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(54) **ADAPTER FOR INSTALLING A HEAT EXCHANGER IN A MOTOR VEHICLE**

(57) Adapter (70) for installing a heat exchanger in a motor vehicle, the adapter (70) being hookable to a header plate (41, 42) of the heat exchanger and comprising a pair of identical adapter elements (71, 71). Each of the adapter elements (71, 72) comprises an end shell portion (71a, 72a) defining an end portion (71b, 72b) of a peripheral edge of the adapter (70), and a first channel portion (71c, 72c) and a second channel portion (71d, 72d) parallel to one another and extending from the end shell portion (71a, 72a), the first channel portion (71c, 72c) and the second channel portion (71d, 72d) defining respective lateral edge portions (71e, 72e, 71f, 72f) of the adapter (70). The adapter elements (71, 72) are coupled to one another in such a way that the first channel portion (71c, 72c) of each of the adapter elements (71, 72) is slidably inserted inside the second channel portion (71d, 72d) of the other of the adapter elements (71, 72).

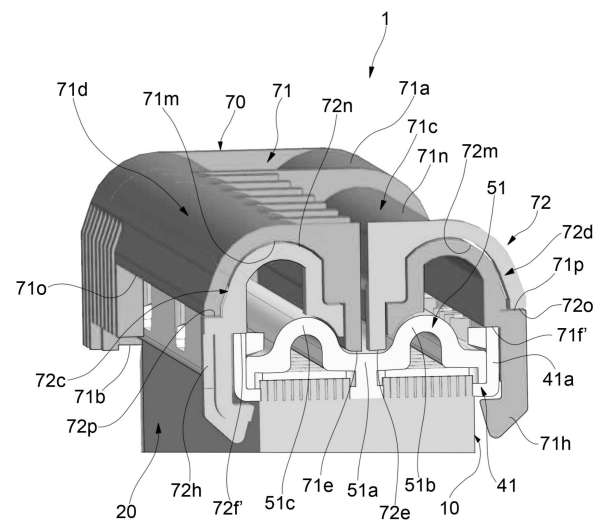


fig.2

Description

[0001] The present invention generally relates to heat exchangers for motor vehicles.

[0002] As is known, the gases used for the implementation of air-conditioning systems in the automotive industry are gradually being replaced by gases with a smaller greenhouse effect, such as carbon dioxide in particular. The different physical characteristics of carbon dioxide compared to fluorinated gases, such as for example R1234YF, result in that the heat exchangers sized for the use of carbon dioxide are more compact, in terms of both overall dimensions of the heat exchanger and transverse dimensions of the header tanks, compared to heat exchangers sized for fluorinated gases.

[0003] Thus arises the problem of having to install the new heat exchangers in the distribution boxes, the housings of which are configured to receive heat exchangers of the older design. Modifying the interfaces of such distribution boxes in order to adapt them to the new heat exchangers would entail significant industrial costs.

[0004] An object of the invention is to make available a solution that allows a new heat exchanger to be installed in its housing within the air-conditioning unit, without having to modify the features of the latter.

[0005] Said object is achieved according to the invention by means of an adapter for installing a heat exchanger in a motor vehicle, said adapter being hookable to a header plate of the heat exchanger so as to rest on a header tank of the heat exchanger, said adapter comprising a pair of identical adapter elements, wherein each of said adapter elements comprises an end shell portion defining an end portion of a peripheral edge of the adapter, and a first channel portion and a second channel portion parallel to one another and extending from the end shell portion, said first channel portion and second channel portion defining respective lateral edge portions of the adapter, wherein said adapter elements are coupled to one another in such a way that the first channel portion of each of said adapter elements is slidably inserted inside the second channel portion of the other of said adapter elements.

[0006] With the adapter according to the invention, it is therefore possible to change the interface on the heat exchangers, in order to be able to install the new heat exchangers on the distribution boxes with housings configured to receive the old interfaces, without having to modify the distribution boxes. The adapter is advantageously made of two identical elements that are assembled to one another in such a way that one is rotated 180° relative to the other. This is advantageous from a production standpoint, because both elements can be produced with a single mold, and also from the standpoint of installation because the assembly of the adapter on the heat exchanger is particularly simple, there being no mandatory mounting orientation of the adapter relative to the heat exchanger. Moreover, thanks to the fact that the two adapter elements can be made to slide relative to

one another, it is possible to adjust the length of the adapter according to the size of the heat exchanger to which the adapter must be coupled.

