

(19)



(11)

EP 3 907 460 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

10.11.2021 Bulletin 2021/45

(51) Int Cl.:

F28F 9/02 (2006.01)

(21) Application number: **20461533.0**

(22) Date of filing: **07.05.2020**

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA ME

Designated Validation States:

KH MA MD TN

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(54) **HEAT EXCHANGER**

(57) An embodiment of the invention herein provides a heat exchanger. The heat exchanger includes a pair of spaced apart manifolds, and a plurality of heat exchange elements extended between the pair of spaced apart manifolds. Further, at least one manifold of the pair

of spaced apart manifolds includes a first part and a second part integrally formed with the first part at an angle. Further, the first part and the second part are having same profile and same cross-section.

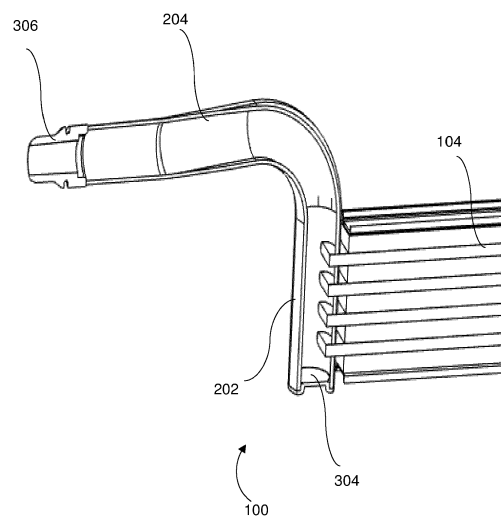


FIG. 3

Description

[0001] The present invention generally relates to a heat exchanger, more particularly to, a heat exchanger having at least one manifold is a tube type manifold.

[0002] Generally, heat exchanger includes heat exchange elements extended between a pair of manifolds. The pair of manifolds may include a header and a cover adapted to encapsulate the header. The heat exchange elements may be fluidically connected to the header provided in the pair of manifolds. The header is connected with the cover, to form a fluidal connection between the heat exchange elements and an external fluid circuit. To enable a fluid connection between the heat exchange elements and the external fluid circuit, the cover has to be connected to conduits of the external circuit carrying the fluid. In order to enable connection between the manifold and the conduits, a connecting member, preferably a connector or a connecting block is connected to the cover of the manifold. Generally, the connector is brazed to the manifold to enable rigid connection between the connector and the manifold. Thereafter, the conduits are connected to the connector, thereby enabling fluid connection to the heat exchange elements.

[0003] However, such external connector connected with the manifold may increase weight and cost of the heat exchanger. Further, it restricts the different angles of connection of the conduits with the manifold, since the connector is rigidly connected to the manifold. As the conventional connectors are brazed to the manifold, the brazing points may corrode, thereby resulting in leakage of the fluid at the connection point. Further, adding external parts, such as the connectors, to the heat exchanger may increase the size of the heat exchanger, which leads to packaging issues in vehicle.

[0004] Accordingly, there remains a need for a manifold that enables avoiding part or all of the above-mentioned problems. Further, there is yet remains a need for a heat exchanger having a manifold with more flexibility in terms of angular arrangements with respect to the conduits.

[0005] In the present description, some elements or parameters may be indexed, such as a first element and a second element. In this case, unless stated otherwise, this indexation is only meant to differentiate and name elements, which are similar but not identical. No idea of priority should be inferred from such indexation, as these terms may be switched without betraying the invention. Additionally, this indexation does not imply any order in mounting or use of the elements of the invention.

[0006] In view of the foregoing, an embodiment of the invention herein provides a heat exchanger. The heat exchanger includes a pair of spaced apart manifolds, and a plurality of heat exchange elements extended between the pair of spaced apart manifolds. Further, at least one manifold of the pair of spaced apart manifolds includes a first part and a second part integrally formed with the first part at an angle. Further, the first part and the second

part are having same profile and same cross-section.

