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**NOTICE OF ENTITLEMENT**

I, John Gordon Hinde, of Spruson & Ferguson, St Martins Tower, 31 Market Street, Sydney, New South Wales 2000, Australia, being the patent attorney for the Applicant(s)/Nominated Person(s) in respect of Application No 18976/92 state the following:-

The Applicant(s)/Nominated Person(s) has/have entitlement from the actual inventor(s) as follows:-

The Applicant(s)/Nominated Person(s), by virtue of a Contract of Employment between the actual inventor(s) as employee(s) and the Applicant(s)/Nominated Person(s) as employer(s), is a person entitled to have the patent assigned to it if a patent were granted on an application made by the actual inventor(s).

The Applicant(s)/Nominated Person(s) is/are the applicant(s) of the application(s) listed in the Declaration under Article 8 of the PCT. The basic application(s) listed on the Declaration under Article 8 of the PCT is/are the first application(s) made in a Convention country in respect of the invention.

DATED this Twenty-Eighth day of October 1993

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John Gordon Hinde

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**(12) PATENT ABRIDGMENT (11) Document No. AU-B-18976/92**  
**(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 659461**

- (54) Title  
**A METHOD FOR JOINING SPIRALLY WOUND THERMOPLASTIC PIPES TOGETHER**
- International Patent Classification(s)  
 (51)<sup>s</sup> **B29C 065/40 F16L 047/02 F16L 047/06**
- (21) Application No. : **18976/92** (22) Application Date : **12.06.92**
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**912880 14.06.91 FI FINLAND**
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- (71) Applicant(s)  
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**SPRUSON & FERGUSON , GPO Box 3898, SYDNEY NSW 2001**
- (56) Prior Art Documents  
**EP 81931**
- (57) Claim 1. A method for joining spirally wound thermoplastic pipes together,

said method comprising the steps of:

providing a first thermoplastic pipe and a second thermoplastic pipe wherein each thermoplastic pipe comprises a spirally wound hollow profile;

positioning an end of the first thermoplastic pipe adjacent an end of the second thermoplastic pipe such that a gap having a step is formed between an end surface of the end of the first pipe and an end surface of the end of the second pipe;

applying a stainless steel band around the end of the first pipe and the end of the second pipe, such that the band is positioned over the gap, and heating the steel band;

placing an extruder and a cooled slide and smoothing organ inside the thermoplastic pipes;

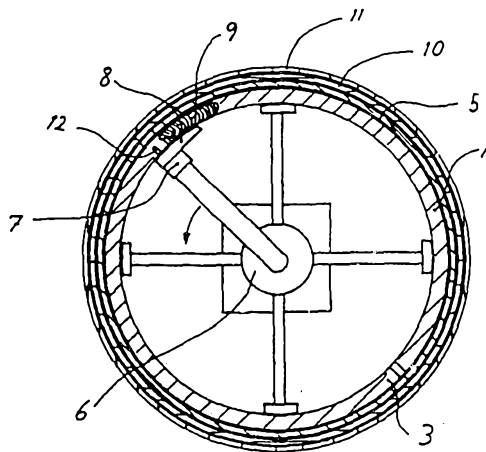
heating the end surfaces with a heating means;

extruding melted thermoplastic into the gap between the two end surfaces with said extruder and applying pressure to the melted thermoplastic with the slide and smoothing organ; and

stopping the heating of the steel band, cooling the extruded thermoplastic and removing the steel band after cooling.

<p>(51) International Patent Classification <sup>5</sup> : B29C 65/40, F16L 47/02</p>	<p>A1</p>	<p>(11) International Publication Number: <b>WO 92/22419</b> (43) International Publication Date: 23 December 1992 (23.12.92)</p>
<p>(21) International Application Number: PCT/FI92/00185 (22) International Filing Date: 12 June 1992 (12.06.92) (30) Priority data: 912880 14 June 1991 (14.06.91) FI (71) Applicant (for all designated States except US): OY KWH PIPE AB [FI/FI]; PB 21, SF-65101 Vasa (FI). (72) Inventor; and (75) Inventor/Applicant (for US only) : BLOMQVIST, Gunnar [FI/FI]; SF-65520 Helsingby (FI). (74) Agent: OY JALO ANT-WUORINEN AB; Skepparebrinken 2 A, SF-00120 Helsingfors (FI).</p>	<p>(81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, KR, LU (European patent), MC (European patent), NL (European patent), NO, SE (European patent), US.</p> <p><b>Published</b> With international search report. In English translation (filed in Finnish).</p> <p style="font-size: 2em; font-weight: bold; text-align: center;">659461</p>	

