

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property

Organization

International Bureau

(43) International Publication Date

30 April 2020 (30.04.2020)



(10) International Publication Number

WO 2020/083681 A1

(51) International Patent Classification:

B29C 73/18 (2006.01) *B60C 19/12* (2006.01)
B29C 73/10 (2006.01) *C09J 7/00* (2018.01)
B29D 30/06 (2006.01)

Published:

— with international search report (Art. 21(3))

(21) International Application Number:

PCT/EP2019/077696

(22) International Filing Date:

14 October 2019 (14.10.2019)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

102018000009657 22 October 2018 (22.10.2018) IT

(71) Applicant: **BRIDGESTONE EUROPE NV/SA** [BE/BE];

KLEINE KLOOSTERSTRAAT 10, 1932 ZAVENTEM (BE).

(72) Inventors: **PEZZULLO, Giuseppe**; Bridgestone Europe

NV/SA - Italian Branch Via del Fosso del Salceto 13/15, 00128 Roma (IT). **BOTTI, Francesco**; Bridgestone Europe NV/SA - Italian Branch Via del Fosso del Salceto 13/15, 00128 Roma (IT).

(74) Agent: **MARCHETTI, Alessio**; Bridgestone Europe NV/

SA - Italian Branch, Via Fosso del Salceto 13/15, 00128 Rome (IT).

(81) Designated States (*unless otherwise indicated, for every*

kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every*

kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) Title: SEALANT LAYER ASSEMBLY

(57) Abstract: A sealant layer assembly which allows a sealant layer to be applied on a tyre outside of tyre production plants. The assembly comprises a sealant layer to be applied on the surface of an inner liner layer facing the inner cavity of a tyre, a net layer arranged on a first surface of the sealant layer, and at least one non-stick protective layer arranged either on a second surface of the sealant layer opposite the first surface or on the net layer.



WO 2020/083681 A1

"SEALANT LAYER ASSEMBLY"**DESCRIPTION**

The invention relates to a sealant layer assembly to allow the sealant layer be applied outside of the tyre production line. In this way, a sealant layer can be applied at the premises of tyre dealers and also on any type of tyre requested by customers, hence without being linked to production limits.

In the tyre manufacturing industry, the use of a viscous sealant layer generally arranged in the inner cavity of the tyre has been known for a long time. In particular, the sealant layer is arranged in contact with the inner liner layer, in the area of the tread band.

The function of the sealant layer is that of creating a sort of instantaneous "seal" around the object that penetrated the tread, thus preventing air from flowing out of the tyre. Furthermore, in case the aforesaid object comes out, the material of the sealant layer has the function of filling the hole left by the object, hence sealing it.

The viscosity of the sealant layer is one of the most important parameters that allow it to effectively carry out the tasks described above. Indeed, the viscosity of the sealant layer must be such as to ensure both the sealing action to be exerted upon the object that penetrated the

tread and the hole left by the object itself in a very short time, as discussed above, and its dimensional stability in the inner cavity of the tyre during the rolling phase or the standing phase of the tyre. Because of its function, the sealant layer is particularly sticky and has low viscosity and, for this reason, hard to be handled when it is separate from the tyre. This is why generally the sealant layer, is applied directly on the surface of the inner liner, typically in the tyre production line. Owing to the above, limited line-up applying a sealant layer is available on the market for the end user. Furthermore, the adhesion forming between the sealant layer and the inner liner makes it difficult for the sealant layer to be removed from the tyre at the end of the life of the sealant layer itself.

Therefore, the need was felt to find a solution capable of allowing the sealant layer to be applied to the tyre also by a tyre dealer or by an end user, whatever the selected brand and model.

By so doing, end users can be sure that a sealant layer will be available in any tyre they choose, hence without being limited by the choices made by manufacturers.

The subject of the invention is a sealant layer assembly which allows a sealant layer to be applied on an inner cavity of a tyre on the outside of tyre production plants; said assembly comprises: (i) a sealant layer to be applied with its first surface on the surface of an inner liner layer

facing the inner cavity of a tyre and made up of a rubber layer whose viscosity is such as to create an instantaneous "seal" around an object that penetrated a tread or closing the hole left by the object, (ii) a net layer arranged on said first surface of the sealant layer to be, in use, interposed between the sealant layer and the surface of the inner liner layer facing the inner cavity of the tyre, and (iii) one non-stick protective layer arranged on said net layer; said net layer having meshes each of which has an area ranging from 0.25 mm² to 25 mm².