[0007] In another embodiment, the first part is connected to the second part at an angle ranging from 2° to 180°.

[0008] In one embodiment, the first part and the second part are perpendicular to each other.

[0009] In yet another embodiment, the first part is connected with the second part along an axis of the first part

[0010] Further, the second part is adapted to be connected with an external fluid circuit to enable fluid circulation in the plurality of heat exchange elements.

[0011] In one embodiment, an end of the second part is bent at angle and adapted to be fluidically connected to the first part of the manifold.

[0012] In one example, the first part is having same length as the second part.

[0013] The first part of the manifold further includes slots adapted to receive the plurality of heat exchange elements.

[0014] In one embodiment, the plurality of heat exchange elements is brazed to the first part of the manifold.

[0015] Further, the heat exchanger includes a sealing cap provided at one end of the first part to seal the cross-section of the first part of the manifold, and another end of the first part being fluidically connected to the second part.

[0016] In one embodiment, the manifold is a tube having the first part and the second part.

[0017] In another embodiment, an open end of the second part of the manifold is connected to a connector that adapted to enable connection to the external fluid circuit.

[0018] Other characteristics, details and advantages of the invention can be inferred from the description of the invention hereunder. A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying figures, wherein:

Figs. 1 and 2 illustrate perspective views of a heat exchanger, in accordance with an embodiment of the present invention;

Fig. 3 illustrates a cross-sectional view of a manifold of the heat exchanger of Fig. 2;

Fig. 4 illustrates a perspective view of the manifold of the heat exchanger of Fig. 2;

Fig. 5 illustrates a perspective view of a first part of the manifold isolated from a second part of the manifold of the heat exchanger of Fig. 2; and

Fig. 6 illustrates an exploded view of the manifold of the heat exchanger showing a sealing cap of Fig. 2.

[0019] It must be noted that the figures disclose the invention in a detailed enough way to be implemented,

the figures helping to better define the invention if need be. The invention should however not be limited to the embodiments disclosed in the description.

[0020] The present invention relates to a heat exchanger having a pair of tube-type manifold. Conventional heat exchanger may include a pair of manifolds, and heat exchange elements extended between the pair of manifolds. Further, a connector is connected to any one of the manifold to fluidically connect the heat exchange elements with an external fluid circuit. However, such external connector may increase weight, size and cost of the heat exchanger. To overcome such problems, a tube type manifold is provided in the heat exchanger. The proposed heat exchanger may include a pair of manifolds. At least one manifold amongst the pair of manifolds includes two parts integrally formed together. In other words, these two parts are made from one element, i.e. they are distinguishable within a single component. Further, one part of the manifold is connected to heat exchange elements, and other part is connected to conduits of external fluid circuit, thereby eliminating a need for a connector to enable fluid communication to the heat exchange elements. The previously mentioned and other advantages of the present invention will be described in greater detail in conjunction with the figures in the following description.

[0021] Figs. 1 and 2 illustrate perspective views of a heat exchanger 100, in accordance with an embodiment of the present invention. The heat exchanger 100 includes a pair of manifolds 102A, 102B and a plurality of heat exchange elements 104. The plurality of heat exchange elements 104 may be extended between the pair of manifolds 102A, 102B. The pair of manifolds 102A, 102B is spaced apart from each other to receive the plurality of heat exchange elements 104. In one embodiment, the plurality of heat exchange elements 104 is brazed to the pair of manifolds 102A, 102B. The plurality of heat exchange elements 104 can be heat exchange tubes or plates. According to the aspect of this embodiment, at least one manifold 102A of the pair of manifolds 102A, 102B includes a first part 202 and a second part 204 integrally formed with the first part 202. The manifold 102A can be a tube having a closed side of the tube and other side being connected to an external fluid conduit. In the present embodiment, one manifold can be a tube type manifold and other manifold can be a conventional manifold. In this embodiment, the conventional manifold enables fluid connection between two sections of fluid flow in the heat exchange elements 104. In such cases, the tube type manifold 102A can be connected to the external fluid conduit, and the other manifold 102B can enable fluid connection between two sections of heat exchange elements 104.