(54) Title: A METHOD FOR JOINING SPIRALLY WOUND THERMOPLASTIC PIPES TOGETHER



(57) Abstract

The present invention relates to a method for joining spirally wound thermoplastic pipes (1, 2) of a hole profile together, characterized by the following steps: working the end surfaces (3, 4) of the spirally wound thermoplastic pipes (1, 2) into a smooth step-formed surface; setting two thermoplastic pipes (1, 2) end against end such that a smooth step-formed gap is formed between the end surfaces (3, 4); applying a stainless steel band (5) over the gap and heating the steel band (5) to ca. 100 °C; applying an extruder (6) with a rotating extruder head (6) and a cooled slide and smoothing organ (8) cooperating therewith inside the pipes (1, 2) to be joined together; heating the end surfaces (3, 4); extruding a weld seam of a melted thermoplastic (9) into the gap between the two end surfaces (3, 4); as well as stopping the heating of the steel band (5) and removal of the steel band (5) from the joining place after cooling.

A METHOD FOR JOINING SPIRALLY WOUND THERMOPLASTIC PIPES  
TOGETHER

The invention relates to a method for joining spirally wound thermoplastic pipes together.

5 According to earlier methods, the joining-together of spirally wound pipes of the above-mentioned type usually occurred by means of extruder welding from the outer and inner side of the pipe. Since pipes of very large diameters, 2m or more, are often concerned, this previously known technique causes considerable technical problems, and it is also very time-consuming. It was very difficult to reach a  
10 satisfactory final result by means of the previously known technique.

It is the object of the present invention to overcome or substantially ameliorate the above disadvantages.

There is disclosed herein a method for joining spirally wound thermoplastic pipes together, said method comprising the steps of:

15 providing a first thermoplastic pipe and a second thermoplastic pipe wherein each thermoplastic pipe comprises a spirally wound hollow profile;

positioning an end of the first thermoplastic pipe adjacent an end of the second thermoplastic pipe such that a gap having a step is formed between an end surface of the end of the first pipe and an end surface of the end of the second pipe;

20 applying a stainless steel band around the end of the first pipe and the end of the second pipe, such that the band is positioned over the gap, and heating the steel band;

placing an extruder and a cooled slide and smoothing organ inside the thermoplastic pipes;



heating the end surfaces with a heating means;

extruding melted thermoplastic into the gap between the two end surfaces with said extruder and applying pressure to the melted thermoplastic with the slide and smoothing organ; and

5 stopping the heating of the steel band, cooling the extruded thermoplastic and removing the steel band after cooling.

A preferred form of the present invention will now be described by way of example with reference to the accompanying drawings, wherein:

10 Fig. 1 shows the joining-together of two spirally wound pipes according to the present invention, seen from the outside in a radial direction, and

Fig. 2 shows the joining-together of Fig. 1, seen in an axial direction.

The joining-together of spirally wound thermoplastic pipes 1, 2 having hollow profiles occurs according to the invention as follows. The ends of the two thermoplastic pipes 1, 2 to be joined together are worked such that an end opening of the corresponding profile is closed and two smooth step-formed end surfaces 3, 4, 15 which fit together, are obtained, whereafter the two pipes are placed end against end and set such that a uniformly wide step-formed gap forms between the end surfaces 3 and 4. The gap width is to be fitted according to the radial dimension of the spirally wound pipe 1, 2. In connection with the most usual pipe dimensions, the gap width 20 varies in the range of 10-40mm. A stainless steel band 5 is applied over the gap between the two thermoplastic pipes 1, 2 and is heated to about 100 °C. In order to avoid melted thermoplastic material adhering to the steel band 5, it is preferably teflon coated. An extruder 6 with a rotating extruder head



7 and a cooled slide and smoothing organ 8 cooperating therewith are applied inside the pipes 1, 2 to be joined together. The end surfaces 3, 4 are heated e.g. with warm air coming from a warm-air blower 12. A weld seam of melted thermoplastic 9 is extruded into the gap between the two end surfaces 3, 4, whereby the slide and smoothing organ 8 brings about the fact that the melted thermoplastic 9 completely fills the gap and a weld pressure is obtained. In this way, a weld seam with a smooth inner surface is formed. After the extrusion of the whole gap is completed, the heating of the steel band 5 is stopped and the extruded thermoplastic seam is cooled, whereafter the steel band 5 is removed from the joining place. A very smooth seam may then be observed, which is nearly invisible to the naked eye.

