Connector of a tubular element, in particular the connector of a condenser-integrated dryer tank of a refrigerating system

The invention relates to a connector (5a, 5b) of a tubular element, in particular a connector of a dryer tank (4) integrated with the header (3) of a refrigerating system condenser, such as vehicle air conditioning system.

The connector (5a, 5b) has a form of a shape stamped in a side surface of the dryer tank (4), said shape having at least two convex arms (51, 52) at each side of the dryer tank (4) longitudinal axis and an a butting face (53) defined by the arms (51, 52), wherein the shape of the butting face (53) corresponds to the side surface of the header (3), bonded to the dryer tank (4) by brazing. The butting face of the connector (5b) may have an orifice (54) corresponding to an orifice bored in the header (3).
Description

[0001] The invention relates to a connector of a tubular element, in particular a connector of a dryer tank integrated with the header of a refrigerating system condenser, such as vehicle air conditioning system.

[0002] In known vehicle air conditioning systems, the condenser and dryer tank commonly form two separate units, connected to each other by means of appropriate pipes, however in order to minimize the installation space there have been proposed constructions of a dryer integrated condensers.

[0003] An example of such a solution is disclosed in U.S. Pat. No. 5,546,761, where a receiver integrated refrigerant condenser, in which the receiver tank is disposed beside the second condenser header, has been presented. U.S. Pat. No. 5,884,503 discloses a condenser fluidly connected to a cylindrical liquid tank by means of at least two coupling brackets, being secured to an outer cylindrical surface of the header and an outer cylindrical surface of the liquid tank by means of brazing. Brackets comprise an additional passageway pipe inserted fixedly into the bracket, enabling the flow of a coolant between the header and the liquid tank.

It has been also proposed to bond the condenser header and the dryer together by brazing. However due to the curvature of these elements, their joint surface of connection does not ensure proper durability, especially during the condenser vibrations caused by vehicle operation. Difficulties arise also due to the required fluid connection between the header and the dryer and consequently due to the necessity of maintaining the high pressure leakproofness of such a connection.

[0004] The aim of the present invention is to provide a connector of a tubular element, having a simple, economical construction, which allows the brazing of this element to another longitudinal element with no need to modify the second element, and which ensures a precise, rigid connection of these elements, as well as durability for mechanical vibrations, and, where necessary, enables a high pressure, leakproof flow communication between these elements.

[0005] In particular, the aim of the present invention is to provide a connector of a dryer tank that will be able to be integrated with the typical header of condenser of a refrigerating system.

[0006] In accordance with the present invention there is provided a connector of a tubular element, which has the form of a shape stamped in a side surface of the tubular element, said shape having at least two convex arms at each side of the tubular element longitudinal axis and a butting face defined by the arms, wherein the shape of the butting face corresponds to the side surface of the longitudinal element, bonded to the tubular element by brazing.

[0007] The term "longitudinal element" as used herein, is to be understood as an element having a substantially constant cross-section, which length is greater than its diameter.

[0008] Since the connectors are stamped in the tubular element side surface during its manufacture from a metal sheet, which is subsequently bent cylindrically and closed e.g. by an overlap, the tubular element is already accommodated to be bonded to the longitudinal element with no need to perform additional assembling operations or to provide additional connectors or other connecting means. The connector construction ensures a controlled zone of brazing. Brazing takes place only on the butting face of the connector, which is large enough to provide a good durability of the connection.

[0009] Preferably the tubular element and/or the longitudinal element side surface is/are covered by a clad layer, which greatly facilitates the brazing operation.

[0010] The braze does not flow along the tubular and/or longitudinal element surface but due to a capillary brazing effect, is sucked into the gap between the side surface of the longitudinal element and the connector butting face, thus creating a durable connection.

[0011] It is particularly preferable if the tubular element is a dryer tank and the longitudinal element is the header of the condenser of a refrigerating system.

[0012] It is worth noting that the shape of the connector does not influence the dryer bore or internal passage, which is advantageous in case additional elements, such as a desiccant bag, are going to be placed inside the dryer.

[0013] The butting face of the connector preferably has an orifice corresponding to the appropriate orifice of the longitudinal element.

[0014] If the connector is used to join the dryer tank to the condenser header, orifices allows the flow of coolant between the header and the dryer tank.

[0015] The orifice is preferably made by lancing and has a collar.

[0016] The collar increases the sealability of the connection, and ensures and prevents the braze flowing inside the header.

