Document indicating that the invention is not novel or does not involve an inventive step with respect to the state of the art.
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01.06.2020

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