



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/AU94/00089 (22) International Filing Date: 25 February 1994 (25.02.94) (30) Priority Data: PL 7483 25 February 1993 (25.02.93) AU (71) Applicant (for all designated States except US): WRIGHT RUBBER GROUP PTY. LIMITED [AU/AU]; 15 Paw Paw Road, Altona North, VIC 3025 (AU). (72) Inventor; and (75) Inventor/Applicant (for US only): TURNER, Murray, John [AU/AU]; 15 Rose Street, Bentleigh, VIC 3204 (AU). (74) Agent: OBERIN, Colin, James; Oberins, Level 32, 530 Collins Street, Melbourne, VIC 3000 (AU).</p>	<p>(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FI, GB, GE, HU, JP, KG, KP, KR, KZ, LK, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, TJ, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  Published With international search report.</p>
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<p>(54) Title: MUDFLAPS (57) Abstract A vehicle mudflap for reducing side-spray from the wheels of heavy vehicles is characterised by a substantially flexible skirt (5) carrying a facing layer (7) of tufted synthetic grass. The facing layer (7) may be mounted on a backing material (9), preferably a flexible woven polypropylene mat, attached to the skirt (5). The synthetic grass tufts (8) preferably project through apertures in the backing material (9) in a U-shaped profile at least 10 mm from the backing material (9).</p> <div data-bbox="813 1232 1404 1836" data-label="Image"> </div>
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**TITLE: MUDFLAPS****BACKGROUND OF THE INVENTION**

The present invention relates to mudflaps. More particularly the present invention relates to vehicle mudflaps of a type suitable for use on heavy vehicles.

5 It is well known that in wet conditions water from a roadway may be picked up by the wheels of a vehicle. In the case of heavy vehicles, including lorries, semi-trailers and buses, mudflaps are generally provided to prevent mud, water and other debris picked up by the wheels of the vehicle from being thrown directly into the path of following vehicles.

10 It has been found however that especially with heavy vehicles travelling at elevated speed, as in a highway or freeway situation, water picked up by the wheels and thrown against mudflaps tends to form spray. Such spray is typically forced laterally from the vehicle via the wheel arches and tends to form a spray barrier extending on either side of the heavy vehicle. This spray barrier travels with the  
15 heavy vehicle.

The spray barrier can drastically reduce visibility and hence form a hazard for other vehicles using the roadway. For example, on a two-way carriageway, the spray barrier may momentarily blind the driver of an on-coming vehicle as it passes a heavy vehicle travelling in the opposite direction. When two vehicles are travelling  
20 in the same direction the spray barrier extending either side of a heavy vehicle may obscure vision from the following vehicle. This may create a dangerous situation for a following vehicle wishing to overtake a slower heavy vehicle but unable to properly see that the roadway ahead is clear.

It has been proposed in, for example, U.S. Patent No. 3,899,192 to Reddaway,  
25 subsequently assigned to Monsanto Company, to address the problem of spray and splash from vehicles by providing a substantially rigid three-dimensional laminated spray-reducing device having resilient blade elements projecting outwardly generally in the direction of the wheel in random, angular crossing relationship to each other to present a tangled mass of such elements. The  
30 secured inner ends of the resilient blade-like elements are disposed generally in laterally spaced rows, the elements secured to and projecting from the surface of

the backing section in daisy configuration. The support member to which the backing section is attached is constructed of a substantially rigid material such as fibreglass, so as to be of a nonsailing type.

5 As noted in a number of subsequent U.S. patents assigned to the same company, such as U.S. Patents Nos. 4,361,606, 4,391,870 and 4,598,000, the device described in U.S. Patent No. 3,899,192 suffers, due to its construction, from a number of disadvantages. These include a tendency to crack at low temperatures due to poor low temperature mechanical properties such as ductility and impact resistance. In addition, the ribbed nature of the base portion of the device  
10 generally leads to localised cracks.

U.S. Patent No. 4,361,606 suggests a rain flap device comprising an irradiated three-dimensional laminate of a three-dimensional low density polyethylene layer fusion bonded to a high density polyethylene substrate, the laminate remaining ductile at temperatures down to at least minus 29°C, as a means of overcoming  
15 the cracking problem. Unfortunately, irradiation of the laminate can add considerably to the production cost, and hence the cost to the customer, of the device.

