(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 310 758 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
14.05.2003 Bulletin 2003/20

(51) Int Cl.[7]: **F28D 7/10**, F28F 9/04

(21) Application number: **02025173.2**

(22) Date of filing: **11.11.2002**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **12.11.2001 IT MI20010594**

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(54) Connection of an uncooled pipe and a cooled pipe in particular for double pipe heat exchangers

(57) A connection (10) between an uncooled pipe (11) and a cooled double-walled pipe (12) with air space (13) between walls run through by cooling fluid let into the air space through a side passage (14) near the connection. The connection comprises a connection zone (15) having a longitudinal section generally in fork form to have a single tubular end (16) connected to the uncooled pipe and an opposite double tubular end (17,18) to which are connected the corresponding walls (19,20) of the cooled double-walled pipe so that the bottom (21) of the fork constitutes an end closing of the air space. Near the fork between the two walls (17-20) is a baffle member (22) which diverts toward the bottom (21) of the fork the cooling fluid entering the air space through said side passage (14) before the cooling fluid starts to travel along the double-walled pipe.

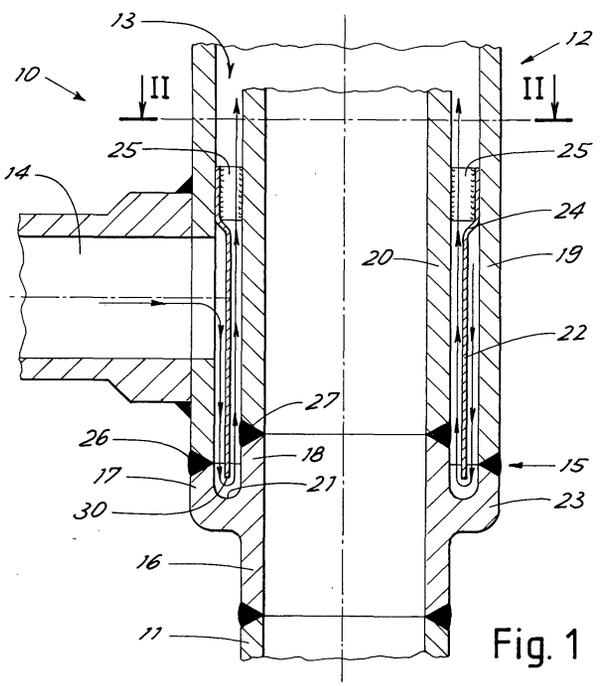

Fig. 1

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Description

[0001] The present invention relates to the connection between an uncooled pipe and a cooled pipe. In particular this type of connection is addressed to the realization of double-pipe heat exchangers to realize the so-called transfer line exchanger (TLE).

[0002] In the prior art the problems related to the connection between cooled pipes and uncooled pipes are well known. Indeed, the cooled pipe is basically realized with two coaxial pipes inserted one in the other to define an internal pipe run through by the hot fluid (for example the gas coming out of a furnace) and from an external jacket identifying the air space in which runs the cooling fluid (for example water) which is fed into the air space through a union on the side wall of the jacket near the end of the cooled pipe, This double-walled structure must be connected to the uncooled pipe which is single-walled.

[0003] To create a union between the pipes there is used a union member with a first tubular single-wall end on which is welded the uncooled pipe and a double-walled opposite end with the two concentric walls on which are welded respectively the internal tube and external jacket of the cooled pipe. The cross section of the union member can be assimilated with a fork.

[0004] In such a connection the walls of the pipes and of the fork union at the contiguous points display different temperatures which produce expansion harmful for the strength of the coupling. In addition the welds between the cooled tube and the fork union are in a zone not well cooled since the union for inlet of the cooling fluid into the air space is located further along the cooled pipe.

[0005] In the prior art it was sought to remedy this situation by placing in the internal zone of the fork a refractory material which would reduce heat transmission to the weld zone.

[0006] It was also proposed to connect the fork member and the cooled pipe only opposite the external jacket of the cooled pipe to allow independent thermal expansion for the internal parts of the pipe and union which are in contact with the hot fluid. This of course requires that the cooling air space in the cooled pipe be closed at the end of the pipe before it reaches the union member. Otherwise the hydraulic seal between the interior of the cooled pipe (run through by the hot fluid) and the air space of the cooling fluid would be lacking. In addition, another airspace containing the refractory is created more or less open to the hot fluid which disturbs the flow and which can start coke formation.

