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(54) **Title :** A Pre-Insulated Pipe and the Method of Producing the Same

(57) **Abstract :**

The present invention relates to a pre-insulated pipe (100) for carrying fluids comprising a plurality of inner pipes (30) with at least one bracket (20) to secure the plurality of inner pipes (30). The at least one bracket (20) is secured within a jacket (10), with an insulator (40) filing the jacket (10) and encapsulating the inner pipes (30).
(Fig. 1)

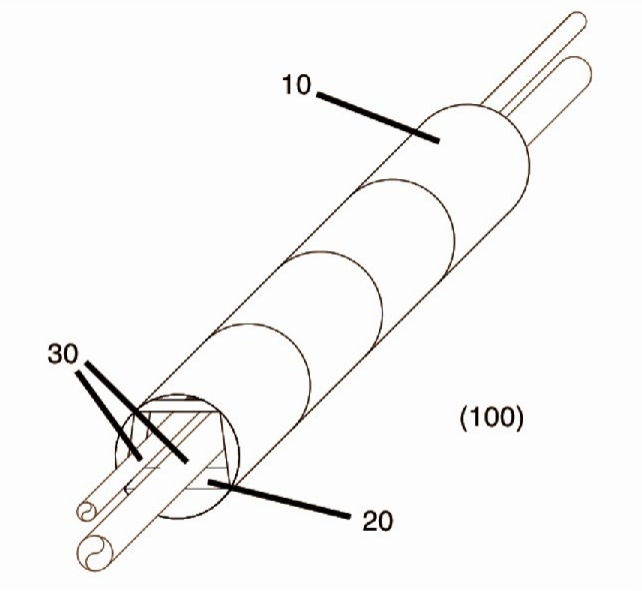

Fig. 1

A Pre-Insulated Pipe and the Method of Producing the Same

Field of Invention

The present invention is related to pipes, particularly pre-insulated pipes, and the method of producing the same.

Background of the Invention

In HVAC, piping is used to transport fluids, such as refrigerant. Due to their temperature-sensitive operation, minimizing heat transfer between the pipe and its surrounding environment is important to maintain its efficiency. Therefore, the pipings used in HVAC are usually insulated to minimize heat transfer.

While typically single insulated pipes are used, it is not uncommon today to see more than one pipe insulated within the same casing. These pipes are required to be straight, as any disuniformity will cause variance of heat transfer within the pipes, which may jeopardize the efficiency of the HVAC system. Further, with longer insulated pipes, multiple pipes within the insulation may curve and contact may happen with each other, which is detrimental to the system.

Several prior art has been devised as an attempt to solve this problem. CN109424797A describes a pipe supporting bracket for supporting multiple pipes within a complex pipe. However, the configuration of the pipe supporting bracket as described adds considerable heft to the piping system, which is not suitable for a HVAC piping system as they are normally installed in higher areas.

US10274111B2 describes a pipe supporting bracket for supporting multiple pipes. The pipe supporting bracket described is not suitable for internal use within a pipe. Further, the configuration of the pipe supporting bracket would not be self-securing when incorporated within a pre-insulated pipe.

US20180243973A1 describes a method for producing a pre-insulated pipe. However, it does not describe a self-securing bracket for fixing the position of inner pipes within the pre-insulated pipe.

CN207814766U describes a polyurethane thermal pipe featuring an interior slippage bracket. The interior slippage bracket described is only suitable for usage for a single inner pipe, and the bracket would not be self-securing when incorporated within a pre-insulated pipe due to its roller system.

Therefore, there exists a demand for a pre-insulated pipe with a self-securing internal bracket for supporting a plurality inner pipes while adding minimal heft

Summary of the Present Invention

An object of the present invention is to provide a pre-insulated pipe with a plurality of inner pipes.

Another object of the present invention is to provide a pre-insulated pipe suitable for usage with variable refrigerant flow systems.

A further object of the present invention is to provide a self-securing bracket for supporting a plurality of inner pipes within a pre-insulated pipe.

Another object of the present invention is to provide a method of producing a pre-insulated pipe with a bracket for supporting a plurality of inner pipes.

The present invention relates to a pre-insulated pipe for carrying fluids, comprising a plurality of inner pipes within a jacket. Within the jacket, at least one bracket is present to secure the inner pipes. An insulator injected into the jacket encapsulates the plurality of inner pipes and bracket, and fills any openings between the inner pipes and the jacket. The bracket is self-secured to the jacket. At least a first inner pipe is secured to one end of the bracket, and at least a second inner pipe is secured to another end of the bracket.

The above and other objects, features and advantages of the invention will become apparent from the following detailed description taken with the accompanying drawings.

