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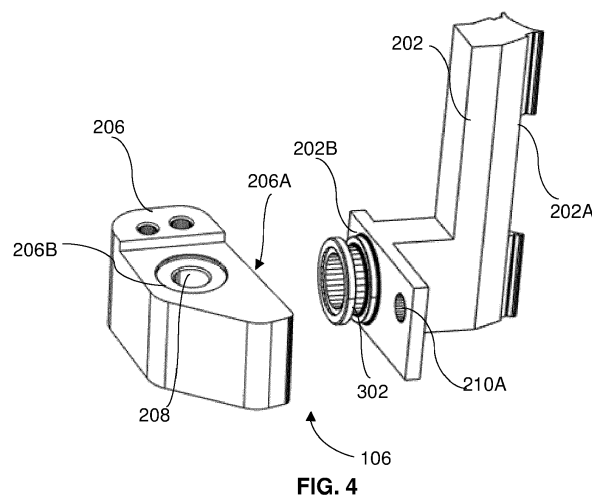
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(54) **A HEAT EXCHANGER WITH A CONNECTOR BLOCK**

(57) In view of the foregoing, an embodiment of the present invention herein provides a heat exchanger and a connector block connected to the heat exchanger. The connector block includes a first part having a first fluid channel, a second part having a second fluid channel, and a connecting member. The first part is connected to

the heat exchanger. Further, the second part is fixed to the first part by means of the connecting member so that the second fluid channel is fluidically connected to the first fluid channel. The second part is made of a synthetic material.



Description

[0001] The present invention generally relates to a heat exchanger provided with a connector assembly, more particularly to a hybrid connector assembly connected to a heat exchanger.

[0002] Generally, heat exchangers provided in Heating Ventilation and Air-conditioning (HVAC) enable heat exchange between two fluid circuits flowing there-through, one fluid circuit being a refrigerant loop and other fluid circuit being a coolant loop. Within the heat exchanger, the refrigerant loop may be formed through heat exchange tubes and the coolant loop may be formed around the heat exchange tubes. Further, connectors can be connected to the heat exchanger to introduce and receive the refrigerant to and from the heat exchange conduits. The connectors may be made of two parts, one part being connected to the heat exchanger and other part being connected to a fluid line carrying the refrigerant to or from the heat exchanger. Both parts of the connector are connected together by connecting means such as brazing, welding etc. Usually, both parts of the connectors are made of a metal alloy. As the connectors connected to the heat exchangers are of two parts, the heat exchanger can be used in the refrigerant loop of non-symmetrical routing. In addition, providing the connectors in two-part form enables them to have complex inner channels for the fluid. Although the two parts connectors are having lot of advantages, the connectors are cumbersome to manufacture in complex designs. As both parts of the connectors are alloy material, the connectors have to undergo a machining process to obtain the final connector, which is time-consuming process. Further, the metal alloy parts contribute to the cost and weight of the heat exchanger.

[0003] The heat exchangers may further provide a receiver drier integrated fluidically within the heat exchanger that may filter debris/pollutant from the refrigerant coming from a first part of the heat exchanger and entering a second part of the heat exchanger. However, such receiver drier does not filter the refrigerant across the entire heat exchanger. Therefore, there is possibility of having debris/pollutant content in the refrigerant exiting the heat exchanger. As a result, the debris present in the unfiltered sections may exit the heat exchanger and damage further components of the refrigerant loop.

[0004] Accordingly, there remains a need for a connector that obviates above-mentioned problems. Further, there remains another need for a two-part connector that is cost effective and economical.

[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 present invention herein provides a heat exchanger and a connector block connected to the heat exchanger. The connector block includes a first part having a first fluid channel, a second part having a second fluid channel, and a connecting member. The first part is connected to the heat exchanger. Further, the second part is fixed to the first part by means of the connecting member so that the second fluid channel is fluidically connected to the first fluid channel. The second part is made of a synthetic material.

[0007] In one embodiment, the first part is of a metal alloy and the second part is of a plastic material.

[0008] Further, the first part includes a protruded portion, formed at the end of the first fluid channel facing the second part, received in a portion of the second fluid channel of the second part.