U.S. Patent No. 4,598,000 discloses a spray reduction device having a substrate layer of high density polyethylene fusion bonded to a three-dimensional molded  
20 layer of linear low density polyethylene. The substrate layer is selected such that flexure of the device is inhibited as much as possible.

The provision of a crack propagation layer of a non-woven polyamide fabric adhered on one side to a high density backing layer of polyethylene and on the other side to a low density polyethylene or polypropylene layer to yield a laminated  
25 product to absorb and dissipate the energy of a crack, has also been proposed in U.S. Patent No. 4,391,870.

No commercial embodiment of the devices disclosed however appears to date to have adequately addressed the problem of cracking in an efficient and economical manner. In addition, the commercial embodiments of the devices disclosed, being  
30 of the same general class and structure, have been generally found to become clog with mud, thus detracting from their intended spray-cracking problem intended to be overcome.

## SUMMARY OF THE INVENTION

The present invention accordingly provides, in one embodiment, a vehicle mudflap for mounting behind a vehicle wheel characterised by a substantially flexible skirt carrying a facing layer of tufted synthetic grass, the facing layer covering at least a portion of the skirt.

The facing layer is preferably in the form of tufted grass mounted on a backing material. The tufts are preferably relatively long and may project at least 10 millimetres and preferably at least 15 millimetres from the backing material. Most preferably the tufts do not extend more than 30 millimetres beyond the backing material. The tufts are preferably resiliently flexible. The tufts may be arranged in the form of a spaced array and are preferably relatively widely spaced from one another. A separation of at least 5 millimetres and preferably between 5 and 15 millimetres between neighbouring tufts is particularly preferred.

The tufts are preferably mounted on a flexible backing material. The backing material may comprise a layer of woven textile material. Woven polyolefin strands, particular a woven polypropylene mat, has been found particularly suitable for use as a backing material for carrying grass tufts in accordance with the present invention.

The grass tufts may be conveniently formed from a polyolefin, most preferably polypropylene. In a particularly preferred arrangement the grass tufts each comprise a bundle of filaments. The filaments may be ribbon-like or of other profile. A bundle of filaments may be mounted on the flexible backing material in a U-shaped profile. In this arrangement the arms of the U each project through apertures in the backing material with the web of the U extending on the reverse side of the backing material between the respective apertures. In this arrangement the neighbouring arms of adjacent tufts may each project through the same aperture in the backing material, whereby to form a denser tuft comprising two arms of adjacent bundles.

To secure the grass tufts to the backing material an adhesive may be applied to the reverse side of the backing material whereby to adhere the backing material and the webs of the U-shaped tufts projecting therethrough. In this way, the likelihood of inadvertent removal of tufts from the backing material may be reduced. It has been found that a rubber latex is particularly suitable for such a backing adhesive.

5 A typical suitable rubber latex backing adhesive is neoprene. Another suitable backing adhesive is a styrene-butadiene rubber (SBR) based adhesive. It has also been found that a synthetic grass layer such as AstroTurf (trade mark) already known and produced for use in sporting applications is suitable for use as the tufted synthetic grass facing layer in accordance with the present invention

10 although longer than usual grass tufts are more preferred.

The skirt of a vehicle mudflap according to the present invention may comprise a vehicle mudflap of known form. Preferably the skirt is formed from a resiliently deformable material and may be adapted to depend from a mounting positioned along the upper marginal edge of the skirt. The skirt may be mounted behind the

15 wheel of a vehicle in any suitable manner. For example, the skirted may be mounted in a similar manner to which a conventional mudflap is mounted. In a preferred embodiment, the skirt includes a thickened outer marginal edge which may be pre-drilled with a plurality of apertures and subsequently attached to complementary mounting means on the vehicle.

20 Compression moulded rubber mudflaps of a conventional type have been found particularly suitable for use as a skirt in accordance with the present invention. Skirts comprising natural rubber materials, and mixtures of natural and SBR rubber materials, are particularly suitable for use in accordance with the present invention, as they are adapted for compression moulding which may be effected with a

25 variety of colours and which may include a logo moulded into the skirt and hence forming a permanent part of the mudflap. Such rubber skirts typically have a thickened outer marginal edge to resist tearing and may be of a suitable weight to depend downwardly from a mounting along the upper marginal edge without undue flapping or movement during use.