Brief Description of the Drawings

Fig. 1 shows an embodiment of the pre-insulated pipe.
Fig. 2 shows a sectional cross sectional view of an embodiment of the pre-insulated pipe.
Fig. 3 shows an embodiment of the bracket in the pre-insulated pipe.
Fig. 4 shows a flowchart of a production process of an embodiment of the pre-insulated pipe.

Detailed Description of the Embodiments

It should be noted that the following detailed description is directed to a pre-insulated pipe with a self-securing bracket, and is not limited to any particular size or shape of the

pre-insulated pipe or the bracket but in fact related to a multitude of sizes and shapes within the general scope of the following description.

It is illustrated in Fig. 1 and Fig. 2 a pre-insulated pipe (100) of an embodiment of the present invention which is for carrying or transporting fluids. The pre-insulated pipe (100) comprises a plurality of inner pipes (30) secured by at least one bracket (20) within a jacket (10), with an insulator (40) encapsulating the plurality of inner pipes (30).

Fig. 3 shows an embodiment of the bracket (20). In an embodiment of the present invention, the at least one bracket (20) is secured within the jacket (10), with at least one first inner pipe secured to one end of the at least one bracket (20), and at least a second inner pipe secured to another end of the at least one bracket (20). The inner pipes (30) are preferred to be secured to the inner portion (21) of the bracket (20).

In another embodiment of the present invention, the inner pipes (30) are high purity copper pipes, preferably acquired from pancake copper pipes or drum copper pipes. It shall be appreciated that the usage of copper pipes provide an advantage in the form of easily malleable inner pipes, which means that no heat is required to soften the inner pipes before bending them to form a curve section of a pre-insulated pipe.

However, due to the nature of high purity copper, the inner pipes (30) are susceptible to bending. It is thus preferred that the inner pipes (30) are straightened before being secured to the bracket (20) and inserted into the jacket (10). Preferably, this is done using a rotary straightener.

To form a curve section from the pre-insulated pipe, a section of the jacket (10) forming the internal section of the curve is removed from a straight pre-insulated pipe. Excess insulator (40) in the section is removed, and the pre-insulated pipe is bent towards the removed jacket (10) section. The internal section of the curve is then closed to seal any openings.

In another embodiment of the present invention, the at least one bracket (20) is self-securing to the jacket (10). Preferably, the at least one bracket (20) is formed as a trapezoidal frame, with the corners of the frame forming contact with the jacket (10), thus supporting the position of the bracket within the jacket (10) via friction. With proper configuration, the bracket (20) can secure its position by itself within the jacket (10) without further intervention.

Preferably, the at least one bracket (20) further comprises a layer of polyethylene insulation at the outer portion (22) of the bracket (20). The layer of polyethylene insulation functions as a cushion between the at least one bracket (20) and the jacket (10), minimizing heat transfer between the at least one bracket (20) and the jacket (10), and enables the at least one bracket (20) to easily slide into position within the jacket (10).

Preferably, the plurality of inner pipes (30) is secured to an internal portion (21) of the at least one bracket (20).

Preferably, the jacket (10) is formed from a malleable metal. The jacket (10) can be formed using any suitable metal forming method capable of producing metal tubes. Preferably, the jacket (10) is formed by bending sheet metal using the spiral duct forming method.

Preferably, the jacket (10) is formed from steel with zinc coated through hot dip continuous galvanizing process to provide protection via Barrier Effect and Galvanic Protection Effect. It is preferred that the thickness of the steel is in a range of 0.1mm to 1.5mm.

Preferably, the insulator (40) is an expandable foam formed from a mixture of Polyol and Isocyanate. The insulator (40) is injected into the jacket (10) after the inner pipes and the bracket have been inserted. Thereafter, the openings of the jacket (10) are enclosed to allow the insulator to expand (40).

It shall be appreciated that the bracket (20) is formed from a thin and light material, such as sheet metal, which maximizes the expansion of the insulator (40), and minimizes the formation of air bubbles. This thus provides an optimum insulation between the jacket (10) and inner pipes (30), without adding substantial load to the pre-insulated pipe (100) while providing excellent support to the inner pipes (30).

It is illustrated in Fig. 4 a flowchart detailing a method for producing a pre-insulated pipe (100). The method comprises the steps of forming a jacket (210), straightening a plurality of inner pipes (220), inserting the bracket secured with the plurality of inner pipes into the jacket (230), and injecting an insulator (40) into the jacket (240).

Preferably, the plurality of inner pipes (30) is formed from high purity copper.