[0022] According to another aspect of the invention, both the manifolds 102A, 102B can be a tube type manifold having the first part 202 and the second part 204. The first part 202 and the second part 204 can be integrally formed and connected together. In one example,

the first part 202 is connected to the second part 204 at an angle ranging from 2° to 180°. The first part 202 is fluidically connected to the heat exchange elements 104 and the second part 204 is connected to the external fluid circuit. In one embodiment, the external fluid circuit can be refrigerant loop or coolant loop. As the first part 202 and the second part 204 are fluidically connected with each other, the heat exchange elements 104 may receive the fluid from the external fluid circuit.

[0023] Figs. 3 and 4 illustrate different views of the manifold 102A of the heat exchanger 100 of Fig. 2. In this example, Fig. 3 is a cross-sectional view of the manifold 102A of the heat exchanger 100 and Fig. 4 is a perspective view of the manifold 102A of the heat exchanger 100. Further, the first part 202 of the manifold 102A may include slots 302 to receive the heat exchange elements 104. In one embodiment, the heat exchange elements 104 are received in the slots 302 formed in the first part 202 and brazed together. The heat exchange elements 104 are fluidically connected to the first part 202 of the manifold 102A. In this example, one end of the first part 202 is fluidically coupled to the second part 204, and other end of the first part 202 is sealed with a sealing cap 304. The sealing cap 304 may seal the cross-section of the first part 202, so that the fluid entering into the first part 202 of the manifold 102A may flow into the heat exchange elements 104. Further, the second part 204 of the manifold 102A may include a connector 306 provided at an end of the second part 204 to couple with the external conduits of the external fluid circuit. In this embodiment, the connector 306 is provided with the second part 204 to couple with the external conduits having different cross-section from the second part 204. In another embodiment, the second part 204 of the manifold 102A is directly brazed to the external conduits of the external fluid circuit.

[0024] Figs. 5 and 6 illustrate perspective views of the manifold 102A of the heat exchanger 100 of Fig. 2. In this example, Fig. 5 shows the first part 202 isolated from the second part 204, and Fig. 6 shows the sealing cap 304 isolated from the manifold 102A. In one embodiment, the first part 202 and the second part 204 of the manifold 102A are having same cross-section and same profile. Further, the first part 202 of the manifold 102A may be of the same length of the second part 204 of the manifold 102A. In one embodiment, the first part 202 of the manifold 102A is perpendicularly connected to the second part 204 of the manifold 102A. In another embodiment, the first part 202 of the manifold 102A is connected to the second part 204 of the manifold 102A along an axis of the first part 202. In yet another embodiment, the first part 202 of the manifold 102A is connected to the second part 204 of the manifold 102A at angle ranging from 2° to 180°.

[0025] Further, one end of the second part 204 of the manifold 102A is bent at an angle and other end of the second part 204 of the manifold 102A is coupled to the external conduits. The bent end of the second part 204

is fluidically connected to the first part 202 of the manifold 102A. Further, the sealing cap 304 is connected to the end of the first part 202, so that cross-section of the manifold 102A is sealed at one end, and another end of the manifold 102A is connected to the external conduits of the external fluid circuit. As the first part 202 and the second part 204 of the manifold 102A are integrally formed together, the heat exchanger 100 can be connected to the external conduits routed at any angle. Further, the heat exchanger 100 can be positioned in a spaced constrained environment, since external parts are not connected to the heat exchanger 100. As the manifold 102A does not require any external connector to connect the heat exchanger 100 with the external fluid circuit, weight, size and cost of the heat exchanger 100 are reduced.

[0026] In any case, the invention cannot and should not be limited to the embodiments specifically described in this document, as other embodiments might exist. The invention shall spread to any equivalent means and any technically operating combination of means.

