(12) UK Patent Application (19) GB (11) 2 342 889 (13) A

(43) Date of A Publication 26.04.2000

(21) Application No 9823129.3

(22) Date of Filing 23.10.1998

(71) Applicant(s)
Rover Group Limited
(Incorporated in the United Kingdom)
International Headquarters,
Warwick Technology Park, WARWICK, CV34 6RG,
United Kingdom

(72) Inventor(s)
Mark Wilson Pharaoh
Robert John Coates
Paul David Stidworthy

(74) Agent and/or Address for Service
John A Moffat
Rover Group Limited, Patent Department,
Gaydon Test Centre, Banbury Road, LIGHTHORNE,
Warwickshire, CV35 0RG, United Kingdom

(51) INT CL^7
B32B 17/10 , B29C 43/20 , B32B 17/04

(52) UK CL (Edition R)
B5N N1704 N1710 N175 N176 N178 N18X N181 N195 N196 N207 N21X N21Y N223 N224 N226 N238 N245 N255 N256 N258 N259 N26Y N260 N261 N262 N2704 N2732 N296 N299 N3120 N494 N499 N50X N515 N517 N549 N552 N648 N649 N658 N66Y N661 N662 N670 N68X N681 N682 N705 N707 N77X
B5A AA1 AD20 AT1P A1R214D A1R214H A1R314C1A A1R314C1B A1R314C1C A1R314C6 A1R422 A2A1 A20T1
U1S S1858

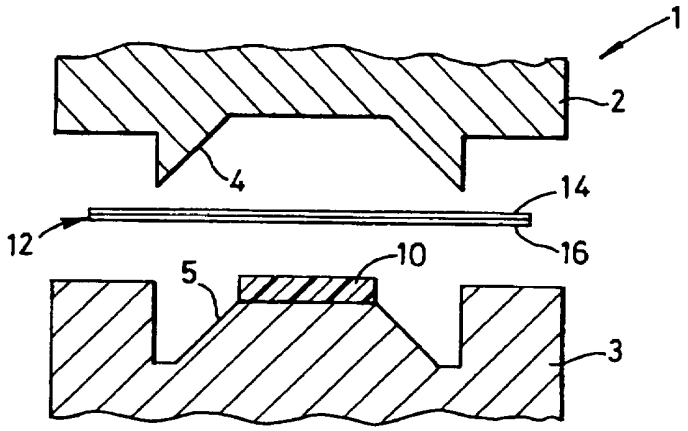
(56) Documents Cited
US 4956224 A **US 4716072 A** **US 4153490 A**

(58) Field of Search
UK CL (Edition Q) **B5A AA1 AB19 AD20 AT1P , B5N**
INT CL^6 **B29C 43/18 43/20 , B32B 17/04 17/10 19/02**
Online: WPI, EDOC, JAPIO

(54) Abstract Title
Coating glass mat thermoplastics

(57) A compression moulded glass mat thermoplastic (GMT) product has a coating layer and an interlayer of melt viscosity suitable to absorb the shrinkage stress of the GMT. Uneven surface finish due to such shrinkage is thus avoided, and the surface finish may be of Class A automotive type. The product may be made by moulding a sheet 12, comprising a coating layer 14 of nylon, polyester or polyvinylfluoride on a backing interlayer 16 of random ethylene/polypropylene copolymer, on to a blank 10 of glass fibre filled polypropylene.