5 The synthetic grass facing layer may be mounted on the skirt by use of an adhesive layer to adhere the flexible backing material to the face of the skirt. The face of the skirt is understood to mean the surface which, in use, faces toward the vehicle wheel. The face of the skirt is preferably substantially planar. With a flexible backing material having a rubber latex backing to hold the tufts in position and a rubber skirt, it has been found that an SBR based rubber adhesive is particularly useful for mounting the backing material onto the skirt in accordance with the present invention.

10 In a particularly preferred arrangement in accordance with the present invention a mudflap of conventional form is prepared by compression moulding of natural, or mixtures of natural and SBR rubber materials. The substantially planar face of the skirt is coated with a neoprene or SBR based adhesive, preferably SBR rubber. The woven polypropylene backing material carrying the grass tufts is pressed against the face of the skirt with the free ends of the tufts projecting outwardly. In  
15 this arrangement, the web of the U-shaped tufts is effectively sandwiched between the woven backing material and the skirt and may form part of the adhesive layer. The skirt may be allowed to air dry, preferably for approximately 24 hours whereby to bind the backing material to the skirt to form a vehicle mudflap in accordance with the present invention.

20 In an alternative embodiment, the skirt may be placed on a heated platten which raises the temperature of the skirt and hence the rubber adhesive whereby to effect cross-linking of the adhesive whereby to bind the backing material to the skirt to form a vehicle mudflap in accordance with the present invention.

25 Most preferably the grass layer substantially covers the face of the skirt. With this arrangement the flexible woven backing material has been found to prolong the life of a conventional mudflap by resisting tearing of the mudflap, particularly in the region of the mounting.

30 It is also envisaged within the scope of the present invention that only a portion of the face of the skirt may be covered with a synthetic grass facing layer. The synthetic grass facing layer may accordingly be applied in the form of one or more strips, although it has been found preferable if substantially the entire face of the skirt is covered with a synthetic grass facing layer.

A mudflap according to the present invention may be mounted behind a wheel in conventional fashion on a heavy vehicle with the synthetic grass facing layer facing toward the vehicle wheel. It has been found that the arrangement of the present invention substantially reduces side spray and is suitable for use in a variety of weather conditions extending from below freezing to above 50 °C without undue cracking or other forms of degradation. By the use of longer grass tufts than that traditionally used in sporting applications, it has been found that mud and other roadway debris does not tend to stick to the filaments of the synthetic grass facing layer but falls to the roadway. Water picked up from the roadway by the vehicle wheels and thrown against the synthetic grass facing layer becomes entrapped in the filaments and flows downwardly and back onto the roadway from the lower marginal edge of the mudflap thereby significantly reducing the incidence of potentially dangerous side-spray.

In another embodiment, the present invention provides a method of forming a vehicle mudflap, comprising coating a substantially flexible skirt with an adhesive, pressing a backing material carrying a layer of synthetic grass against a face of the skirt, the free ends of the synthetic grass layer projecting outwardly, and air-drying of the adhesive to bind the backing material to the skirt, to form a vehicle mudflap.

In another embodiment, the present invention provides a vehicle mudflap comprising a substantially flexible skirt carrying a facing layer of tufted synthetic grass attached to a flexible woven backing material adhered to said skirt, the free ends of the tufted synthetic grass layer projecting outwardly, the tufts extending from 10 - 30 mm from the backing material, said synthetic grass layer covering substantially an entire face of said skirt.

In another embodiment, the present invention provides a vehicle mudflap comprising a substantially flexible skirt carrying a facing layer of resiliently flexible spaced tufts of relatively long synthetic grass embedded in a flexible woven polypropylene backing material adhered directly to a face of said skirt, the tufts extending at least 10 mm from the backing material, said synthetic grass layer covering substantially an entire face of said skirt.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

To further assist in the understanding of the present invention, particularly preferred embodiments of the invention will now be described in relation to the accompanying drawings.

