

**TITLE : PIPE MEMBER EQUIPPED WITH HEAT INSULATION CORE PIPELINE,
AUXILIARY HEAT CONDUCTION STRUCTURE AND U-SHAPED PIPELINE**

BACKGROUND OF THE INVENTION

5 (a) Field of the Invention

The present invention relates to a pipe member equipped with heat insulation core pipeline, auxiliary heat conduction structure and U-shaped pipeline for being installed within the thermal storage body (500) composed of natural thermal storage body, such as shallow surface of the earth, or pool, lake, river, ocean, or artificial objects in solid, or gaseous, or liquid state; wherein the pipe member equipped with heat insulation core pipeline, auxiliary heat conduction structure and U-shaped pipeline is constructed through that the piping segments of fluid inlet terminal and/or outlet terminal of the U-type core piping and loop piping are directly made of thermal insulating material, or thermal insulating structure is installed between the inlet terminal and the outlet terminal; so as to prevent thermal energy loss because of thermal conduction between adjacent piping segments of inlet terminal and outlet terminal on the same side when thermal conductive fluid with temperature difference passing through, and the exterior of the thermal insulating device (400) is further installed with an auxiliary thermal conductive structure (110) made of thermal conductive material, thereby preventing the thermal insulating device (400) from generating thermal resistance in the columnar thermal conductive body (300).

20 (b) Description of the Prior Art

Traditionally, thermal energy loss often occurs in U-type piping device of U-type piping heat exchanger, because of thermal conduction by temperature difference between adjacent piping segments of fluid inlet terminal and fluid outlet terminal installed on the same side when fluid with temperature difference passing through.

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SUMMARY OF THE INVENTION

The present invention relates to a U-type pipeline capable of thermal energy transmission

with each other in a radiate arrangement, wherein the piping segments of the U-type fluid piping inlet end and/or outlet end of the U-type piping capable of thermal energy transmission with each other in the radiate arrangement are directly made of thermal insulating materials, or a thermal insulating structure is installed between the inlet end and the outlet end; and the above piping
5 system is installed within the thermal conductive body made of thermal conductive material, so as to prevent thermal energy loss because of thermal conduction by temperature difference between adjacent piping segments with temperature difference of the inlet end and the outlet end installed on the same side when fluid with temperature difference passing through, and the exterior of the thermal insulating device (400) is further installed with an auxiliary thermal conductive structure
10 (110) made of thermal conductive material, thereby preventing the thermal insulating device (400) from generating thermal resistance in the columnar thermal conductive body (300).

According to another aspect of the present invention, a U-type pipeline for heat exchange with a thermal body comprises a first fluid inlet and outlet terminal 101; a second fluid inlet and outlet terminal 102; and a thermal insulating device 400 disposed around a part of the length of the
15 pipeline in the region of the first fluid inlet and outlet terminal 101, and having an auxiliary thermal conductive structure 110 disposed around the exterior of the thermal insulating device 400.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows an embodiment of conventional U-type piping (100) installed within the
20 thermal storage body (500).

FIG. 2 shows an embodiment of conventional U-type piping (100) installed within the columnar thermal conductive body (300), wherein the columnar thermal conductive body (300) is placed within the thermal storage body (500).

FIG. 3 is a schematic structural view illustrating the exterior of the thermal insulating device
25 (400) of the thermal insulating piping segment of the U-type piping (100) is installed with an auxiliary thermal conductive structure (110) made of thermal conductive material, according to the present invention.

FIG. 4 is a cross sectional view of FIG. 3.

FIG. 5 is a schematic structural view illustrating the exterior of the thermal insulating device (400) of the thermal insulating piping segment of the U-type piping (100) is installed with an auxiliary thermal conductive structure (110) made of thermal conductive material and the exterior
5 is enveloped by the columnar thermal conductive body.

FIG. 6 is a cross sectional view of FIG. 5.

DESCRIPTION OF MAIN COMPONENT SYMBOLS

- 100: U-type piping
- 10 101: First fluid inlet and outlet terminal
- 102: Second fluid inlet and outlet terminal
- 110: auxiliary thermal conductive structure
- 111: Thermal conductive fluid
- 300: Columnar thermal conductive body
- 15 400: Thermal insulating device
- 500: Thermal storage body
- 1011: Piping segment of the first fluid inlet and outlet terminal (101)

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

- 20 The present invention relates to a pipe member equipped with heat insulation core pipeline, auxiliary heat conduction structure and U-shaped pipeline for being installed within the thermal storage body (500) composed of natural thermal storage body, such as shallow surface of the earth, or pool, lake, river, ocean, or artificial objects in solid, or gaseous, or liquid state; wherein the pipe member equipped with heat insulation core pipeline, auxiliary heat conduction structure and
- 25 U-shaped pipeline is constructed through that the piping segments of fluid inlet terminal and/or outlet terminal of the U-type core piping and loop piping are directly made of thermal insulating material, or thermal insulating structure is installed between the inlet terminal and the outlet

terminal; so as to prevent thermal energy loss because of thermal conduction between adjacent piping segments of inlet terminal and outlet terminal on the same side when thermal conductive fluid with temperature difference passing through, and the exterior of the thermal insulating device (400) is further installed with an auxiliary thermal conductive structure (110) made of thermal conductive material, thereby preventing the thermal insulating device (400) from generating thermal resistance in the columnar thermal conductive body (300).