Fig. 1



GB 2 342 889 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig. 1

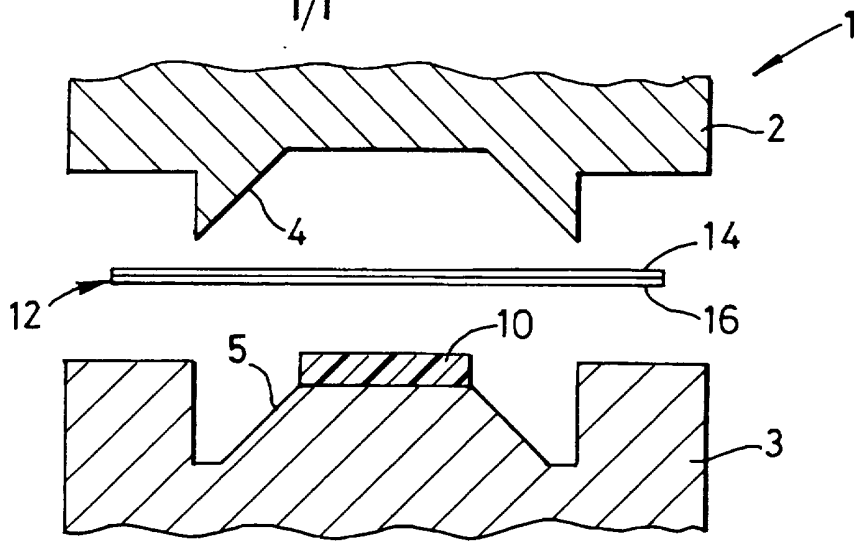


Fig. 2

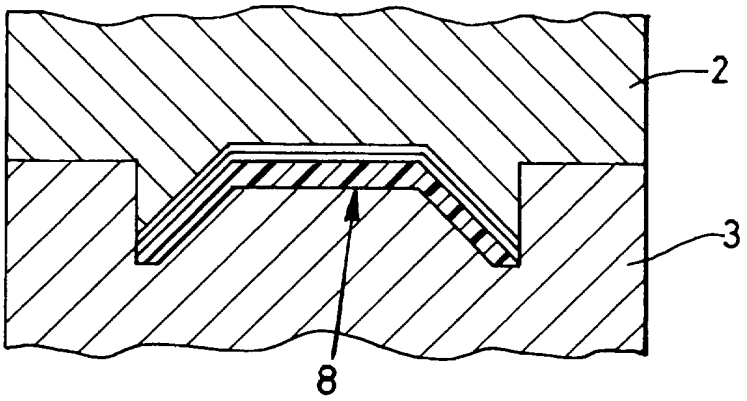
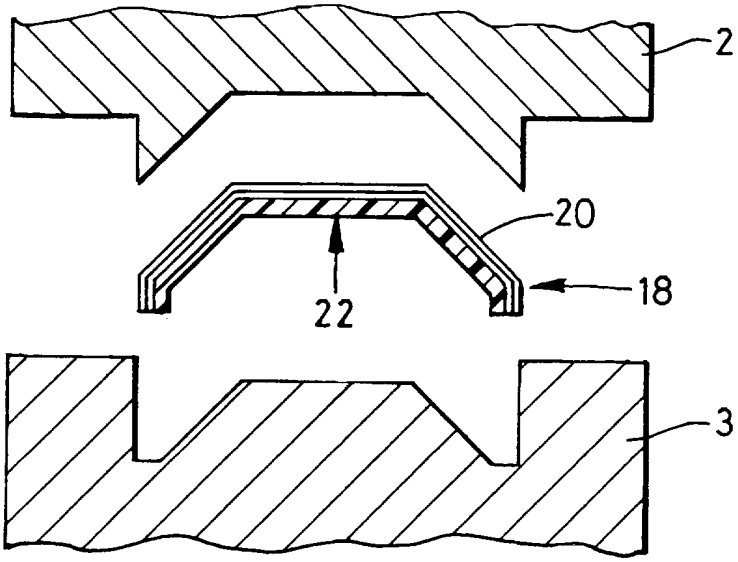


Fig. 3



A Polymer Coating System

The present invention relates to an improved polymer coating system. The invention has particular, but not exclusive, use in the automotive industry.

A known construction of an automotive bumper having a support, a core and a shell comprises a foamed polyurethane core, a support of a glass fibre reinforced polyester resin sheet moulding compound and a shell of a propylene polymer modified with an ethylene/propylene rubber and a coating material such as polyurethane.