- 5 In the drawings in which like features are indicated by common numerals, Figure 1 is a partial perspective view showing a vehicle mudflap according to the present invention mounted behind a rear wheel of a lorry;  
Figure 2 is a side view of the embodiment of Figure 1;  
Figure 3 is a cross-sectional view through a portion of a vehicle mudflap according to a preferred embodiment of the present invention;  
10 Figure 4 is a front view of a portion of a synthetic grass facing layer according to a preferred embodiment of the present invention;  
Figure 5 is a back view of the portion of Figure 4.

- 15 In the embodiments shown in the drawings a vehicle mudflap 1 is mounted immediately behind wheel 2 of a lorry 3.

The mounting 4 may be of any suitable type for the vehicle concerned.

Vehicle mudflap 1 comprises a substantially flexible skirt 5 in the embodiment shown in Figure 1. The skirt 5 is a compression moulded rubber skirt in which a logo 6 is moulded into the back of the skirt.

- 20 Skirt 5 carries a synthetic grass facing layer 7. The facing layer 7 is in the form of a spaced array of tufted grass 8.

- As best seen in Figure 3, the grass tufts each comprise a bundle of filaments mounted on flexible backing material 9. In the embodiment illustrated in Figure 5, flexible backing material 9 comprises a layer of woven textile material preferably a  
25 woven polypropylene mat.

As is clearly seen from Figures 3 and 5, grass tufts 8, which preferably comprise bundles of polypropylene filaments are mounted in a U-shaped profile on flexible backing material 9.

As clearly seen in Figure 3, the arms of a U-shaped tuft may each project through apertures in backing material 9 with the web of the U extending on the reverse side of backing material 9 between the respective apertures. In this arrangement the neighbouring arms of adjacent tufts each project through the same aperture in backing material 9.

Although not clearly seen in the drawings, grass tufts 8 are adhered to the reverse side of backing material 9 by the application of an adhesive to the reverse side of backing material 9 i.e. to the side shown in Figure 5.

Synthetic grass facing layer 7 is mounted on the skirt 5 as best seen in Figure 3 by the application of an adhesive 10. In this arrangement the web of U-shaped tufts 8 is sandwiched between flexible backing material 9 and the face of the skirt 5 and held in place by adhesive 10. The skirt 5/adhesive 10/facing layer 7 combination is subsequently air-dried to bind the backing material 9 to the skirt 5, to form a finished vehicle mudflap 1.

As clearly seen in Figures 1 and 2, mudflap 1 may be mounted behind a vehicle wheel 2 in conventional fashion with synthetic grass facing layer 7 facing toward the vehicle wheel 2 so that water picked up from the roadway by vehicle wheel 2 will impact on facing layer 7 to become entrapped in tufts 8 and flow downwardly and onto the roadway from the lower marginal edge of mudflap 1 thereby significantly reducing the incidence of potentially dangerous side spray.

In order to produce a vehicle mudflap in accordance with the present invention, a substantially flexible skirt is coated with an adhesive 10, a backing material 9 carrying a layer 7 of tufted synthetic grass is pressed against a face of the skirt 5, the free ends of the tufted synthetic grass layer 7 projecting outwardly, and the skirt 5 air-dried to bind the backing material 9 to the skirt, to form a vehicle mudflap 1.

5 The provision in a preferred embodiment of a flexible skirt in the form of a conventional rubber mudflap, having resiliently flexible, spaced, relatively long synthetic grass tufts in the form of bundles of filaments, the tufts embedded in a backing layer adhered directly to a face of the skirt, results in a spray-reducing device having improved water retention capabilities, a reduced tendency to become clogged with debris picked up from road surfaces, and a reduced tendency to crack in conditions of low temperature.

10 While it has been convenient to describe the invention herein in relation to particular preferred embodiments, it is to be appreciated that other constructions and arrangements are also considered as falling within the scope of the invention. Various modifications, alterations, variations and/or additions to the constructions and arrangements described herein are also considered as falling within the ambit and scope of the present invention.