[0009] The heat exchanger further includes an O-ring provided on the protruded portion, and a filter provided between the first fluid channel of the first part and the second fluid channel of the second part.

[0010] In one embodiment, the filter is provided within the protruded portion of the first part.

[0011] In another embodiment, the filter is provided outside of the protruded portion of the first part.

[0012] Preferably, the connecting member is a screw or a rivet.

[0013] In one embodiment, the first part is brazed to the manifold.

[0014] Preferably, the heat exchanger includes a first manifold, a second manifold, a plurality of heat exchange elements extended between the first manifold and a second manifold and the connector block.

[0015] In one embodiment, the first part of the connector block is brazed directly to the heat exchanger.

[0016] Preferably, the connector block is an outlet connector.

[0017] Preferably, the heat exchanger further includes an inlet connector block connected to the first manifold, and a baffle provided in the first manifold to divide the plurality of heat exchange elements into a first section of elements and a second section of elements.

[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 schematic views of a heat exchanger provided with connector blocks, in accordance with an embodiment of the present invention;

Fig. 3 illustrates a perspective view of a first connector block of Fig. 1;

Fig. 4 illustrates an exploded view of the first connector block depicting a first part and the second part of the first connector block;

Fig. 5 illustrates a perspective view of the second part of the first connector block of Fig. 3 and

Fig. 6 illustrates a perspective view of the first part of the first connector block of Fig. 3.

[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 needs be. The invention should however not be limited to the embodiment disclosed in the description.

[0020] The present invention relates to a heat exchanger, particularly to a heat exchanger provided with a split type connector for enabling refrigerant flow into the heat exchanger. Conventional split connectors were made of alloy materials that leads to increase in cost and weight of the connectors. Further, such conventional connectors are difficult manufacture in complex designs. To overcome such issues, one part of the connector amongst the two-part split connector is made of a synthetic material, such as plastic materials. Particularly, the part of the connector which is used to connect with an external fluid circuit is made of plastic.

[0021] Figs. 1 and 2 illustrate schematic views of a heat exchanger 100 provided with connector blocks 106, 108, in accordance with an embodiment of the present invention. The heat exchanger 100 includes a first manifold 102A, a second manifold 102B, and a plurality of heat exchange elements 104 extended between the first manifold 102A and the second manifold 102B. The plurality of heat exchange elements 104 is fluidically connecting the first manifold 102A with the second manifold 102B. In the present embodiment, the heat exchanger 100 is a two-pass heat exchanger, in which the refrigerant flows from the first manifold 102A to second manifold 102B, then from the second manifold 102B back to the first manifold 102A. The plurality of heat exchange elements 104, hereinafter referred to as heat exchange elements, is divided into a first section of elements 104A and a second section of elements 104B, so as to form two-pass heat exchanger. The heat exchanger 100 further includes a baffle 110 provided in the first manifold 102A to fluidically isolate the first section of elements 104A from the second section of elements 104B within the first manifold 102A. Further, the first section of elements 104A is fluidically connected to the second section of elements 104B through the second manifold 102B and a receiver drier 130 arranged parallel to the second manifold 102B.

[0022] Further, the heat exchanger 100 includes a first connector block 106 and a second connector block 108 adapted to enable refrigerant circulation to the heat exchange elements 104. The first connector block 106 is connected to the first manifold 102A to introduce/receive the refrigerant to/from the first section of elements 104A, depending on the type of the heat exchanger 100. Further, the second connector block 108 is connected to the

first manifold 102A, corresponding to the second section of elements 104B, to introduce/receive the refrigerant to/from the second section of elements 104B depending on the type of heat exchanger 100. In one embodiment, the heat exchanger 100 can be a condenser. In such case, the first connector block 106 can act as an outlet connector block that is adapted to receive the refrigerant from the heat exchange elements 104, and the second connector block 108 can act as an inlet connector block that is adapted to introduce the refrigerant to the heat exchange elements 104. In another embodiment, the heat exchanger can be an evaporator. In such case, the first connector block 106 can act as inlet connector block that is adapted to introduce the refrigerant to the heat exchange elements 104, and the second connector block 108 can act as an outlet connector block that is adapted to receive the refrigerant from the heat exchange elements 104.

