



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/GB91/01549 (22) International Filing Date: 11 September 1991 (11.09.91) (30) Priority data: 9019888.8 12 September 1990 (12.09.90) GB (71) Applicant (for all designated States except US): CHEM-RES-IST PLASTICS FABRICATIONS LIMITED [GB/GB]; Britannia House, Lockway, Ravensthorpe Industrial Estate, Dewsbury, West Yorkshire WF13 3SX (GB). (72) Inventor; and (75) Inventor/Applicant (for US only) : QUINN, Seamus [GB/GB]; Shays Laith Farm, New Hey Road, Scammonden, Huddersfield, West Yorkshire HD3 3FW (GB).		(74) Agent: WHARTON, Peter, Robert; Urquhart-Dykes & Lord, Alliance House, 29/31 Kirkgate, Bradford BD1 1QB (GB). (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, LU (European patent), NL (European patent), NO, SE (European patent), US. Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: A METHOD OF PRODUCING A TUBE OR CONTAINER BY WINDING A THERMOPLASTIC MATERIAL		
(57) Abstract A tube or container is formed by winding a strip (16) of thermoplastic material onto the surface of a drum (10) or of the mandrel. The drum (10) is first covered with a sheet or sheets (14) of lining material, preferably of the same thermoplastic material as the strips (16). Furthermore, the drum (10) or mandrel is not heated, but the winding strips (16) are preheated or may even be the output of a plastics material extruder.		

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⁺ Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

**A METHOD OF PRODUCING A TUBE OR CONTAINER
BY WINDING A THERMOPLASTIC MATERIAL**

This invention relates to a method of making tubes and containers of helically wound thermoplastic material.

It has previously been proposed to make tubes or containers by winding a band of thermoplastic material onto the heated surface of a metal drum or other mandrel. The thermoplastic material is itself heated until it is in the plastic state so that adjacent edges fuse together to produce an unbroken cylindrical container wall.

In a modification to this method, it has been proposed to cover the metal drum or mandrel with a heat insulating material, such as a layer of silicone rubber, so as to prevent heat loss therefrom.

This method produced satisfactory cylindrical containers but was costly owing to the amount of heat needed to maintain the metal drum at the required elevated temperature. Furthermore, the interior surface of a container produced in this way would often have helical surface imperfections owing to its method of production and require to be surface finished prior to use.

The invention seeks to provide a method of producing tubes or containers improved in the above respects.

According to the present invention there is provided a method of producing a tube or container by winding a thermoplastic material onto the surface of a drum or other mandrel characterised in that the drum is first covered with a sheet or sheets of lining material and in that the drum or mandrel is not heated.

The sheet or sheets of lining material will bond to the

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helically wound band of thermoplastic material during formation of the tube or container and will form the inner surface in the finished product. Since the sheet material is smooth the inner surface of the finished container or tube will also be smooth and no surface finishing will be required.

It has furthermore been found that using the lining sheet in accordance with the method of the invention it is unnecessary to heat the drum or mandrel and thus considerable energy is saved. The lining sheet should preferably be of a heat insulating material, for example a plastics material, and will preferably be of the same plastics material as the thermoplastic band. This prevents the metal drum or mandrel leading the heat away too quickly from the heated band of thermoplastic material. The use of a lining sheet also means that the drum or mandrel may be of a lighter construction than would otherwise be necessary.

The thermoplastic material employed may be any of the materials employed previously with this type of container, and polyolefin materials such as polyethylene are preferred, especially high density polyethylene.

The invention will be described further, by way of example, with reference to the accompanying drawing, in which:

Figure 1 is a section through a winding drum illustrating the method of the invention; and

Figure 2 is a partial longitudinal section corresponding to figure 1.

Referring to the drawings, a metal winding drum 10 of a suitable metal such as steel or aluminium is provided and has an outer surface 12 onto which a sheet or sheets of a

thermoplastic lining material 14 may be affixed. A strip of heated thermoplastic, for example polyethylene, material 16 is fed onto the drum 10 over the lining sheet 14 where it is wound helically (as can be seen better from figure 2). The strip 16 is preheated, or may even be the output of a plastics material extruder.

The adjacent edges of the helically wound strip 16 bond or weld to one another and the strip also bonds to the lining sheet 14. Once the drum 10 has been completely wound and the strip 16 has cooled sufficiently, the tube or container may be removed therefrom in the conventional manner by ensuring that the cylinder is slightly undersize and is held open to its nominal diameter by a wedge segment which is removed after production allowing the cylinder diameter to be reduced once again.