**CLAIMS**

1. A vehicle mudflap for mounting behind a vehicle wheel, characterised by a substantially flexible skirt carrying a facing layer of tufted synthetic grass, said facing layer covering at least a portion of said skirt.
- 5 2. A vehicle mudflap according to claim 1, characterised in that said facing layer is mounted on a backing material attached to said skirt.
3. A vehicle mudflap according to claim 2, characterised in that said synthetic grass tufts each comprise a bundle of relatively long ribbon-like filaments.
- 10 4. A vehicle mudflap according to claim 3, characterised in that said tufts are arranged in the form of a spaced array.
5. A vehicle mudflap according to claim 4, characterised in that said tufts project at least 10 mm from said backing material.
6. A vehicle mudflap according to claim 5, characterised in that said tufts project at least 15 mm from said backing material.
- 15 7. A vehicle mudflap according to claim 5, characterised in that said backing material is formed from a flexible woven polypropylene material.
8. A vehicle mudflap according to claim 7, characterised in that said tufts are project through apertures in said backing material in a U-shaped profile.
9. A vehicle mudflap according to claim 8, characterised in that said backing material is adhered to said skirt by a backing adhesive.
- 20 10. A vehicle mudflap according to claim 9, characterised in that the backing adhesive is selected from neoprene-based adhesives, rubber latex adhesives and SBR rubber based adhesives.
- 25 11. A vehicle mudflap according to claim 9, characterised in that said bundles of filaments are formed from polypropylene.

12. A vehicle mudflap according to claim 11, characterised in that said facing layer covers substantially an entire face of said skirt.
- 5 13. A method of forming a vehicle mudflap, characterised by coating a substantially flexible skirt with an adhesive, pressing a backing material carrying a layer of tufted synthetic grass against a face of the skirt, the free ends of the synthetic grass layer projecting outwardly, and air-drying to bind the backing material to the skirt, to form a vehicle mudflap.
- 10 14. A vehicle mudflap for mounting behind a vehicle wheel, characterised by a substantially flexible skirt carrying a facing layer of tufted synthetic grass attached to a flexible woven backing material adhered to said skirt, the free ends of the tufted synthetic grass layer projecting outwardly, the tufts extending from 10 - 30 mm from the backing material, said synthetic grass layer covering substantially an entire face of said skirt.
- 15 15. A vehicle mudflap for mounting behind a vehicle wheel, characterised by a substantially flexible skirt carrying a facing layer of resiliently flexible spaced tufts of relatively long synthetic grass embedded in a flexible woven polypropylene backing material adhered directly to a face of said skirt, the tufts extending at least 10 mm from the backing material, said synthetic grass layer covering substantially an entire face of said skirt.