[0023] In the present example, the first connector block 106 is a two-part split connector block and the second connector block 108 is a single part connector block. However, it is possible to have both the first and second connector blocks 106, 108 as the two-part split connectors in the present heat exchanger 100. According to the present invention, the first connector block 106 includes a first part 202 and a second part 206 fluidically connected to the first part 202. The first part 202 of the first connector block 106 may be connected to the first manifold 102A of the heat exchanger 100, while the second part 206 may be connected to a conduit carrying the refrigerant or the refrigerant loop. In one example, the first part 202 is directly brazed to the first manifold 102A of the heat exchanger 100.

[0024] Figs. 3 and 4 illustrates different views of the first connector block 106 of Fig. 1. In this example, Fig. 3 is a perspective view of the first connector block 106 and Fig. 4 is an exploded view of the first connector block 106 showing the first part 202 and the second part 206 of the first connector block 106. The first part 202 includes a first fluid channel 204 and the second part 206 includes a second fluid channel 208. The first part 202 is connected to the second part 206 in such a way that the first fluid channel 204 of the first part 202 is in fluidic communication with the second fluid channel 208 of the second part 206. The second part 206 is fixed to the first part 202 by means of a connecting member 210. In one embodiment, the connecting member 210 can be a screw, or a rivet, however it does not restrict to any type connecting member as long as the connecting member fixes the first part 202 with the second part 206 of the first connector block 106.

[0025] Further, the first part 202 and the second part 206 of the first connector block 106 are made of dissimilar materials. Particularly, the second part 206 is made of a synthetic material. In this example, the first part 202 is of a metal alloy and the second part 206 is of a plastic material. Further, a first side 202A of the first part 202 is connected to the first manifold 102A of the heat exchang-

er 100, while a second side 202B of the first part 202 is adapted to be connected to the second part 206 of the first connector block 106. The first fluid channel 206 is formed within the first part 202 in such a way that the first fluid channel 206 starts at the first side 202A of the first part 202 and ends at the second side 202B of the first part 202. In the present embodiment, a first side 206A of the second part 206 is adapted to be in contact with the second side 202B of the first part 202, when the first part 202 is fixed with the second part 206 of the first connector block 106. Further, the second fluid channel 208 is formed within the second part 206 in such a way that the second fluid channel 208 starts at the first side 206A of the second part 206 and ends at second side 206B of the second part 206.

[0026] The first connector block 202 further includes a protruded portion 302 formed on the first part 202 of the first connector block 106, particularly, the protruded portion 302 is formed on the first part 202 at the end of the first fluid channel 204 facing the second part 202. In other words, the protruded portion 302 is formed on the second side 202B of the first part 202 of the first connector block 106. Further, the protruded portion 302 of the first part 202 is adapted to be received in a portion of the second fluid channel 208 of the second part 206. In other words, at least a part of the protruded portion 302 is received within the second fluid channel 208 formed at the first side 206A of the second part 206 of the first connector block 106. The first part 202 of the first connector block 106 is directly brazed to the heat exchanger 100, particularly brazed to the first manifold 102A of the heat exchanger 100. The first connector block 106 further may include a complementary aperture 210A formed on the both first part 202 and second part 206 to receive the connecting member 210. Although the first and second parts 202, 206 are made of dissimilar materials, the connecting member 210 is capable to enabling fluid tight connection between the first part 202 and the second part 206 of the first connector block 106.

[0027] Figs. 5 and 6 illustrate perspective view of the first part 202 and the second part 206 of the first connector block 106 of Fig. 3. Particularly, Fig. 5 is a perspective view of the second part 206 of the first connector block 106 and Fig. 6 is a perspective view of the first part 202 of the first connector block 106. The heat exchanger 100 further includes an O-ring 304 provided on the protruded portion 302 of the first part 202. The protruded portion 302 along with the O-ring 304 is received with the second fluid channel 208 of the second part 206 of the first connector block 106. Further, the O-ring 304 ensure the fluid tight connection between the first part 202 and the second part 206 of the first connector block 106. The heat exchanger 100 further includes a filter 306 is provided between the first part 202 and the second part 206 of the first connector block 106. In one example, the filter 306 is provided within the protruded portion 302 of the first part 202 of the first connector block 106. In another example, the filter 306 is provided outside of the protruded

portion 302 of the first part 202 of the first connector block 106. The filter 306 is adapted to remove impurities and pollution from the refrigerant flowing there-through. Further, the filter 306 can be provided within the second connector block 108. Although above features are explained with respect the first connector block 106, it can be applied to the second connector block 108, in case the second connector block 108 is a two-part split type connector.