[0007] In addition to the complexity and the cost of realization, such a solutions suffers from periodic breakage or the refractory material which must therefore be replaced at considerable cost and labor. In addition, the arms of the fork which receive the insulating material must be relatively long to receive the insulating material in sufficient quantity and shift the junction between the fork union and the cooled pipe sufficiently far from the hot zone. This involves another increase in the costs of the connection since the fork member due to its nature must be made of higher quality and therefore more costly material compared with the rest of the structure.

[0008] The general purpose of the present invention is to remedy the above mentioned shortcomings by making available a stout and relatively economical connection between an uncooled pipe and a cooled pipe and in particular for realizing TLE exchangers.

[0009] In view of this purpose it was sought to provide in accordance with the present invention a connection between an uncooled pipe an a cooled pipe with double wall and with air space between walls run through by cooling fluid let into the air space through a side passage near the connection and comprising a zone of connection having a longitudinal section generally in fork form to have a single tubular end connected to the uncooled pipe and an opposite double tubular end to which are connected the corresponding walls of the cooled double-walled pipe so that the bottom of the fork constitutes an end closing of the air space characterized in that near the fork between the two walls is a baffle member which diverts toward the bottom of the fork the cooling fluid entering the air space through said side passage before the cooling fluid starts to travel along the double-walled pipe.

[0010] To clarify the explanation of the innovative principles of the present invention and its advantages compared with the prior art there is described below with the aid of the annexed drawings a possible embodiment thereof by way of non-limiting example applying said principles. In the drawings:

FIG 1 shows a longitudinal cross section view of the connection in accordance with the present invention, and
FIG 2 shows a view cross sectioned along plane of cut II-II of FIG 1.

[0011] With reference to the figures, FIG 1 shows the longitudinal cross section of a connection designated as a whole by reference number 10 and realized in accordance with the present invention. Said connection is made between an uncooled pipe (11) and a cooled double-walled pipe (12). The cooled pipe 12 has an airspace 13 between the walls run through by cooling fluid let into the air space through a side passage 14 near the connection.

[0012] The connection zone 15 has a longitudinal cross section generally shaped like a fork to have a single tubular end 16 connected to the uncooled pipe and an opposite double tubular end 17, 18 to which are connected the corresponding walls 19, 20 of the cooled pipe with double wall. In this manner the bottom 21 of the fork constitutes a terminal closing of the air space 13.

[0013] Near the fork between the two facing walls is a baffle member 22 which divers toward the bottom 21

of the fork the cooling fluid which enters the air space through the side passage 14 before the cooling fluid proceeds along the double-walled pipe.

[0014] As may be seen in the figure the forked connection zone 15 is advantageously made with a separate forked member 23 to the end 16 of which is welded the uncooled pipe and at the opposite double end 17, 18 is welded the double-walled pipe.

[0015] As may be seen in FIGS 1 and 2 the baffle member is formed of a cylindrical baffle plate arranged in an intermediate position between the double walls and with extension along the same double walls. A first end 24 of the cylindrical baffle plate opposite the bottom 21 of the fork is closed on the outermost wall of the air space while the opposite end 30 of the cylindrical baffle plate terminates near the bottom 21 of the fork to allow a space for passage of the fluid between the opposing faces of the baffle plate.

[0016] As may be seen again in FIG 1, near the first end 24 the baffle plate is advantageously bent outward to meet with the outermost wall of the air space so as to close the passage. Again advantageously, near said first end 24 of the baffle there are spacers 25 arranged radially in the air space as seen also in FIG 2.

[0017] The forked member has the two ends 17, 18 welded to the two walls of the double-walled pipe with weld zones 26, 27 of the two walls facing opposite faces of the baffle member 22.

[0018] To allow easy assembly of the connection the weld zone 26 of the outermost wall is nearer the bottom 21 of the fork with respect to the weld zone 27 of the innermost wall.

[0019] To facilitate uniform passage of the cooling fluid the bottom 21 of the fork is in rounded radial section with curvature axis generally near the free end of the baffle 22 to have a virtually constant section for passage of the fluid between the two faces of the baffle plate.

