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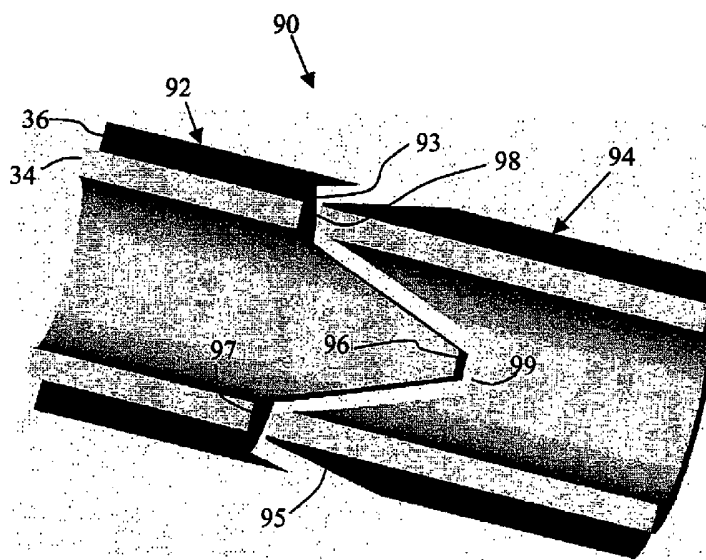
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[Continued on next page]

(54) Title: JOINING OF MULTILAYER THERMOPLASTIC PIPES



(57) Abstract: First and second pipes (92, 94) having at least two concentric layers of thermoplastic material are joined to form a pipe assembly. A non-planar mating surface (93, 95) is prepared on the end of each pipe. The pipes are brought into abutment at the mating surfaces (93, 95) to form a joining zone. Each of the mating surfaces (93, 95) is heated and then cooled under compression to solidify the joining zone, thereby forming a weld. Preferably separate heating processes are used to melt and join the separate layers, thereby substantially eliminating the intermingling of the layers, which may be chemically incompatible. A strong, durable joint is effected in a simple and reliable manner. Optionally, a melt flow insert is disposed between the pipes (92, 94) being joined to provide physical separation between the volumes of the different layers that are melted during the formation of the joint.



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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INTERNATIONAL SEARCH REPORT

International Application No.
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B29C65/02 F16L9/133 F16L11/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B29C F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 202 13 974 U (HENZE GMBH KUNSTSTOFFWERK) 7 November 2002 (2002-11-07) page 6, lines 23-25 - page 7, lines 10-12; figures 1,5,6	1-22
A	DE 37 08 705 A (GRUBER ALOIS & SOHN AGRU) 6 October 1988 (1988-10-06) column 2, line 59 - column 3, line 17; claims 1-4; figures 4,5.1-5,4	2-4,6,7, 16,18, 19,22
A	WO 00/20157 A (JONES IAN ANTHONY ; WISE ROGER JEREMY (GB); WELDING INST (GB)) 13 April 2000 (2000-04-13) cited in the application claim 1; figure 1	11-14
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
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- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *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.
- *Z* document member of the same patent family

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2004/005248

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 288 884 A (BUEDENBENDER BERND) 2 November 1988 (1988-11-02) figure 10 -----	5,20
A	JP 06 147386 A (SEKISUI CHEM CO LTD) 27 May 1994 (1994-05-27) figure 1 & PATENT ABSTRACTS OF JAPAN vol. 018, no. 469 (M-1666), 31 August 1994 (1994-08-31) & JP 06 147386 A (SEKISUI CHEM CO LTD), 27 May 1994 (1994-05-27) abstract -----	8-10
X	GB 1 329 364 A (CPF PLASTICS LTD) 5 September 1973 (1973-09-05) figure 1 -----	23-25, 29,30
X	EP 1 130 303 A (SEKISUI CHEMICAL CO LTD) 5 September 2001 (2001-09-05) paragraphs '0337!', '0346!', '0350!; figures 38,41A,43 -----	26-28
A	US 5 918 643 A (STRASZEWSKI KLAUS ET AL) 6 July 1999 (1999-07-06) figure 1 -----	26-28
A	US 4 630 846 A (NISHINO YOSHINORI ET AL) 23 December 1986 (1986-12-23) figures 12-14,17 -----	1-30

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2004/005248

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-22

Process claims 1-16 and corresponding product claims 17-22 address joining a first pipe and a second pipe, each of said pipes having an outside surface and an inside surface and being comprised of a plurality of layers of thermoplastic materials, including prepared a first non-planar mating surface at one end of said first pipe and a prepared second non-planar mating surface at one end of said second pipe.

2. claims: 23-25, 29, 30

Product claims 23, 24 and the corresponding method claim 25 are related to joining first and second thermoplastic pipe using a tubular joint insert therebetween, each of said pipes having an outside surface and an inside surface and an inner welding layer with inside and outside diameters and an outside layer. Claims 29 and 30 address the corresponding insert.

3. claims: 26-28

Product claim 26 and corresponding method claims 27, 28 are related to joining a first pipe and a second pipe, each of said pipes having an outside surface and an inside surface and comprising at least inner and outer layers of thermoplastic materials, the relative thickness of said layers varying along the length of said pipes.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2004/005248

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