If the desired product is a container, once the formed tube is removed from the drum or mandrel a base may be affixed thereto e.g. by a plastic welding.

The containers produced in accordance with the invention have smooth internal surfaces, owing to the presence of the lining sheets 14, and require less energy in their production.

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CLAIMS

1. A method of producing a tube or container by winding a thermoplastic material onto the surface of a drum or other mandrel characterising that the drum is first covered with a sheet or sheets of lining material and in that the drum or mandrel is not itself heated.
2. A method as claimed in claim 1 in which the thermoplastic material is preheated.
3. A method as claimed in either of claims 1 or 2 in which the thermoplastic material is the output of a plastics material extruder.
4. A method as claimed in any of claims 1 to 3 in which the sheet of lining material has a smooth inner surface.
5. A method as claimed in any of claims 1 to 4 in which the lining material is produced from the same thermoplastic material as the windings.
6. A method as claimed in any of claims 1 to 5 in which the thermoplastic material is a polyolefin material.
7. A method as claimed in claim 6 in which the polyolefin is high density polyethylene.
8. A method as claimed in any of claims 1 to 6 which after in which once the formed tube is removed from the drum or mandrel a base is affixed thereto by plastic moulding.

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9. A method as claimed in any of claims 1 to 8 in which the drum or mandrel is slightly under size and is held open to its nominal diameter by a wedge segment which is removed after production allowing the diameter to remove once again and the finished article easily removed therefrom.

1/1

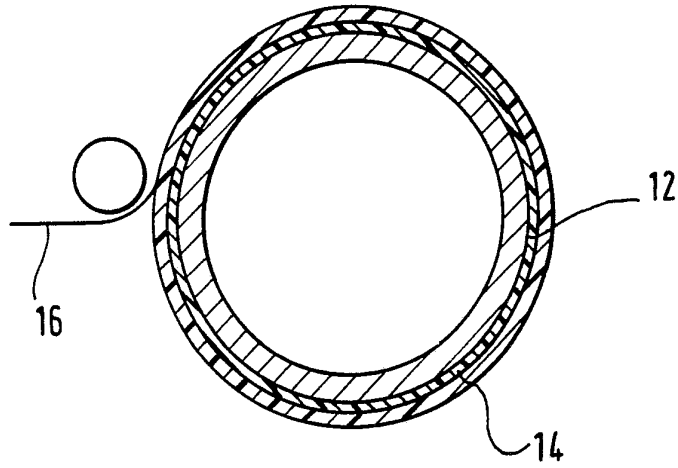


Fig. 1.

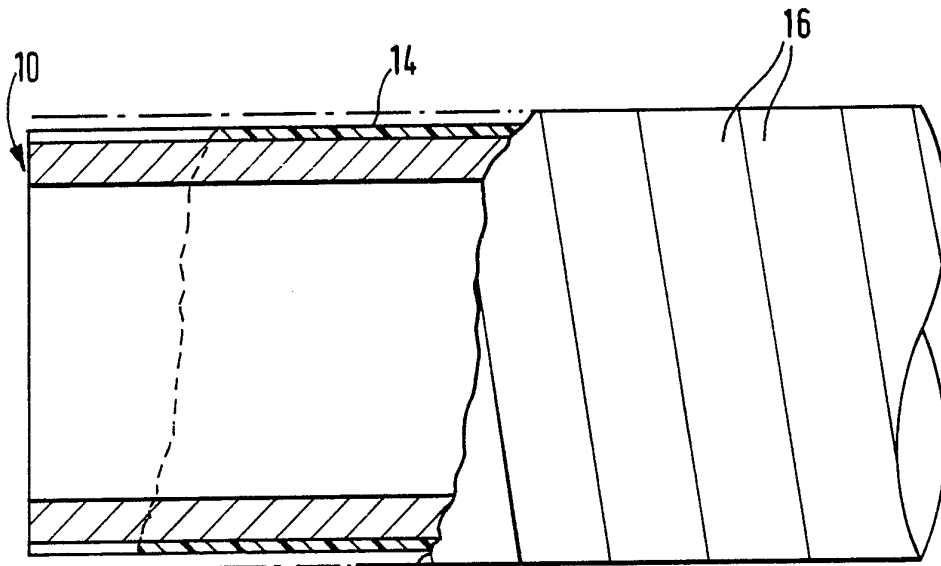


Fig. 2.