According to a preferred embodiment, the heating of the steel band 5 occurs electrically, preferably by short-circuiting.

For setting the temperature of the steel band 5 to the desired level, it may preferably be provided with a temperature sensor coupled to a regulating circuit, which is arranged to regulate the electricity supply to the steel band.

The joining place, after the steel band 5 has been applied, has preferably to be surrounded with an insulation layer, as well as a felt cloth 10, which is in turn surrounded with a rubber sleeve 11, which prevents moisture and wetness from coming into contact with the steel band 5, which may detrimentally affect the heating cycle.

The claims defining the invention are as follows:

1. A method for joining spirally wound thermoplastic pipes together, said method comprising the steps of:

providing a first thermoplastic pipe and a second thermoplastic pipe wherein  
5 each thermoplastic pipe comprises a spirally wound hollow profile;

positioning an end of the first thermoplastic pipe adjacent an end of the second thermoplastic pipe such that a gap having a step is formed between an end surface of the end of the first pipe and an end surface of the end of the second pipe;

applying a stainless steel band around the end of the first pipe and the end of  
10 the second pipe, such that the band is positioned over the gap, and heating the steel band;

placing an extruder and a cooled slide and smoothing organ inside the thermoplastic pipes;

heating the end surfaces with a heating means;

15 extruding melted thermoplastic into the gap between the two end surfaces with said extruder and applying pressure to the melted thermoplastic with the slide and smoothing organ; and

stopping the heating of the steel band, cooling the extruded thermoplastic and removing the steel band after cooling.

20 2. A method according to claim 1, wherein the steel band is heated electrically.

3. A method according to claim 2, wherein the steel band is provided with a temperature sensor, and a regulating circuit is arranged to maintain the temperature of the steel band at a desired level based upon readings from said  
25 temperature sensor.

4. A method according to any one of claims 1-3, wherein said gap is about 10-20mm wide.

5. A method according to claim 4, wherein the steel band is polytetrafluoroethylene (teflon) coated.



6. A method according to claim 5, wherein the steel band is surrounded with a felt cloth and a rubber sleeve surrounds the felt cloth.

7. A method according to any one of claims 1-3, wherein the heating means is a warm air blower and the end surfaces are heated with warm air coming from  
5 the warm air blower before the thermoplastic is extruded.

8. A method according to claim 1, wherein said step of heating the steel band includes heating the steel band to about 100°C.

9. A method for joining spirally wound thermoplastic pipes, together, said method being substantially as hereinbefore described with reference to the  
10 accompanying drawings.