[0007] Preferred embodiments of the invention are defined in the dependent claims, which are to be understood as an integral part of the present description.

[0008] Further features and advantages of the invention will become clearer with the following detailed description of one embodiment of the invention, made with reference to the accompanying drawings, provided purely for illustrative and non-limiting purposes, wherein:

- Figure 1 is a perspective view of a heat exchanger provided with adapters according to the invention;
- Figure 2 is a sectional view of a portion of the heat exchanger of figure 1;
- Figures 3 and 4 are perspective views of one of the adapters in two different length configurations; and
- Figures 5 and 6 are perspective views of one of the identical elements of the adapter of figures 3 and 4.

[0009] With reference to figures 1 and 2, a heat exchanger is shown, denoted overall by number 1. In the illustrated example, the heat exchanger 1 is a fluid-heat-transfer-medium-to-air heat exchanger, in particular an evaporator of an HVAC system of a motor vehicle. In particular, the heat transfer fluid may be carbon dioxide.

[0010] The heat exchanger 1 is a double-row heat exchanger; it therefore comprises a first heat exchange row 10 and a second heat exchange row 20 superimposed one above the other. The superimposition relationship is referred to the direction of the air that crosses the heat exchanger 1 and carries out heat exchange with the heat transfer fluid inside the heat exchanger 1; said direction is orthogonal to the larger faces of the heat exchanger 1.

[0011] The first heat exchange row 10 comprises a first header and a second header and a plurality of parallel and coplanar ducts (not visible in the figures) that interconnect the first header and the second header of the first heat exchange row. The second heat exchange row 20 comprises a first header and a second header and a plurality of parallel and coplanar ducts (not visible in the figures) that interconnect the first header and the second header of the second heat exchange row. On opposite sides of the mass formed by the ducts of the first heat exchange row 10 and by the ducts of the second heat exchange row 20, two side plates 31 and 32 are fixed.

[0012] The above-described elements are joined to one another in a manner known per se, for example by brazing.

[0013] The first header of the first heat exchange row 10 and the first header of the second heat exchange row 20 are enclosed between a first header plate 41, shown in figures 1 and 2, and a first header tank 51, shown in figure 2. The first header tank 51 actually constitutes a double tank. The first header plate 41 and the first header tank 51

are joined in a manner known per se, for example by crimping and subsequent material-joining process, for example brazing.

[0014] The second header of the first heat exchange row 10 and the second header of the second heat exchange row 20 are enclosed between a second header plate 42 and a second header tank not visible in the figures, in an arrangement identical to that described above.

[0015] In each of the header plates 41 and 42 a plurality of slits is formed, more precisely two arrays of parallel slits, visible in figure 2. An end of a respective duct of the mass formed by the ducts of the first heat exchange row 10 and the ducts of the second heat exchange row 20 is inserted in each of said slits.

[0016] The heat exchanger further comprises two ducts 61, 62 respectively for inlet and outlet, for connection to a circuit of the heat transfer fluid (not illustrated). Moreover, within the header tanks there may conventionally be arranged baffles, openings, or communication holes in such a way that the heat transfer fluid is capable of making multiple passages within the heat exchanger. The arrangement of the fluid paths within the heat exchanger is not essential for the purposes of the invention.

[0017] Figure 2 shows a section taken at the first header plate 41 and the first header tank 51. As mentioned above, the arrangement of the second header plate 42 and the second header tank is identical, and therefore in the following description generic reference will be made to "header plate" and "header tank", without further qualifications.

[0018] An adapter 70 is hooked to the header plate 41 so as to rest on the header tank 51. The adapter 70 makes it possible to adapt the reduced dimensions of the exchanger and the shape of the header tank to those of a different type of heat exchanger having larger dimensions and a different profile of the header tank, in such a way that the heat exchanger in question can be installed in the same installation housing as the different type of heat exchanger. In figure 1, said installation housing within the motor vehicle is represented schematically by the dashed line A. In the case of an evaporator, in particular, the housing A is made inside a distribution box of an HVAC system. In this way it is possible to adapt a heat exchanger using carbon dioxide as heat transfer fluid so that it can be installed inside a distribution box that has been set up for the installation of a heat exchanger using a fluorinated heat transfer fluid, for example R1234YF.