[0020] It is now clear that the predetermined purposes of the present invention have been achieved.

[0021] The cooling fluid is obliged to run along the path shown by the arrows in FIG 1. In this manner the connection zone is cooled effectively by the process fluid and no refractory layer in the bottom of the fork or other systems are necessary to hold temperatures low. The bottom can be shallow advantageously for cooling and economy of materials.

[0022] It was surprisingly found that a connection realized in this manner while not having all the complications of prior art connections is exceptionally strong and has long life while not displaying those points of maximum stress which were found in connections realized in accordance with the prior art and which were responsible for the inevitable periodic breakages.

[0023] Naturally the above description of an embodiment applying the innovative principles of the present invention is given by way of non-limiting example of said principles within the scope of the exclusive right claimed here.

[0024] For example the proportions of the parts can vary depending on specific practical requirements.

Claims

1. Connection (10) between an uncooled pipe (11) and a cooled double-walled pipe (12) with air space (13) between walls run through by cooling fluid let into the air space through a side passage (14) near the connection and comprising a zone of connection (15) having a longitudinal section generally in fork form to have a single tubular end (16) connected to the uncooled pipe and an opposite double-walled tubular end (17,18) to which are connected the corresponding walls (19,20) of the cooled double-walled pipe so that the bottom (21) of the fork constitutes an end closing of the air space **characterized in that** near the fork between the two walls (17-20) is a baffle (22) member which diverts toward the bottom (21) of the fork the cooling fluid entering the air space through said side passage (14) before the cooling fluid starts to travel along the double-walled pipe.

2. Connection in accordance with claim 1 **characterized in that** the forked connection zone (15) is realized with a separate forked member (23) at one end (16) of which is welded the uncooled pipe and at an opposite end (17,18) of which is welded the double-walled pipe.

3. Connection in accordance with claim 1 **characterized in that** the baffle member is made up of a cylindrical baffle plate (22) arranged in an intermediate position between the double walls and with extension along the double walls with a first end (24) of the cylindrical baffle which is opposite the bottom (21) of the fork being closed on the outermost wall of the air space and the opposite end (30) of the cylindrical baffle plate terminating near the bottom (21) of the fork to allow a space for passage of the fluid between the opposing faces of the baffle plate.

4. Connection in accordance with claim 3 **characterized in that** near said first end (24) the baffle plate is bent outward to join with the outermost wall of the air space.

5. Connection in accordance with claim 3 **characterized in that** near said first end (24) of the baffle plate there are spacers (25) arranged radially in the air space.

6. Connection in accordance with claims 2 and 3 **characterized in that** the fork member has the two ends (17,18) welded to the two walls of the double-walled pipe with weld zones (26,27) of the two walls facing

opposite faces of the baffle member (22).

7. Connector in accordance with claim 6 **characterized in that** the weld zone (26) of the outermost wall is nearer the bottom (21) of the fork than the weld zone (27) of the innermost wall.

8. Connection in accordance with claim 3 **characterized in that** the bottom (21) of the fork has a rounded radial cross section with curvature axis generally near the free end of the baffle plate (22) to have a virtually constant cross section for passage of the fluid between the two faces of the baffle plate.