[0017] The connector, according to the invention, is presented below on the basis of preferred embodiments in connection with the drawings on which:

Fig. 1 is a side view of a condenser-integrated dryer tank with connectors according to the present invention, after bonding condenser elements by brazing;

Fig. 2 is a top axonometric view of the dryer tank, having three connectors according to the present invention and a condenser header before their pre-assembling;

Fig. 3A and Fig. 3B is a top axonometric view of connectors according to the first and the second embodiment of the present invention respectively;
Fig. 4A and Fig. 4B 3 is a cross-section of connectors according to the first and the second embodiment of the present invention along the line A-A of Fig. 3.

Fig. 5 is a front view of the connector according to the second embodiment of the present invention, and

Fig. 6 is a rear view of the connector according to the second embodiment of the present invention.

[0018] The disclosed embodiment concerns connectors of a dryer tank integrated with the header of a vehicle air conditioning system condenser, therefore the tubular element is referred to below as the dryer tank and the longitudinal element as the header. However it is to be understood, that other applications of connectors according to the present invention, for joining other tubular elements by means of brazing are also possible. The longitudinal element may also have another cross-section other than circular, e.g. elliptical or even square.

[0019] The condenser 1 shown in Fig. 1 is a part of the refrigerating cycle of a vehicle air conditioning system, not shown in detail in the drawings, and is connected between the compressor and the expansion valve in a manner known to a person skilled in the art. The condenser is made of aluminium alloy and comprises a cooling core 2 consisting of plural parallel tubes and cooling fins, and two cylindrical headers 3 fluidly connected to the reciprocal ends of each tube. The cylindrical dryer 4 is fluidly connected to one header by means of three connectors 5a and 5b, the lower two of which enable flow of the coolant between the condenser header 3 and the dryer tank 4, while the top one serves only as a mounting point. Each connector has the form of a shape stamped in the side surface of the dryer tank 4. The stamps were made during the manufacture of the dryer tank 4 from an aluminium sheet covered by a clad layer. After stamping the connectors, the sheet, forming the dryer tank 4 was subsequently bent cylindrically and closed by an overlap 41. The completed dryer tank is a non-serviceable part closed by two end caps 42.

[0020] Fig. 2 shows the header 3 and the dryer tank 4 before the brazing operation. Each connector 5a and 5b has two convex arms 51 and 52 on each side of the dryer tank. The arms define the butting surface 53 of the connector that corresponds to the shape of the header 3 that will be bonded to the dryer tank. Additionally, connectors 5b comprise orifices 54 for the flow of coolant between the header and the dryer tank. After assembling the condenser, the entire unit is placed in a furnace, where the one-shot brazing process is carried out.

[0021] Fig. 3A show the connector 5a in an axonometric view and Fig. 4A in horizontal cross-section along the line A-A of Fig. 3a after bonding the dryer tank 4 with the header 3. As shown, during the furnace brazing of these elements, due to a capillary brazing effect, braze 6 is sucked into the gap between the header's side surface and the connector butting face 53, thus creating a durable connection.

[0022] The shape of the connector does not influence the dryer internal passage 43, which is advantageous, since there are no obstacles in placing additional elements, such as a desiccant bag, inside the dryer.

[0024] Fig. 3B and Fig. 4B show the second embodiment of the connector 5b with orifice 54. Orifice 54 was made during the stamping of the connector by a lancing technique. Consequently the orifice 54 comprises a shoulder 55 cooperating with an orifice 31 bored in the side surface of the header 3.

[0025] Fig. 5 shows the front view of the connector 5b and Fig. 6 the rear view, i.e. the view from inside the tubular element 3 of the connector 5b. As shown the arms 51 and 52 define and delimit the butting face 53, having an area large enough to provide a durable and strong connection.

Claims

1. A connector of a tubular element, characterised in that it has a form of a shape (5a, 5b) stamped in a side surface of the tubular element (4), said shape having at least two convex arms (51, 52) at each side of the tubular element (4) longitudinal axis and an a butting face (53) defined by the arms (51, 52), wherein the shape of the butting face (53) corresponds to the side surface of the longitudinal element (3), bonded to the tubular element (4) by brazing.

2. A connector as claimed in claim 1, characterised in that the tubular element (4) and/or the longitudinal element (3) is/are covered by a clad layer.

3. A connector as claimed in claim 1 or 2, characterised in that the tubular element is a dryer tank (4) and the longitudinal element is a header (3) of a refrigerating system condenser.

4. A connector as claimed in claim 1 or 2, characterised in that the butting face (53) of the connector (5b) has an orifice (54) corresponding to the orifice (31) of the longitudinal element (3).

5. A connector as claimed in claim 4, characterised in that the orifice (54) is made by lancing and comprises a collar (55).

6. A connector as claimed in claim 1 or 2, characterised in that the tubular element (4) is made of an aluminium alloy.
### DOCUMENTS CONSIDERED TO BE RELEVANT

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The present search report has been drawn up for all claims

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