It has been experimentally proven that this range of meshes area allows both an effective sealing action of the sealant layer and an effective removal action of the sealant layer by pulling away the net layer.

Hereinafter, sealant layer means a rubber layer to be arranged on the surface of the inner liner facing the inner cavity and whose viscosity is such as to create an instantaneous "seal" around the object that penetrated the tread, thus preventing air from flowing out of the tyre or closing the hole left by the object.

Preferably, said assembly comprises a second non-stick protection layer, arranged on a second surface of the sealant layer.

Preferably, the net layer is made of a synthetic or natural polymer material.

Preferably, the net layer is made of a material comprised in the group consisting of polyethylene, polypropylene, polyethylene terephthalate, nylon, Kevlar®, and Rayon.

Preferably, the sealant layer has a thickness ranging from 2 to 5 mm.

Preferably, the non-stick protective layer is a one-sided silicone paper.

Preferably, the protective layer is made of a material chosen in the group consisting of paper, metal film and plastic film on which a surface treatment has carried out; said surface treatment being carried out by a material chosen in the group consisting of silicon, paraffin, fluoropolymers, polyethylene.

Below are some explanatory, non-limiting examples.

A compound was prepared in order to manufacture a sealant layer, whose phr composition is shown in Table I.

TABLE I

Halobutyl rubber	100.0
Carbon black	40.0
Plasticizer	240.00
Sulphur	0.5
Stearic acid	1.5
Zinc oxide	1.0
Accelerator	4.0

The halobutyl rubber is a bromobutyl rubber.

The type of carbon black used is identified with N550.

The plasticizer used is naphthenic oil.

The accelerator used is dibenzothiazyl disulfide (MBTS).

The ingredients indicated in Table I were mixed with one another and stirred at a temperature of 100°C for 10 minutes.

Manufacturing procedure:

According to a non-limiting embodiment, the assembly manufacturing procedure involved a first coupling step to couple a net layer and a non-stick protective paper to one another and, subsequently, a second coupling step, during which a sealant layer is applied to the net layer already coupled to the non-stick protective paper. The process took place at a temperature of 85°C. Preferably, the process must take place at a temperature ranging from 60 to 110°C.

In order to avoid a change of shape of the layer of sealant material (elastic shrinkage or viscous flow phenomena), the temperature was quickly reduced to -5 °C. Preferably, during this step, the temperature is reduced below 10°C and, more preferably, below 0°C, so as to get close to the Tg of the sealant material.

In the example described herein, the net layer used is made of polypropylene, whose meshes have the shape of a rhombus with an area of 9 mm².

In the example described herein, the non-stick

protective layer is a one-sided silicone paper with a 135g basis weight produced by "Rossella s.r.l."

After having been manufactured as described above, the assembly was wound so as to form a roll and then stored.

Should manufacturers want to produce and store the assembly in the form of already packed strips with a predetermined length, a further non-stick protective layer must be applied on the sealant layer surface opposite the one where the mesh layer is applied.

Application procedure:

The assembly according to the invention will then be applied on a tyre according to the procedure described below:

A strip with suitable dimensions is cut out of the assembly preserved at a low temperature. The strip is heated until it reaches a temperature ranging from 40°C to 80°C (preferably 50°C). Preferably, the heating is obtained by means of an IR radiation (1000 W arranged at a 1 m distance for 20 min), so as to obtain a merely superficial heating, or by means of an oven at 50°C for 10 minutes.

After the material has been heated up, the non-stick protective layer under the net layer must be removed and material strip must be applied in the desired position on the inner liner (net layer arranged in contact with the inner liner) applying pressure to ensure the adhesion. At this point, the protective layer arranged on the sealant layer is removed as well, if present. At the end of the sealant layer

application procedure, the tyre is fitted on the rim and inflated up to the operating pressure.

The net layer, for it does not adhere to the inner liner or adheres to it to a smaller extent compared to the sealant layer, can be more easily removed and, by pulling it away from the inner liner, ensures an easier removal of the sealant layer. Therefore, upon disposal of the tyre, it is sufficient to make a cut in the sealant layer so as to expose the net layer and, hence, remove it together with the sealant layer.

