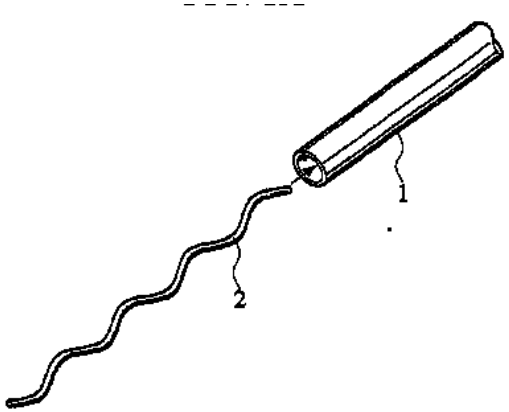
Understanding patent claims

(d) Double pipe



The invention

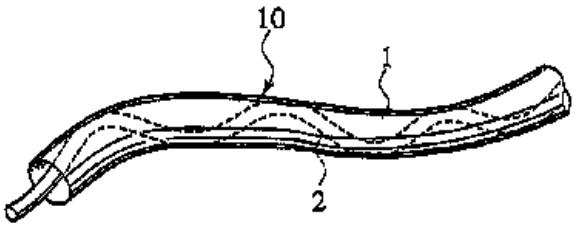
- The invention relates to a double pipe and a method of manufacturing it. The double pipe is preferably employed in a vehicle air conditioner for circulating coolant in dual passages.
- According to the invention an inner pipe 2 is formed in a spiral or wavy configuration and is securely held by an inner circumferential face of an outer pipe 1.
- The technical effects of the invention are twofold:
  - ease of manufacturing the double pipe
  - suppression of chattering noise due to vibrations.



The invention

A first method of manufacturing the double pipe 10 comprises the following steps:

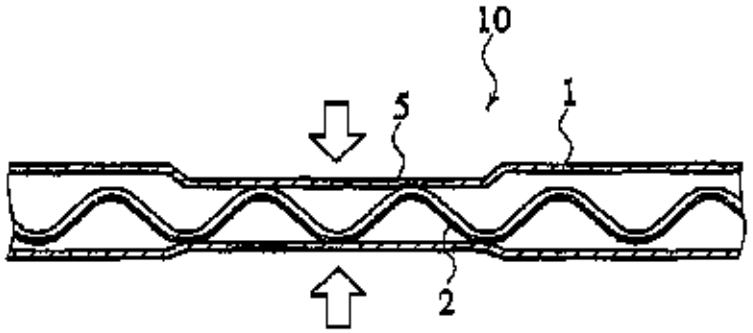
1. Spirally forming an independent inner pipe 2, the outer diameter of the spiral being equal to or slightly smaller than the inner diameter of an outer pipe 1.
2. Inserting the spiral inner pipe 2 into the outer pipe 1.
3. Curving the outer pipe 1 into a predetermined shape according to a piping layout as shown in Fig. 1B, so that each curved part of the outer pipe 1 presses the inner pipe 2 against an inner wall of the outer pipe.



The invention

A second method of manufacturing the double pipe 10 comprises the following steps:

1. Spirally forming an independent inner pipe 2, the outer diameter of the spiral being equal to or slightly smaller than the inner diameter of an outer pipe 1.
2. Inserting the spiral inner pipe 2 into the outer pipe 1.
3. Crushing a part of the wall of the outer pipe 1 to form a flattened cross-section 5, thus fixing the outer pipe 1 and inner pipe 2 to each other.



How to patent this invention: claim it!

1. Try: "A double pipe that is easy to manufacture."

Making a double pipe "easy to manufacture" is a technical problem. Problems cannot be patented - only solutions.

2. Try: "An air-conditioner double pipe comprising an outer pipe and an inner pipe arranged inside the outer pipe."

You don't want anyone circumventing the patent by employing the double pipe in a technical field different from air conditioners.

3. Try: "A double pipe comprising an outer pipe and an inner pipe, the inner pipe being securely fixed within the outer pipe."

This patent claim is as broad as possible and adequately defines the invention for the time being.