[0028] As the second part 206 of the connector 106 is of a plastic material, complex designs of the connector block can be achieved. In addition, weight and cost of the connector block can be controlled with the above-mentioned design. As the connector block can be designed in complex designs, the heat exchanger 100 can be connected to the non-symmetrical refrigerant loop or unconventional refrigerant loop.

[0029] All the above-described embodiments are just to explain the present invention while more embodiments and combinations thereof might exist. Hence, the present invention should not be limited to the above-described embodiments alone.

Claims

1. A heat exchanger (100) and a connector block (106) connected to the heat exchanger (100), wherein the connector block (106) comprises: a first part (202) comprising a first fluid channel (204), connected to the heat exchanger (100); a second part (206) comprising a second fluid channel (208); and a connecting member (210), wherein the second part (206) is fixed to the first part (202) by means of the connecting member (210) so that the second fluid channel (208) is fluidically connected to the first fluid channel (204), wherein the second part (206) is made of a synthetic material.
2. The heat exchanger (100) as claimed in claim 1, wherein the first part (202) is of a metal alloy and the second part (206) is of a plastic material.
3. The heat exchanger (100) as claimed in any of the preceding claims, wherein the first part (202) comprises a protruded portion (302), formed at the end of the first fluid channel (204) facing the second part (206), received in a portion of the second fluid channel (208) of the second part (206).
4. The heat exchanger (100) as claimed in claim 3, further comprising an O-ring (304) provided on the protruded portion (302).
5. The heat exchanger (100) as claimed in any of the preceding claims, further comprising a filter (306) provided between the first fluid channel (204) of the first part (202) and the second fluid channel (208) of

the second part (206).

6. The heat exchanger (100) as claimed in claim 5, wherein the filter (306) is provided within the protruded portion (302) of the first part (202). 5
7. The heat exchanger (100) as claimed in claim 5, wherein the filter (306) is provided outside of the protruded portion (302) of the first part (202). 10
8. The heat exchanger (100) as claimed in any of the preceding claims, wherein the connecting member (210) is a screw or a rivet.
9. A heat exchanger (100) as claimed in any of the preceding claims, further comprising: a first manifold (102A); a second manifold (102B); a plurality of heat exchange elements (104) extended between the first manifold (102A) and a second manifold (102B); and the connector block (106) as claimed in any of the preceding claims coupled to the first manifold (102A). 15 20
10. The heat exchanger (100) as claimed in any of the preceding claims, wherein the first part (202) is brazed directly to the heat exchanger (100). 25
11. The heat exchanger (100) according to claim 9, wherein the first part (202) is brazed to the manifold (102A). 30
12. The heat exchanger (100) as claimed in claim 9, wherein the connector block (106) is an outlet connector. 35
13. The heat exchanger (100) according to any of claims 9 - 12, further comprising an inlet connector block (108) connected to the first manifold (102A).
14. The heat exchanger (100) as claimed in any of the claims 9 -13, further comprising a baffle (110) provided in the first manifold (102A) to divide the plurality of heat exchange elements (104) into a first section of elements (104A) and a second section of elements (104B). 40 45