[0019] With reference also to figures 3 to 6, the adapter 70 comprises a pair of identical adapter elements 71 and 72 made of plastic material. Each of the adapter elements comprises an end shell portion 71a, 72a defining an end portion 71b, 72b of a peripheral edge of the adapter 70, and a first channel portion 71c, 72c and a second channel portion 71d, 72d parallel to one another and extending from the end shell portion 71a, 72a. The first channel portion 71c, 72c and the second channel portion 71d, 72d

define respective lateral edge portions of the adapter 70, more precisely an inner lateral edge portion 71e, 72e and an outer lateral edge portion 71f, 72f of the adapter 70.

[0020] The adapter elements 71, 72 are coupled to one another in such a way that the first channel portion 71c, 72c of each of said adapter elements 71, 72 is slidably inserted inside the second channel portion 71d, 72d of the other of said adapter elements 71, 72. The two identical adapter elements 71, 72 are thus rotated by 180° relative to one another. As can be seen in figures 3 and 4, the length of the adapter 70 can be adjusted by sliding the adapter elements 71, 72 relative to one another (figure 4 shows the minimum length configuration, wherein the distal ends of the second channel portions 71d, 72d abut against respective stop walls formed on the end shell portions 71a, 72a). In this way the adapter 70 can be coupled with heat exchangers of different widths, as exemplified in figure 1 wherein the upper side of the heat exchanger has a header plate and a header tank having a length greater than the width of the duct mass, and the lower side of the heat exchanger has a header plate and a header tank with a length equal to the width of the duct mass. The adapter 70 coupled to the upper side of the heat exchanger will therefore be adjusted to a greater length than the adapter 70 coupled to the lower side of the heat exchanger.

[0021] At least one first hooking element 71g, 72g, in particular an elastically deformable hooking tooth, is formed on the end portion 71b, 72b of the peripheral edge of the adapter 70. At least one second hooking element 71h, 72h, in particular an elastically deformable hooking tooth, is formed on the lateral portion of the peripheral edge 71f, 72f of the adapter 70 at the first channel portion 71c, 72c. As can be seen in figure 2, the first hooking element 71g, 72g and the second hooking element 71h, 72h are configured to engage an undercut of the edge of the header plate 41, so as to achieve the coupling between the adapter 70 and the heat exchanger.

[0022] As can be seen in figure 2, an inner surface 71m, 72m of the second channel portion 71d, 72d of each of the adapter elements 71, 72 is complementary to an outer surface 71n, 72n of the first channel portion 71c, 72c of the other of the adapter elements 71, 72.

[0023] The second channel portion 71d, 72d of each adapter element 71, 72 comprises a peripheral edge portion 71o, 72o sliding along a step portion 71p, 72p formed on the outer surface 71n, 72n of the first channel portion 71c, 72c of the other adapter element 71, 72.

[0024] When the adapter 70 is hooked to the header plate 41, it rests on the header tank 51. In particular, the inner lateral edge portions 71e, 72e of the adapter 70 rest on a flat central portion 51a of the header tank 51, interposed between two tank portions 51b, 51c that delimit the headers of the two heat exchange rows. Inner stepped portions 71f, 72f of the outer lateral edge portions 71f, 72f of the adapter 70 rest on an edge wall 41a of the header plate 41 extending along the perimeter of the header

plate 41, and projecting orthogonally with respect to it.

portion (71d, 72d) of each of said adapter elements (71, 72).