Claims

1. A heat exchanger (100), comprising:

a pair of spaced apart manifolds (102A, 102B);
and

a plurality of heat exchange elements (104) extended between the pair of spaced apart manifolds (102A, 102B), wherein at least one manifold of the pair of spaced apart manifolds (102A, 102B) comprises a first part (202) and a second part (204) integrally formed with the first part (202) at an angle, wherein the first part (202) and the second part (204) are having same profile and same cross-section.

2. The heat exchanger (100) as claimed in claim 1, wherein the first part (202) is connected to the second part (204) at an angle ranging from 2° to 180°.

3. The heat exchanger (100) as claimed in claim 2, wherein the first part (202) and the second part (204) are perpendicular to each other.

4. The heat exchanger (100) as claimed in any of the preceding claims, wherein the second part (204) is adapted to be connected with an external fluid circuit to enable fluid circulation in the plurality of heat exchange elements (104).

5. The heat exchanger (100) as claimed in any of the preceding claims, wherein the first part (202) is connected with the second part (204) along an axis of the first part (202).

6. The heat exchanger (100) as claimed in any of the preceding claims, wherein an end of the second part (204) is bent at angle and adapted to be fluidically connected to the first part (202) of the manifold (102A).

7. The heat exchanger (100) as claimed in any of the preceding claims, wherein the first part (202) is having same length as the second part (204).

8. The heat exchanger (100) as claimed in any of the preceding claims, wherein the first part (202) of the manifold (102A) comprises slots (302) adapted to receive the plurality of heat exchange elements (104).

9. The heat exchanger (100) as claimed in claim 8, wherein the plurality of heat exchange elements (104) is brazed to the first part (202) of the manifold (102A).

10. The heat exchanger (100) as claimed in any of the preceding claims, further comprising a sealing cap (304) provided at one end of the first part (202) to seal the cross-section of the first part (202) of the manifold (102A), and another end of the first part (202) being fluidically connected to the second part (204).

11. The heat exchanger (100) as claimed in any of the preceding claims, wherein the manifold (102A) is a tube having the first part (202) and the second part (204).

12. The heat exchanger (100) as claimed in claim 4, wherein an open end of the second part (204) of the manifold (102A) is connected to a connector (306) that adapted to enable connection to the external fluid circuit.