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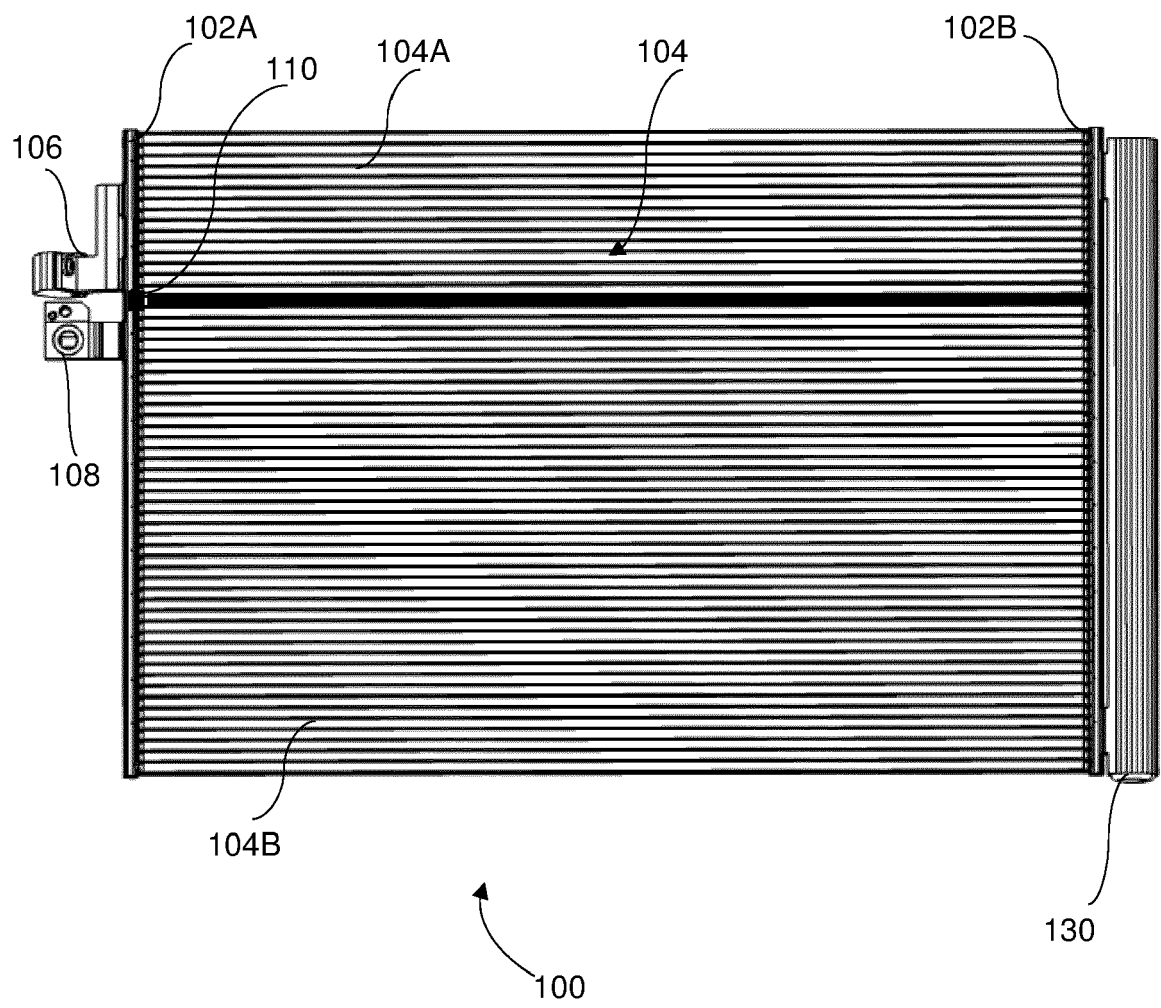