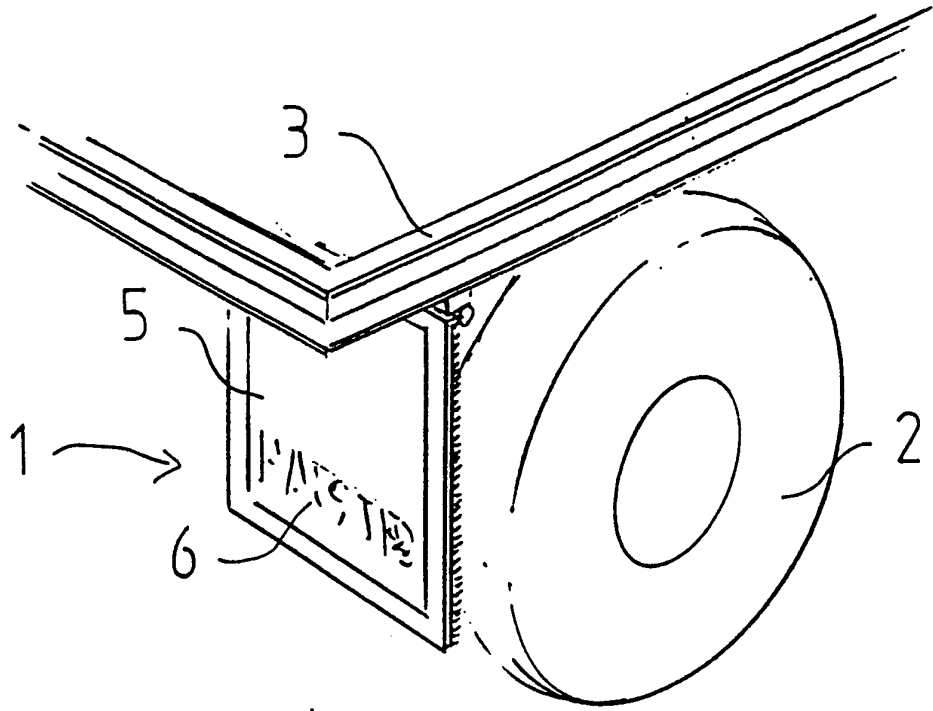


FIG. 1

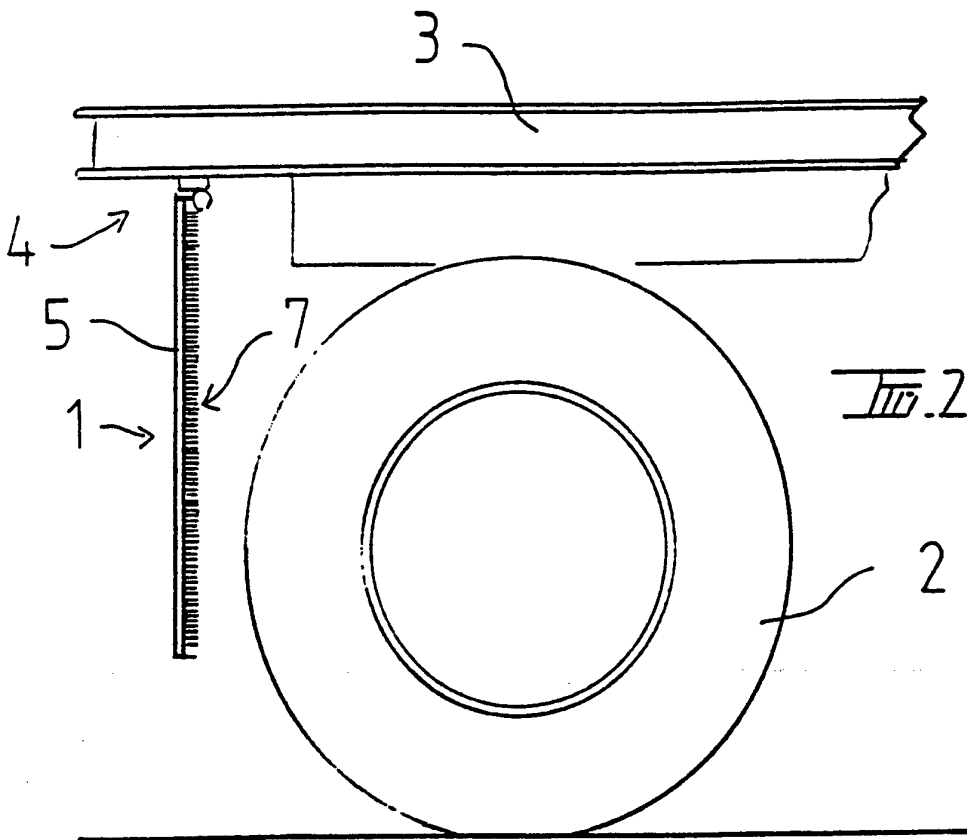


FIG. 2

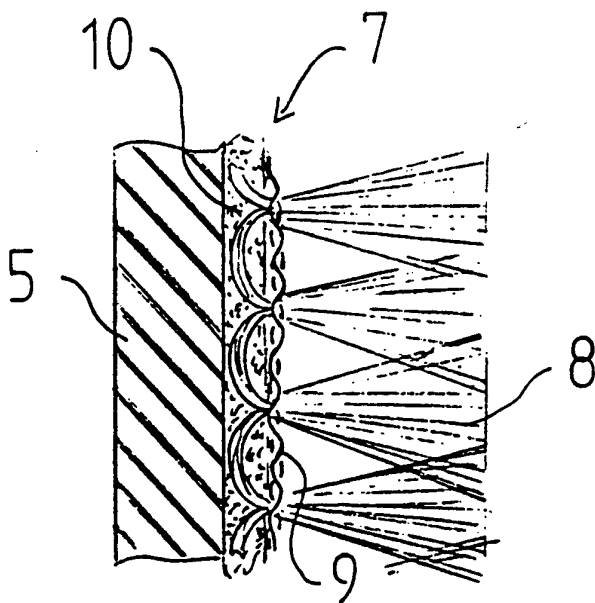


FIG. 3.