However, this does not produce a high quality surface finish, the automotive Class A finish. The surface finish of compression moulded glass mat thermoplastic (GMT) components is generally quite poor. A GMT typically comprises a glass fibre filled polypropylene. During cooling, the polypropylene shrinks relative to its molten state. The end result is that the glass fibres are left proud of the surface of the polypropylene creating an uneven and hence undesirable surface finish. To overcome this problem it is known, in the example given above, to modify the rubber containing propylene polymer by the addition of additives such as talc, chalk and the like to improve coating adhesion and properties such as heat resistance and shrinkage.

It is an advantage of the present invention that it provides for an improved surface finish of a moulded glass mat thermoplastic than has previously been possible. Conveniently, the surface finish is of the Class A automotive type.

According to a first aspect of the present invention a coated glass mat thermoplastic comprises a glass mat thermoplastic, an interlayer and a coating layer characterised in that the interlayer has a melt viscosity suitable to absorb the shrinkage stresses of the glass mat thermoplastic.

Preferably, the interlayer comprises a layer of a random ethylene/polypropylene copolymer.

According to a second aspect of the present invention, a method of coating a glass mat thermoplastic comprises the steps of providing an open compression mould, the mould comprising a cavity defined by a first mould surface and a second mould surface, providing a body of a glass mat thermoplastic on the first mould surface, providing a coating sheet with a backing layer having a melt viscosity suitable to absorb the shrinkage stresses of the glass mat thermoplastic, placing the sheet on the body with the backing layer adjacent the body, and closing the mould to apply pressure to the blank causing the materials within the mould to deform, fill the cavity and solidify on cooling and then opening the mould to remove a coated glass mat plastics component.

The invention has the advantage that the low melt interlayer masks the differential shrinkage such that a good surface finish is obtained on the coated component. The surface finish of the component is determined by the surface finish of the second mould surface. In particular, a Class A automotive finish can be obtained by the use of a suitably smooth mould surface, for example a chromed mould surface.

Preferably, the interlayer comprises a random ethylene/polypropylene copolymer.

Preferably the coating layer comprises a nylon, a polyester or a polyvinyldifluoride (PVDF).

The invention will now be described, by way of example only, with reference to the accompanying drawings, in which

Figure 1 shows in diagrammatic form a section through an apparatus in a first step of the method of the present invention;

Figure 2 shows in diagrammatic form a section through the apparatus of Figure 1 in a further step of the method of the present invention; and

Figure 3 shows in diagrammatic form a section through the apparatus of Figure 1 in a final step of the method of the present invention.

The invention will now be described with reference to Figures 1 to 3. A mould assembly 1 is shown comprising a first mould platen 2 and a second mould platen 3. The first mould platen 2 includes a first mould surface 4 and the second mould platen 3 includes a second mould surface 5 complimentary to the first mould surface 4 on the first mould platen 2. The first and second mould surfaces, when brought together define a cavity 8.

A plurality of sheets of a glass mat thermoplastic may be placed onto the second mould surface 5 of the second mould platen 3 to form a blank 10 of glass mat thermoplastic material. A single sheet is shown in the drawings for reasons of clarity. The glass mat thermoplastic sheets 10 comprises a glass fibre filled thermoplastic material, in which the thermoplastic material is typically a polypropylene. The sheets may be preheated prior to location on the platen. The sheets may typically be heated to about 200°C. Preheating expands the glass mat thermoplastic sheets and places the thermoplastic material in a condition that it might more easily flow to the shape desired.