A prior art search will show whether the invention
– as claimed – is actually **new.**

Result of the prior art search

The prior art search revealed European patent application No. 1 138 997 A, which discloses a similar invention.

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

(11) EP 1 138 997 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
04.10.2001 Bulletin 2001/40

(51) Int Cl.7: F16L 9/18, F16L 39/00

(21) Application number: 01107256.4

(22) Date of filing: 23.03.2001

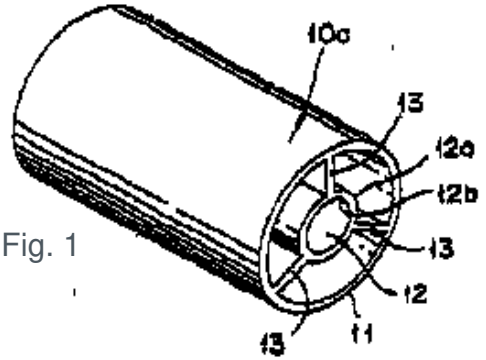
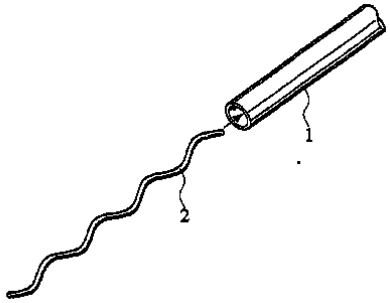


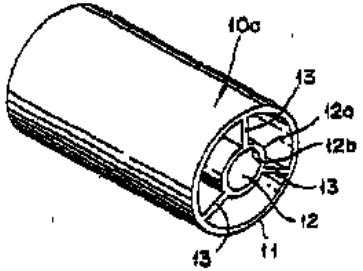
Fig. 1

As shown in Fig. 1, a duplex pipe 10 to be used as a work is formed in such a manner that an outer pipe 11, an inner pipe 12 and connecting ribs 13 for connecting together the outer and inner pipes 11 and 12 are moulded of aluminium material by extrusion working or by drawing working into an integrated body. Preferably, the duplex pipe 10 is used as a refrigerant pipe in the cooling cycle of an air conditioner for a car.

Comparison of the two inventions

The invention as claimed	EP 1 138 997 A as prior art
"A double pipe comprising an outer pipe and an inner pipe, the inner pipe being securely fixed within the outer pipe."	"A duplex pipe 10 ... [with] an outer pipe 11, an inner pipe 12 and connecting ribs 13 for connecting together the outer and inner pipes 11 and 12."





Since all of the claimed features are anticipated by the prior art, the claimed subject-matter is not new!

Delimiting the invention over the prior art

In order to delimit the invention over the prior art you have to add additional features that restrict the scope of protection.

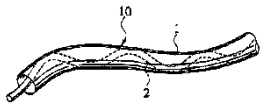
For example, the claim could be re-phrased in the following way:
"A double pipe comprising:
an outer pipe; and
an inner pipe having a spiral or wavy shape configured to be held by an inner circumferential face of the outer pipe."

This claim is certainly new over EP 1 139 997 A because the inner tube disclosed therein is straight and does not have a spiral or wavy shape.

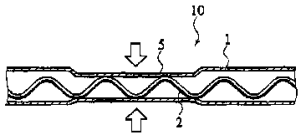
The technical effect of the spiral or wavy inner tube can be seen in that the inner pipe can be securely fixed within the outer tube without having to provide radially extending ribs. This facilitates the manufacturing process of the double pipe.

Claims filed with the European Patent Office (EPO)

Claim 1:
"A double pipe comprising:
an outer pipe; and
an inner pipe having a spiral or wavy shape configured to be held by an inner circumferential face of the outer pipe."



Claim 2: "A double pipe according to claim 1, characterised in that the diameter of the spiral or an amplitude of the wavy shape of the inner pipe is equal to or less than an inner diameter of the undeformed outer pipe; and the outer pipe is curved to hold the inner pipe at each curved part."



Claim 3: "A double pipe according to claim 1, characterised in that the diameter of the spiral or an amplitude of the wavy shape of the inner pipe is equal to or less than an inner diameter of the undeformed outer pipe; and the outer pipe has locally crushed parts extending inwardly in a diametrical direction to hold the inner pipe at each crushed part."