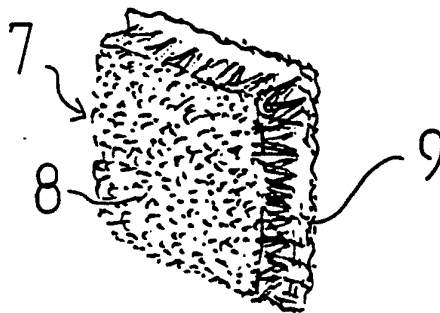


FIG. 4.

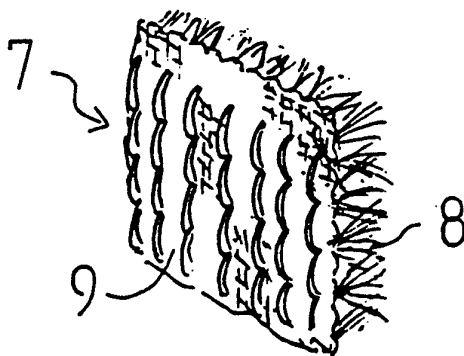
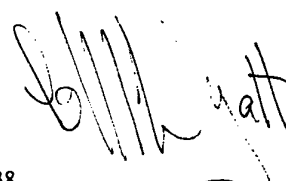


FIG. 5.

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/AU 94/00089

<p><b>A. CLASSIFICATION OF SUBJECT MATTER</b>                  Int. Cl.<sup>5</sup> B62D 25/16, 25/18</p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>																	
<p><b>B. FIELDS SEARCHED</b></p> <p>Minimum documentation searched (classification system followed by classification symbols)                  IPC: B62D 25/16, 25/18</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched                  AU: IPC as above</p> <p>Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)                  DERWENT</p>																	
<p><b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b></p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to Claim No.</th> </tr> </thead> <tbody> <tr> <td>X, Y</td> <td>US,A,3899192 (REDDAWAY) 12 August 1975 (12.08.75) whole document pertinent; notably column 4, lines 33-37 and Fig. 3</td> <td>1-15</td> </tr> <tr> <td>X, Y</td> <td>GB,A,2126181 (WOLF) 21 March 1984 (21.03.84) page 1, lines 85-110 and Fig. 2</td> <td>1-7,14-15</td> </tr> <tr> <td>X, Y</td> <td>US,A,4391870 (ELLIS) 5 July 1983 (05.07.83) column 2, lines 7-47</td> <td>1-15</td> </tr> <tr> <td>X, Y</td> <td>EP,A,204681 (MONSANTO COMPANY) 10 December 1986 (10.12.86) page 4, line 1 - page 6, line 18</td> <td>1-15</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.	X, Y	US,A,3899192 (REDDAWAY) 12 August 1975 (12.08.75) whole document pertinent; notably column 4, lines 33-37 and Fig. 3	1-15	X, Y	GB,A,2126181 (WOLF) 21 March 1984 (21.03.84) page 1, lines 85-110 and Fig. 2	1-7,14-15	X, Y	US,A,4391870 (ELLIS) 5 July 1983 (05.07.83) column 2, lines 7-47	1-15	X, Y	EP,A,204681 (MONSANTO COMPANY) 10 December 1986 (10.12.86) page 4, line 1 - page 6, line 18	1-15
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<p>Date of the actual completion of the international search                  17 May 1995 (17.05.95)</p>		<p>Date of mailing of the international search report                  23 May 1994 (23.05.94)</p>															
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
X, Y	US,A,4598000 (MANTARRO) 1 July 1986 (01.07.86) column 2, line 57 - column 5, line 28 and Figs. 1-3	1-15
X, Y	US,A,4361606 (BUTLER et al) 30 November 1982 (30.11.82) column 3, line 12 - column 4, line 5 and Fig. 2	1-6
X	WO,A,93/01963 (FORBOPOLI GRAS GmbH) 4 February 1993 (04.02.93) Figs. 1 and 2	1-6

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian 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		Patent Family Member					
US	3899192	CA	1022213				
US	4391870	AU	13087/83	CA	1208113	DK	1460/83
		EP	91419	ES	521161	FI	831119
		JP	58191155	NO	831187	ZA	8302403
		US	4439483				
EP	204681	CA	1275032	JP	61278474		
WO	93/0193	CA	2114126	EP	595947		
<b>END OF ANNEX</b>							