A sheet 12 comprising a coating layer 14 of a nylon, a polyester or a polyvinyldifluoride (PVDF) is provided with a backing layer 16 having a melt viscosity suitable to absorb the shrinkage stresses of the glass mat thermoplastic. Preferably, the backing layer 16 comprises a random ethylene/polypropylene copolymer. Such a sheet 12 comprising a coating layer of polyvinyldifluoride is commercially available from Rexam. The sheet 12 is placed on the blank 10 of glass mat thermoplastics material with the backing layer 16 adjacent the blank.

The first mould platen 2 is then brought down into contact with the second mould platen 3 to form the cavity 8. The platens 2,3 close the cavity about its edges to prevent the

thermoplastics material from flowing out of the cavity 8. The platens 2,3 may be heated to about 100°C. This ensures that the thermoplastics material has an opportunity to flow to fill the cavity behind the sheet 12 prior to solidification of the thermoplastics material on cooling.

During cooling, the thermoplastics material begins to shrink relative to its molten state. A surface of the interlayer of random ethylene/propylene copolymer adjacent the thermoplastics material, due to the heat of the thermoplastics material, becomes at least partially able to flow to fill up the gaps formed by shrinkage. Further, the low melt interlayer retains a melt condition while the glass mat thermoplastic shrinks. In other words, the low melt interlayer is the last to solidify and in this way the shrinkage stresses generated by the glass mat thermoplastic are accommodated by the low melt interlayer. The coating layer adjacent the mould is able to retain its integrity and its smooth surface to provide a smooth surface finish on the final moulded component.

The mould assembly is then opened to allow for the removal of the moulded component 18. The finished component 18 has a surface finish on a front side 20 corresponding to the surface finish of the first mould surface 4. In this way, a Class A automotive surface finish may be obtained on the front side 20 of the component 18.

The second mould surface 5 does not need to be of any particular surface quality if a rear surface 22 of the component is to be hidden from view.

CLAIMS

1. A coated glass mat thermoplastic comprising a glass mat thermoplastic, an interlayer and a coating layer characterised in that the interlayer has a melt viscosity suitable to absorb the shrinkage stresses of the glass mat thermoplastic.

2. A coated glass mat thermoplastic according to claim 1, characterised in that the intermediate layer comprises a random ethylene/polypropylene copolymer.

3. A coated glass mat thermoplastic according to claim 1 or claim 2, characterised in that the coating layer comprises a nylon, a polyester or a polyvinyldifluoride (PVDF).

4. A coated glass mat thermoplastic substantially as described herein with reference to and as illustrated in the accompanying drawings.

5. A method of coating a glass mat thermoplastic comprises the steps of providing an open compression mould, the mould comprising a cavity defined by a first mould surface and a second mould surface, providing a body of a glass mat thermoplastic on the first mould surface, providing a coating sheet comprising a coating layer and a backing layer having a melt viscosity suitable to absorb the shrinkage stresses of the glass mat thermoplastic, placing the sheet on the body with the backing layer adjacent the body, and closing the mould to apply pressure to the blank causing the materials within the mould to deform, fill the cavity and solidify on cooling and then opening the mould to remove a coated glass mat plastics component.

6. A method according to claim 5, characterised in that the intermediate layer comprises a random ethylene/polypropylene copolymer.

7. A method according to claim 5 or claim 6, characterised in that the coating layer comprises a nylon, a polyester or a polyvinyldifluoride (PVDF).

8. A method of coating a glass mat thermoplastic substantially as described herein with reference to and as illustrated in the accompanying drawings

Application No: GB 9823129.3 **Examiner:** Richard Kennell
Claims searched: 1-8 **Date of search:** 7 January 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): B5A (AA1, AB19, AD20, AT1P), B5N

Int Cl (Ed.6): B29C 43/18 43/20; B32B 17/04 17/10 19/02

Other: Online: WPI, EDOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	US 4956224 A	(LECA), see adhesive layer (C)	1
X	US 4716072 A	(KIM), whole document, see especially Figure 2	1,3,5,7
X	US 4153490 A	(WERZ), see intermediate layer 3 and col 1 lines 45-50	1,5

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.