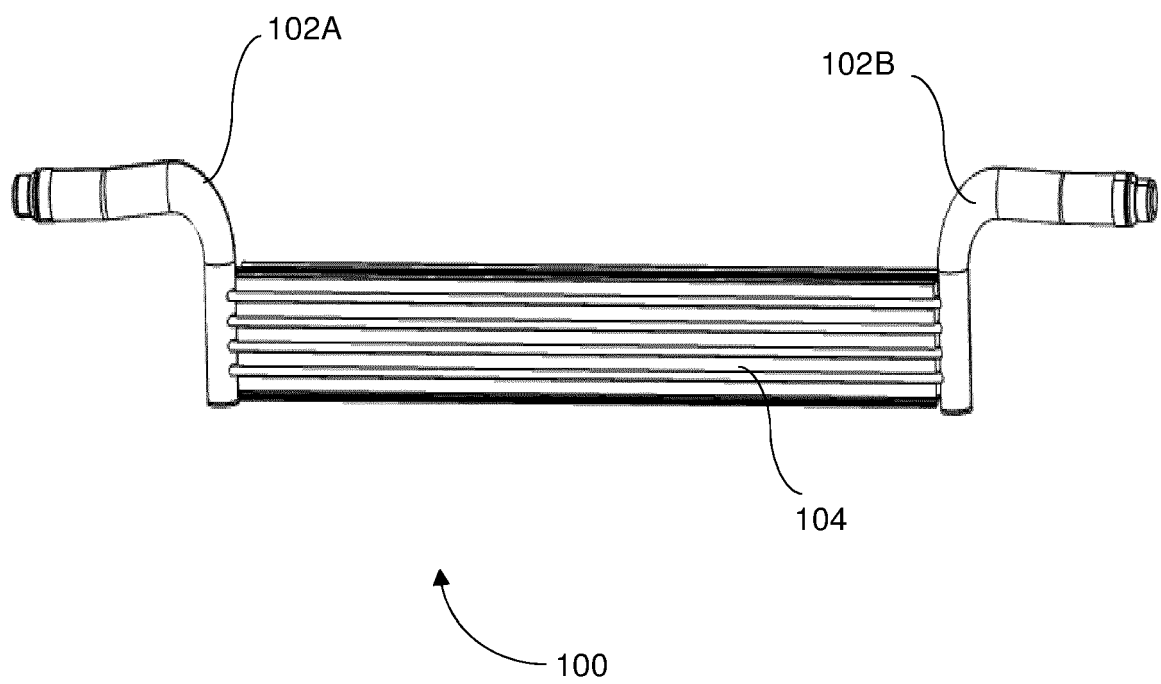


FIG. 1

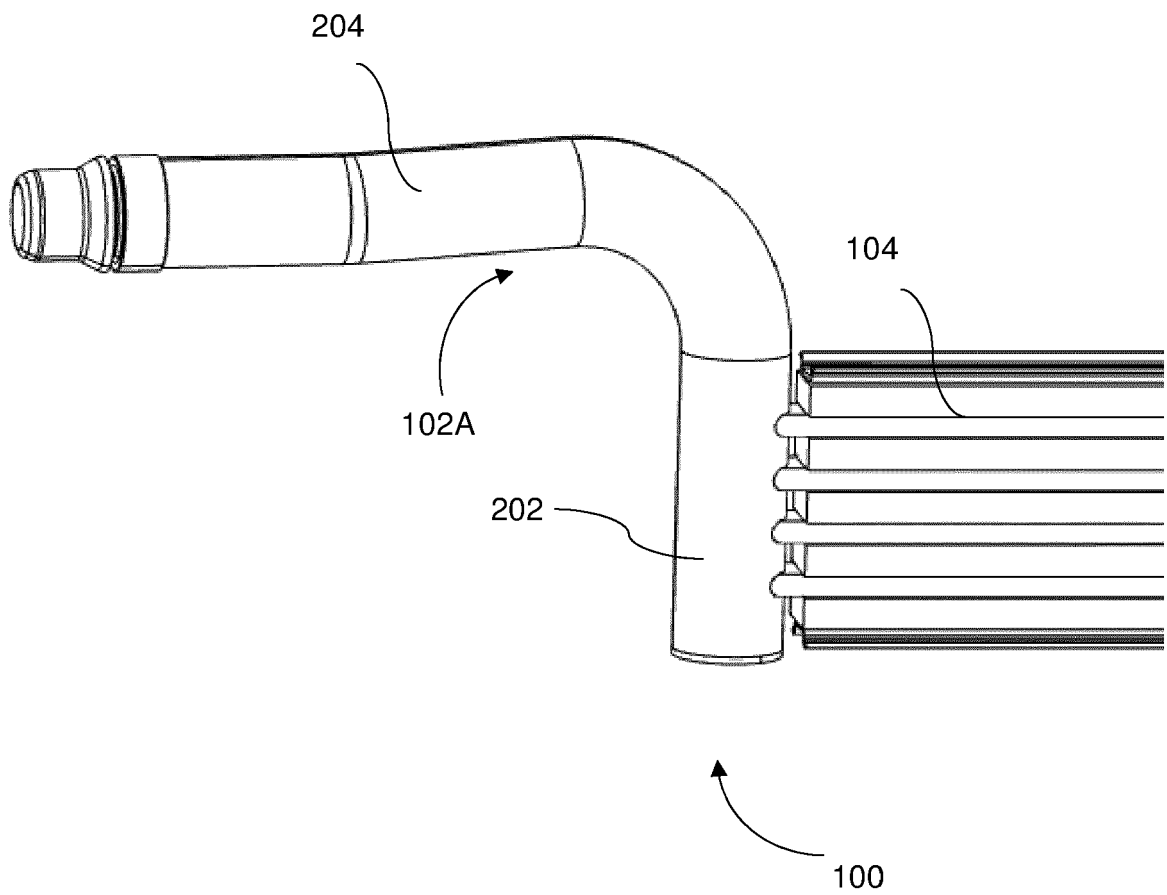


FIG. 2

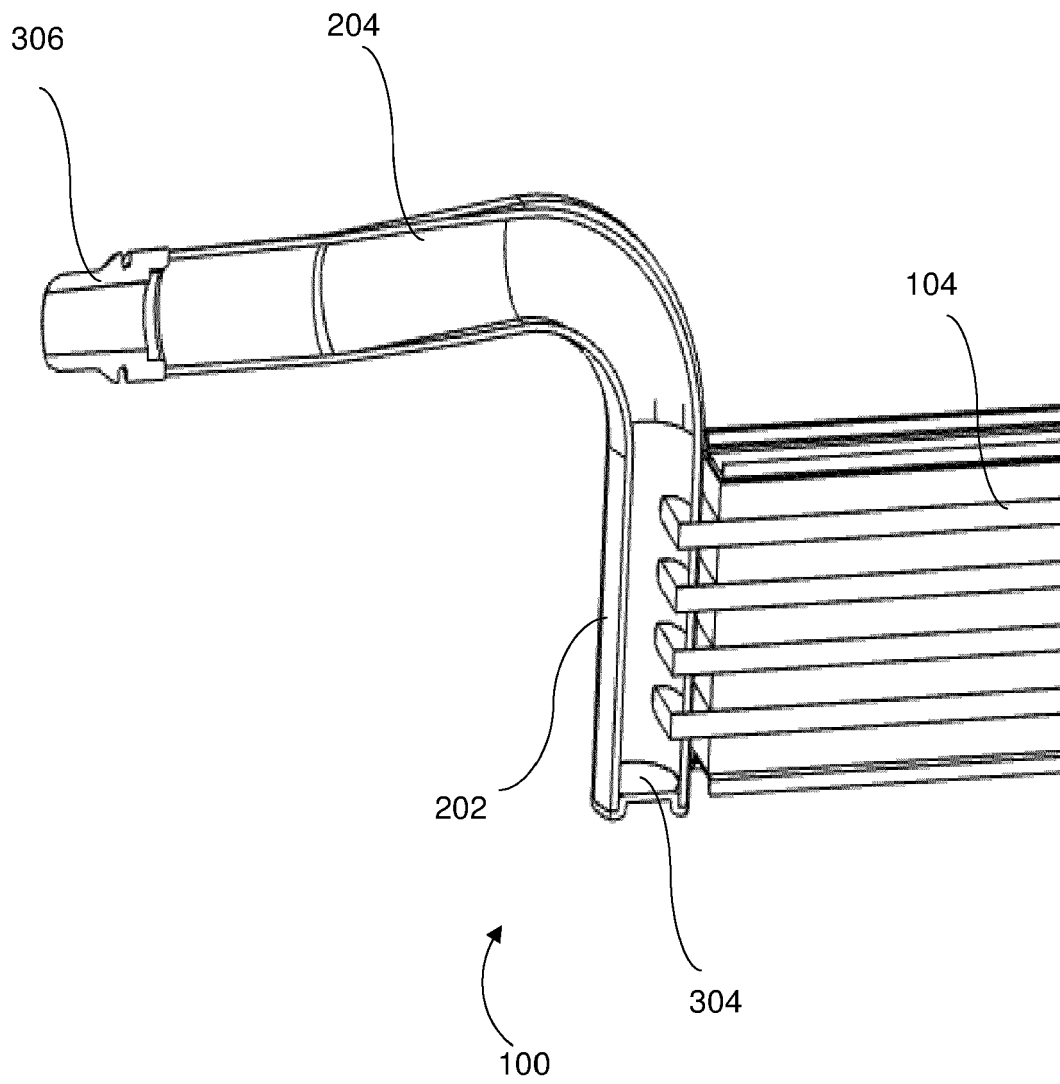