SUBSTITUTE SHEET

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 91/01549

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: B 29 C 53/60, B 65 D 3/04																										
II. FIELDS SEARCHED Minimum Documentation Searched⁷ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%; border-bottom: 1px solid black;">Classification System</th> <th style="border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="height: 40px; vertical-align: bottom;">IPC5</td> <td>B 29C; B 29 D; B 65 D</td> </tr> </table> Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched⁸			Classification System	Classification Symbols	IPC5	B 29C; B 29 D; B 65 D																				
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III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category¹⁰</th> <th style="width: 60%;">Citation of Document,¹¹ with indication, where appropriate, of the relevant passages¹²</th> <th style="width: 30%;">Relevant to Claim No.¹³</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td rowspan="2">US, A, 3428507 (ERIC BALL) 18 February 1969, see column 4, line 22 - line 30; column 5, line 27 - line 38</td> <td style="text-align: center; vertical-align: top;">1,4-7</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="text-align: center; vertical-align: top;">2,3,8</td> </tr> <tr> <td></td> <td style="text-align: center;">--</td> <td></td> </tr> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td rowspan="2">US, A, 3294609 (WILLIAM A. FOLL) 27 December 1966, see column 2, line 10 - line 67; column 3, line 1 - line 51; figures 1,2,3</td> <td style="text-align: center; vertical-align: top;">1,3-7</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="text-align: center; vertical-align: top;">2,8</td> </tr> <tr> <td></td> <td style="text-align: center;">--</td> <td></td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td rowspan="2">US, A, 2502638 (MERRILL A. BECHT) 4 April 1950, see column 1, line 12 - line 26; column 2, line 16 - line 41; column 3, line 33 - line 36; figures 1,3</td> <td style="text-align: center; vertical-align: top;">1-8</td> </tr> <tr> <td></td> <td style="text-align: center;">--</td> </tr> </tbody> </table>			Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	X	US, A, 3428507 (ERIC BALL) 18 February 1969, see column 4, line 22 - line 30; column 5, line 27 - line 38	1,4-7	Y	2,3,8		--		X	US, A, 3294609 (WILLIAM A. FOLL) 27 December 1966, see column 2, line 10 - line 67; column 3, line 1 - line 51; figures 1,2,3	1,3-7	Y	2,8		--		Y	US, A, 2502638 (MERRILL A. BECHT) 4 April 1950, see column 1, line 12 - line 26; column 2, line 16 - line 41; column 3, line 33 - line 36; figures 1,3	1-8		--
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* Special categories of cited documents:¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "I" 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) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "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 "X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "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. "&" document member of the same patent family																										
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black; vertical-align: bottom;"> Date of the Actual Completion of the International Search 9th December 1991 </td> <td style="width: 50%; border-bottom: 1px solid black; vertical-align: bottom;"> Date of Mailing of this International Search Report 13 JAN 1992 </td> </tr> <tr> <td style="border-bottom: 1px solid black; vertical-align: bottom;"> International Searching Authority EUROPEAN PATENT OFFICE </td> <td style="border-bottom: 1px solid black; vertical-align: bottom;"> Signature of Authorized Officer Mme N. KUIPER </td> </tr> </table>			Date of the Actual Completion of the International Search 9th December 1991	Date of Mailing of this International Search Report 13 JAN 1992	International Searching Authority EUROPEAN PATENT OFFICE	Signature of Authorized Officer Mme N. KUIPER																				
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
Y	US, A, 3126306 (ORVILLE B. SHERMAN) 24 March 1964, see column 1, line 24 - line 38; column 2, line 1 - line 11; column 2, line 55 - column 3, line 6 --	1-8
A	DE, B, 1096591 (THE FIRESTONE TIRE & RUBBER COMPANY) 5 January 1961, see column 4, line 31 - line 40; figure 6 -- -----	1-9

ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. PCT/GB 91/01549

SA 51308

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 European Patent Office EDP file on 31/10/91
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3428507	18/02/69	BE-A- 664164 DE-A-C- 1475569 NL-A- 6506378 SE-C- 329527	16/09/65 16/01/69 22/11/65 30/01/75
US-A- 3294609	27/12/66	NONE	
US-A- 2502638	04/04/50	NONE	
US-A- 3126306	24/03/64	NONE	
DE-B- 1096591	05/01/61	NONE	

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