Preferably, the plurality of inner pipes (30) is straightened using a rotary straightener. As the inner pipes (30) are formed from high purity copper, the inner pipes are soft and thus are susceptible to bending. Straightening of the inner pipes is done to ensure the inner pipes (30) are straight before being inserted into the jacket (10). The pre-insulated pipe can achieve an optimized efficiency with straightened inner pipes.

The jacket (10) can be formed using any suitable metal forming method capable of producing metal tubes. Preferably, the jacket (10) is formed by bending sheet metal using the spiral duct forming method.

Preferably, the jacket (10) is formed from steel with a thickness in the range of 0.1-1.5 mm with zinc coated through hot dip continuous galvanizing process to provide protection via Barrier Effect and Galvanic Protection Effect.

Preferably, the insulator (40) injected into the pre-insulated pipe is an expandable foam formed from the mixture of Polyol and Isocyanate.

Preferably, the method for producing a pre-insulated pipe further comprises the step of enclosing the jacket (10) after the injection of the insulator (40) to allow the expansion of the insulator (40). It is preferred that the jacket (10) is put into an incline to allow the expansion of the insulator (40) so that the expansion occurs evenly and to prevent the formation of air bubbles.

While the preferred embodiments of the present invention have been described and illustrated, it should now be apparent to those skilled in the art that various changes and modifications can be made without departing from the scope of the invention. Accordingly, the following claims are intended to embrace such changes, modifications and areas of application that are within the scope of this invention.

CLAIMS

1. A pre-insulated pipe (100) for carrying fluids, comprising:

a plurality of inner pipes (30);

a bracket (20) for securing the plurality of the inner pipes (30);

an insulator (40) encapsulating the plurality of the inner pipes (30) and the bracket (20); and

a jacket (10) surrounding the insulator (40);

wherein the bracket (20) is self-secured to the jacket (10) within the pre-insulated pipe (100); and

wherein at least a first inner pipe is secured to one end of the bracket (20), and at least a second inner pipe is secured to another end of the bracket (20).

Abstract

A Pre-Insulated Pipe and the Method of Producing the Same

The present invention relates to a pre-insulated pipe (100) for carrying fluids comprising a plurality of inner pipes (30) with at least one bracket (20) to secure the plurality of inner pipes (30). The at least one bracket (20) is secured within a jacket (10), with an insulator (40) filing the jacket (10) and encapsulating the inner pipes (30).

(Fig. 1)