Claims

1. Adapter (70) for installing a heat exchanger in a motor vehicle, said adapter (70) being hookable to a header plate (41, 42) of the heat exchanger so as to rest on a header tank (51) of the heat exchanger, said adapter (70) comprising a pair of identical adapter elements (71, 72), wherein each of said adapter elements (71, 72) comprises an end shell portion (71a, 72a) defining an end portion (71b, 72b) of a peripheral edge of the adapter (70), and a first channel portion (71c, 72c) and a second channel portion (71d, 72d) parallel to each other and extending from the end shell portion (71a, 72a), said first channel portion (71c, 72c) and second channel portion (71d, 72d) defining respective lateral edge portions (71e, 72e, 71f, 72f) of the adapter (70), wherein said adapter elements (71, 72) are coupled to each other in such a way that the first channel portion (71c, 72c) of each of said adapter elements (71, 72) is slidingly inserted within the second channel portion (71d, 72d) of the other of said adapter elements (71, 72).
2. Adapter according to claim 1, wherein at least one first hooking element (71g, 72g) is formed on the end portion (71b, 72b) of the peripheral edge of the adapter (70), and at least one second hooking element (71h, 72h) is formed on the lateral edge portion (71f, 72f) of the adapter (70) at the first channel portion (71c, 72c), said first hooking element (71g, 72g) and second hooking element (71h, 72h) being configured to engage an edge of the header plate (41, 42) of the heat exchanger.
3. Adapter according to any of the preceding claims, wherein an inner surface (71m, 72m) of the second channel portion (71d, 72d) of each of said adapter elements (71, 72) is complementary to an outer surface (71n, 72n) of the first channel portion (71c, 72c) of the other of said adapter elements (71, 72).
4. Adapter according to claim 3, wherein the second channel portion (71d, 72d) of each of said adapter elements (71, 72) comprises a peripheral edge portion (71o, 72o) sliding along a step portion (71p, 72p) formed on the outer surface (71n, 72n) of the first channel portion (71c, 72c) of the other of said adapter elements (71, 72).
5. Adapter according to any of the preceding claims, wherein said lateral edge portions of the adapter (70) comprise an outer lateral edge portion (71f, 72f) defined by the first channel portion (71c, 72c) of each adapter element (71, 72), and an inner lateral edge portion (71e, 72e) defined by the second channel
6. Heat exchanger comprising a header plate (41, 42) and a header tank (51) attached to the header plate (41, 42), and an adapter (70) according to any of the preceding claims, which adapter is hooked to the header plate (41, 42) and resting on the header tank (51).