CLAIMS

1. Sealant layer assembly which allows a sealant layer to be applied on an inner cavity of a tyre outside of tyre production plants; said assembly comprises: (i) a sealant layer to be applied with its first surface on the surface of an inner liner layer facing the inner cavity of a tyre and made up of a rubber layer whose viscosity is such as to create an instantaneous "seal" around an object that penetrated a tread or closing the hole left by the object, (ii) a net layer arranged on said first surface of the sealant layer to be, in use, interposed between the sealant layer and the surface of the inner liner layer facing the inner cavity of a tyre, and (iii) one non-stick protective layer arranged on said net layer; said net layer having meshes each of which has an area ranging from 0.25 mm² to 25 mm².

2. An assembly according to claim 1, characterized in that it comprises a second non-stick protection layer arranged on a second surface of the sealant layer.

3. An assembly according to one of the preceding claims, characterized in that the net layer is made of a synthetic or natural polymer material.

4. An assembly according to claim 1, characterized in that the net layer is made of a material comprised in the group consisting of polyethylene, polypropylene,

polyethylene terephthalate, nylon, Kevlar®, and Rayon.

5. An assembly according to one of the preceding claims, characterized in that said sealant layer has a thickness ranging from 2 to 5 mm.

6. An assembly according to one of the preceding claims, characterized in that said non-stick protective layer is a one-sided silicone paper.

7. An assembly according to one of the preceding claims, characterized in that said non-stick protective layer is made of a material chosen in the group consisting of paper, metal film and plastic film on which a surface treatment has carried out; said surface treatment being carried out by a material chosen in the group consisting of silicon, paraffin, fluoropolymers, polyethylene.

8. Method for producing an assembly according one of the previous claims, comprising a first coupling step wherein a net layer and a non-stick protective layer are coupled to one another and, subsequently, a second coupling step, wherein a sealant layer is applied to the net layer already coupled to the non-stick protective paper; said second coupling step being carried out at a temperature ranging from 60 to 110°C.

9. Method according to claim 8, characterized in that after said second coupling step the temperature is quickly reduced below 10°C.

10. Method according to claim 8, characterized in that

after said second coupling step the temperature is quickly reduced below 0°C.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/077696

A. CLASSIFICATION OF SUBJECT MATTER
INV. B29C73/18 B29C73/10 B29D30/06 B60C19/12 C09J7/00
ADD.
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)
B29C B29L B29D B60C C08J C09J
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 practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 3 260 296 A (SPRINGER CLAXTON SHERRY) 12 July 1966 (1966-07-12) column 1, line 9 - line 12 column 1, line 44 - line 47 column 2, line 65 - column 3, line 75 figures 2-4 -----	1,2,5-7 3,4 8-10
X Y	US 2 012 935 A (SMITH HAROLD W ET AL) 27 August 1935 (1935-08-27) page 1, column 1, line 1 - line 4 page 1, column 2, line 20 - page 2, column 1, line 40 figures 1,2 -----	1,2,5-7 3,4
A	US 3 282 319 A (BARNETT ERNEST E) 1 November 1966 (1966-11-01) column 2, line 65 - column 3, line 27 figures 8,11 -----	1-10
	-/--	

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "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)
- "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 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

"&" document member of the same patent family

Date of the actual completion of the international search 14 January 2020	Date of mailing of the international search report 21/01/2020
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Ullrich, Klaus

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/077696

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2011/052852 A1 (SAMANTA SUSNATA [US] ET AL) 3 March 2011 (2011-03-03) paragraphs [0008], [0011], [0012], [0025], [0027], [0031], [0032] figure 1 -----	1-10
Y	US 2010/258229 A1 (COLBY E BRUCE [US] ET AL) 14 October 2010 (2010-10-14) paragraph [0040] -----	3,4

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/EP2019/077696

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3260296	A	12-07-1966	NONE

US 2012935	A	27-08-1935	NONE

US 3282319	A	01-11-1966	NONE

US 2011052852	A1	03-03-2011	US 2011052852 A1 03-03-2011
			WO 2011025554 A1 03-03-2011

US 2010258229	A1	14-10-2010	BR PI0722230 A2 03-06-2014
			EP 2225095 A1 08-09-2010
			US 2010258229 A1 14-10-2010
			WO 2009070165 A1 04-06-2009