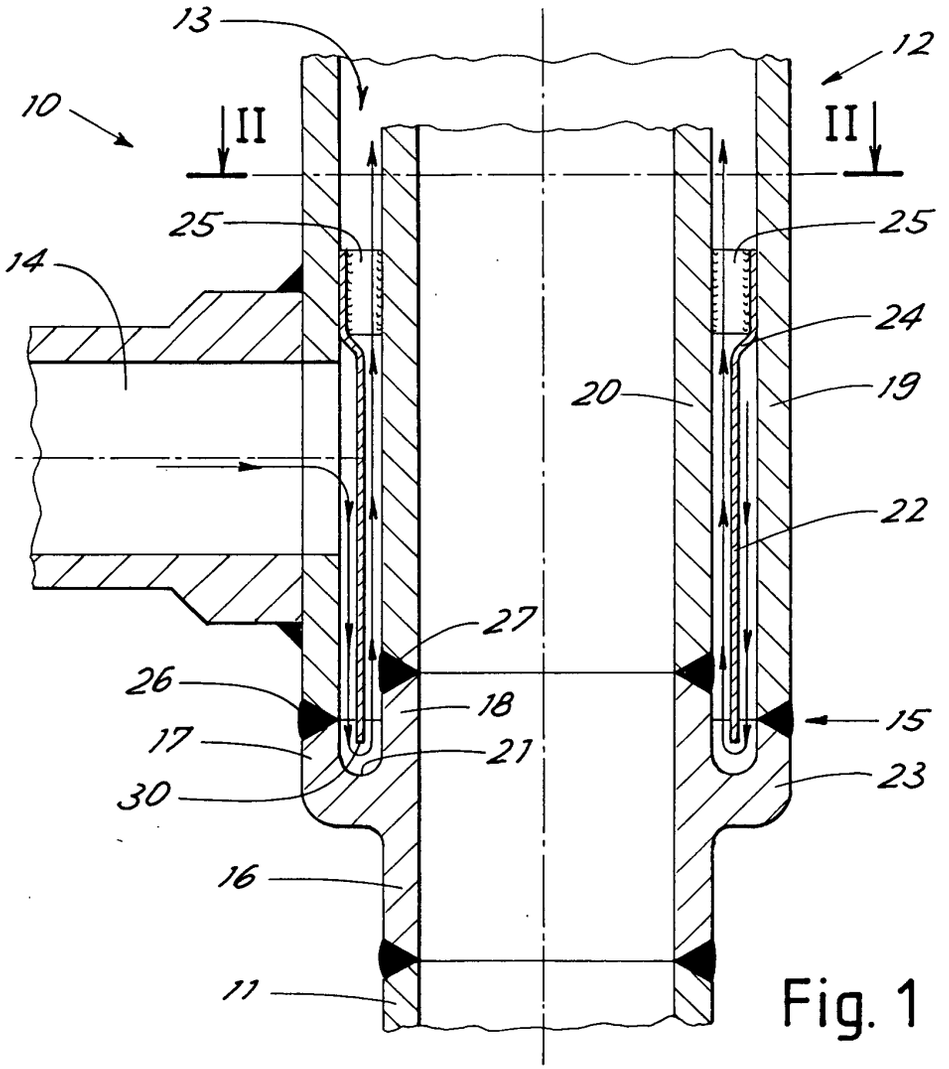
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Fig. 1

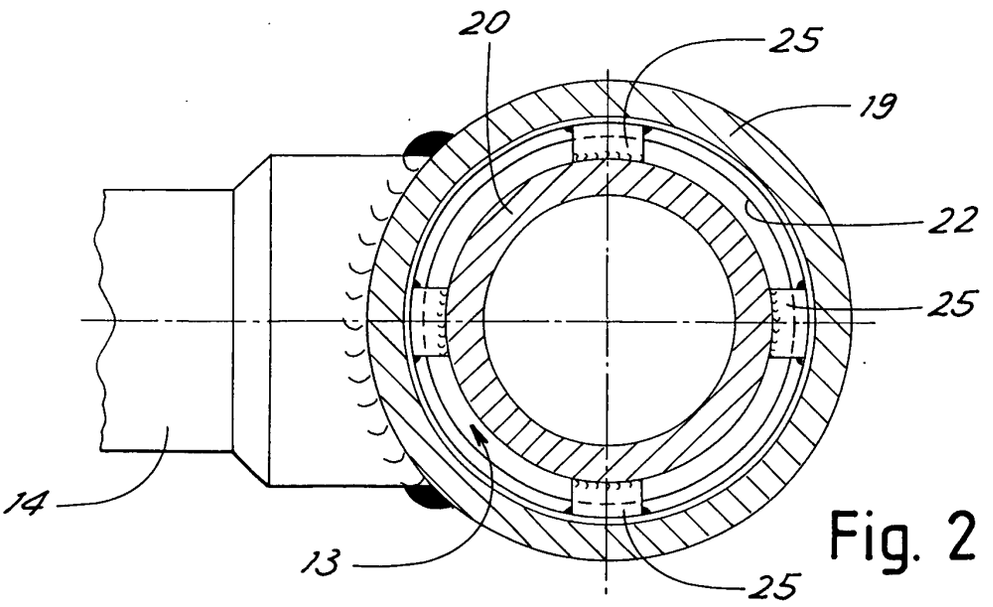
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Fig. 2