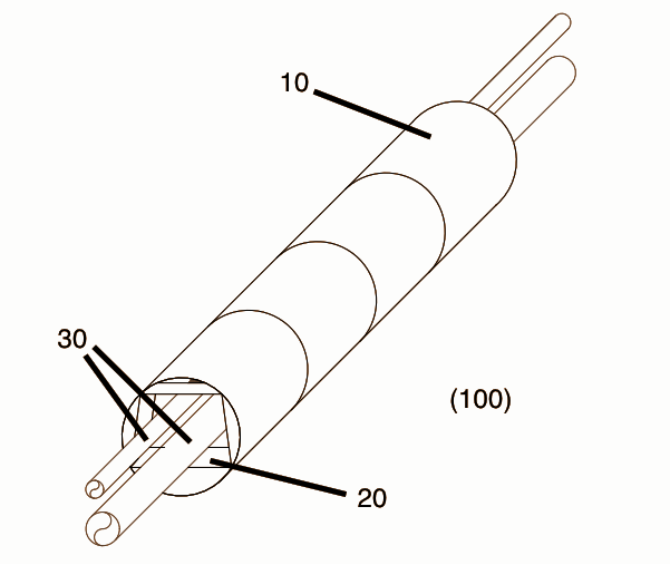

Fig. 1

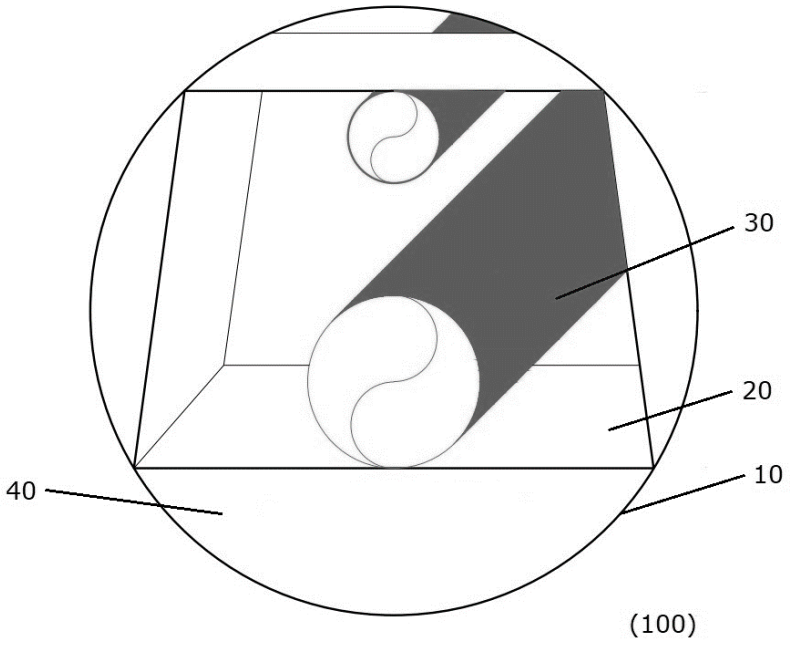

Fig. 2

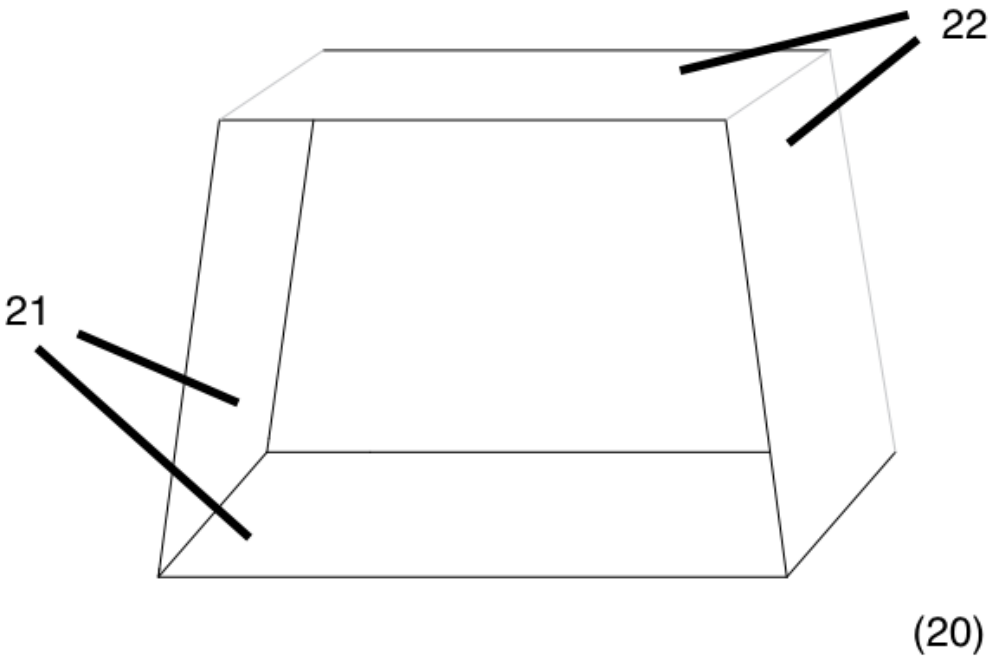
22
21
(20)

Fig. 3

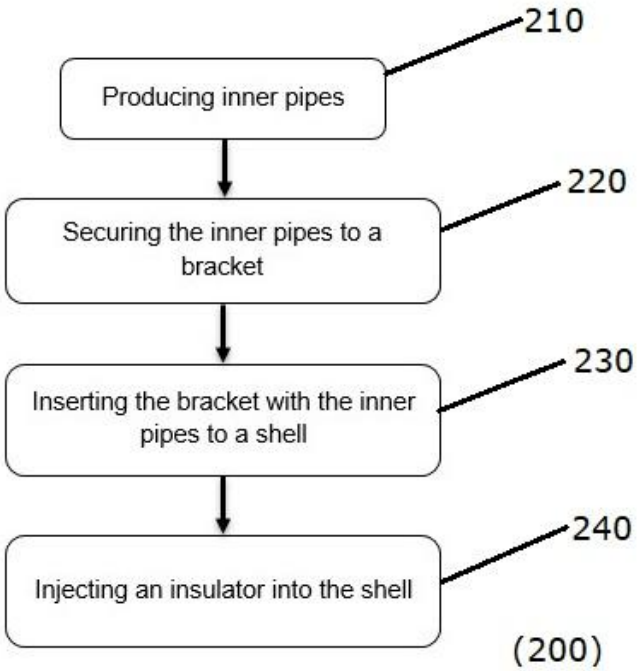
210
Producing inner pipes
220
Securing the inner pipes to a bracket
230
Inserting the bracket with the inner pipes to a shell
240
Injecting an insulator into the shell
(200)

Fig. 4