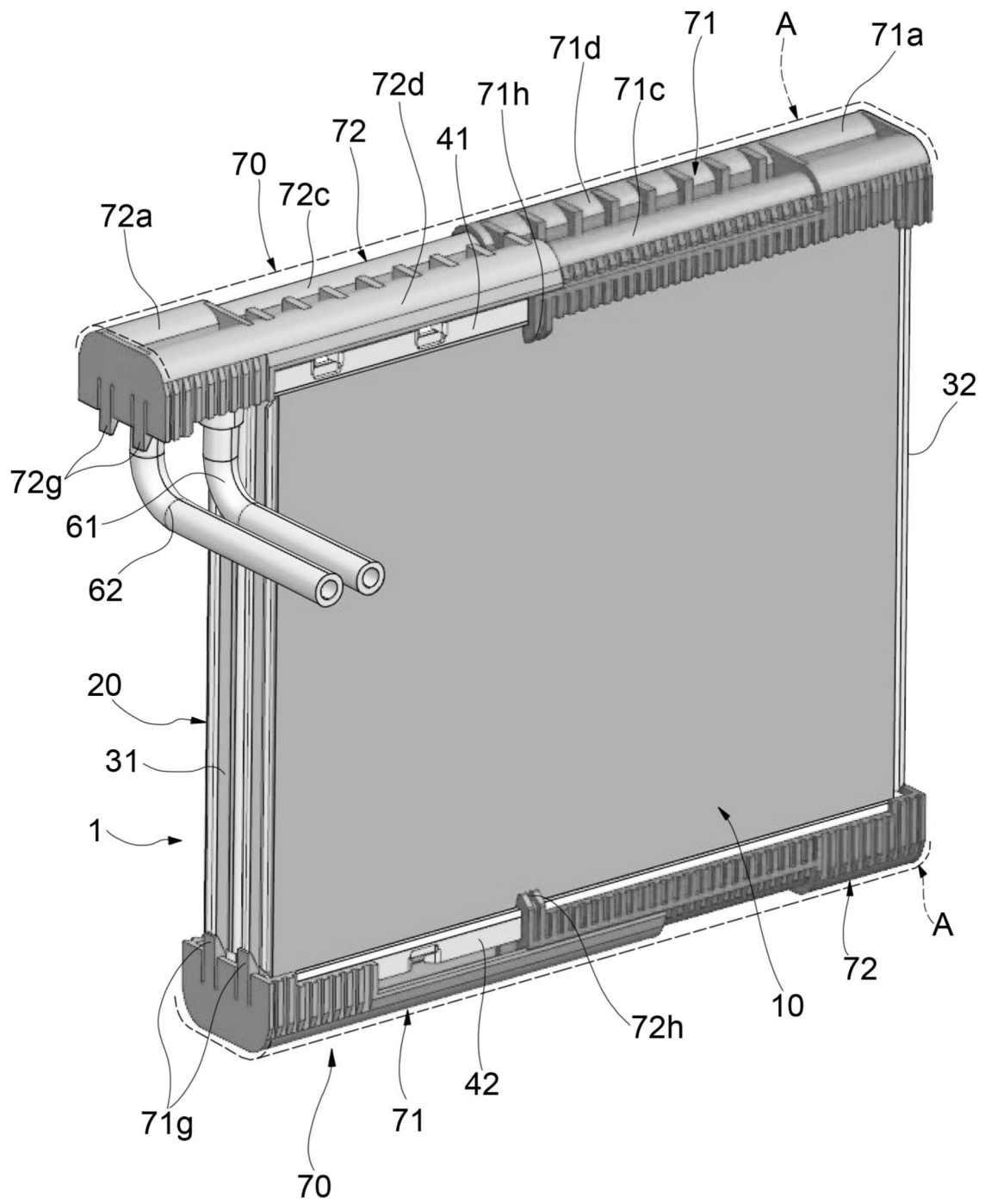


fig.1

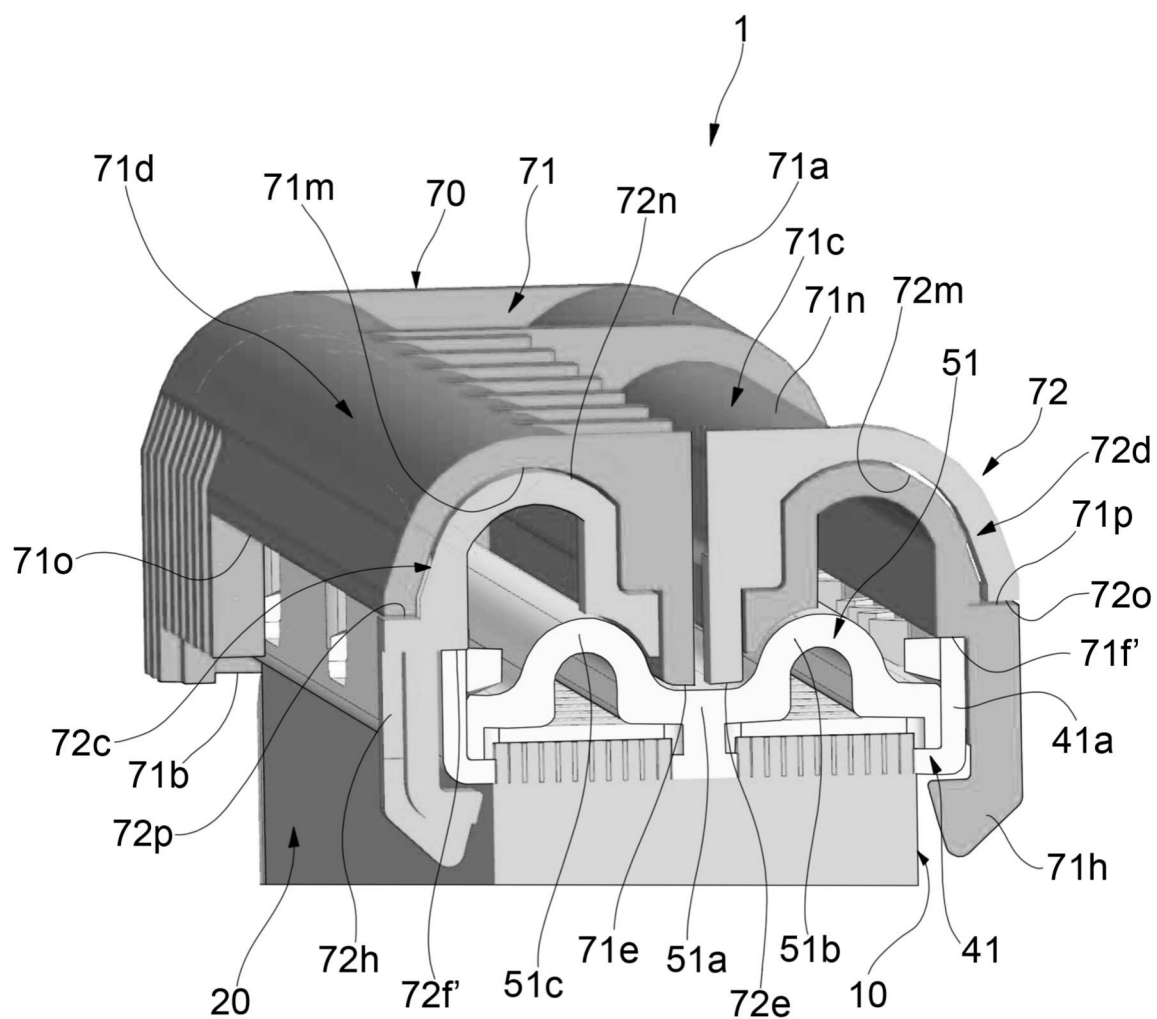


fig.2

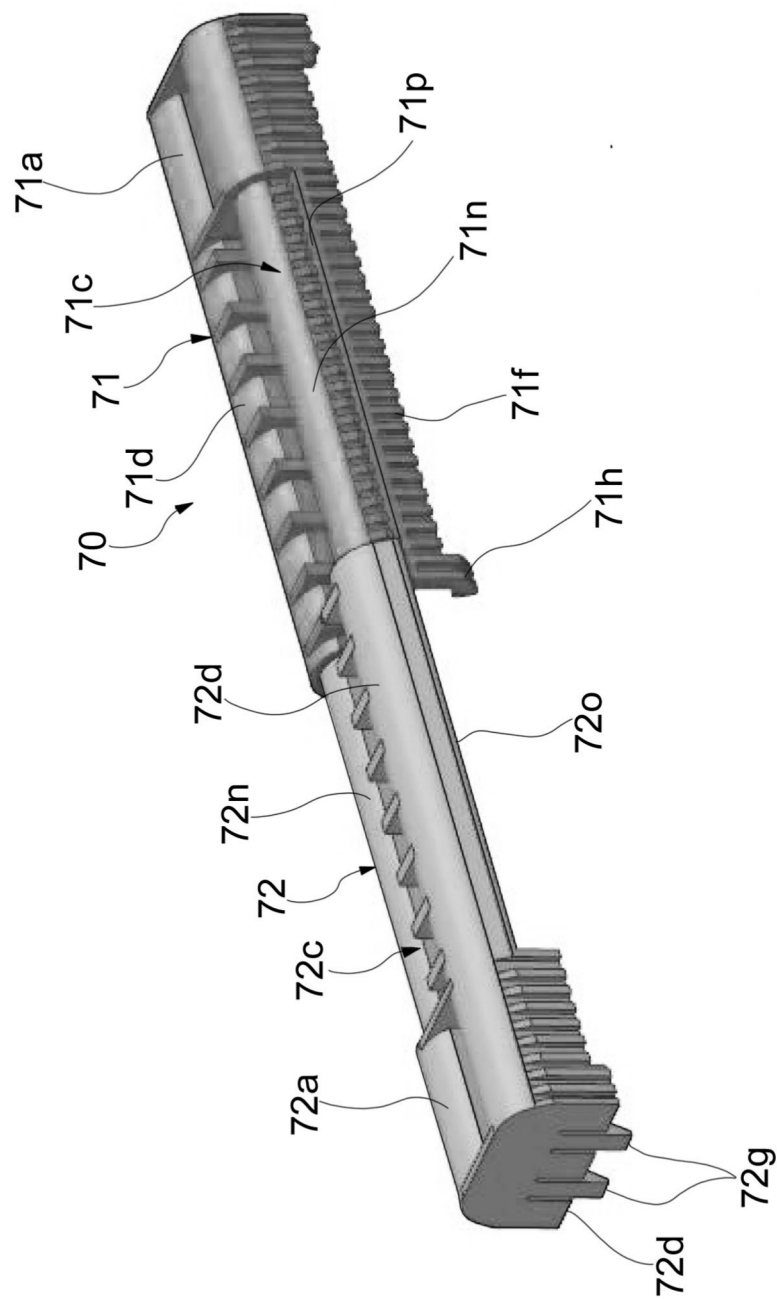