FIG. 1

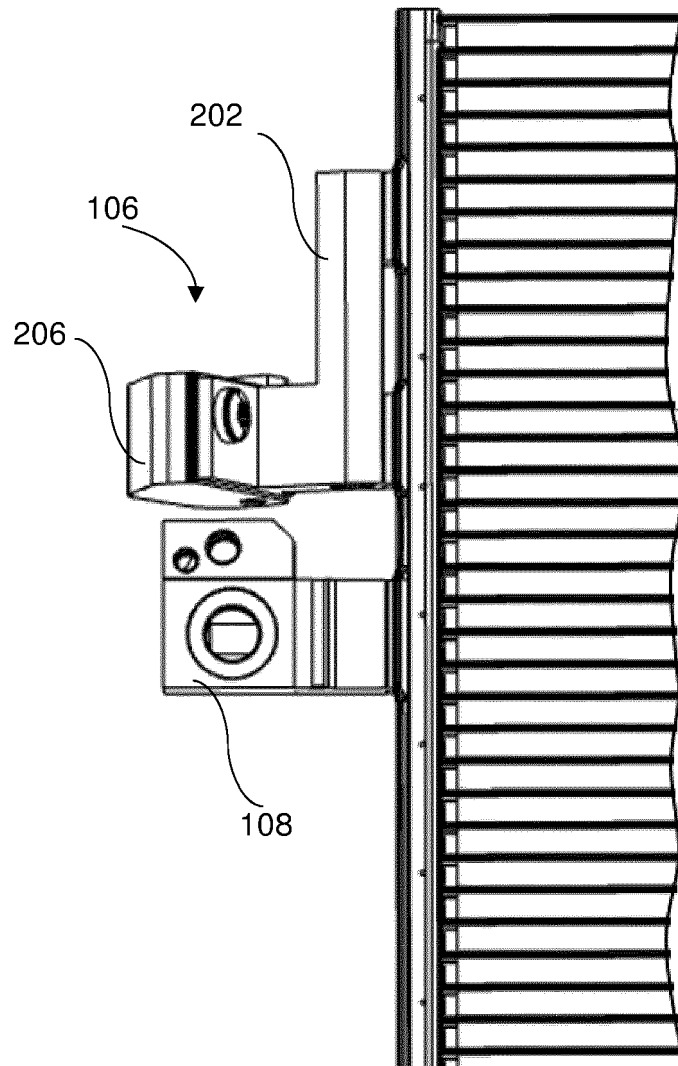


FIG. 2

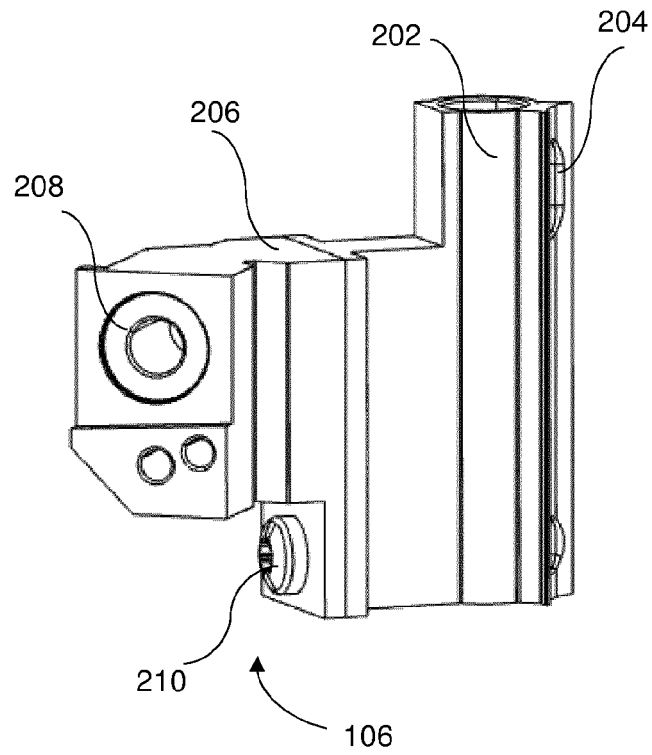


FIG. 3

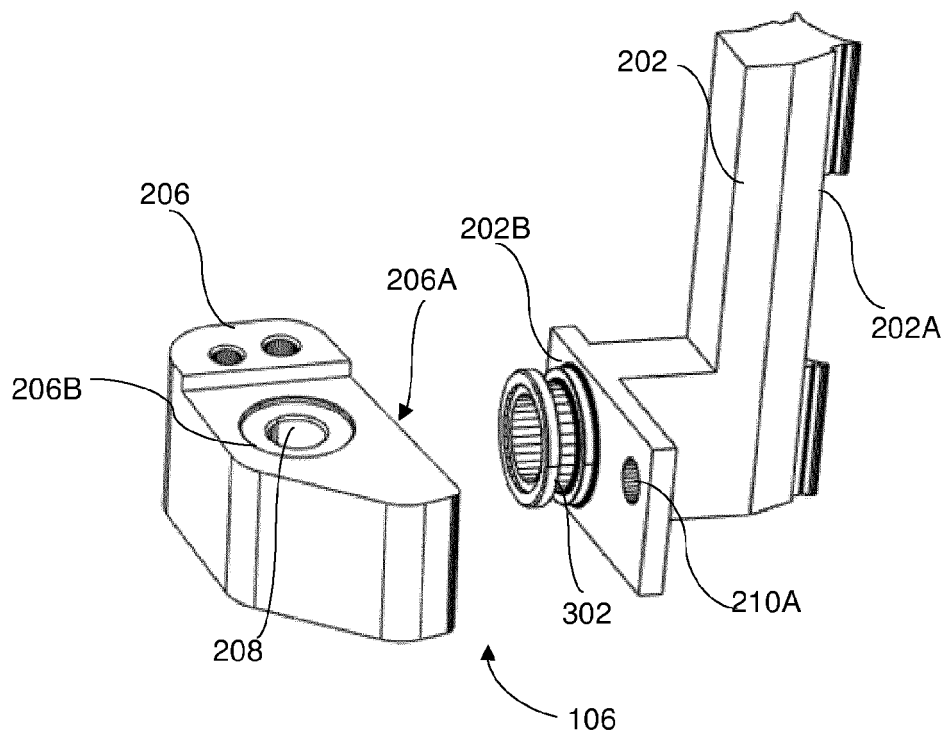


FIG. 4

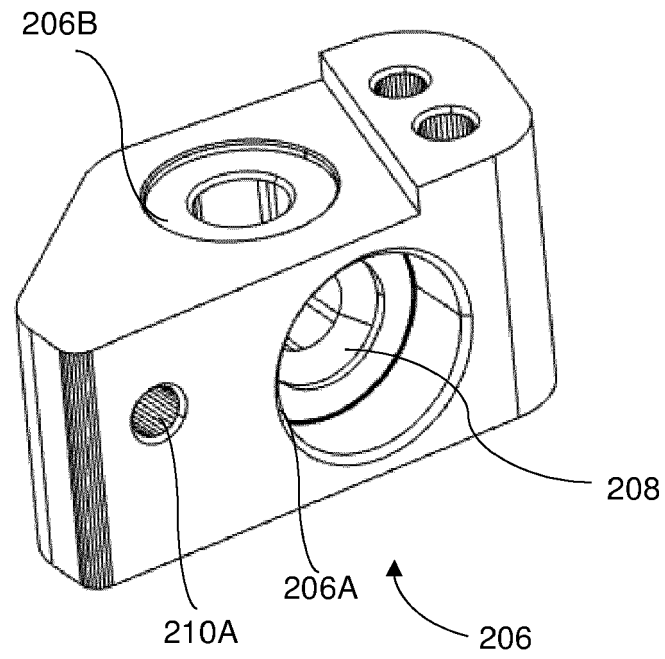


FIG. 5

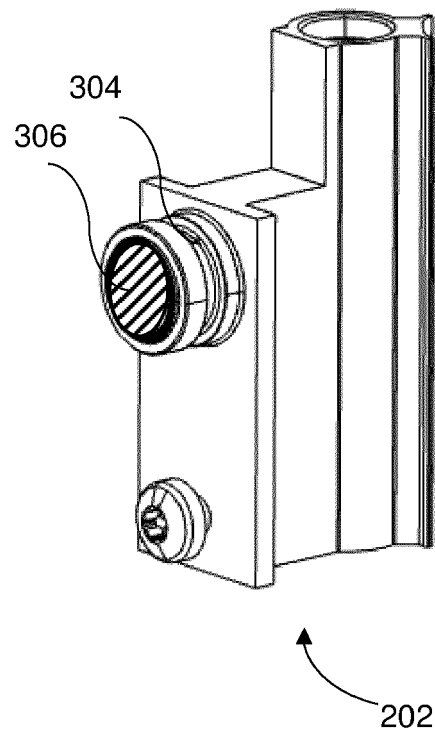


FIG. 6



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Place of search Munich		Date of completion of the search 9 February 2021	Examiner Bain, David
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