Introductory part of the description as filed

The present invention relates to a double pipe and a method of manufacturing the same. Preferably, the double pipe is used as a refrigerant pipe in the cooling cycle of an air conditioner for a car.

Technical field of the invention

A conventional double pipe is disclosed in EP 1 138 997 A, for example, that arranges connecting ribs between an outer pipe and an inner pipe of the double pipe. The double pipe with the connecting ribs is usually produced by extruding or drawing an aluminium material through dies.

Discussion of prior art

The extruding or drawing process to form the double pipe having the connecting ribs requires complicated metal dies. In addition, the double pipe with the connecting ribs involves a cutting process of the connecting ribs when terminating ends of the double pipe. These necessities increase the manufacturing cost of the double pipe.

Problem arising from prior art

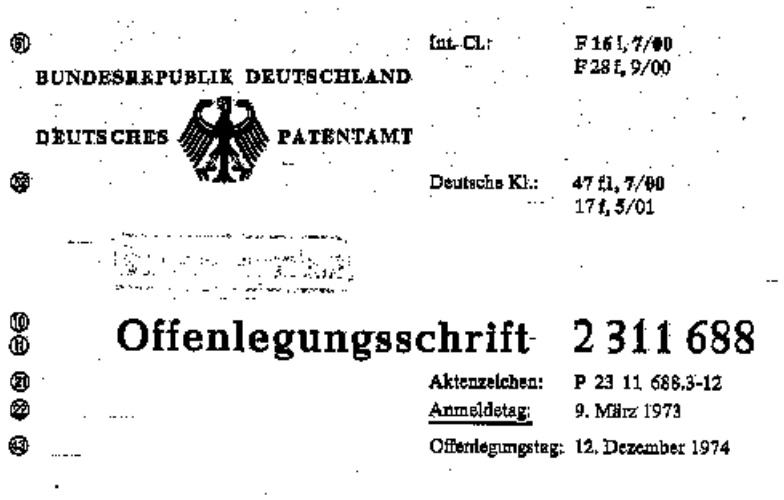
An object of the present invention is to provide a low-cost double pipe which is easy to manufacture.

Objective technical problem

In order to accomplish the object, the present invention provides a double pipe including an outer pipe and an inner pipe that is spirally or wavy formed and is held by an inner circumferential face of the outer pipe.

Solution to the problem

Additional prior art found by the EPO



(51) Int. Cl.: F 16 l, 7/00
F 28 f, 9/00

BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

(52) Deutsche Kl.: 47 f1, 7/00
17 f, 5/01

(10) (11) **Offenlegungsschrift 2 311 688**

(21) Aktenzeichen: P 23 11 688.3-12

(22) Anmeldetag: 9. März 1973

(43) Offenlegungstag: 12. Dezember 1974

The EPO found a very relevant piece of prior art.

"Rohr mit einer durch seinen Innenraum geführten, an der Rohrwandung gehalterten Rohrleitung"

"Pipe with a tube being guided within the lumen of the pipe and being held at the inner pipe wall"

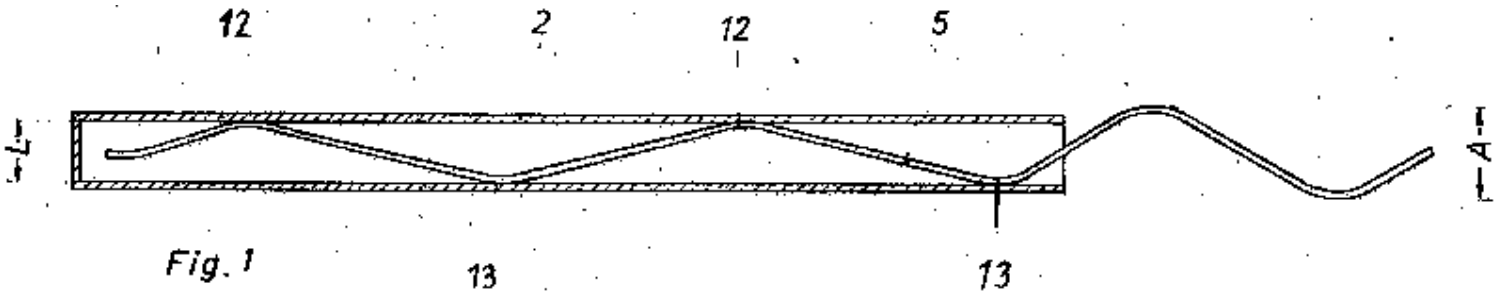


Fig. 1

Additional prior art found by the EPO

Claim 1 of DE 2 311 688 translated into English reads as follows:

"Pipe 2 with a tube 5 being guided within the lumen of the pipe 2 and being held at the inner pipe wall ...,
characterised in that the tube 5 is provided with periodic bends along at least a part of its length whose amplitude A is greater than the inner diameter L of the pipe 2,
such that the tube 5 is deformed when being introduced into the pipe 2 and contacts the pipe wall 2 under pressure due to the tube's restoring force."

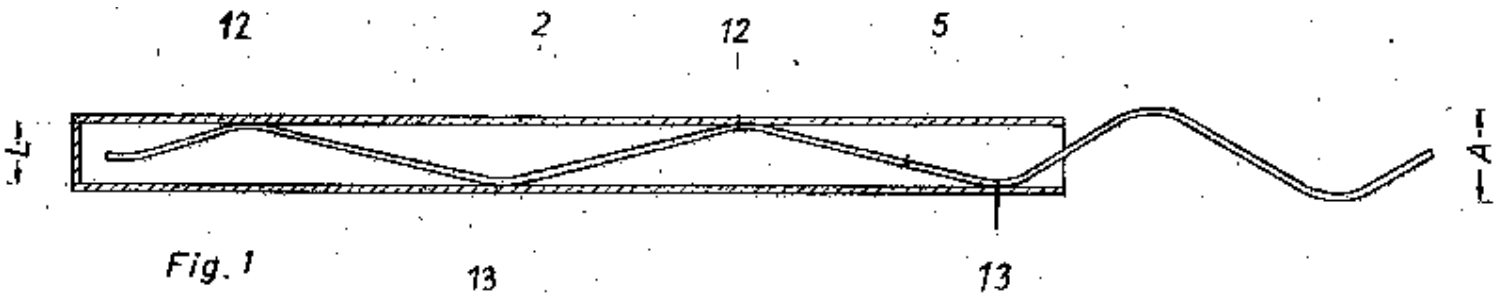


Fig. 1

The opinion of the EPO

Applicant's claim:
"A double pipe comprising:
an outer pipe; and
an inner pipe having a spiral or wavy shape configured to be held by an inner circumferential face of the outer pipe."

CLAIM of DE 2 311 688:
"Pipe 2 with a tube 5 being guided within the lumen of the pipe 2 and being held at the inner pipe wall ..., characterised in that the tube 5 is provided with periodic bends along at least a part of its length ..."

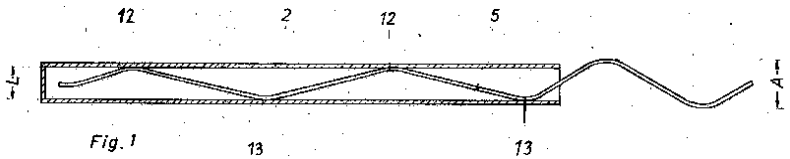


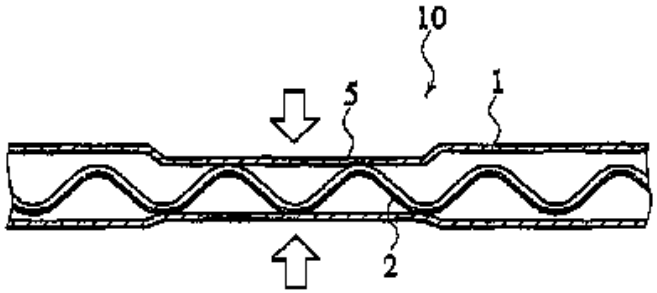
Fig. 1

All of the features of the applicant's claim are fully anticipated by the disclosure of DE 2 311 688.