fig.3

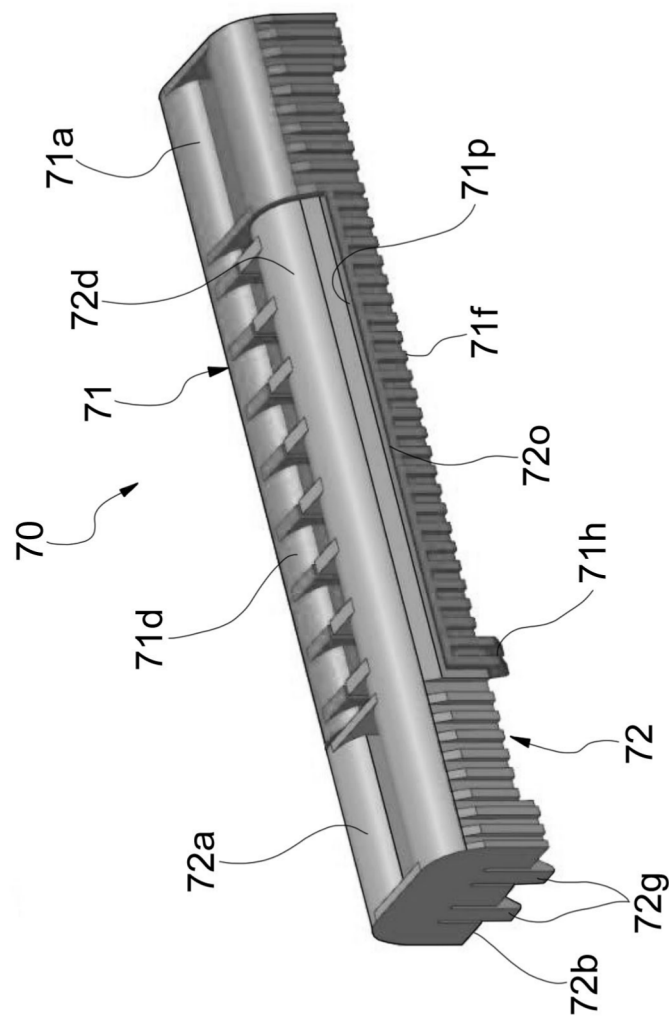


fig.4

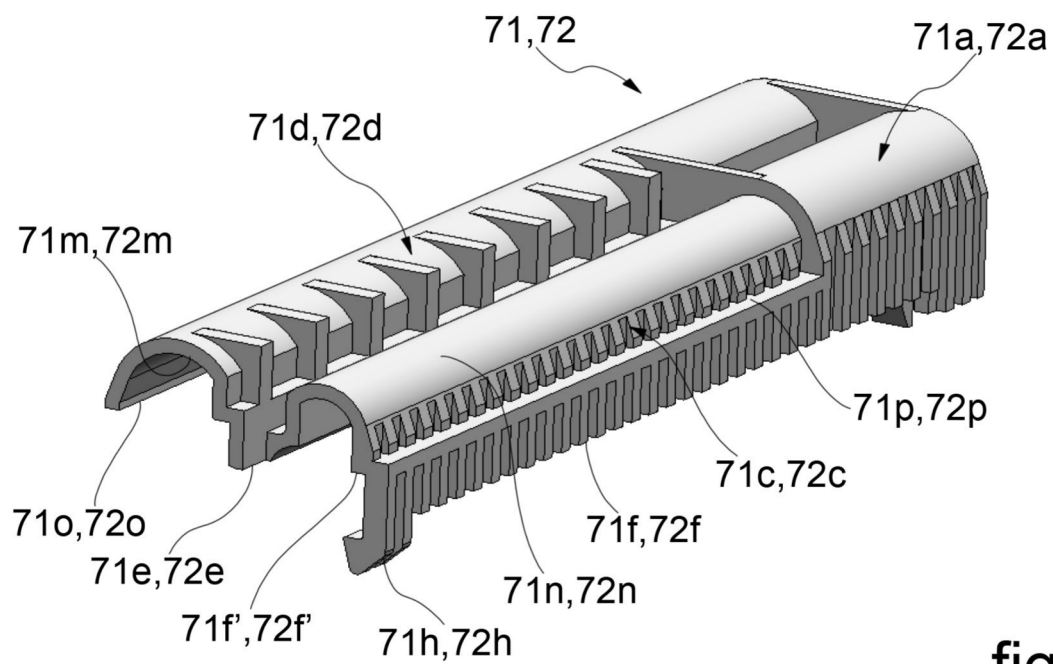


fig.5