FIG. 3

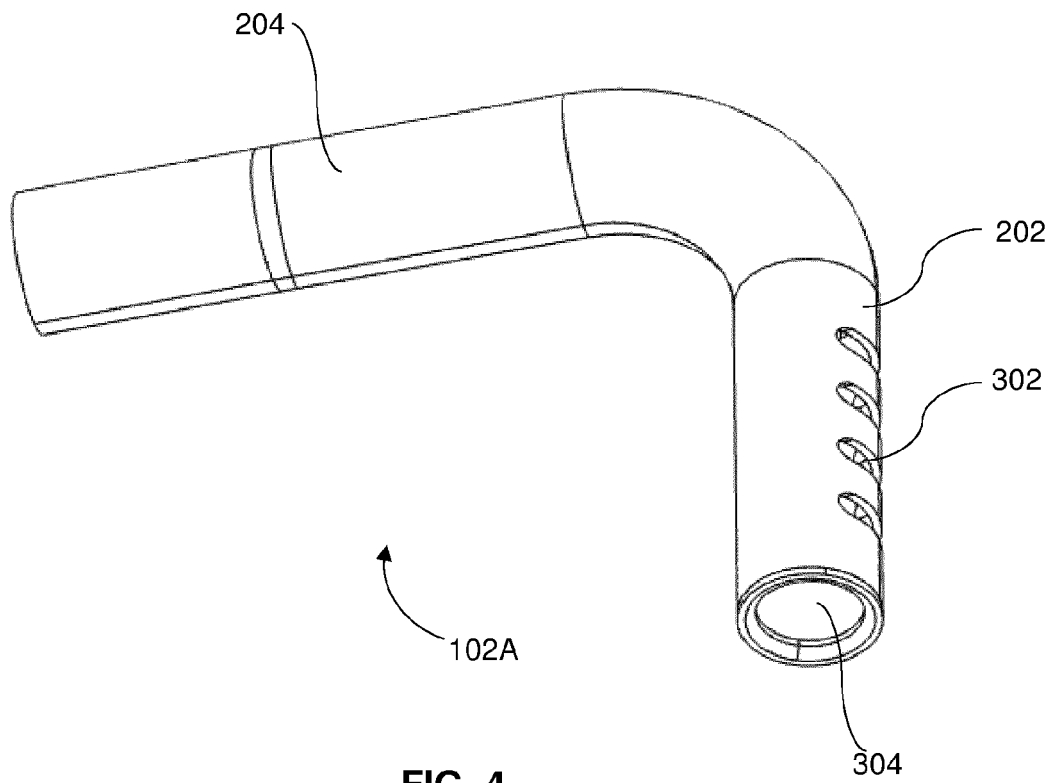


FIG. 4

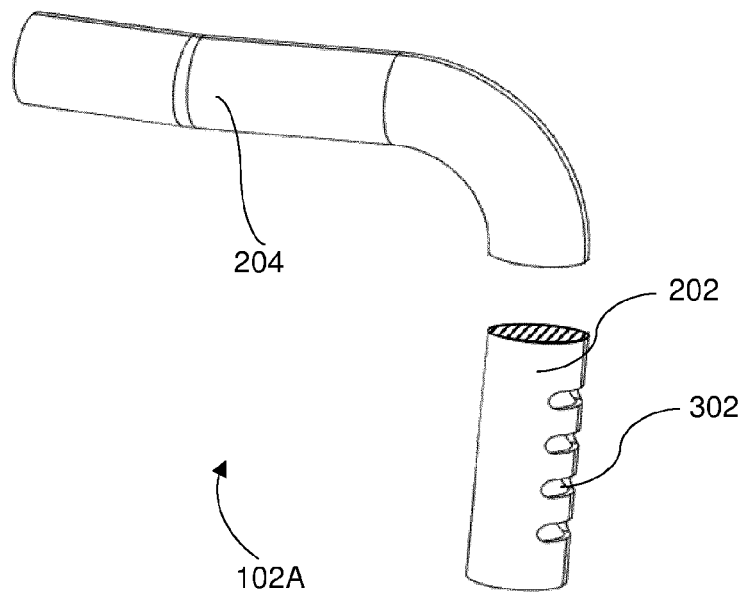


FIG. 5

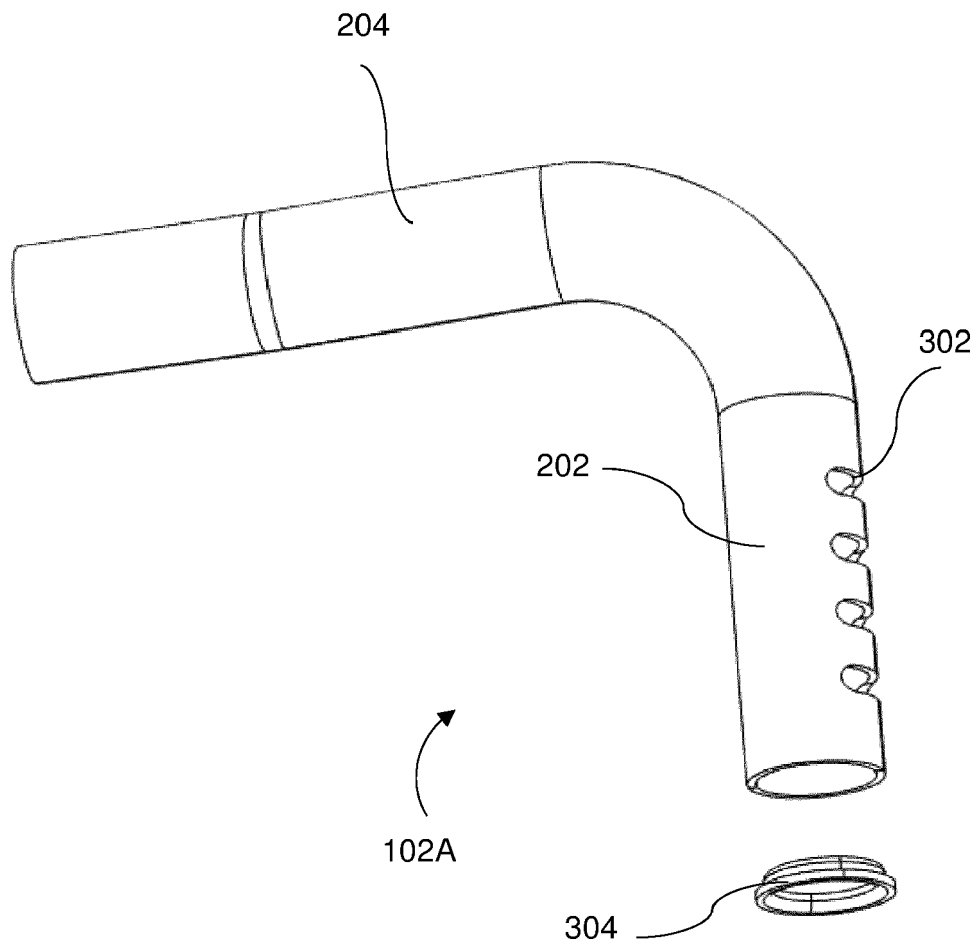


FIG. 6



EUROPEAN SEARCH REPORT

Application Number
EP 20 46 1533

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 11 September 2020	Examiner Martínez Rico, Celia
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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