As for the pipe member equipped with heat insulation core pipeline, auxiliary heat conduction structure and U-shaped pipeline of the present invention, each of the U-type piping (100) is used for passing through one or more following thermal conductive fluid (111), including for passing through:

- 1) liquid state fluid;
- 2) gaseous state fluid;
- 3) liquid to gaseous state fluid; and
- 4) gaseous to liquid state fluid.

Traditionally, thermal energy loss often occurs in U-type piping device of U-type piping heat exchanger, because of thermal conduction by temperature difference between adjacent piping segments of fluid inlet terminal and fluid outlet terminal installed on the same side when fluid with temperature difference passing through, which is illustrated by examples as followings:

FIG. 1 shows an embodiment of conventional U-type piping (100) installed within the thermal storage body (500); when the thermal conductive fluid (111) passing through the piping segment of the first fluid inlet and outlet terminal (101) and the adjacent piping segment of the second fluid inlet and outlet terminal (102) respectively installed on the same side of the U-type piping (100) are in temperature difference, the two piping segments will produce thermal conduction and therefore result in thermal energy loss.

FIG. 2 shows an embodiment of conventional U-type piping (100) installed within the columnar thermal conductive body (300), wherein the columnar thermal conductive body (300) is placed within the thermal storage body (500).

When the columnar thermal conductive body (300) is installed at the pipe member equipped with heat insulation core pipeline, auxiliary heat conduction structure and U-shaped pipeline of the thermal storage body (500) composed of natural thermal storage body, such as shallow surface of the earth, or pool, lake, river, ocean, etc, or artificial objects in solid, or gaseous, or liquid state, and the thermal conductive fluid (111) with temperature difference passes through the first fluid inlet and outlet terminal (101) and the second fluid inlet and outlet terminal (102) of the U-type piping, there will be thermal energy loss, because of thermal conduction between adjacent piping segments of the first fluid inlet and outlet terminal (101) and the second fluid inlet and outlet terminal (102) installed on the same side;

The present invention relates to a pipe member equipped with heat insulation core pipeline, auxiliary heat conduction structure and U-shaped pipeline for being installed within the thermal storage body (500) composed of natural thermal storage body, such as shallow surface of the earth, or pool, lake, river, ocean, etc, or artificial objects in solid, or gaseous, or liquid state; wherein the pipe member equipped with heat insulation core pipeline, auxiliary heat conduction structure and U-shaped pipeline is constructed through that the piping segments of the U-type fluid piping inlet terminal and/or outlet terminal, which are radial U-type pipelines for passing thermal energy through each other, are directly made of thermal insulating material, or thermal insulating structure is installed between the inlet terminal and the outlet terminal; so as to prevent thermal energy loss because of thermal conduction between adjacent piping segments of inlet terminal and outlet terminal on the same side when thermal conductive fluid with temperature difference passing through.

FIG. 3 is a schematic structural view illustrating the exterior of the thermal insulating device (400) of the thermal insulating piping segment of the U-type piping (100) is installed with an auxiliary thermal conductive structure (110) made of thermal conductive material, according to the present invention.

FIG. 4 is a cross sectional view of FIG. 3.

As shown in FIG. 3 and FIG. 4, it mainly consists of:

--U-type piping (100): made of U-type tubular body for the thermal conductive fluid (111) passing through, wherein the U-type piping (100) is composed of a piping structure and installed in the thermal storage body (500); the U-type piping (100) has the first fluid inlet and outlet terminal (101) and the second fluid inlet and outlet terminal (102), the piping segment (1011) close to the first fluid inlet and outlet terminal (101) is installed the thermal insulating device (400);

--Thermal insulating device (400): related to a thermal insulating structure constituted by the followings with thermal insulating effects, such as solid, flexible body, or foam, or enveloped colloid, gas, or liquid, or vacuum structure, for being provided to envelope the piping segment (1011) of the first fluid inlet and outlet terminal (101) of the U-type piping (100), or the piping segment (1011) of the first fluid inlet and outlet terminal (101) is directly composed of thermal insulating material or sleeved with thermal insulating material;

--Auxiliary thermal conductive structure (110): composed of thermal conductive material and installed at the exterior of the thermal insulating device (400);

FIG. 5 is a schematic structural view illustrating the exterior of the thermal insulating device (400) of the thermal insulating piping segment of the U-type piping (100) is installed with an auxiliary thermal conductive structure (110) made of thermal conductive material and the exterior is enveloped by the columnar thermal conductive body.