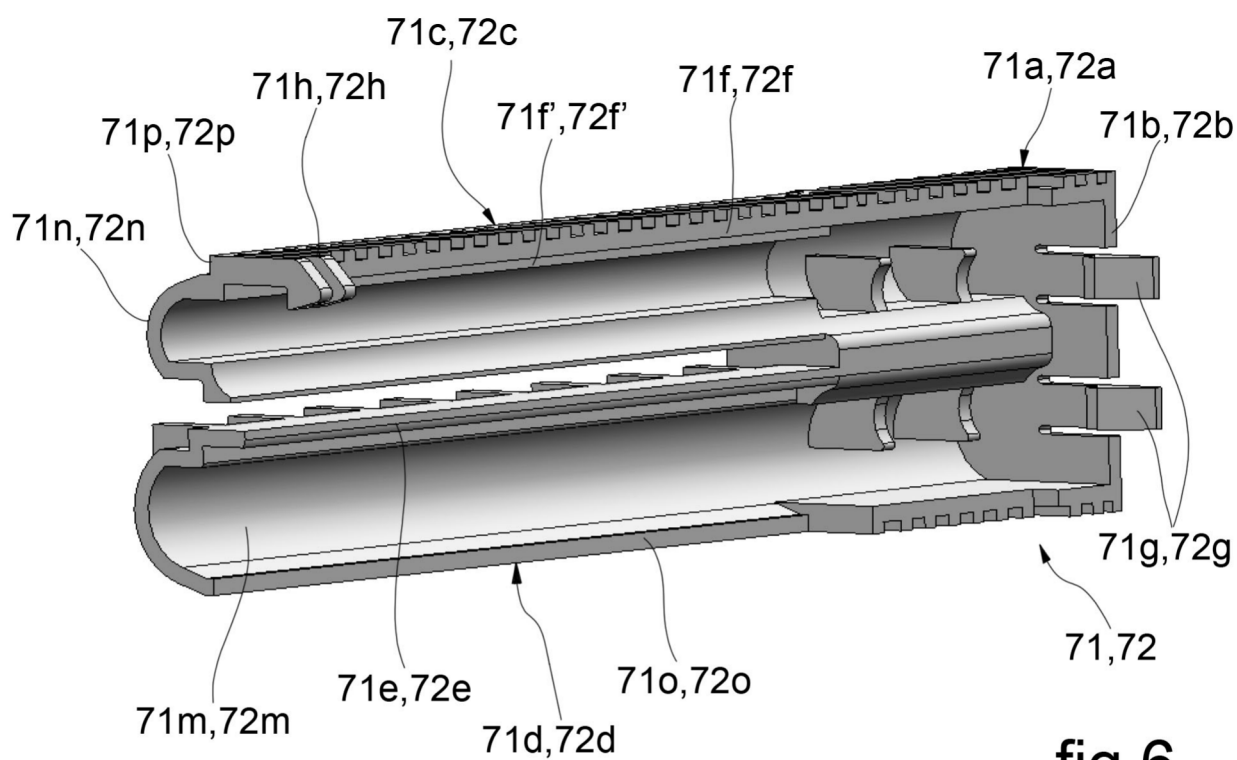


fig.6



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Application Number

EP 25 21 4503

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Munich		2 March 2026	Axters, Michael
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