EPO response:
Please amend your claims if you want your invention protected!

Further analysis

In the present case, the applicant was particularly interested in the embodiment according to claim 3 and chose to focus on that.



Comparison of the invention with the prior art

	Technical features of the invention	EP 1 138 997 A	DE 2 311 688
Claim 1	Double pipe with inner and outer pipe	✓	✓
	Inner pipe having a spiral or wavy shape	**No**	✓
Claim 3	Diameter of the spiral or amplitude of the wavy shape of the inner pipe being equal to or less than an inner diameter of the undeformed outer pipe, the outer pipe having locally crushed parts extending inwardly in a diametrical direction to hold the inner pipe at each crushed part	**No**	**No**

Result of the analysis

Document DE 2 311 688 does not show the features of claim 3 as filed.

In particular, the outer tube disclosed in DE 2 311 688 is not provided with any crushed parts.

Furthermore, before the inner pipe is introduced into the outer pipe, the amplitude of the wavy shape of the inner pipe is greater than the inner diameter of the undeformed outer pipe.

The technical effect of these distinguishing features is twofold:

1. Suppression of chattering noise caused by vibrations, thanks to the reliable fixation of the inner pipe within the outer pipe by the crushed parts.
2. Facilitation of the insertion of the spiral or wavy inner pipe into the outer pipe due to the small diameter of the spiral or the small amplitude of the wave, respectively.

Result of the analysis

The problem to be solved by the present invention may therefore be regarded as the provision of a double pipe which is capable of suppressing any chattering noise between an inner pipe and an outer pipe due to vibrations. Furthermore, the double pipe should allow easy manufacturing.

None of the documents cited discloses a solution according to claim 3 or teaches how to combine two or more distinct disclosures to arrive at the claimed invention. Therefore, the subject-matter of claim 3 is inventive.

Result of the analysis

As a result, the applicant filed an amended claim based on a combination of claims 1 and 3 as filed:

"A double pipe comprising:
an outer pipe; and
an inner pipe having a spiral or wavy shape configured to be held by an inner circumferential face of the outer pipe,
characterised in that
the diameter of the spiral or an amplitude of the wavy shape of the inner pipe is equal to or less than an inner diameter of the undeformed outer pipe; and
the outer pipe has locally crushed parts extending inwardly in a diametrical direction to hold the inner pipe at each crushed part."

The applicant also filed an independent claim directed to a method of manufacturing a double pipe corresponding to this product claim.

The original description filed with the EPO supports the amendments to the claims

"Accordingly, unlike the conventional double pipe employing connecting ribs, the double pipe 10 needs no complicated extrusion dies. Without the connecting ribs, the double pipe 10 involves a **simple termination process, to thereby reduce manufacturing cost**." [0016]

"When inserting the spiral inner pipe 2 into the outer pipe 1, there is a gap between the outer pipe 1 and the inner pipe 2, and therefore **no excessive force is needed for the insertion of the inner pipe**." [0018]

"On the other hand, any one of the embodiments firmly fixes the outer and inner pipes of a double pipe to each other to **suppress a chattering noise** without restricting the shape of each bend of the double pipe." [0043]

The patent is finally granted on the basis of the amended claim

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

(11) EP 1 447 606 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
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F16L 7/00 *(2006.01)* ***F16L 9/19*** *(2006.01)*
F28D 7/02 *(2006.01)*

(21) Application number: **04003546.1**

(22) Date of filing: **17.02.2004**

(54) **Double pipe and method of manufacturing the double pipe**

Doppelrohr und Verfahren zu dessen Herstellung

Tuyau double et procédé de production associé

Claims

1. A double pipe comprising:

an outer pipe (1); and
an inner pipe (2) having a spiral or wavy shape configured to be held by an inner circumferential face of the outer pipe (1),

characterized in that
a diameter of the spiral or an amplitude of the wavy shape of the inner pipe (2) is equal to or less than an inner diameter (D2) of the undeformed outer pipe (1); and
the outer pipe (1) has locally crushed parts (5) extending inwardly in a diametrical direction to hold the inner pipe (2) at each crushed part (5).