DATED this Third Day of March 1995

**Oy KWH Pipe Ab**

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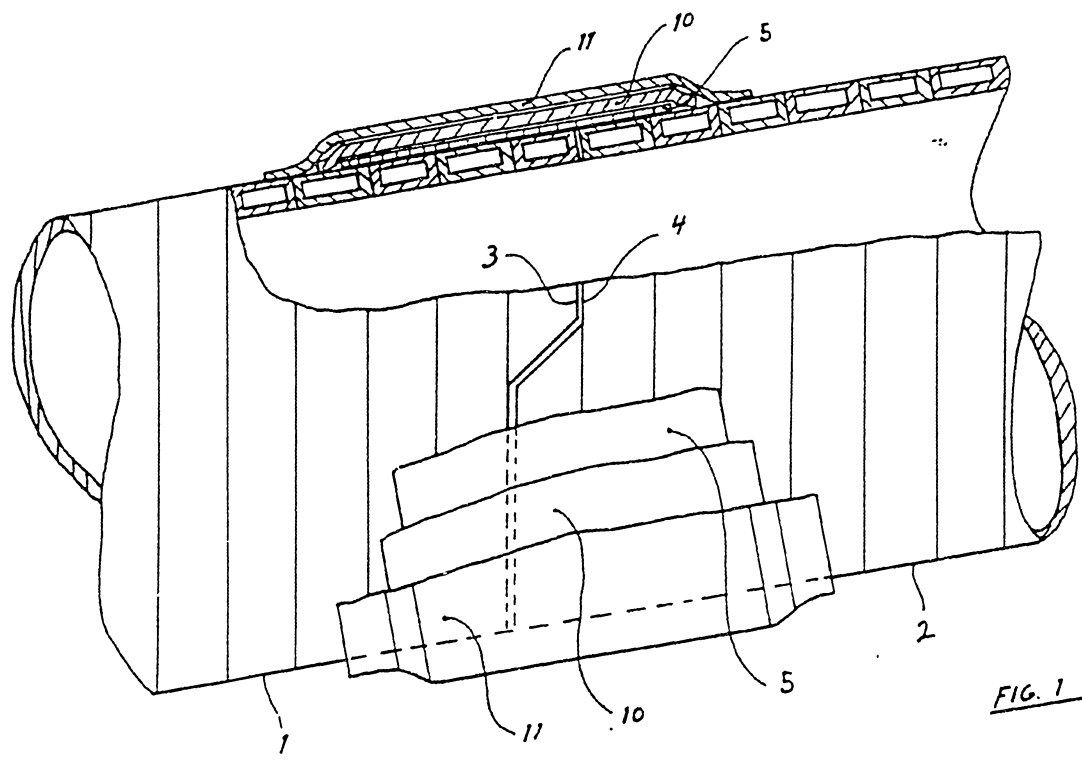


FIG. 1

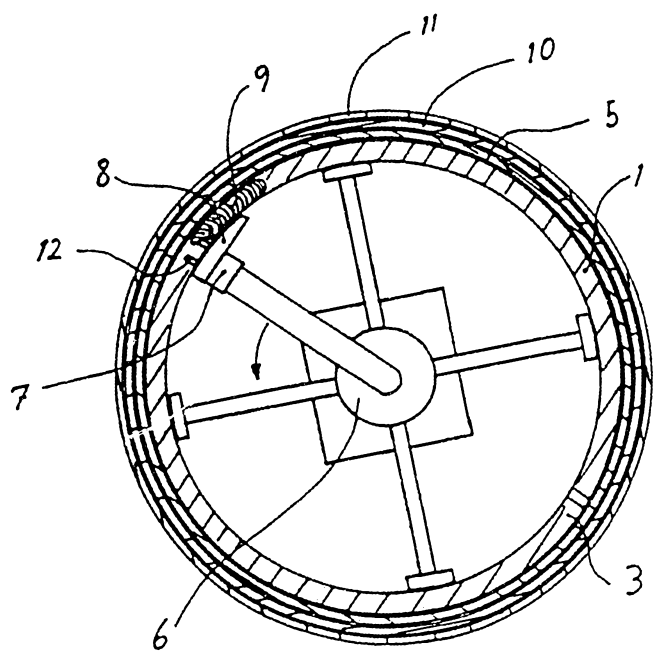


FIG. 2

## INTERNATIONAL SEARCH REPORT

International Application No **PCT/FI 92/00185**

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC5: B 29 C 65/40, F 16 L 47/02		
<b>ii. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC5	B 29 C; F 16 L	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched <sup>8</sup>		
SE,DK,FI,NO classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
A	EP, A1, 0081931 (GULF OIL CORPORATION) 22 June 1983, see page 5, line 1 - line 25; figure 9 --	1
A	CH, A5, 653951 (OY WIIK & HÖGLUND AB) 31 January 1986, see figure 9; claims 1-3 --	1
A	DE, C1, 2947583 (STURM, WERNER, HÄGENDORF) 23 April 1987, see claim 1 -- -----	2-3
<p><b>* Special categories of cited documents:<sup>10</sup></b></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
27th August 1992	1992 -09- 1 4	
International Searching Authority	Signature of Authorized Officer	
<b>SWEDISH PATENT OFFICE</b>	<i>Johan von Döbeln</i> Johan von Döbeln	

ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.PCT/FI 92/00185

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
The members are as contained in the Swedish Patent Office EDP file on 31/07/92  
The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A1- 0081931	83-06-22	JP-A- 58122820	83-07-21
CH-A5- 653951	86-01-31	NONE	
DE-C1- 2947583	87-04-23	NONE	