FIG. 6 is a cross sectional view of FIG. 5.

As shown in FIG. 5 and FIG. 6, it mainly consists of:

--U-type piping (100): made of U-type tubular body for the thermal conductive fluid (111) passing through, wherein the U-type piping (100) is composed of a piping structure and installed in the columnar thermal conductive body (300) composed of solid state or colloidal object; the U-type piping (100) has the first fluid inlet and outlet terminal (101) and the second fluid inlet and outlet terminal (102), and the piping segment (1011) close to the first fluid inlet and outlet terminal (101) is installed the thermal insulating device (400);

--Thermal insulating device (400): related to a thermal insulating structure constituted by the

followings with thermal insulating effects, such as solid, flexible body, or foam, or enveloped colloid, gas, or liquid, or vacuum structure, for being provided to envelope the piping segment (1011) of the first fluid inlet and outlet terminal (101) of the U-type piping (100), or the piping segment (1011) of the first fluid inlet and outlet terminal (101) is directly composed of thermal insulating material or sleeved with thermal insulating material;

--Auxiliary thermal conductive structure (110): composed of thermal conductive material and installed at the exterior of the thermal insulating device (400);

The structure includes one or more than one of the following structural states:

- 1) Columnar structure enveloped by columnar thermal conductive body (300): being provided with the columnar thermal conductive body (300) made of thermal conductive material and having various geometric cross section shapes such as round, oval, square, rectangular, or star-like shapes, being served to envelope the U-type piping (100), the periphery of the piping segment (1011) of the first fluid inlet and outlet terminal (101) is installed with the thermal insulating device (400), and the exterior of the thermal insulating device (400) further is installed with the auxiliary thermal conductive structure (110) made of thermal conductive structure, thereby preventing the thermal insulating device (400) from generating thermal resistance in the columnar thermal conductive body (300), so as to configure the columnar structure enveloped by columnar thermal conductive body (300); and
- 2) Columnar structure utilizing columnar thermal conductive body (300) having piping therein as the structure member: directly made of the columnar thermal conductive body (300), and formed in the structural state having piping therein, and having the piping segment (1011) installed at the first fluid inlet and outlet terminal (101) of the U-type piping (100), the thermal insulating device (400) is installed between the piping segment (1011) and the thermal conductive body structure, and the exterior of the thermal insulating device (400) is further installed with the auxiliary thermal conductive structure (110) made of thermal conductive material for preventing the thermal insulating device (400) from generating thermal resistance in the columnar thermal conductive body (300), so as to configure the

columnar structure utilizing columnar thermal conductive body (300) having piping therein
as the structure member.

CLAIMS

1. A U-shaped pipe heat exchanger for installation in a natural thermal storage body (500), the U-shaped pipe heat exchanger comprising:
 - a pipe bent in a U-shape so that the pipe forms a first piping segment and a second piping segment, and the U-shaped pipe is disposed for carrying a thermal conductive fluid (111);
 - a thermal insulating material (400) disposed around the first piping segment or second piping segment to reduce thermal energy loss between the first piping segment and second piping segments;
 - a thermal conductive material (110) disposed around the thermal insulating material (400), so as to reduce thermal resistance in the natural thermal storage body surrounding the thermal insulating material (400).
2. The U-shaped pipe heat exchanger according to claim 1, wherein the thermal insulating material is formed by any one of the following selection: solid insulating material; flexible or foam insulating material; colloidal, gas or liquid insulating material; and vacuum structure.
3. The U-shaped pipe heat exchanger according to claim 1 or 2, further comprising a columnar thermal conductive body (300) to envelope the U-shaped pipe.
4. The U-shaped pipe heat exchanger according to claim 3, wherein the columnar thermal conductive body (300) has a various geometric cross-sectional shape, such as round, oval, square, rectangular and star-like.
5. The U-shaped pipe heat exchanger according to any one of claims 1-4, wherein a free end of the first piping segment serves as a fluid inlet and outlet terminal.
6. The U-shaped pipe heat exchanger according to any one of claims 1-4, wherein a free end of the second piping segment serves as a fluid inlet and outlet terminal.

7. The U-shaped pipe heat exchanger according to any one of the preceding claims, wherein the natural thermal storage body includes a shallow part of the earth or a shallow part of a pool, lake, river or ocean, and the natural thermal storage body may exist in a solid, liquid or gas state.